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MINERALS YEARBOOK

1956

Volume III of Three Volumes

AREA REPORTS

Prepared by the field staff of the

BUREAU OF MINES

REGIONAL DIVISIONS OF MINERAL INDUSTRIES

UNITED STATES DEPARTMENT OF THE INTERIOR

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FOREWORD

MINERALS YEARBOOK, 1956, published in three volumes provides a record of performance of the Nation's minerals industry during the year, with enough background information to interpret the year's developments.

Volume I includes chapters on metal and nonmetal mineral commodities, with the exception of the mineral fuels. Included also are a chapter reviewing these mineral industries, a statistical summary, and chapters on mining technology, metallurgical technology, and employment and injuries.

Volume II includes chapters on each mineral fuel, an employment and injuries presentation, and a mineral-fuels review chapter that summarizes developments in the fuel industries and incorporates all data previously published in the Statistical Summary chapter. Also now included in this review chapter are data on energy production and uses that have previously been included in the Bituminous Coal chapter.

Volume III is comprised of chapters covering each of the 48 States, plus chapters on the Territory of Alaska, the Territory of Hawaii and island possessions in the Pacific Ocean, and the Commonwealth of Puerto Rico and island possessions in the Caribbean Sea, including the Canal Zone. Volume III also has a Statistical Summary chapter, identical with that in Volume I, and another presenting employment and injury data.

The data in the Minerals Yearbook are based largely upon information supplied by mineral producers, processors, and users, and acknowledgment is made of this indispensable cooperation given by industry. Information obtained from individuals by means of confidential surveys has been grouped to provide statistical aggregates. Data on individual producers are presented only if available from published or other nonconfidential sources, or when permission of the individuals concerned has been granted.

MARLING J. ANKENY, *Director.*

ACKNOWLEDGMENTS

In preparing this volume of the MINERALS YEARBOOK, the Bureau of Mines was assisted in collecting statistical data and mineral-industry information by State and Territorial agencies, through cooperative agreements. Many State chapters were reviewed by staff members of these agencies, and in some instances the staff members collaborated in preparing the chapters and are shown as coauthors. For this assistance, acknowledgment is made to the following cooperating State and Territorial organizations:

Alabama: Geological Survey of Alabama.
Alaska: Alaska Department of Mines.
Arkansas: Division of Geology.
California: Division of Mines.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Georgia: Department of Mines, Mining, and Geology.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Department of Conservation.
Iowa: Iowa Geological Survey.
Kansas: State Geological Survey of Kansas.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.
Maine: Department of Development of Industry and Commerce.
Maryland: Department of Geology, Mines, and Water Resources.
Michigan: Michigan Department of Conservation.
Mississippi: Mississippi Geological Survey.
Missouri: Division of Geological Survey and Water Resources.
Montana: Montana Bureau of Mines and Geology.
Nevada: Nevada Bureau of Mines.
New Hampshire: New Hampshire State Planning and Development Commission.
New Jersey: Bureau of Geology and Topography.
New York: State Geological and Natural History Surveys.
North Carolina: Division of Mineral Resources.
North Dakota: North Dakota Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Oregon: State Department of Geology and Mineral Industries.
Pennsylvania: Bureau of Topographic and Geological Survey.
Puerto Rico: Mineralogy and Geology Section, Economic Development Administration, Puerto Rico.
South Carolina: Department of Geology, Mineralogy and Geography.
South Dakota: State Geological Survey.
Tennessee: Tennessee Department of Conservation.
Texas: Bureau of Economic Geology, The University of Texas.
Utah: Utah Geological and Mineralogical Survey.
Virginia: Virginia Geological Survey.
Washington: Department of Conservation and Development.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological Survey.
Wyoming: Geological Survey of Wyoming.

Except for the two review chapters, this volume was prepared by the field staffs of the five Divisions of Mineral Industries. The following supervised preparation of the chapters: Albert J. Kauffman,

Jr., chief, Division of Mineral Industries, Region I, Albany, Oreg.; Alvin Kaufman, chief, Field Office, Region I, Juneau, Alaska; R. B. Maurer, chief, Division of Mineral Industries, Region II, San Francisco, Calif.; Alfred L. Ransome, chief, Division of Mineral Industries, Region III, Denver, Colo.; Robert S. Sanford, chief, Division of Mineral Industries, Region IV, Bartlesville, Okla.; Robert D. Thomson, acting chief, Division of Mineral Industries, Region V, Pittsburgh, Pa.; Samuel A. Gustavson, chief, Field Office, Region V, Minneapolis, Minn.; and Avery H. Reed, Jr., chief, Field Office, Region V, Knoxville, Tenn. Preparation of this volume was supervised and the chapters coordinated with those in volumes I and II by Paul Yopes, assistant to the chief, Division of Minerals.

Statisticians and researchers in the Division of Mineral Industries who gave substantial assistance to the authors of the chapters were: In Region I, May G. Downey, Ruth Robotham, and Clara M. Hutcheson; in Region III, Stella K. Drake and Mary Jelliffe; in Region IV, Lovenia M. Edwards, Rosalie M. Miller, Geraldine M. Wright, and Darwina V. Goodchief; in Region V, Dorothy O. Stearns, Roy H. Davis, Eunice M. Garner, Ruth C. Melby, Richard J. Bishop, and Wanda J. Peterson.

The manuscripts upon which this volume is based have been reviewed to insure statistical consistency among the tables, figures, and text, between this volume and volumes I and II and between this volume and those for former years, by a staff under the direct supervision of Kathleen J. D'Amico, assisted by Julia Muscal, Hope R. Anderson, Helen L. Gealy, Ruby J. Phillips, Anita C. Going, Helen E. Tice, Fairy L. McClendon, and Anne C. Rogers.

Minerals Yearbook compilations are based largely on data provided by the mineral industries. Acknowledgment is made of the willing contribution both by companies and individuals of these essential data.

CHARLES W. MERRILL,
Chief, Division of Minerals.

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Statistical Summary of Mineral Production

By Kathleen J. D'Amico [1]

THIS SUMMARY is identical to the summary given in volume III of this series of mineral production in the United States (including Alaska and Hawaii), its island possessions, the Canal Zone, and the Commonwealth of Puerto Rico and of the principal minerals imported into and exported from the United States. For further details on production see commodity and area chapters. A summary table comparing world and United States mineral production also is included.

Mineral production may be measured at any of several stages of extraction and processing. The stage of measurement used in the chapter is normally what is termed "mine output." It usually refers

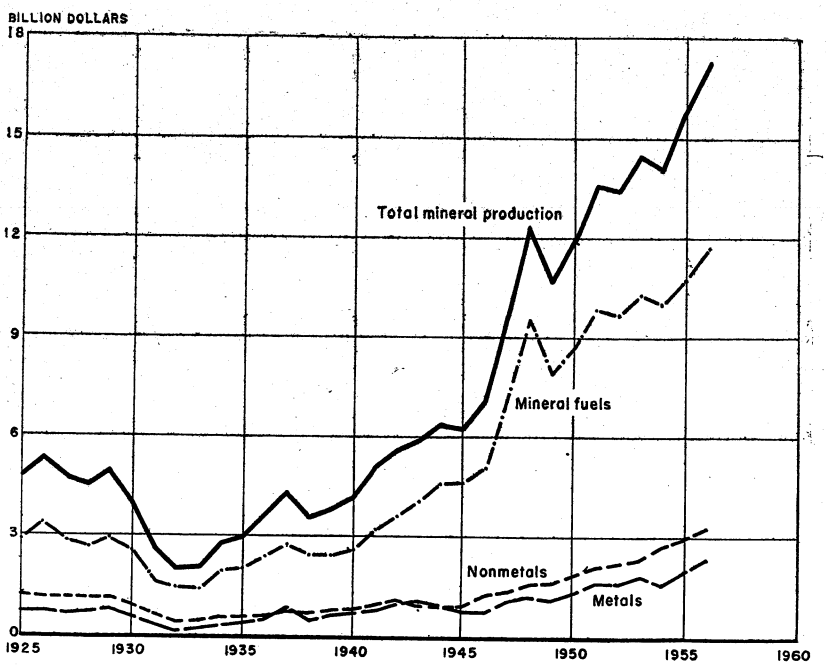

FIGURE 1.—Value of mineral production in the United States, 1925–56.

[1] Publications editor.

to minerals in the form in which they are first extracted from the ground but customarily included, for some minerals, the product of auxiliary processing operations at or near mines.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. The quantities of gold, silver, copper, lead, zinc, and tin are recorded on a mine basis—that is, as the recoverable content of ore sold or treated; the values assigned to these quantities, however, are based on the average selling price of refined metal, not the mine value. Mercury is measured in the form of recovered metal and valued at the average New York price for metal.

Data for clays and limestone, 1954–56 include output used in making cement and lime. Mineral-production totals have been adjusted to eliminate duplication of these values.

The weight or volume units shown are those customary in the particular industries producing the respective commodities. No adjustment has been made in the dollar values for changes in the purchasing power of the dollar.

TABLE 1.—Value of mineral production in continental United States, 1925–56, by mineral groups [1]

(Million dollars)

Year	Mineral fuels	Non-metals (except fuels)	Metals	Total	Year	Mineral fuels	Non-metals (except fuels)	Metals	Total
1925	2,910	1,187	715	4,812	1941	3,228	989	890	5,107
1926	3,371	1,219	721	5,311	1942	3,568	1,056	999	5,623
1927	2,875	1,201	622	4,698	1943	4,028	916	987	5,931
1928	2,666	1,163	655	4,484	1944	4,574	836	900	6,310
1929	2,940	1,166	802	4,908	1945	4,569	888	774	6,231
1930	2,500	973	507	3,980	1946	5,090	1,243	729	7,062
1931	1,620	671	287	2,578	1947	7,188	1,338	1,084	9,610
1932	1,460	412	128	2,000	1948	9,502	1,552	1,219	12,273
1933	1,413	432	205	2,050	1949	7,920	1,559	1,101	10,580
1934	1,947	520	277	2,744	1950	8,689	1,822	1,351	11,862
1935	2,013	564	365	2,942	1951	9,779	2,079	1,671	13,529
1936	2,405	685	516	3,606	1952	9,616	2,163	1,617	13,396
1937	2,798	711	756	4,265	1953 [2]	10,257	2,350	1,811	14,418
1938	2,436	622	460	3,518	1954 [2]	9,919	[3] 2,629	1,518	14,066
1939	2,423	754	631	3,808	1955 [2]	10,780	[3] 2,969	2,055	15,804
1940	2,662	784	752	4,198	1956 [2]	11,708	[3] 3,276	2,362	17,346

[1] Data for 1925–46 are not strictly comparable with those for subsequent years, since for the earlier years the value of heavy clay products has not been replaced by the value of raw clays used for such products.
[2] Includes Alaska and Hawaii.
[3] The total has been adjusted to eliminate duplicating the value of clays and stone.

TABLE 2.—Mineral production [1] in the United States,[2] 1953–56

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
MINERAL FUELS								
Asphalt and related bitumens (native):								
Bituminous limestone and sandstone	1,440,544	4,349	1,337,822	3,686	1,427,207	4,111	1,458,533	4,114
Gilsonite	60,505	2,184	75,943	2,724	82,822	3,117	89,003	3,822
Carbon dioxide, natural (estimated) thousand cubic feet	670,600	203	638,900	211	702,417	234	713,030	235
Coal:								
Bituminous [3] thousand short tons	454,439	2,241,150	387,463	1,759,290	464,638	2,092,383	500,874	2,412,004
Lignite do	2,851	6,794	4,243	10,330				
Pennsylvania anthracite do	30,949	299,140	29,083	247,870	26,205	206,097	28,900	236,785
Helium thousand cubic feet	157,652	2,103	189,873	3,202	235,868	3,881	266,937	4,413
Natural gas million cubic feet	8,396,916	774,966	8,742,546	882,501	9,405,351	978,357	10,081,923	1,083,812
Natural-gas liquids:								
Natural gasoline and cycle products thousand gallons	5,327,448	406,242	5,385,282	402,418	5,844,904	423,775	5,807,100	431,958
LP-gases do	4,692,870	191,598	5,204,304	178,994	5,972,698	195,231	6,487,413	265,185
Peat	204,209	1,618	244,163	2,258	273,669	2,283	292,097	2,460
Petroleum (crude) thousand 42-gallon barrels	2,357,082	6,327,100	2,314,988	6,424,930	2,484,428	6,870,380	2,617,283	7,262,925
Total mineral fuels		10,257,000		9,919,000		10,780,000		11,708,000
NONMETALS (EXCEPT FUELS)								
Abrasive stone: [4]								
Grindstones and pulpstones	2,499	170	2,218	164	2,799	196	(5)	(5)
Millstones	(5)	18	(5)	(5)	(5)	(5)	(5)	4
Pebbles (grinding)	2,472	81	3,070	99	2,130	68	2,330	71
Tube-mill liners (natural)	1,219	69	933	59	(5)	(5)	1,061	74
Asbestos	54,456	4,857	47,621	4,698	44,568	4,487	41,312	4,742
Barite	944,212	9,436	883,283	8,508	1,108,103	10,809	1,299,888	13,498
Boron minerals	715,228	17,668	790,449	26,714	924,496	33,816	944,950	39,592
Bromine thousand pounds	164,143	35,372	187,399	41,313	184,454	39,856	196,730	47,434
Cement thousand 376-pound barrels	260,697	698,268	274,703	763,413	306,128	884,381	321,295	989,233
Clays thousand short tons	42,299	125,025	42,497	123,165	48,106	139,540	r 50,149	r 157,329
Emery	10,562	144	9,758	132	10,735	151	12,153	174
Epsom salts from epsomite	200	8	(5)	(5)	100	5	(5)	(5)
Feldspar long tons	452,600	4,594	411,018	3,490	465,378	3,801	622,429	5,764
Fluorspar	318,036	15,737	245,628	12,333	279,540	12,590	329,719	14,257
Garnet (abrasive)	10,520	989	14,183	971	11,835	1,191	9,812	1,073
Gem stones (estimated)	(6)	502	(6)	613	(6)	818	(5)	925
Graphite	6,281	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Gypsum	8,292,876	23,175	8,995,960	27,384	10,683,733	33,938	10,316,483	34,099

See footnotes at end of table.

TABLE 2.—Mineral production [1] in the United States,[2] 1953–56—Continued

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
NONMETALS (EXCEPT FUELS)—continued								
Iron oxide pigment materials (crude)			16,259	129	16,190	157	15,362	156
Lime	9,666,845	112,001	8,620,735	101,525	10,469,536	126,890	10,567,252	135,532
Magnesite	553,147	3,224	284,015	1,391	486,088	2,713	686,569	2,502
Magnesium compounds from sea water and brines (except for metals)—M_gO equivalent	136,824	10,460	113,774	9,469	155,779	12,704	169,019	13,668
Marl:								
Calcareous (except for cement)	277,354	173	206,257	152	183,044	128	285,653	215
Greensand	6,821	193	2,838	199	5,704	218	(5)	(5)
Mica:								
Scrap	73,259	1,824	81,073	1,734	95,432	2,058	86,309	1,850
Sheet—pounds	1,068,706	2,154	668,788	2,393	642,113	3,370	887,871	2,747
Perlite	198,751	1,440	219,703	1,762	286,157	2,282	310,800	2,550
Phosphate rock—thousand long tons	12,504	76,632	13,821	86,669	12,265	75,379	15,747	97,922
Potassium salts—K_2O equivalent	1,731,607	65,403	1,918,157	71,819	[8] 2,005,863	[8] 76,176	2,103,347	79,751
Pumice	1,338,206	2,510	1,647,397	2,974	1,804,488	3,369	1,482,214	4,750
Pyrites—long tons	922,647	5,006	908,715	7,159	[8] 1,006,943	[8] 8,391	1,069,904	9,743
Quartz from pegmatites and quartzite	245,755	1,384	(10)	(10)	(10)	(10)	(10)	(10)
Salt (common)—thousand short tons	21,013	78,146	20,926	105,487	22,693	123,257	24,206	136,139
Sand and gravel—do	440,086	374,451	556,160	503,293	[8] 591,683	[8] 535,510	624,697	595,101
Sand and sandstone (ground)	784,792	6,874	(11)	(11)	(11)	(11)	(11)	(11)
Slate	698,589	12,638	760,921	12,961	760,440	12,914	645,479	11,666
Sodium carbonate (natural)	419,206	10,627	527,282	13,536	613,594	15,001	652,891	17,400
Sodium sulfate (natural)	248,230	3,341	249,701	3,890	284,549	5,381	329,607	6,328
Stone [12]—thousand short tons	303,814	476,168	409,196	609,445	467,272	[8] 702,142	503,396	761,876
Strontium minerals (crude)	50	1	12	(13)	177	4	4,040	77
Sulfur:								
Frasch-process mines—long tons	5,224,202	141,054	5,328,040	142,014	5,839,300	163,156	5,675,913	150,356
Other mines—do	152,473	769	185,085	(5)	199,899	(5)	185,532	(5)
Sulfur, recovered elemental—do	315,019	8,059	399,950	11,209	458,021	12,585	503,314	14,241
Talc, pyrophyllite and soapstone	631,538	3,524	618,994	3,493	725,708	[8] 4,517	739,039	4,859
Titanium-iron concentrate (non-titanium use)	1,585	8	(5)	(5)	1,350	7		
Tripoli	36,183	1,139	41,625	1,459	47,362	213	45,009	203
Vermiculite	189,535	2,445	195,538	2,538	204,040	2,702	192,628	2,543
Value of items that cannot be disclosed: Aplite, brucite, calcium-magnesium chloride, certain clays, diatomite, iodine, kyanite, lithium minerals, olivine, sharpening stones, wollastonite, and values indicated by footnote 5. Excludes value of clays used for cement (1953)		12,475		22,580		30,805		40,778
Total nonmetallic minerals		2,350,000		[14] 2,629,000		[14] 2,969,000		[14] 3,276,000

METALS									
Antimony ore and concentrate	antimony content	2,161	(15)	766	(15)	633	(15)	590	(15)
Bauxite	long tons, dried equivalent	1,579,739	13,439	1,994,896	16,403	1,788,341	14,543	1,743,344	13,973
Beryllium concentrate	gross weight	751	355	669	304	500	268	460	237
Chromite	do	58,817	3,433	163	7,164	153,253	6,644	[16] 207,662	[16] 8,715
Cobalt (content of concentrate)	pounds	1,775,489	(15)	2,219,396	(15)	2,438,546	(15)	3,657,491	3,462
Columbium-tantalum concentrate	do	14,867	30	32,829	57	12,954	22	216,606	(15)
Copper (recoverable content of ores, etc.)		926,448	531,781	835,472	492,929	998,570	744,933	1,106,215	940,283
Gold (recoverable content of ores, etc.)	troy ounces	1,958,293	68,540	1,837,310	64,306	1,880,142	65,805	1,831,765	64,112
Iron ore, usable (excluding byproduct iron sinter)	thousand long tons, gross weight	117,198	790,491	76,126	525,818	105,237	748,602	[8] 96,730	[9] 747,665
Lead (recoverable content of ores, etc.)		342,644	89,773	325,419	89,165	338,025	100,731	352,826	110,787
Manganese ore (35 percent or more Mn)	gross weight	157,536	12,480	206,128	15,176	287,254	21,651	344,735	26,990
Manganiferous ore (5 to 35 percent Mn)	do	1,239,390	6,947	558,332	3,079	911,636	5,128	680,651	3,984
Manganiferous residuum	do	293,758	(15)	214,931	(15)	213,370	(15)	130,129	(15)
Mercury	76-pound flasks	14,337	2,767	18,543	4,903	18,955	5,504	24,177	6,284
Molybdenum (content of concentrate)	thousand pounds	53,823	52,362	64,021	64,070	64,709	66,919	57,126	72,012
Nickel (content of ore and concentrate)		11	(15)	14	(15)	4,411	(15)	7,392	(15)
Silver (recoverable content of ores, etc.)	troy ounces	37,570,838	34,004	36,941,383	33,434	37,197,742	33,666	38,948,121	35,250
Titanium concentrate:									
Ilmenite	gross weight	512,176	7,223	531,895	7,375	573,192	10,268	735,388	14,199
Rutile	do	6,476	703	7,305	870	9,182	1,122	12,065	1,749
Tungsten ore and concentrate	60-percent WO_3 basis	9,590	35,944	13,691	51,433	16,412	60,841	14,737	51,201
Uranium ore		(17)	(17)	(17)	(17)	(17)	(17)	3,000,000	67,570
Vanadium	pounds	6,114,851	(15)	6,051,784	(15)	6,571,655	(15)	7,735,088	(15)
Zinc (recoverable content of ores, etc.)		547,430	125,321	473,471	102,180	514,671	126,609	542,340	148,503
Zirconium concentrate		21,234	794	17,959	820	28,913	1,426	(15)	(15)
Value of items that cannot be disclosed: Magnesium chloride for magnesium metal, platinum-group metals (crude), rare-earth metals concentrates, tin (1953–55), and values indicated by footnote 15			34,378		38,880		40,596		45,242
Total metals			1,811,000		1,518,000		2,055,000		2,362,000
Grand total mineral production			14,418,000		14,066,000		15,804,000		17,346,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Includes Alaska and Hawaii.
[3] Includes small quantity of anthracite mined in States other than Pennsylvania.
[4] Excludes sharpening stones, value for which is included with "Nonmetallic items that cannot be disclosed."
[5] Figure withheld to avoid disclosing individual company confidential data; value included with "Nonmetal items that cannot be disclosed."
[6] Weight not recorded.
[7] Excludes certain clays, value included with "Nonmetal items that cannot be disclosed."
[8] Final figure. Supersedes preliminary figure given in commodity chapter.
[9] Revised figure.
[10] Beginning with 1954, quartz from pegmatites and quartzite included with stone.
[11] Beginning with 1954, sand and sandstone (ground) included with sand and gravel or stone.
[12] Excludes abrasive stone, bituminous limestone, bituminous sandstone, and ground soapstone, all included elsewhere in table. Also excludes limestone for cement and lime in 1953.
[13] Less than $1,000.
[14] The total has been adjusted to eliminate duplication in the value of clays and stone.
[15] Figure withheld to avoid disclosing individual company confidential data, value included with "Metal items that cannot be disclosed."
[16] Includes 45,710 short tons of concentrate produced in 1955 and 1956 from low-grade ore and concentrate stockpiled near Coquille, Oreg. during World War II.
[17] Data not available.

TABLE 3.—Minerals produced in the United States,[1] by States, and principal producing States in 1956

State	Antimony	Aplite	Asbestos	Asphalt	Barite	Bauxite	Beryllium	Boron	Bromine	Brucite	Calcium magnesium chloride	Carbon dioxide	Cement	Chromite	Clays	Coal
Alabama				2		2							2		√	√
Alaska														4		√
Arizona			2												√	√
Arkansas					1	1	√						√		√	√
California			3		√		2	1	3		2	√	√	3	√	√
Colorado							√					2			√	
Connecticut															√	
Delaware															√	
Florida													√		√	
Georgia					4	3	√						√		4	√
Hawaii															√	
Idaho	1				√								√		√	
Illinois													√		√	4
Indiana													3		√	√
Iowa													√		√	√
Kansas													√		√	3
Kentucky				√									√		√	
Louisiana													√		√	
Maine							√						√		√	√
Maryland															√	
Massachusetts															√	
Michigan									2		1		4		√	
Minnesota													√		√	
Mississippi													√		√	
Missouri				√	2								√		√	√
Montana					√								√	1	√	√
Nebraska													√		√	
Nevada	2				3		4			1					√	
New Hampshire															√	
New Jersey															√	
New Mexico					√		3					1			√	√
New York													√		√	
North Carolina							√								√	√
North Dakota															√	√
Ohio												4	√		1	√
Oklahoma				4									√		√	√
Oregon												√		2	√	
Pennsylvania													1		2	2
Rhode Island																
South Carolina					√										√	
South Dakota							1						√		√	√
Tennessee					√								√		√	√
Texas				1					1				√		3	
Utah				3								3	√		√	√
Vermont			1												√	
Virginia		1					√						√		√	√
Washington												4	√	√	√	
West Virginia									4		3		√		√	1
Wisconsin															√	
Wyoming							√								√	√

[1] Includes Alaska and Hawaii.

TABLE 3.—Minerals produced in the United States,[1] by States, and principal producing States in 1956—Continued

State	Cobalt	Columbium-tantalum	Copper	Diatomite	Emery	Epsomite	Feldspar	Fluorspar	Garnet	Gem stones	Gold	Graphite	Gypsum	Helium	Iodine
Alabama															
Alaska										3	3		√		
Arizona			1				√								
Arkansas										√			√		
California			√	1			2			√	4		2		1
Colorado		√	√				3	3		√	√		√		
Connecticut							√								
Delaware															
Florida									3						
Georgia							√			√					
Hawaii															
Idaho	1	1	√						2	√	√				
Illinois								1							
Indiana													√		
Iowa													3		
Kansas													√	3	
Kentucky								√							
Louisiana													√		
Maine		2					√			√					
Maryland															
Massachusetts															
Michigan			√							√			1		
Minnesota										√					
Mississippi															
Missouri	2		√												
Montana			3					2		√	√		√		
Nebraska										√					
Nevada			4	2				4		√	√		√		
New Hampshire							√			√					
New Jersey										√					
New Mexico		4	√							√	√			2	
New York					1				1	√			√		
North Carolina			√				1			√	√				
North Dakota															
Ohio													√		
Oklahoma													√		
Oregon			√	3						1	√				
Pennsylvania	3		√							√	√				
Rhode Island												2			
South Carolina															
South Dakota		3					4			√	1		√		
Tennessee			√					√			√				
Texas							√			2		1	4	1	
Utah		2						√		√	2		√		
Vermont			√							√	√				
Virginia							√			√			√		
Washington			√	4		1				4	√		√		
West Virginia															
Wisconsin										√					
Wyoming			√				√			√	√		√		

[1] Includes Alaska and Hawaii.

TABLE 3.—Minerals produced in the United States,[1] by States, and principal producing States in 1956—Continued

State	Iron ore	Iron oxide pigments	Kyanite	Lead	Lime	Magnesite	Magnesium chloride	Magnesium compounds	Manganese	Mercury	Mica	Molybdenum	Natural gas	Natural-gas liquids	Nickel
Alabama	3				√						4		√		
Alaska				√	√					√					
Arizona				√	√				3	√		3	√		
Arkansas	√				√				4				√	√	
California	√			√	√	3		1	√	1	√	√	√	2	
Colorado	√			4							√	1	√	√	
Connecticut					√										
Delaware															
Florida					√								√		
Georgia	√	2							√		3				
Hawaii					√										
Idaho				2						3					
Illinois				√	4								√	√	3
Indiana					√								√		
Iowa					√										
Kansas				√									√	√	
Kentucky	√			√									√	√	
Louisiana					√								2	3	
Maine					√						√				
Maryland					√								√		
Massachusetts					√										
Michigan	2	1			√			2					√	√	
Minnesota	1	√			√				√						
Mississippi	√												√	√	
Missouri	√	√		1	2								√		2
Montana	√			√	√				2				√	√	
Nebraska													√	√	
Nevada	√			√	√	2			1	2		√			
New Hampshire											√				
New Jersey	√				√			3							
New Mexico	√			√	√			√	√		√	4	4	√	
New York	√	4		√	√								√		
North Carolina				√							1				
North Dakota															
Ohio					1								√	√	
Oklahoma				√	√								√	√	
Oregon	√	3		√						4			3	4	
Pennsylvania	√	√			3						√				1
Rhode Island															
South Carolina			2								2				
South Dakota	√				√						√				
Tennessee	√			√	√				√		√		√		
Texas	√				√		1	4		√			1	1	
Utah	4			3	√							2	√	√	
Vermont					√										
Virginia		√	1	√	√				√				√		
Washington	√			√	√	1									
West Virginia					√								√	√	
Wisconsin	√			√	√										
Wyoming	√												√	√	

[1] Includes Alaska and Hawaii.

TABLE 3.—Minerals produced in the United States,[1] by States, and principal producing States in 1956—Continued

State	Olivine	Peat	Perlite	Petroleum	Phosphate rock	Platinum-group metals	Potassium salts	Pumice	Pyrites	Rare-earth metals	Salt	Sand and gravel	Silver	Slate	Sodium carbonate
Alabama				√							√	√			
Alaska						1						√	√		
Arizona			4					3		√		√	4		
Arkansas				√								√		√	
California		√	√	2		2	2	1	3	4	√	1	√	√	2
Colorado		2	√					√	4	√	√	√	√		
Connecticut		√										√			
Delaware												√			
Florida		1		√	1					2		√			
Georgia		√										√		1	
Hawaii								√			√	√			
Idaho					3			4		3		√	1		
Illinois		√		√								3	√		
Indiana		√		√								√			
Iowa		4										√			
Kansas				√				√			√	√			
Kentucky				√								√	√		
Louisiana				3							4	√			
Maine		√										√		√	
Maryland							√					√			
Massachusetts		√										√			
Michigan		3		√			4				1	2	√		
Minnesota		√										√			
Mississippi				√								√			
Missouri				√								√	√		
Montana				√	4			√	√			√	2		
Nebraska				√				√				√			
Nevada			3	√				√			√	√	√		
New Hampshire		√										√			
New Jersey		√										√			
New Mexico			1	√			1	2		√	√	√	√		
New York		√		√							3	√	√	4	
North Carolina												√	√		
North Dakota				√				√				√			
Ohio		√		√							√	4			
Oklahoma				4				√			√	√			
Oregon								√				√	√		3
Pennsylvania									√			√	√	3	
Rhode Island												√			
South Carolina										1		√			
South Dakota				√								√	√		
Tennessee				√	2				1			√	√		
Texas				1				√			2	√			
Utah			√	√	√		3	√			√	√	3		
Vermont									√			√	√	2	
Virginia				√					2		√	√	√	√	
Washington	2	2						√				√	√		
West Virginia				√							√	√			
Wisconsin												√			
Wyoming				√	√			√				√	√		1

[1] Includes Alaska and Hawaii.

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TABLE 3.—Minerals produced in the United States,[1] by States, and principal producing States in 1956—Continued

State	Sodium sulfate	Stone	Strontium	Sulfur	Talc, pyrophyllite, and soapstone	Tin	Titanium	Tripoli	Tungsten	Uranium	Vanadium	Vermiculite	Wollastonite	Zinc	Zirconium
Alabama		√			√										
Alaska		√													
Arizona		√							√	4	3			√	
Arkansas		√		4	√										
California	1	√	1	3	2				2	√				√	
Colorado		√							√	3	1			√	
Connecticut		√													
Delaware		√													
Florida		√					2								1
Georgia		√			4										
Hawaii		√													
Idaho		√					4		√					3	
Illinois		√		√				1						√	
Indiana		√		√											
Iowa		√													
Kansas		√												√	
Kentucky		√												√	
Louisiana		√		√											
Maine		√													
Maryland		√			√										
Massachusetts		√													
Michigan		2													
Minnesota		√													
Mississippi		√													
Missouri		√												√	
Montana		√		√	√							1		1	
Nebraska		√													
Nevada		√			√				1	√				√	
New Hampshire															
New Jersey		√		√										√	
New Mexico		√		√					√	1	4			√	
New York		√			1		1						1	2	
North Carolina		√			3				3						
North Dakota		√		√											
Ohio		3		√											
Oklahoma		√		√				2						√	
Oregon		√													
Pennsylvania		1		√	√			3							
Rhode Island		√													
South Carolina		√					√					2			
South Dakota		√													
Tennessee		√												4	
Texas	2	4		1	√					√					
Utah		√							√	2	2			√	
Vermont		√			√										
Virginia		√			√		3							√	
Washington		√	2		√				√	√				√	
West Virginia		√		√											
Wisconsin		√												√	
Wyoming	3	√		2					√	√	√				

[1] Includes Alaska and Hawaii.

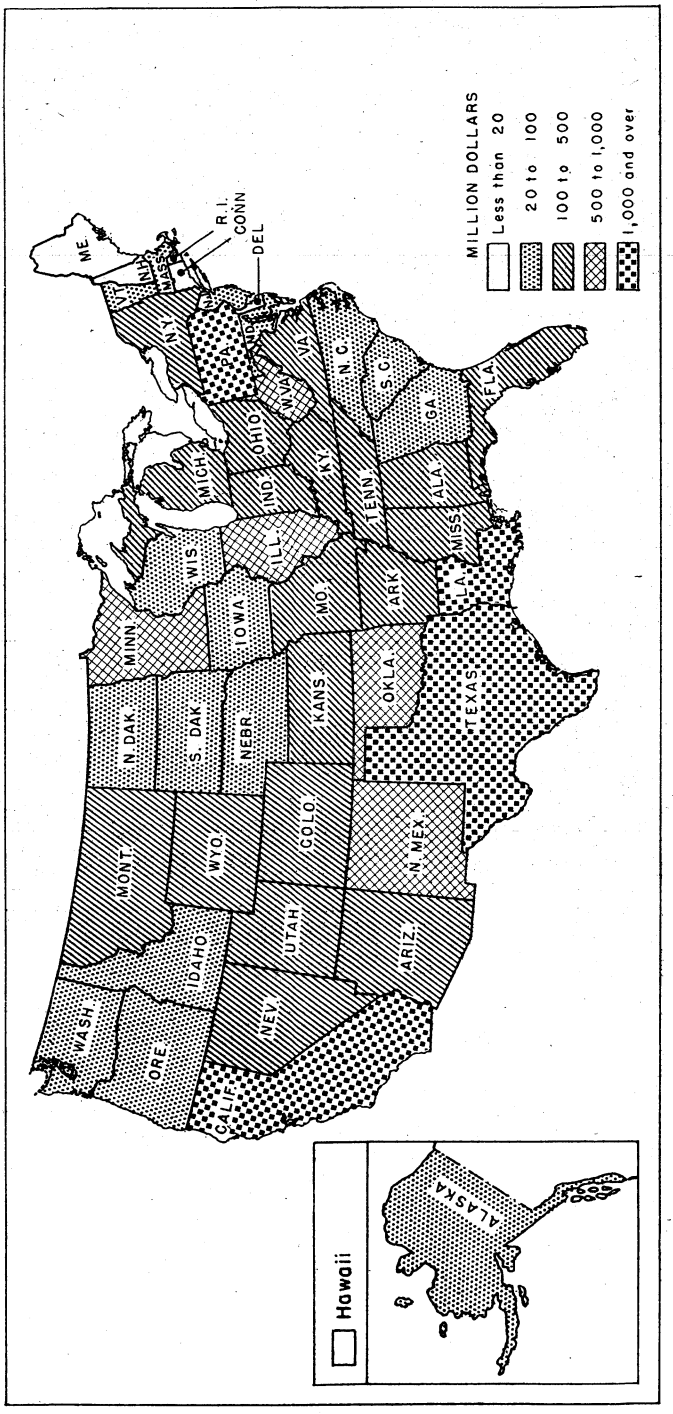

FIGURE 2.—Value of mineral production in the United States (including Alaska and Hawaii), 1956, by States

TABLE 4.—Value of mineral production in the United States,[1] 1953–56, by States, in thousand dollars, and principal minerals produced in 1956

State	1953	1954	1955	1956			
				Value	Rank	Percent of U. S. total	Principal minerals in order of value
Alabama	187,087	154,639	186,453	189,186	22	1.09	Coal, cement, iron ore, stone.
Alaska	24,252	24,408	25,412	23,408	42	.13	Gold, coal, sand and gravel, platinum-group metals.
Arizona	258,471	254,479	378,277	485,751	11	2.80	Copper, cement, zinc, uranium.
Arkansas	127,090	131,745	132,822	135,210	26	.78	Petroleum, bauxite, sand and gravel, stone.
California	1,393,987	1,429,627	1,456,513	1,555,263	2	8.97	Petroleum, cement, natural gas, natural-gas liquids.
Colorado	212,690	255,852	286,219	329,450	16	1.90	Petroleum, molybdenum, coal, cement.
Connecticut	7,917	9,581	10,428	11,876	46	.07	Stone, sand and gravel, lime, clays.
Delaware	659	947	1,658	1,232	50	.01	Sand and gravel, stone, clays.
District of Columbia	15						
Florida	92,336	106,510	108,957	140,490	24	.81	Phosphate rock, stone, cement, titanium concentrate.
Georgia	51,395	55,828	60,417	67,912	31	.39	Clays, stone, cement, sand and gravel.
Hawaii	3,332	3,596	3,592	6,972	47	.04	Stone, sand and gravel, lime, pumice.
Idaho	67,063	69,689	68,513	75,178	29	.43	Lead, zinc, silver, phosphate rock.
Illinois	462,443	473,077	533,062	572,321	7	3.30	Petroleum, coal, stone, sand and gravel.
Indiana	169,781	165,369	183,479	195,674	21	1.13	Coal, cement, petroleum, stone.
Iowa	51,994	58,798	63,555	66,529	32	.38	Cement, stone, sand and gravel, coal.
Kansas	413,231	449,587	470,830	493,307	10	2.85	Petroleum, natural gas, cement, stone.
Kentucky	381,742	327,503	391,068	443,168	12	2.56	Coal, petroleum, natural gas, stone.
Louisiana	965,237	998,057	1,156,637	1,281,849	3	7.39	Petroleum, natural gas, natural-gas liquids, sulfur.
Maine	10,503	10,716	12,991	12,179	45	.07	Cement, sand and gravel, stone, slate.
Maryland	27,085	30,743	35,491	40,532	38	.23	Stone, sand and gravel, cement, coal.
Massachusetts	17,191	18,851	22,109	25,085	41	.14	Stone, sand and gravel, lime, clays.
Michigan	286,487	279,940	363,787	394,536	14	2.27	Iron ore, cement, copper, salt.
Minnesota	542,545	351,474	501,151	501,027	9	2.89	Iron ore, sand and gravel, stone, cement.
Mississippi	107,868	110,563	122,620	133,098	27	.77	Petroleum, natural gas, sand and gravel, cement.
Missouri	128,207	131,280	151,626	163,693	23	.94	Lead, cement, stone, lime.
Montana	132,184	126,412	166,993	213,728	19	1.23	Copper, petroleum, zinc, sand and gravel.
Nebraska	33,281	42,393	54,237	71,776	30	.41	Petroleum, cement, sand and gravel, stone.
Nevada	73,523	89,138	113,220	126,233	28	.73	Copper, tungsten concentrate, manganese ore, sand and gravel.
New Hampshire	1,805	2,112	2,605	3,436	48	.02	Sand and gravel, stone, mica, feldspar.
New Jersey	51,945	47,044	57,495	64,279	34	.37	Stone, sand and gravel, iron ore, magnesium compounds.
New Mexico	336,545	373,519	436,494	513,303	8	2.96	Petroleum, potassium salts, copper, natural gas.
New York	186,868	192,738	216,907	237,016	18	1.37	Cement, iron ore, stone, sand and gravel.
North Carolina	38,451	41,651	41,210	39,985	39	.23	Stone, tungsten concentrate, sand and gravel, mica.
North Dakota	19,237	22,223	44,123	53,555	36	.31	Petroleum, coal, sand and gravel, natural-gas liquids.

Ohio	302,242	293,659	340,457	375,488	15	2.16	Coal, stone, cement, lime.
Oklahoma	679,003	650,205	711,089	757,116	6	4.37	Petroleum, natural gas, natural-gas liquids, stone.
Oregon	24,449	32,268	31,736	34,011	40	.20	Sand and gravel, cement, stone, nickel.
Pennsylvania	1,121,622	925,545	969,910	1,088,867	4	6.28	Coal, cement, stone, petroleum.
Rhode Island	1,462	1,461	1,834	1,627	49	.01	Sand and gravel, stone, graphite.
South Carolina	17,771	17,744	20,197	21,342	44	.12	Cement, clays, stone, sand and gravel.
South Dakota	33,823	37,874	40,526	41,797	37	.24	Gold, sand and gravel, stone, cement.
Tennessee	98,050	105,686	119,316	137,846	25	.79	Coal, cement, stone, zinc.
Texas	3,647,913	3,730,705	3,993,310	4,211,284	1	24.28	Petroleum, natural gas, natural-gas liquids, sulfur.
Utah	298,589	255,495	331,929	396,942	13	2.29	Copper, coal, iron ore, uranium.
Vermont	20,302	20,483	23,884	23,131	43	.13	Stone, slate, asbestos, copper.
Virginia	152,979	129,603	172,541	208,806	20	1.20	Coal, stone, cement, sand and gravel.
Washington	54,577	53,300	67,334	61,665	35	.36	Cement, sand and gravel, stone, zinc.
West Virginia	790,110	636,311	755,512	935,074	5	5.39	Coal, natural gas, natural-gas liquids, stone.
Wisconsin	55,212	54,286	65,813	65,860	33	.38	Stone, sand and gravel, iron ore, zinc.
Wyoming	255,906	281,306	297,752	316,897	17	1.83	Petroleum, clays, coal, sodium salts.
Total	14,418,000	14,066,000	15,804,000	17,346,000		100.00	Petroleum, coal, natural gas, cement.

[1] Includes Alaska and Hawaii.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States

ALABAMA

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Cement [3]—thousand 376-pound barrels	10,428	25,701	11,122	28,583	13,721	38,350	14,065	41,840
Clays—thousand short tons	1,198	1,816	1,331	2,258	(4)	(4)	[5] 2,195	[5] 2,147
Coal—do	12,532	79,370	10,283	67,338	13,088	79,337	12,663	79,322
Iron ore (usable)—thousand long tons, gross weight	7,446	55,640	5,913	33,327	6,814	44,657	5,633	34,825
Lime	470,541	5,018	421,807	4,488	462,194	5,186	466,399	5,089
Mica (sheet)	(4)	(4)	(4)	(4)	(4)	(4)	1,122	7
Natural gas—million cubic feet	41	2	87	5	282	20	42	3
Petroleum (crude)—thousand 42-gallon barrels	1,694	3,290	1,584	3,690	1,411	2,910	3,069	7,335
Sand and gravel—thousand short tons	3,711	3,003	3,966	3,451	3,680	3,524	4,999	4,621
Stone (except for cement and lime, 1953)—do	3,957	8,155	7,394	11,609	8,269	11,867	[5] 12,343	[5] 14,702
Talc					1,500	8	2,200	5
Value of items that cannot be disclosed: Native asphalt, bauxite, pozzolan cement, clays (kaolin), graphite (1953), scrap mica, salt, stone (dimension limestone and marble), and values indicated by footnote 4		5,092		4,856		4,325		4,083
Total Alabama		187,087		[7] 154,639		[7] 186,453		[7] 189,186

ALASKA

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Antimony ore and concentrate—antimony content							28	(4)
Chromite—gross weight			2,953	208	7,082	625	7,193	711
Clays—thousand short tons			(4)	(4)	1	4		
Coal—do	861	8,451	667	6,442	640	5,759	727	6,374
Copper (recoverable content of ores, etc.)			4	2	1	1		
Gold (recoverable content of ores, etc.)—troy ounces	253,783	8,882	248,511	8,698	249,294	8,725	209,296	7,325
Lead (recoverable content of ores, etc.)	9	2			1	(8)	1	(8)
Mercury—76-pound flasks	40	8	1,046	277	(4)	(4)	3,280	853
Sand and gravel—thousand short tons	7,689	5,080	6,640	6,302	9,793	8,242	5,955	5,880
Silver (recoverable content of ores, etc.)—troy ounces	35,387	32	33,697	31	33,693	31	28,360	26
Stone—thousand short tons	47	170	284	466	266	290	195	595
Tin (content of concentrate)—long tons	49	106	199	410	86	183		
Tungsten ore and concentrate—60-percent WO_3 basis	3	(4)						
Value of items that cannot be disclosed: Gem stones (1953–54, 1956), platinum group metals, and values indicated by footnote 4		1,521		1,572		1,552		1,644
Total Alaska		24,252		24,408		25,412		23,408

ARIZONA

Beryllium concentrate	gross weight	(4)	(4)	(4)	(4)	(4)	6	3
Brucite		100	1					
Clays	thousand short tons	197	715	254	814	254	869	[5] 112	[5] 168
Coal	do	5	32	11	68	9	59	10	66
Copper (recoverable content of ores, etc.)		393, 525	225, 883	377, 927	222, 977	454, 105	338, 762	506	430, 022
Fluorspar		1, 951	113	(4)	(4)				
Gem stones		(9)	(4)	(9)	(4)	(9)	97	(9)	104
Gold (recoverable content of ores, etc.)	troy ounces	112, 824	3, 949	114, 809	4, 018	127, 616	4, 467	146, 110	5, 114
Gypsum		13, 484	44	(4)	(4)	(4)	(4)	95, 666	366
Lead (recoverable content of ores, etc.)		9, 428	2, 470	8, 385	2, 297	9, 817	2, 925	11, 999	3, 768
Lime		96, 408	1, 238	88, 932	1, 131	112, 028	1, 438	126, 876	1, 756
Manganese ore (35 percent or more Mn)	gross weight	(4)	(4)			1, 444	(4)	42, 008	3, 468
Mercury	76-pound flasks			163	43	477	138	(4)	(4)
Mica (scrap)		3, 721	115	1, 682	18	1, 353	9		
Molybdenum (content of concentrate)	thousand pounds	1, 447	1, 426	1, 538	1, 525	1, 497	1, 511	2, 392	2, 670
Natural gas	million cubic feet					(4)	(4)	21	3
Perlite		1, 511	10	1, 296	7	10, 568	84	15, 928	108
Pumice		123, 797	426	80, 883	126	92, 136	373	114, 609	366
Sand and gravel	thousand short tons	3, 447	2, 681	3, 764	3, 067	7, 755	6, 519	7, 932	6, 167
Silver (recoverable content of ores, etc.)	troy ounces	4, 351, 429	3, 938	4, 298, 811	3, 891	4, 634, 179	4, 194	5, 179, 185	4, 687
Stone (except limestone for cement and lime, 1953)	thousand short tons	442	619	1, 205	1, 914	1, 601	2, 329	1, 623	2, 474
Tungsten concentrate	60-percent WO_3 basis	134	469	132	457	181	676	186	637
Zinc (recoverable content of ores, etc.)		27, 530	6, 332	21, 461	4, 636	22, 684	5, 580	25, 580	7, 009
Value of items that cannot be disclosed: Asbestos, barite (1953–55), cement, clays (bentonite, 1955), columbium-tantalum concentrate (1955), diatomite (1954–55), feldspar, quartz (1953), rare-earth metals concentrates (1955), uranium ore (1955), vanadium, vermiculite (1953–54), and values indicated by footnote 4			8, 010		8, 172		9, 201		17, 901
Total Arizona			258, 471		[7] 254, 479		[7] 378, 277		[7] 485, 751

ARKANSAS

Abrasive stones (whetstones)		(4)	(4)	(4)	(4)	(4)	35	11
Barite		380, 763	3, 945	370, 621	3, 489	462, 986	3, 755	486, 254	4, 256
Bauxite	long tons, dried equivalent	1, 529, 976	12, 976	1, 949, 368	15, 994	1, 721, 243	14, 026	1, 668, 432	13, 307
Clays	thousand short tons	529	1, 734	617	2, 556	739	2, 376	719	1, 636
Coal	do	775	6, 144	477	3, 589	578	4, 319	590	4, 601
Gem stones						(9)	4	(9)	25
Iron ore (usable)	thousand long tons, gross weight	(10)	(4)	(10)	(4)			(4)	(4)
Manganese ore (35 percent or more Mn)	gross weight	6, 123	527	13, 728	1, 021	23, 744	1, 727	29, 485	2, 066
Natural gas	million cubic feet	41, 510	2, 200	33, 470	1, 841	32, 123	1, 799	30, 162	1, 810
Natural-gas liquids:									
Natural gasoline and cycle products	thousand gallons	58, 422	4, 123	50, 778	3, 234	47, 483	3, 239	41, 529	2, 541
LP-gases	do	55, 188	2, 562	58, 506	2, 521	57, 088	2, 169	56, 146	2, 293
Petroleum (crude)	thousand 42-gallon barrels	29, 681	77, 170	29, 130	79, 520	28, 369	76, 880	29, 355	78, 965

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

ARKANSAS—Continued

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Sand and gravel—thousand short tons	4,904	4,955	6,612	6,567	9,003	7,663	10,200	8,730
Slate	34,516	316	41,845	379	(4)	(4)	(4)	(4)
Stone (except limestone for cement and lime, 1953)—thousand short tons	3,545	5,070	4,604	5,930	6,176	8,026	6,325	8,113
Value of items that cannot be disclosed: Abrasive stones (oilstones), cement, gypsum, lime, soapstone (1954–56), recovered elemental sulfur and values indicated by footnote 4		5,368		5,742		7,616		8,182
Total Arkansas		127,090		r 131,745		r 132,822		r 135,210

CALIFORNIA

Boron minerals	715,228	17,668	790,449	26,714	924,496	33,817	944,950	39,592
Cement—thousand 376-pound barrels	32,002	90,873	32,762	98,251	35,087	103,804	39,290	120,511
Chromite—gross weight	26,512	2,078	30,661	2,285	22,105	1,834	27,082	2,192
Clays—thousand short tons	2,430	4,953	2,723	4,477	2,860	5,027	2,982	6,137
Coal (lignite)—do			(4)	(4)	8	77	12	120
Copper (recoverable content of ores, etc.)	382	219	362	214	613	457	859	730
Gem stones	(9)	(4)	(9)	(4)	(9)	(4)	(9)	90
Gold (recoverable content of ores, etc.)—troy ounces	234,591	8,211	237,886	8,326	251,737	8,811	193,816	6,784
Gypsum	1,199,489	2,856	1,161,502	2,804	1,307,625	3,274	1,399,390	3,402
Iron ore (usable)—thousand long tons, gross weight	1,698	(4)	1,270	(4)	1,777	(4)	2,414	(4)
Lead (recoverable content of ores, etc.)	8,664	2,270	2,671	732	8,265	2,463	9,296	2,919
Lime	301,422	4,653	212,381	3,388	268,009	4,373	302,479	5,078
Magnesium compounds from sea water and bitterns (partly estimated) MgO equivalent	55,886	3,484	40,969	2,716	58,042	3,833	66,007	4,532
Manganese ore (35 percent or more Mn)—gross weight	5,413	(4)	831	45	3,136	271	6,595	595
Manganiferous ore (5 to 35 percent Mn)—do	534	10	(4)	(4)				
Marl, calcareous	6,028	21	5,464	22	(4)	(4)		
Mercury—76-pound flasks	9,290	1,793	11,262	2,978	9,875	2,867	9,017	2,344
Natural gas—million cubic feet	531,346	104,675	507,289	104,502	538,178	119,476	504,458	113,503
Natural-gas liquids:								
Natural gasoline and cycle products—thousand gallons	910,350	85,691	923,160	89,293	929,649	89,003	876,902	84,615
LP-gases—do	397,572	21,961	396,186	22,262	360,902	19,379	410,232	21,332
Peat	9,196	74	(4)	(4)	(4)	(4)	18,918	215
Perlite	15,282	113	14,811	103	15,653	125	15,119	135
Petroleum (crude)—thousand 42-gallon barrels	365,085	909,060	355,865	907,460	354,812	887,030	350,754	918,975

Pumice	433,105	648	566,664	652	797,306	1,099	634,356	2,334
Salt (common) thousand short tons	1,123	6,263	1,186	6,126	1,315	6,751	1,444	7,606
Sand and gravel do	58,430	53,224	70,525	68,139	64,879	66,820	86,526	96,776
Silver (recoverable content of ores, etc.) troy ounces	1,036,372	938	309,575	280	954,181	864	938,139	849
Stone (except limestone for cement and lime, 1953) thousand short tons	[6] 14,497	[6] 18,473	23,304	37,541	24,708	37,164	32,583	46,109
Strontium minerals	50	1	12	(5)	177	4	(4)	(4)
Sulfur ore long tons	152,203	(4)	185,085	(4)	199,599	(4)	(4)	(4)
Talc, pyrophyllite and soapstone	126,442	1,133	133,474	1,211	166,551	1,553	153,710	1,419
Tungsten concentrate 60-percent WO_3 basis	2,382	8,939	3,512	13,209	4,383	16,201	3,719	13,449
Zinc (recoverable content of ores, etc.)	5,358	1,232	1,415	306	6,836	1,682	8,049	2,205
Value of items that cannot be disclosed: Asbestos, barite, bromine, calcium-magnesium chloride, carbon dioxide, masonry cement (1956), diatomite, feldspar, abrasive garnet (1954–56), iodine, lithium minerals (1953–54), magnesite, mica (1954–56), molybdenum, platinum group metals (crude), potassium salts, pyrites, quartz (1953), rare-earth metals concentrate, ground sandstone (1953), slate, sodium carbonate and sulfate, stone (dimension and crushed marble 1953), recovered elemental sulfur, titanium iron concentrate (nontitanium use 1953–55), uranium ore (1956), and values indicated by footnote 4. Excludes value of clays used for cement (1953)		42,473		43,738		[11] 55,689		69,025
Total California		1,393,987		[7] 1,429,627		[7 11] 1,456,513		[7] 1,555,263

COLORADO

Beryllium concentrate gross weight	75	39	60	27	46	23	179	94
Clays thousand short tons	778	1,430	855	1,003	464	1,118	523	1,215
Coal do	3,548	19,198	2,900	16,079	3,568	20,100	3,502	19,832
Columbium-tantalum concentrate pounds	(4)	(4)	4,967	10	4,325	7	52	(5)
Copper (recoverable content of ores, etc.)	2,941	1,688	4,523	2,669	4,323	3,225	4,228	3,594
Feldspar long tons	43,508	268	(4)	(4)	46,114	314	47,014	327
Fluorspar	53,276	2,872	59,197	3,197	(4)	(4)	(4)	(4)
Gem stones	(5)	(4)	(5)	(4)	(5)	48	(5)	30
Gold (recoverable content of ores, etc.) troy ounces	119,218	4,173	96,146	3,365	88,577	3,100	97,668	3,418
Gypsum	62,936	233	64,650	253	76,649	329	88,026	353
Iron ore (usable) thousand long tons, gross weight	1	4	6	(4)	4	(4)	(4)	(4)
Lead (recoverable content of ores, etc.)	21,754	5,700	17,823	4,883	15,805	4,710	19,856	6,235
Mica:								
Scrap	1,599	19	(4)	(4)	699	13	517	7
Sheet pounds	33,851	(4)	42,545	(4)	45,837	(4)	8	(5)
Molybdenum thousand pounds	28,509	1,654	45,705	3,976	49,152	4,866	(4)	(4)
Natural gas million cubic feet	6,067	(4)	9,028	(4)			54,205	5,312
Peat	36,402	98,650	46,206	127,990	52,653	144,800	58,516	162,674
Petroleum (crude) thousand 42-gallon barrels	47,919	100	(4)	(4)	70,530	163	50,015	109
Pumice					(4)	(4)	16	23
Rare-earth metals concentrates					4	17	4	18
Salt thousand short tons	12,439	8,609	13,552	9,027	12,912	8,915	15,152	11,082
Sand and gravel do								

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

COLORADO—Continued

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Silver (recoverable content of ores, etc.)—troy ounces	2,200,317	1,991	3,417,072	3,093	2,772,073	2,509	2,284,701	2,068
Stone (except limestone for cement and lime, 1953)—thousand short tons	[6] 884	[6] 1,751	1,804	2,112	2,149	3,508	2,250	5,217
Tungsten concentrate—60-percent WO_3 basis	817	2,002	927	3,421	1,152	4,079	873	3,010
Uranium ore							495,450	12,000
Vanadium	4,530,612	[4]	4,528,472	[4]	4,595,359	[4]	5,582,484	[4]
Zinc (recoverable content of ores, etc.)	37,809	8,696	35,150	7,592	35,350	8,696	40,246	11,027
Value of items that cannot be disclosed: Carbon dioxide, cement, lithium minerals (1953–54), natural-gas liquids, perlite, pyrites, stone (crushed basalt 1953), tin (1953–55), vermiculite (1954), and values indicated by footnote 4. Excludes value of clays used for cement (1953)		52,713		67,874		[11] 76,969		83,578
Total Colorado		212,690		[7] 255,852		[7 11] 286,219		[7] 329,450

CONNECTICUT

Beryllium concentrate—gross weight	33	14	13	8	5	3	[4]	[4]
Clays—thousand short tons	438	448	289	285	325	315	338	390
Feldspar—long tons	9,829	63	9,280	60	[4]	[4]	[4]	[4]
Lime	[4]	[4]	[4]	[4]	34,917	503	39,748	609
Mica (sheet and scrap)	[4]	[4]	[4]	[4]	3	13	[12] 310	[12] 2
Peat	7,475	31	5,856	24	[4]	[4]	22,315	152
Sand and gravel—thousand short tons	3,026	2,348	4,846	4,315	4,345	4,080	4,369	4,101
Stone (except limestone for lime, 1953)—do	[6] 2,827	[6] 4,235	2,829	4,269	3,642	5,451	[6] 4,428	[6] 6,590
Value of items that cannot be disclosed: Columbium-tantalum concentrate (1953–55), stone (dimension basalt 1953, crushed granite and dimension limestone 1955, dimension limestone, 1956) and values indicated by footnote 4		778		725		123		124
Total Connecticut		7,917		[7] 9,581		[7] 10,428		[7] 11,876

DELAWARE

Sand and gravel—thousand short tons	521	400	972	752	2,297	1,407	1,160	967
Stone—do	80	215	[4]	[4]	79	228	83	232
Value of items that cannot be disclosed: Nonmetals and values indicated by footnote 4		44		195		23		33
Total Delaware		659		947		1,658		1,232

FLORIDA

Clays	thousand short tons	258	2,952	372	3,337	413	4,816	432	5,826
Lime		(4)	(4)	(4)	(4)	(4)	(4)	39,542	490
Natural gas	million cubic feet	34	2	35	3	36	4	35	3
Peat		27,678	186	37,449	168	61,098	232	58,496	203
Petroleum (crude)	thousand 42-gallon barrels	543	(4)	548	(4)	495	(4)	(4)	(4)
Phosphate rock	thousand long tons	9,331	56,525	10,437	64,500	8,747	53,640	11,822	74,290
Sand and gravel	thousand short tons	3,731	3,199	3,469	2,661	5,066	4,349	5,815	5,034
Stone (except limestone for cement and lime, 1953)		[6] 9,429	[6] 11,309	[6] 14,225	[6] 16,832	[6] 17,028	[6] 22,966	18,779	25,183
Titanium concentrate:									
Ilmenite	gross weight	151,109	2,322	157,157	2,412	(4)	(4)	(4)	(4)
Rutile	do	6,476	703	7,305	869	9,182	1,122	(4)	(4)
Zirconium concentrate		21,234	794	17,959	820	28,913	1,425	43,794	2,160
Value of items that cannot be disclosed: Cement, abrasive garnet, gem stones (1956)), rare-earth metals concentrates (1956), stone (dimension limestone (1953–55)), and values indicated by footnote 4. Excludes value of clays used for cement (1953)			14,344		15,956		22,787		28,452
Total Florida			92,336		[7] 106,510		[7] 108,957		[7] 140,490

GEORGIA

Clays	thousand short tons	2,651	23,455	2,711	24,107	2,953	26,145	3,047	29,501
Coal	do	14	71	8	41	12	62	8	42
Gold (recoverable content of ores, etc.)	troy ounces	2	(8)						
Iron ore (usable)	thousand long tons, gross weight	260	1,101	222	872	257	994	357	1,609
Iron oxide pigments				(4)	(4)	6,139	36	(4)	(4)
Lime		9,345	95	(4)	(4)				
Mica (sheet)	pounds	14,063	74	(4)	(4)	(4)	(4)	20,149	150
Peat		2,305	(4)	5,150	61	(4)	(4)	6,225	48
Sand and gravel	thousand short tons	2,051	1,901	2,703	2,466	2,988	2,199	2,426	2,183
Stone (except limestone for cement and lime, 1953)	do	7,112	17,756	8,058	21,384	[6] 7,488	[6] 14,250	[6] 9,196	[6] 20,714
Talc and soapstone		57,891	203	50,536	177	53,828	118	57,916	122
Value of items that cannot be disclosed: Asbestos (1953–54), barite, bauxite (1955–56), beryllium concentrate, cement, feldspar (1954–56), gem stones (1955–56), manganese ore (1954–56), manganiferous ore (1955–56), scrap mica, ground sand and sandstone (1953), slate, stone (dimension and crushed marble and crushed sandstone 1955, crushed marble and crushed sandstone, 1956), and minerals indicated by footnote 4. Excludes value of clays used for cement (1953)			6,739		7,481		17,495		14,558
Total Georgia			51,395		[7] 55,828		[7] 60,417		[7] 67,912

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

HAWAII

Minera	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Clays—thousand short tons	(4)	(4)	(4)	(4)	(4)	(4)	2	2
Lime	7,431	224	8,375	251	6,453	202	9,555	306
Pumice			(4)	(4)	130,306	76	58,851	92
Salt—thousand short tons	(4)	(4)	(4)	(4)	(4)	(4)	(10)	18
Sand and gravel—do	111	157	119	319	165	426	193	503
Stone—do	[9] 1,300	[9] 2,654	1,485	2,993	1,414	2,884	3,494	6,076
Value of items that cannot be disclosed: Other nonmetals and values indicated by footnote 4		297		59		22		
Total Hawaii		3,332		[13] 3,596		[13] 3,592		[13] 6,972

IDAHO

Antimony ore and concentrate—antimony content	(4)	(4)	764	(4)	633	(4)	549	(4)
Beryllium concentrate—gross weight	1	1	(4)	(4)				
Clays—thousand short tons	26	21	(4)	(4)	35	30	[5] 23	[5] 13
Cobalt (content of concentrate)—pounds	1,211,039	(4)	1,702,272	(4)	1,691,334	(4)	2,385,013	(4)
Columbium-tantalum concentrate—do	(4)	(4)			(4)	(4)	215,900	(4)
Copper (recoverable content of ores, etc.)	3,136	1,800	4,828	2,848	5,618	4,191	6,656	5,658
Gold (recoverable content of ores, etc.)—troy ounces	17,630	617	13,245	463	10,572	370	10,029	351
Gypsum	150	[3]	(4)	(4)	(4)	(4)		
Iron ore (usable)—thousand long tons							1	(4)
Lead (recoverable content of ores, etc.)	74,610	19,548	69,302	18,989	64,163	19,121	64,231	20,197
Mercury—76-pound flasks	(4)	(4)	609	161	1,107	321	3,394	882
Mica, sheet—pounds	24,216	223	(4)	(4)	(4)	(4)		
Nickel (content of ore and concentrate)	11	(4)	13	(4)	33	(4)	49	(4)
Peat			500	(4)	(4)	(4)		
Phosphate rock—thousand long tons	1,002	4,150	1,093	5,687	1,330	6,038	1,438	6,539
Pumice	85,224	160	(4)	(4)	(4)	(4)	101,913	206
Sand and gravel—thousand short tons	3,776	2,841	6,718	4,569	8,652	3,934	7,874	5,661
Sand and sandstone (ground)	5,304	44	(14)	(14)	(14)	(14)	(14)	(14)
Silver (recoverable content of ores, etc.)—troy ounces	14,639,740	13,250	15,867,414	14,361	13,831,458	12,518	13,471,916	12,193
Stone (except limestone for cement, 1953)—thousand short tons	1,142	2,261	2,329	3,013	1,525	1,866	1,791	2,752
Titanium concentrate—gross weight	1,585	8			1,330	7	48,619	261
Tungsten concentrate—60-percent WO_3 basis	441	1,666	471	(4)	642	(4)	582	(4)
Zinc (recoverable content of ores, etc.)	72,153	16,595	61,528	13,290	53,314	13,115	49,561	13,580

Value of items that cannot be disclosed: Barite, cement, fire clay (1956), abrasive garnet, gem stones (1954–56), fluorspar (1953, 1955), scrap mica (1954), monazite (1955–56), quartz (1953), stone (crushed limestone 1955), vanadium (1953–54), and values indicated by footnote 4		3,878		[13] 6,308		[13] 7,002		[13] 6,885
Total Idaho		67,063		69,689		68,513		75,178
ILLINOIS								
Cement	thousand 376-pound barrels	8,651	21,962	9,109	23,148	9,397	25,032	9,301	27,264
Clays	thousand short tons	2,305	4,573	2,027	3,482	2,339	3,979	2,258	4,005
Coal	do	46,010	181,598	41,971	160,213	45,932	167,938	48,102	184,678
Fluorspar		163,303	8,567	107,830	5,989	166,337	7,838	178,254	8,470
Lead (recoverable content of ores, etc.)		3,391	888	3,232	886	4,544	1,354	3,832	1,203
Lime		519,992	6,987	532,051	7,421	644,181	9,416	[4]	[4]
Natural gas	million cubic feet	9,282	1,559	9,475	1,345	8,033	1,036	6,177	933
Peat		[4]	[4]	[4]	[4]	[4]	[4]	14,451	158
Petroleum (crude)	thousand 42-gallon barrels	59,026	170,590	66,798	199,060	81,423	236,940	82,346	241,274
Sand and gravel	thousand short tons	21,522	20,540	24,443	26,164	26,362	28,139	31,239	33,254
Sand and sandstone (ground)		276,215	2,462	[14]	[14]	[14]	[14]	[14]	[14]
Silver (recoverable content of ores, etc.)	troy ounces	2,338	2	1,160	1	3,075	3	1,580	1
Stone (except limestone for cement and lime, 1953)	thousand short tons	22,939	29,737	26,407	31,134	28,866	35,621	31,855	40,859
Zinc (recoverable content of ores, etc.)		14,556	3,348	14,427	3,116	21,700	5,338	24,039	6,587
Value of items that cannot be disclosed: Iron oxide pigments (1954), natural-gas liquids, recovered elemental sulfur, tripoli, and values indicated by footnote 4. Excludes value of clays used for cement (1953)			9,630		13,061		12,666		26,048
Total Illinois			462,443		[7] 473,077		[7] 533,062		[7] 572,321
INDIANA									
Abrasive stones		[4]	[4]	[4]	[4]	[4]	[4]	3	5
Clays	thousand short tons	1,654	2,514	1,946	2,991	1,729	2,938	2,051	3,457
Coal	do	15,812	62,354	13,400	48,913	16,149	58,000	17,089	64,061
Lime		[4]	[4]	[4]	[4]	[4]	[4]	80	1
Marl, calcareous (except for cement)		13,540	7	28,536	19	17,080	10	99,561	66
Natural gas	million cubic feet	701	49	735	44	1,226	152	791	96
Peat		6,919	41	[4]	[4]	[4]	[4]	11,383	79
Petroleum (crude)	thousand 42-gallon barrels	12,823	37,570	11,204	33,160	10,988	31,980	11,513	33,733
Sand and gravel	thousand short tons	11,203	9,501	14,405	11,879	17,082	14,306	16,667	14,353
Stone (except limestone for cement and lime, 1953)	do	9,213	22,297	11,182	27,460	14,124	34,680	14,700	31,575
Value of items that cannot be disclosed: Cement, gypsum (1955–56), pyrites (1953), recovered elemental sulfur, and values indicated by footnote 4. Excludes value of clays used for cement (1953)			35,448		42,448		43,888		50,598
Total Indiana			169,781		[7] 165,369		[7] 183,479		[7] 195,674

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

IOWA

Minera	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Cement.....thousand 376-pound barrels	9,111	23,330	9,859	27,044	10,430	29,539	10,760	32,823
Clays.....thousand short tons	913	975	883	921	(4)	(4)	[5] 852	[5] 1,078
Coal.....do	1,388	5,262	1,197	4,503	1,258	4,402	1,358	4,732
Gypsum	1,151,692	2,940	1,106,626	3,036	1,337,160	4,177	1,177,488	3,919
Lead (recoverable content of ores, etc.)			4	1				
Peat	17,233	(4)	(4)	(4)	(4)	(4)	27,375	(4)
Sand and gravel.....thousand short tons	10,385	6,401	12,200	9,276	11,771	8,345	12,895	9,525
Stone (except limestone for cement 1953).....do	10,715	13,215	13,240	16,388	15,705	18,555	14,035	17,256
Value of items that cannot be disclosed: Nonmetals and minerals indicated by footnote 4		224		251		1,252		467
Total Iowa		[15] 51,994		[7] 58,798		[7] 63,555		[7] 66,529

KANSAS

Cement [16].....thousand 376-pound barrels	8,546	21,428	9,076	23,874	9,454	25,854	10,598	30,696
Clays.....thousand short tons	671	750	(4)	(4)	[5] 768	[5] 873	977	1,169
Coal.....do	1,715	7,101	1,372	5,603	742	3,166	884	3,856
Helium.....thousand cubic feet	42,783	564	37,530	593	42,750	663	45,035	698
Lead (recoverable content of ores, etc.)	3,347	877	4,033	1,105	5,498	1,638	7,635	2,398
Natural gas.....million cubic feet	420,607	36,172	412,369	43,711	471,041	52,286	526,091	59,448
Natural-gas liquids:								
Natural gasoline.....thousand gallons	(4)	(4)	(4)	(4)	118,599	6,318	105,482	5,928
LP-gases.....do	(4)	(4)	(4)	(4)	92,596	2,643	90,287	3,843
Petroleum (crude).....thousand 42-gallon barrels	114,566	308,180	119,317	335,280	121,669	340,670	124,204	346,529
Pumice	(4)	(4)	23,433	93	2,320	60	(4)	(4)
Salt (common).....thousand short tons	905	7,481	877	7,779	911	8,432	1,004	9,168
Sand and gravel.....do	8,728	5,668	10,422	7,194	10,665	6,910	12,515	8,022
Stone (except limestone for cement, 1953).....do	8,769	11,304	10,377	12,942	12,483	15,946	13,434	15,703
Zinc (recoverable content of ores, etc.)	15,515	3,568	19,110	4,128	27,611	6,792	28,665	7,854
Value of items that cannot be disclosed: Natural cement, fire clay (1955), gypsum, and values indicated by footnote 4. Excludes value of clays used for cement (1953)		10,138		9,721		1,616		1,465
Total Kansas		413,231		[7] 449,587		[7] 470,830		[7] 493,307

KENTUCKY

Clays	thousand short tons	711	3,118	571	2,995	876,	4,416	905	4,079
Coal	do	65,060	302,872	56,964	236,737	69,020	288,665	74,555	331,358
Fluorspar		47,244	2,101	35,831	1,510	8,899	308	14,865	608
Lead (recoverable content of ores, etc.)		52	14	80	22			228	72
Natural gas	million cubic feet	71,405	15,638	72,713	16,579	73,214	17,352	73,687	17,022
Natural-gas liquids:									
Natural gasoline	thousand gallons	35,406	2,394	28,224	1,552	34,991	2,492	35,275	2,414
LP-gases	do	176,232	4,993	189,966	5,066	189,247	6,451	248,992	8,709
Petroleum (crude)	thousand 42-gallon barrels	11,518	33,520	13,791	40,270	15,518	44,850	17,628	51,297
Sand and gravel	thousand short tons	3,052	2,900	4,730	4,402	4,899	5,298	5,684	5,974
Silver (recoverable content of ores, etc.)	troy ounces							31	(8)
Stone (except limestone for cement, 1953)		[6] 7,430	[6] 9,268	10,130	13,286	11,934	15,579	11,553	15,324
Zinc (recoverable content of ores, etc.)		489	112	458	99			417	114
Value of items that cannot be disclosed: Native asphalt, cement, iron ore (1956), stone (dimension sandstone, 1953). Excludes value of clays used for cement (1953)			4,812		5,626		6,446		7,079
Total Kentucky			381,742		[7] 327,503		[7] 391,068		[7] 443,168

LOUISIANA

Clays	thousand short tons	624	952	[5] 714	[5] 941	[5] 651	[5] 659	[5] 785	[5] 785
Gypsum		(4)	(4)	(4)	(4)	335,371	587	275,984	598
Natural gas	million cubic feet	1,293,644	106,079	1,399,222	124,531	1,680,032	189,844	1,886,302	215,038
Natural-gas liquids:									
Natural gasoline and cycle products	thousand gallons	665,532	55,421	665,070	54,330	782,328	59,158	773,949	62,394
LP-gases	do	287,280	12,654	292,226	11,620	291,138	10,323	305,222	14,727
Petroleum (crude)	thousand 42-gallon barrels	256,632	721,150	246,558	722,370	271,010	793,280	299,421	877,951
Salt (common)	thousand short tons	3,061	9,189	3,089	11,101	3,563	15,407	3,704	17,695
Sand and gravel	do	4,538	5,162	7,910	9,687	8,574	10,942	9,832	12,158
Stone (except limestone for cement and lime, 1953)	thousand short tons			2,044	3,127	3,253	4,961	4,405	6,674
Sulfur (Frasch-process)	long tons	1,609,364	43,453	1,853,563	49,222	2,072,418	58,028	2,238,852	59,330
Value of items that cannot be disclosed: Cement, bentonite (1954–56), lime, recovered elemental sulfur, and values indicated by footnote 4. Excludes clays used for cement (1953)			11,177		13,334		15,309		16,563
Total Louisiana			965,237		[13] 998,057		[13] 1,156,637		[13] 1,281,849

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

MAINE

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Beryllium concentrate—gross weight	(4)	(4)	(4)	(4)	22	13	12	7
Cement—thousand 376-pound barrels	2,001	5,422	1,973	5,425	2,349	6,875	(4)	(4)
Clays—thousand short tons	30	28	27	27	33	33	26	23
Feldspar—long tons	17,637	117	(4)	(4)	26,282	189	22,219	144
Gem stones			(5)	(4)	(5)	5	(5)	1
Lime	(4)	(4)	(4)	(4)	(4)	(4)	11,997	179
Mica: Scrap	(4)	(4)	(4)	(4)	71	2	114	3
Sheet—pounds	(4)	(4)	10,320	37	21,121	129	19,913	146
Peat	2,428	74	(4)	(4)	(4)	(4)	(4)	(4)
Sand and gravel—thousand short tons	8,072	2,608	7,461	2,538	7,529	2,855	7,196	3,085
Stone (except limestone for cement and lime, 1953)—do	[6] 249	[6] 1,215	1,024	2,356	1,192	2,542	942	2,238
Value of items that cannot be disclosed: Columbium-tantalum concentrate, quartz from pegmatites or quartzite (1953), slate, stone (crushed limestone, 1953), and values indicated by footnote 4		1,039		865		857		6,912
Total Maine		10,503		[13] 10,716		[13] 12,991		[13] 12,179

MARYLAND

Clays—thousand short tons	671	1,136	627	1,166	698	1,265	[6] 636	[6] 1,046
Coal—do	531	2,442	422	1,879	512	2,002	669	2,685
Lime	71,705	708	67,081	685	74,497	669	52,604	581
Natural gas—million cubic feet	1,408	268	1,394	282	3,116	626	4,619	1,169
Sand and gravel—thousand short tons	7,380	8,919	10,098	12,171	9,695	12,211	[17] 10,147	[17] 12,395
Stone (except limestone for cement and lime, 1953)—thousand short tons	[6] 3,578	[6] 6,275	5,065	8,266	[6] 5,343	[6] 8,800	6,229	13,305
Value of items that cannot be disclosed: Beryllium concentrate (1954), cement, ball clay, (1956), gem stones (1956), greensand marl (1954–56), mica (1954), potassium salts, slate (1953–55), stone (dimension limestone and crushed marble 1953, oystershell 1955), and talc and soapstone. Excludes value of clays used for cement (1953)		7,337		7,289		11,028		10,727
Total Maryland		27,085		[7] 30,743		[7] 35,491		[7] 40,532

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MASSACHUSETTS

Clays	thousand short tons	152	196	129	121	125	142	128	213
Lime		135,383	2,156	127,836	1,709	134,952	1,957	134,248	2,093
Peat		2,061	16	(4)	(4)	(4)	(4)	300	(4)
Sand and gravel	thousand short tons	7,308	5,931	9,640	8,366	9,581	8,926	10,189	9,520
Stone (except limestone for lime, 1953)	do	3,458	8,821	2,942	9,040	4,128	11,381	5,442	13,753
Value of items that cannot be disclosed: Mineral fuels and nonmetals			71		12		6		3
Total Massachusetts			17,191		[13] 18,851		[13] 22,109		[13] 25,085

MICHIGAN

Cement	thousand 376-pound barrels	15,853	41,860	16,712	45,692	19,738	58,048	21,880	67,798
Clays	thousand short tons	1,646	1,686	1,871	1,919	1,938	2,019	2,110	2,401
Copper (recoverable content of ores, etc.)		24,097	13,832	23,593	13,920	50,066	37,349	61,526	52,297
Gypsum		1,446,973	4,091	1,693,279	5,036	1,762,105	5,661	1,715,832	5,861
Iron ore (usable)	thousand long tons, gross weight	13,313	94,692	9,709	70,004	14,144	104,258	12,536	98,111
Magnesium compounds from well brines (partly estimated) MgO equivalent		43,190	4,592	37,038	4,104	46,336	5,064	(4)	(4)
Manganiferous ore (5 to 35 percent Mn)	gross weight	76,251	(4)	15,361	(4)				
Marl, calcareous (except for cement)		183,685	73	106,668	38	119,313	57	157,246	95
Natural gas	million cubic feet	7,774	1,275	6,962	1,239	8,300	955	10,911	1,451
Peat		25,439	257	(4)	(4)	(4)	(4)	31,111	475
Petroleum (crude)	thousand 42-gallon barrels	12,285	35,870	12,028	35,600	11,266	32,900	10,740	30,824
Salt (common)	thousand short tons	5,127	22,172	5,064	29,397	4,975	31,668	5,548	35,644
Sand and gravel	do	30,460	23,171	32,041	25,516	37,214	29,491	42,150	35,146
Silver (recoverable content of ores, etc.)	troy ounces					478,000	433	379,990	344
Stone (except limestone for cement and lime, 1953)	thousand short tons	21,616	17,639	27,758	21,904	33,636	28,909	33,999	31,010
Value of items that cannot be disclosed: Bromine, calcium-magnesium chloride, gem stones (1955–56), lime, magnesium chloride for metal (1953–55), natural-gas liquids, potassium salts, ground sand and sandstone (1953), and values indicated by footnote 4. Excludes value of clays used for cement (1953)			25,277		29,272		31,850		38,717
Total Michigan			286,487		[7] 279,940		[7] 363,787		[7] 394,536

MINNESOTA

Clays	thousand short tons	91	149	(4)	(4)	(4)	(4)	[5] 80	[5] 91
Iron ore (usable)	thousand long tons, gross weight	80,534	517,851	48,613	319,633	69,419	465,170	62,637	461,904
Manganiferous ore (5 to 35 percent Mn)	gross weight	1,091,491	(4)	504,057	(4)	864,628	(4)	633,919	(4)
Marl, calcareous (except for cement)		(4)	(4)	(4)	(4)	(4)	(4)	875	(8)
Sand and gravel	thousand short tons	19,774	7,304	23,849	16,319	25,396	17,429	28,197	18,254
Stone (except limestone for cement and lime, 1953)	do	2,271	6,587	[6] 2,629	[6] 7,485	[6] 3,005	[6] 7,043	[6] 3,084	[6] 7,552
Value of items that cannot be disclosed: Abrasive stones, cement, fire clay (1956), gem stones (1955–56), lime, manganese ore (1955–56), peat (1954–56), stone, crushed sandstone, 1954–56), and values indicated by footnote 4			10,654		8,204		11,739		13,443
Total Minnesota			542,545		[13] 351,474		[13] 501,151		[13] 501,027

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

MISSISSIPPI

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Clays thousand short tons	560	3,158	559	3,103	701	3,913	613	3,590
Natural gas million cubic feet	154,254	12,340	140,448	11,657	163,167	15,664	185,137	18,143
Natural-gas liquids:								
Natural gasoline and cycle products thousand gallons	32,214	2,295	27,804	1,944	22,382	1,573	24,829	1,751
LP-gases do	17,724	713	15,288	528	12,242	396	10,698	580
Petroleum (crude) thousand 42-gallon barrels	35,620	84,060	34,240	85,600	37,741	92,840	40,824	100,019
Sand and gravel thousand short tons	2,654	2,174	5,442	4,287	5,625	4,603	5,315	4,701
Stone do	38	44	181	181	573	573	656	656
Value of items that cannot be disclosed: Certain metals and nonmetals. Excludes value of clays used for cement (1953)		3,084		3,353		3,590		4,174
Total Mississippi		107,868		[13] 110,563		[13] 122,620		[13] 133,098

MISSOURI

Barite	330,763	3,338	312,791	3,047	363,692	4,004	381,642	4,462
Cement thousand 376-pound barrels	9,860	26,238	11,379	31,425	[13] 12,255	[13] 34,912	[13] 12,012	[13] 36,888
Clays thousand short tons	2,232	11,182	1,927	5,859	2,402	6,902	2,658	8,016
Coal do	2,393	9,849	2,514	10,028	3,232	12,772	3,283	13,223
Copper (recoverable content of ores, etc.)	2,374	1,363	1,925	1,136	1,722	1,285	1,890	1,606
Iron ore (usable) thousand long tons, gross weight	275	(4)	173	(4)	261	(4)	(4)	(4)
Lead (recoverable content of ores, etc.)	125,895	32,984	125,250	34,319	125,412	37,373	123,783	38,868
Lime	1,212,107	12,084	1,125,919	11,165	1,464,828	14,408	1,481,611	15,814
Natural gas million cubic feet	15	3	16	(4)	15	3	12	2
Petroleum (crude) thousand 42-gallon barrels	39	(4)	(4)	(4)	72	190	65	176
Sand and gravel thousand short tons	5,792	5,234	9,891	10,204	9,984	9,981	9,585	10,117
Silver (recoverable content of ores, etc.) troy ounces	359,781	326	352,971	320	268,620	243	295,111	267
Stone (except limestone for cement and lime, 1953) thousand short tons	[6] 13,948	[6] 20,553	18,672	24,752	[6] 22,369	[6] 29,580	24,578	33,577
Zinc (recoverable content of ores, etc.)	9,981	2,296	5,210	1,125	4,476	1,101	4,380	1,200
Value of items that cannot be disclosed: Native asphalt, masonry cement (1955–56), cobalt (1955–56), iron oxide pigment materials (1955–56), manganese ore (1953–54), nickel (1955–56), ground sand and sandstone (1953), stone (dimension marble 1953, 1955), tripoli (1953–54), and values indicated by footnote 4. Excludes value of clays used for cement (1953)		2,757		2,908		4,833		5,897
Total Missouri		128,207		[7] 131,280		[7] 151,626		[7] 163,693

MONTANA

Chromite	gross weight	26,089	870	123,096	4,133	118,703	3,719	118,780	3,807
Clays	thousand short tons	37	38	(4)	(4)	(4)	(4)	[5] 33	[5] 31
Coal:									
Bituminous	do	1,848	4,884	1,491	4,157	1,247	3,782	846	3,468
Lignite	do	25	93						
Copper (recoverable content of ores, etc.)		77,617	44,552	59,349	35,016	81,542	60,830	96,426	81,962
Fluorspar		5,932	(4)	15,102	(4)	25,223	(4)	59,775	(4)
Gem stones				(9)	(4)	(9)	(4)	(9)	35
Gold (recoverable content of ores, etc.)	troy ounces	24,768	867	23,660	828	28,123	984	38,121	1,334
Iron ore (usable)	thousand long tons, gross weight	7	45	6	(4)	7	(4)	12	(4)
Lead (recoverable content of ores, etc.)		19,949	5,227	14,820	4,061	17,028	5,075	18,642	5,853
Manganese ore (35 percent or more Mn)	gross weight	113,429	(4)	58,661	(4)	106,026	(4)	80,552	(4)
Manganiferous ore (5 to 35 percent Mn)	do	5,598	(4)	5,266	(4)	6,341	(4)	4,752	(4)
Mica, sheet	pounds			(4)	(4)			56	1
Natural gas	million cubic feet	27,889	1,645	30,252	2,057	28,255	1,724	25,847	1,758
Petroleum (crude)	thousand 42-gallon barrels	11,920	26,020	14,195	31,230	15,654	35,380	21,760	56,141
Phosphate rock	thousand long tons	(4)	(4)	(4)	(4)	(4)	(4)	558	3,957
Pumice		3,000	15	175	1	(4)	(4)	(4)	(5)
Sand and gravel	thousand short tons	6,203	2,994	13,341	7,460	13,772	6,615	10,024	7,174
Silver (recoverable content of ores, etc.)	troy ounces	6,689,556	6,054	5,177,942	4,686	6,080,390	5,503	7,385,908	6,685
Stone (except limestone for cement and lime, 1953)	thousand short tons	[6] 803	[6] 1,125	1,320	1,385	1,274	1,200	1,247	1,816
Talc		(4)	(4)	(4)	(4)	(4)	(4)	22,197	210
Tungsten ore and concentrate	60-percent WO_3 basis	14	(4)	678	(4)	1,211	(4)	1,230	(4)
Zinc (recoverable content of ores, etc.)		80,271	18,462	60,952	13,166	68,588	16,873	70,520	19,322
Value of items that cannot be disclosed: Antimony ore and concentrate (1953), barite, cement, clay (bentonite 1956), gypsum, lime, natural-gas liquids, pyrites, stone (dimension granite 1953), recovered elemental sulfur (1956), vermiculite, and values indicated by footnote 4			19,293		18,519		25,637		21,080
Total Montana			132,184		[13] 126,412		[13] 166,993		[13] 213,728

NEBRASKA

Clays	thousand short tons	176	187	164	164	151	151	153	154
Gem stones						(9)	2	(9)	3
Natural gas	million cubic feet	6,748	911	6,801	796	12,515	2,553	13,541	2,844
Petroleum (crude)	thousand 42-gallon barrels	6,344	17,190	7,783	21,400	11,203	30,810	16,204	45,209
Sand and gravel	thousand short tons	5,970	4,340	8,548	6,992	8,405	6,193	10,350	7,404
Stone (except limestone for cement, 1953)	do	1,407	2,070	2,660	3,512	3,081	4,177	3,063	4,142
Value of items that cannot be disclosed: Cement, natural-gas liquids, and pumice. Excludes value of clays used for cement (1953)			8,583		10,637		11,144		12,772
Total Nebraska			33,281		[7] 42,393		[7] 54,237		[7] 71,776

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

NEVADA

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Antimony ore and concentrate—antimony content	20	(4)	4	(4)			13	(4)
Barite	99,525	615	83,833	517	113,694	709	178,440	1,067
Clays—thousand short tons	(4)	(4)	5	9	6	13	14	32
Copper (recoverable content of ores, etc.)	61,850	35,502	70,217	41,428	78,925	58,878	82,883	70,450
Fluorspar	(4)	(4)	(4)	(4)	(4)	(4)	15,646	(4)
Gem stones	(9)	(4)	(9)	(4)	(9)	(4)	(9)	50
Gold (recoverable content of ores, etc.)—troy ounces	101,799	3,563	79,067	2,767	72,913	2,552	72,646	2,543
Gypsum	701,584	1,975	654,422	2,217	836,744	2,836	790,356	2,701
Iron ore (usable)—thousand long tons, gross weight	444	2,648	351	2,025	325	1,667	917	2,498
Lead (recoverable content of ores, etc.)	4,371	1,145	3,041	833	3,291	981	6,384	2,004
Manganese ore (35 percent or more Mn)—gross weight	20,150	1,685	(4)	(4)	101,469	(4)	121,482	(4)
Manganiferous ore (5 to 35 percent Mn)—do	25,064	432	12,870	165				
Mercury—76-pound flasks	3,254	628	4,974	1,315	5,750	1,669	5,859	1,523
Petroleum—thousand 42-gallon barrels			33	40	64	110	64	111
Pumice	21,269	86	(4)	(4)	(4)	(4)	11,534	34
Sand and gravel—thousand short tons	2,266	2,089	3,531	2,957	3,580	3,762	4,687	4,569
Silver (recoverable content of ores, etc.)—troy ounces	697,086	631	560,182	507	845,397	765	1,220,473	1,105
Stone (except limestone for lime, 1953)—thousand short tons	1,036	1,399	1,833	2,011	1,612	2,609	1,401	2,281
Talc and soapstone	10,906	73	5,866	54	10,732	[17] 79	10,540	98
Tungsten concentrate—60-percent WO_3 basis	3,683	13,824	5,331	20,048	6,155	22,751	5,400	19,263
Zinc (recoverable content of ores, etc.)	5,812	1,337	',035	224	2,670	657	7,488	2,052
Value of items that cannot be disclosed: Brucite (1953–54, 1956), diatomite, lime, magnesite, calcareous marl, molybdenum, perlite, salt, sulfur ore (1953, 1955–56), uranium (1956), and values indicated by footnote 4		5,891		12,435		13,752		14,404
Total Nevada		73,523		[13] 89,138		[11 13] 113,220		[13] 126,233

NEW HAMPSHIRE

Beryllium concentrate—gross weight	57	33	12	7	20	12	(4)	(4)
Clays—thousand short tons	45	41	36	36	35	35	36	47
Columbium-tantalum concentrate—pounds	770	1	255	(5)	(4)	(4)		
Feldspar—long tons	28,961	286	(4)	(4)	(4)	(4)	(4)	(4)
Gem stones					(9)	5	(9)	1

Mica:								
Sheet—pounds	90,716	383	42,466	234	(4)	(4)	50,873	178
Scrap	(4)	(4)	325	12	(4)	(4)	305	10
Peat	(4)	(4)	(4)	(4)	(4)	(4)	320	(4)
Sand and gravel—thousand short tons	2,249	506	2,241	1,095	2,432	1,593	3,862	1,822
Stone—do	77	539	72	473	(4)	(4)	(4)	(4)
Value of items that cannot be disclosed: Abrasive stones, and values indicated by footnote 4		16		255		960		1,378
Total New Hampshire		1,805		2,112		2,605		3,436
NEW JERSEY								
Clays—thousand short tons	532	1,326	578	1,246	644	1,562	651	2,214
Iron ore (usable)—thousand long tons, gross weight	816	10,115	476	6,622	760	13,633	912	16,842
Manganiferous residuum—gross weight	293,758	(4)	214,931	(4)	213,370	(4)	130,129	(4)
Marl (greensand)	6,821	193	2,101	185	(4)	(4)	(4)	(4)
Peat	21,706	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Sand and gravel—thousand short tons	7,362	10,836	10,005	14,705	11,153	16,425	11,194	18,239
Sand and sandstone (ground)	127,921	919	(14)	(14)	(14)	(14)	(14)	(14)
Stone (except limestone for lime, 1953)—thousand short tons	6,036	13,308	5,772	12,110	[6] 8,358	[6] 17,528	9,012	20,825
Sulfur, recovered elemental—long tons	(4)	(4)	(4)	(4)	7,404	244	8,972	291
Zinc (recoverable content of ores, etc.) [19]	45,700	9,923	37,416	7,992	11,643	2,864	4,667	1,260
Value of items that cannot be disclosed: Ball clay (1956), gem stones (1955–56), lime, magnesium compounds, stone (crushed marble 1955), and values indicated by footnote 4		5,325		[13] 4,184		[13] 5,239		[13] 4,608
Total New Jersey		51,945		47,044		57,495		64,279
NEW MEXICO								
Barite	(4)	(4)	(4)	(4)	(4)	(4)	4,059	81
Beryllium concentrate—gross weight	89	52	117	44	106	56	31	(4)
Clays—thousand short tons	49	104	48	83	45	109	40	95
Coal—do	514	3,081	123	727	202	1,236	158	923
Columbium-tantalum concentrate—pounds	(4)	(4)	2,093	4	76	(8)	95	(8)
Copper (recoverable content of ores, etc.)	72,477	41,602	60,558	35,729	66,417	49,547	74,345	63,193
Fluorspar	11,890	(4)	8,876	(4)	(4)	(4)		
Gem stones	(9)	(4)	(9)	(4)	(9)	25	(9)	30
Gold (recoverable content of ores, etc.)—troy ounces	2,614	91	3,539	124	1,917	67	3,275	115
Gypsum			887	3				
Helium—thousand cubic feet	11,158	150	41,755	735	53,721	946	76,072	1,350
Iron ore (usable)—thousand long tons, gross weight	8	(4)	3	(4)	9	(4)	(4)	(4)
Lead (recoverable content of ores, etc.)	2,943	771	887	243	3,296	982	6,042	1,897
Lime							30,771	373

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

NEW MEXICO—Continued

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Manganese ore (35 percent or more Mn)—gross weight					1,390	(4)	22,011	1,834
Manganiferous ore (5 to 35 percent Mn)—do	(4)	(4)	20,546	82	40,320	(4)	38,782	(4)
Mica:								
Scrap					84	3	767	22
Sheet—pounds			2,054	14	9,431	65	6,247	53
Natural gas—million cubic feet	399,086	24,344	449,346	35,049	540,664	48,119	626,340	55,118
Natural-gas liquids:								
Natural gasoline and cycle products—thousand gallons	171,654	10,094	224,112	11,744	261,023	15,425	306,595	16,560
LP-gases—do	121,212	4,618	225,994	5,704	278,403	6,767	308,218	11,065
Perlite	84,891	662	111,040	886	147,805	1,091	167,705	1,271
Petroleum (crude)—thousand 42-gallon barrels	70,441	185,260	74,820	205,760	82,958	227,310	87,893	241,706
Potassium salts—K_2O equivalent	1,552,831	58,076	1,732,240	64,367	[17] 1,841,122	[17] 69,641	1,930,754	72,802
Pumice	528,649	760	363,926	1,060	393,597	780	292,330	667
Salt (common)—thousand short tons	62	216	51	333	50	597	58	501
Sand and gravel—do	1,416	1,239	6,519	8,340	4,556	6,005	6,054	5,776
Silver (recoverable content of ores, etc.)—troy ounces	205,309	186	109,132	99	251,072	227	392,967	356
Stone—thousand short tons	625	511	772	714	1,573	1,547	1,268	1,272
Tungsten ore and concentrate—60-percent WO_3 basis			(20)	1	1	3	(20)	2
Zinc (recoverable content of ores, etc.)	13,373	3,076	6	1	15	3,758	35,010	9,593
Value of items that cannot be disclosed: Carbon dioxide, diatomite (1953–55), molybdenum, magnesium compounds (1954, 1956), rare earth metals concentrates (1956), recovered elemental sulfur, uranium ore (1956), vanadium, and values indicated by footnote 4		1,652		1,673		2,188		26,739
Total New Mexico		336,545		373,519		[11] 436,494		[13] 513,303

NEW YORK

Cement [16]—thousand 376-pound barrels	14,965	39,388	14,497	38,861	17,942	52,150	18,604	57,329
Clays—thousand short tons	961	1,303	1,199	1,494	1,394	1,676	1,235	1,508
Emery	10,562	144	9,758	132	10,735	151	12,153	174
Gem stones					(9)	(9)	(9)	2
Gypsum	987,156	3,507	1,133,579	4,005	1,249,119	4,404	1,140,187	4,817
Iron ore (usable)—thousand long tons, gross weight	3,415	36,346	2,803	31,707	3,202	38,019	(4)	(4)
Lead (recoverable content of ores, etc.)	1,435	376	1,187	325	1,037	309	1,608	505
Lime	(4)	(4)	(4)	(4)	82,890	1,366	86,737	1,030
Natural gas—million cubic feet	2,347	742	2,598	847	3,637	1,073	4,098	1,160
Peat	3,775	46	(4)	(4)	(4)	(4)	2,900	23

Petroleum (crude)—thousand 42-gallon barrels	3,800	16,260	3,257	11,140	2,904	10,310	2,748	12,091
Salt (common)—thousand short tons	3,322	17,351	3,413	22,754	3,780	25,214	3,873	27,545
Sand and gravel—do	22,531	23,494	30,082	29,756	25,562	25,542	27,815	28,722
Silver (recoverable content of ores, etc.)—troy ounces	35,398	32	34,576	31	66,162	60	84,158	76
Slate	113,575	1,733	114,929	1,742	90,668	1,345	64,282	944
Stone (except limestone for cement and lime, 1953)—thousand short tons	15,962	25,251	19,410	31,426	22,812	37,919	22,805	36,135
Talc	156,299	941	(4)	(4)	(4)	(4)	(4)	(4)
Zinc (recoverable content of ores, etc.)	51,529	11,852	53,199	11,491	53,016	13,042	59,111	16,196
Value of items that cannot be disclosed: Abrasive stone (1953–54), beryllium concentrate (1954), natural cement, abrasive garnet, iron oxide pigments (1955–56), calcareous marl (1953–54), stone (crushed unclassified 1953), recovered elemental sulfur (1954), titanium concentrate, wollastonite and values indicated by footnote 4. Excludes value of clays used for cement (1953)		8,102		9,883		8,773		52,734
Total New York		186,868		[7] 192,738		[7] 216,907		[7] 237,016
NORTH CAROLINA								
Abrasive stones	(4)	16	587	12	[21] 227	12	[21] 454	16
Beryllium concentrate—gross weight	(4)	(4)	(4)	(4)	(4)	(4)	3	2
Clays—thousand short tons	1,466	2,535	1,873	2,520	2,375	1,792	2,663	2,027
Feldspar—long tons	268,042	3,291	230,744	2,221	242,724	2,185	255,637	3,191
Gem stones					(5)	(5)	(5)	1
Gold (recoverable content of ores, etc.)—troy ounces			214	8	190	7	882	31
Lead (recoverable content of ores, etc.)			4	1	2	1	10	3
Mica:								
Scrap	56,834	1,429	61,049	1,457	60,887	1,377	47,125	1,065
Sheet—pounds	619,895	1,308	479,221	1,787	553,444	2,745	770,903	2,135
Sand and gravel—thousand short tons	6,911	4,993	7,441	5,508	7,786	5,911	7,581	6,264
Silver (recoverable content of ores, etc.)—troy ounces			438	(5)	181	(5)	753	1
Stone—thousand short tons	[6] 9,317	[6] 14,424	10,134	15,625	10,903	16,533	[6] 8,352	[6] 11,471
Talc and pyrophyllite	119,341	578	112,704	389	125,206	572	125,487	529
Tungsten concentrate—60-percent WO_3 basis	2,074	(4)	2,538	(4)	2,609	(4)	2,732	(4)
Value of items that cannot be disclosed: Abrasive stone (millstones 1954), asbestos (1953–55), columbium-tantalum concentrate (1953), copper (1954–56), lithium minerals, manganiferous ores (1953), olivine, quartz (1953), stone (dimension and crushed marble 1953, crushed and dimension granite, crushed miscellaneous, and dimension sandstone 1956), vermiculite (1953–55), and values indicated by footnote 4		9,877		12,123		10,075		13,249
Total North Carolina		38,451		41,651		41,210		39,985

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

NORTH DAKOTA

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Clays thousand short tons	23	48	(4)	(4)	(4)	(4)	[5] 52	[5] 71
Coal (lignite) do	2,803	6,618	(4)	(4)	3,102	7,261	2,815	6,578
Natural gas million cubic feet	498	34	1,093	69	5,256	405	11,725	950
Petroleum (crude) thousand 42-gallon barrels	5,183	10,370	6,025	12,890	11,143	32,200	13,495	39,136
Pumice					3,500	10	4,840	5
Sand and gravel thousand short tons	6,174	2,165	7,105	2,219	11,169	2,638	5,946	4,259
Stone do	35	2	1	4	77	80	83	87
Sulfur, recovered elemental long tons							1,735	46
Value of items that cannot be disclosed: Certain nonmetals and values indicated by footnote 4				7,041		1,529		2,423
Total North Dakota		19,237		22,223		44,123		53,555

OHIO

Cement thousand 376-pound barrels	12,532	32,957	13,077	35,929	14,914	42,966	16,065	49,794
Clays thousand short tons	5,635	9,328	5,051	11,137	6,297	15,677	6,703	17,675
Coal do	34,737	131,475	32,469	117,520	37,870	133,814	38,934	148,650
Lime	2,945,800	35,310	2,549,046	31,444	3,038,949	39,394	2,995,320	40,805
Natural gas million cubic feet	37,542	8,334	28,824	6,111	33,756	7,595	25,368	6,088
Peat	27,696	261	29,540	357	22,484	249	15,509	174
Petroleum (crude) thousand 42-gallon barrels	3,610	9,710	3,880	10,710	4,353	12,580	4,785	15,025
Salt (common) thousand short tons	3,040	7,485	2,749	12,359	2,905	14,769	2,972	15,923
Sand and gravel do	24,032	27,076	25,827	27,873	27,906	31,995	30,200	36,146
Stone (except limestone for cement and lime, 1953) do	[6] 25,286	[6] 39,041	32,627	47,802	33,273	49,841	[6] 33,418	[6] 50,947
Value of items that cannot be disclosed: Abrasive stones, calcium-magnesium chloride, gypsum, natural gasoline, ground sand and sandstone (1953), stone (dimension unclassified 1953, crushed sandstone 1956), recovered elemental sulfur, and values indicated by footnote 4. Excludes value of clays used for cement (1953)		1,265		2,084		2,865		5,394
Total Ohio		302,242		[7] 293,659		[7] 340,457		[7] 375,488

OKLAHOMA

Clays	thousand short tons	578	637	452	1,283	[5] 724	[5] 727	[5] 705	[5] 701
Coal	do	2,168	13,227	1,915	11,265	2,164	12,668	2,007	12,341
Lead (recoverable content of ores, etc.)		9,304	2,438	14,204	3,892	14,126	4,209	12,350	3,878
Natural gas	million cubic feet	599,955	41,397	616,355	43,145	614,976	45,508	678,603	54,288
Natural-gas liquids:									
Natural gasoline and cycle products	thousand gallons	433,650	28,066	478,590	24,332	504,692	28,770	489,963	26,543
LP-gases	do	414,036	14,886	453,810	13,506	512,320	14,297	579,101	23,427
Petroleum (crude)	thousand 42-gallon barrels	202,570	546,940	185,851	518,520	202,817	563,830	215,862	600,096
Pumice		[4]	[4]	[4]	[4]			305	3
Salt	thousand short tons	[4]	[4]	[4]	[4]	[4]	[4]	10	90
Sand and gravel	do	5,011	4,258	5,424	4,265	6,294	4,786	5,947	4,842
Stone (except limestone for cement and lime, 1953)	do	8,490	7,931	9,239	9,147	10,933	12,295	10,547	12,417
Zinc (recoverable content of ores, etc.)		33,413	7,685	43,171	9,325	41,543	10,220	27,515	7,539
Value of items that cannot be disclosed: Native asphalt, clay (bentonite, 1955–56), cement, gypsum, lime, ground sand and sandstone (1953), stone (dimension limestone 1954), recovered elemental sulfur, tripoli, and values indicated by footnote 4. Excludes value of clays used for cement (1953)			11,538		12,584		15,525		12,965
Total Oklahoma			679,003		[7] 650,205		[7] 711,089		[7] 757,116

OREGON

Chromite	gross weight	6,216	484	6,655	538	5,341	463	[22] 54,577	[22] 2,001
Clays	thousand short tons	292	296	[4]	[4]	251	276	257	278
Copper (recoverable content or ores, etc.)		9	5	5	3	4	3	7	6
Gem stones		[9]	[4]	[9]	[4]	[9]	[4]	[9]	250
Gold (recoverable content of ores, etc.)	troy ounces	8,488	297	6,520	228	1,708	60	2,738	96
Iron ore (usable)	thousand long tons					2	[4]	1	[4]
Lead (recoverable content of ores, etc.)		5	1	5	1	3	1	5	2
Manganese ore (35 percent or more Mn)	gross weight	46	[4]						
Manganiferous ore (5 to 35 percent Mn)	do	271	[4]						
Mercury	76-pound flasks	648	125	489	129	1,056	307	1,893	492
Nickel (content of ore and concentrate)				1,993	[4]	4,181	[4]	6,866	[4]
Pumice		73,080	174	67,852	178	[4]	[4]	[4]	[4]
Sand and gravel	thousand short tons	8,763	8,630	13,157	14,150	11,954	11,832	11,637	11,647
Silver (recoverable content of ores, etc.)	troy ounces	12,259	11	14,335	13	8,815	8	13,542	12
Stone (except limestone for cement and lime, 1953)	thousand short tons	[6] 4,939	[6] 6,302	5,872	8,618	7,742	9,418	6,098	7,890
Value of items that cannot be disclosed: Carbon dioxide, cement, diatomite, iron oxide pigments (1954, 1956), perlite (1953), quartz (1953), sodium carbonate (1956), stone (crushed granite 1953), tungsten concentrate, and values indicated by footnote 4. Excludes value of clays used for cement (1953)			8,124		9,634		10,500		12,679
Total Oregon			24,449		[7] 32,268		[7] 31,736		[7] 34,011

See footnotes at end of table.

TABLE 5.—Mineral production[1] in the United States,[2] 1953–56, by States—Continued

PENNSYLVANIA

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Cement.....thousand 376-pound barrels	42,094	114,003	43,068	117,912	48,090	141,969	51,964	162,387
Clays.....thousand short tons	3,575	9,988	3,524	10,244	4,020	12,413	[5] 4,413	[5] 23,782
Coal:								
Anthracite.....do	30,949	299,140	29,083	247,870	26,205	206,097	28,900	236,785
Bituminous.....do	93,331	516,490	72,010	378,659	85,713	440,452	90,287	479,437
Cobalt (content of concentrate).....pounds	564,450	(4)	517,124	(4)	478,840	(4)	533,329	(4)
Copper (recoverable content of ores, etc.)	3,027	1,737	(4)	(4)	(4)	(4)	(4)	(4)
Gold (recoverable content of ores, etc.).....troy ounces	1,134	40	1,317	46	1,610	56	(4)	(4)
Iron ore (usable).....thousand long tons, gross weight	1,021	(4)	708	(4)	838	(4)	(4)	(4)
Iron oxide pigment materials (crude)					519	7	600	7
Lime	1,335,300	16,010	1,081,583	13,206	1,424,051	17,632	1,443,430	18,282
Natural gas.....million cubic feet	105,558	30,717	145,934	43,634	99,172	29,652	104,508	33,652
Natural-gas liquids:								
Natural gasoline.....thousand gallons	(4)	(4)	4,830	320	4,305	281	4,081	251
LP-gases.....do	1,008	90	1,008	89	995	90	1,127	99
Peat	8,232	48	15,621	141	23,277	220	20,498	213
Petroleum (crude).....thousand 42-gallon barrels	10,649	45,680	9,107	31,150	8,531	30,200	8,230	35,718
Pyrophyllite (sericite schist)	2,463	5	1,898	9	(4)	(4)	(4)	(4)
Sand and gravel.....thousand short tons	14,715	20,692	14,218	20,596	13,313	20,512	14,047	21,321
Silver (recoverable content of ores, etc.).....troy ounces	6,972	6	8,415	8	10,379	9	(4)	(4)
Slate	202,386	4,420	194,205	4,419	186,035	4,421	153,824	4,194
Stone (except limestone for cement and lime, 1953).....thousand short tons	[6] 26,193	[6] 48,094	40,522	61,193	44,438	[17] 68,918	[6] 44,913	[6] 73,831
Sulfur, recovered elemental.....long tons	(4)	(4)	(4)	(4)	7,738	263	11,350	386
Tripoli	(4)	(4)	(4)	(4)	[11] 1,090	[11] 6	1,030	7
Value of items that cannot be disclosed: Clays (kaolin 1956), gem stones (1955–56), graphite (crystalline 1953), mica, pyrites, ground sand and sandstone (1953), stone (dimension basalt 1953, 1956, shell 1956) and values indicated by footnote 4. Excludes value of clays used for cement (1953)		14,462		12,549		15,819		16,202
Total Pennsylvania		1,121,622		[7] 925,545		[7 11] 969,910		[7] 1,088,867

RHODE ISLAND

Sand and gravel	thousand short tons	898	776	1,013	980	1,941	1,498	1,308	1,263
Stone	do	162	617	(4)	(4)	(4)	(4)	42	221
Value of items that cannot be disclosed: Nonmetals and values indicated by footnote 4			69		481		336		143
Total Rhode Island			1,462		1,461		1,834		1,627

SOUTH CAROLINA

Clays	thousand short tons	964	4,802	1,136	4,702	1,086	5,463	1,087	5,450
Mica (sheet)	pounds			(4)	(4)	(4)	(4)	5,400	14
Sand and gravel	thousand short tons	2,976	2,565	2,814	2,550	3,127	2,677	3,229	2,926
Stone	do	2,914	3,976	2,862	4,233	3,455	4,921	3,304	4,285
Value of items that cannot be disclosed: Barite, cement, kyanite, scrap mica (1954–56), rare-earth metals concentrates (1956), stone (dimension granite 1953–54, dimension granite and crushed limestone 1956), titanium (1956), vermiculite, and values indicated by footnote 4. Excludes values of clays used for cement (1953)			6,428		6,374		7,400		9,277
Total South Carolina			17,771		[13] 17,744		[13] 20,197		[13] 21,342

SOUTH DAKOTA

Beryllium concentrate	gross weight	392	158	337	140	294	157	195	95
Clays	thousand short tons	331	2,826	(4)	(4)	(4)	(4)	[5] 201	[5] 201
Coal (lignite)	do	24	82	(4)	(4)	26	90	25	90
Columbium-tantalum concentrate	pounds	4,431	9	25,447	43	5,638	10	237	(8)
Feldspar	long tons	50,601	321	(4)	(4)	42,164	267	45,226	289
Gem stones		(9)	(4)	(9)	5	(9)	7	(9)	10
Gold (recoverable content of ores, etc.)	troy ounces	534,987	18,725	541,445	18,951	529,865	18,545	568,523	19,898
Gypsum		(4)	(4)	8,518	11	12,592	16	15,794	63
Iron ore (usable)	thousand long tons, gross weight	1	(4)	2	(4)	2	(4)	22	101
Lead (recoverable content of ores, etc.)		10	3						
Mica:									
Scrap		1,687	27	1,510	27	1,322	27	1,268	31
Sheet	pounds	11,174	77	16,299	65	4,854	21	12,494	57
Natural gas	million cubic feet	5	(4)	7	(4)				
Sand and gravel	thousand short tons	5,402	2,818	14,819	7,840	13,538	10,097	12,539	8,423
Silver (recoverable content of ores, etc.)	troy ounces	138,642	125	151,407	137	154,092	140	136,118	123
Stone (except limestone for cement and lime, 1953)	thousand short tons	[6] 1,189	[6] 4,997	1,615	4,929	2,262	5,680	2,200	5,725
Tungsten ore and concentrate	60-percent WO_3 basis	2	(4)	(20)	1				
Value of items that cannot be disclosed: Cement, clays (bentonite 1956), lime, lithium minerals (1953–54), petroleum (1954–56), stone (dimension miscellaneous 1953), vanadium (1954), and values indicated by footnote 4. Excludes value of clays used for cement (1953)			3,655		6,121		6,115		7,547
Total South Dakota			33,823		[7] 37,874		[7] 40,526		[7] 41,797

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

TENNESSEE

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Cement—thousand 376-pound barrels	7,277	18,283	7,569	19,734	8,812	23,673	8,755	25,435
Clays—thousand short tons	1,037	3,479	1,015	3,781	1,208	4,170	1,379	4,888
Coal—do	5,467	25,152	6,429	25,477	7,053	28,747	8,848	35,609
Copper (recoverable content of ores, etc.)	7,829	4,494	9,087	5,362	9,911	7,394	10,449	8,882
Fluorspar	426	(4)					(4)	(4)
Gold (recoverable content of ores, etc.)—troy ounces	293	10	218	8	221	8	189	7
Iron ore (usable)—thousand long tons, gross weight	13	83	(4)	(4)	(4)	(4)	(4)	(4)
Lead (recoverable content of ores, etc.)	9	2					5	1
Lime	114,474	1,178	80,372	968	103,257	1,102	124,592	1,436
Manganese ore (35 percent or more Mn)—gross weight	2,625	202	11,823	920	15,895	1,280	17,821	1,417
Natural gas—million cubic feet	89	11	89	10	39	5	45	6
Petroleum (crude)—thousand 42-gallon barrels	16	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Phosphate rock—thousand long tons	1,519	11,305	1,633	11,743	1,466	10,526	1,685	11,643
Sand and gravel—thousand short tons	5,231	5,630	5,155	6,141	5,137	5,814	5,629	6,480
Silver (recoverable content of ores, etc.)—troy ounces	68,935	62	60,795	55	66,619	60	64,878	59
Stone (except limestone for cement and lime, 1953)—thousand short tons	[6] 10,485	[6] 16,948	14,040	22,046	14,381	22,276	[6] 15,556	[6] 23,796
Zinc (recoverable content of ores, etc.)	38,465	8,847	30,326	6,550	40,216	9,893	46,023	12,610
Value of items that cannot be disclosed: Barite, manganiferous ore (1954), scrap mica (1956), pyrites, stone (crushed granite 1953, crushed sandstone 1956), and minerals indicated by footnote 4. Excludes value of clays used for cement (1953)		2,364		5,480		6,994		8,772
Total Tennessee		98,050		[7] 105,686		[7] 119,316		[7] 137,846

TEXAS

Abrasive stone: Pebbles, grinding	400	5	(4)	(4)	(4)	(4)	(4)	(4)
Cement—thousand 376-pound barrels	19,140	48,498	21,928	56,674	24,856	67,549	25,966	75,695
Clays—thousand short tons	2,371	4,679	2,401	7,002	[5] 3,097	[5] 5,100	[5] 3,146	[5] 4,765
Copper (recoverable content of ores, etc.)					1	1		
Gem stones	(9)	(4)	(9)	100	(9)	115	(9)	115
Gypsum	1,067,854	2,861	1,218,048	3,773	1,349,434	4,220	1,156,956	3,623
Helium—thousand cubic feet	103,711	1,389	110,588	1,874	139,397	2,272	145,830	2,364
Iron ore (usable)—thousand long tons, gross weight	1,015	(4)	915	(4)	875	(4)	(4)	(4)
Lime	475,569	4,381	547,436	5,422	584,855	5,549	592,136	6,938
Natural gas—million cubic feet	4,383,158	333,120	4,551,232	386,855	[8] 30,798	378,464	4,999,889	434,990

Natural-gas liquids:								
Natural gasoline and cycle products—thousand gallons	2,750,370	200,479	2,732,100	200,559	2,987,808	206,506	2,964,609	216,378
LP-gases—do	2,777,880	109,131	2,983,962	95,913	3,450,430	110,414	3,731,047	144,745
Peat	1,375	(4)	(4)	(4)				
Petroleum (crude)—thousand 42-gallon barrels	1,019,164	2,777,900	974,275	2,768,490	1,053,297	2,989,330	1,107,808	3,097,390
Salt (common)—thousand short tons	2,845	5,011	2,864	9,310	3,583	12,867	3,963	14,370
Sand and gravel—do	15,101	12,845	26,316	24,841	31,518	28,480	29,336	27,213
Silver (recoverable content of ores, etc.)—troy ounces			100	(3)	126	(3)		
Sodium sulfate	(4)	(4)	(4)	(4)	46,718	1,099	(4)	(4)
Stone (except limestone for cement and lime, 1953)—thousand short tons	[6] 9,095	[6] 8,550	[6] 25,840	[6] 29,344	27,321	33,544	32,773	36,350
Sulfur (Frasch-process)—long tons	3,614,838	97,601	3,474,477	92,792	3,766,882	105,128	3,437,061	91,026
Sulfur, recovered elemental—do	84,717	2,202	107,232	2,889	114,989	3,144	140,164	3,865
Talc and soapstone	16,210	71	19,362	128	35,064	213	41,332	244
Value of items that cannot be disclosed: Native asphalt, bromine, clay (fuller's earth 1955–56), coal (lignite), graphite, magnesium chloride (for metal), magnesium compounds (except for metal), mercury (1955–56), pumice, stone (crushed basalt 1953, dimension sandstone 1954), uranium ore (1956), and values indicated by footnote 4. Excludes value of clays used for cement (1953)		39,190		52,527		50,069		62,350
Total Texas		3,647,913		[7] 3,730,705		[7] 3,993,310		[7] 4,211,284

UTAH

Asphalt and related bitumens, native: Gilsonite	60,505	2,184	75,943	2,724	82,822	3,117	(4)	(4)
Clays—thousand short tons	188	1,448	(4)	(4)	(4)	(4)	[5] 227	[5] 492
Coal—do	6,544	37,689	5,008	29,761	6,296	40,005	6,522	34,436
Copper (recoverable content of ores, etc.)	269,496	154,691	211,835	124,983	232,949	173,780	250,604	213,013
Fluorspar	15,527	375	4,403	82	7,328	151	10,581	265
Gem stones					(9)	6	(9)	10
Gold (recoverable content of ores, etc.)—troy ounces	483,430	16,920	403,401	14,119	441,206	15,442	416,031	14,561
Iron ore (usable)—thousand long tons, gross weight	4,617	26,497	3,041	19,277	3,847	24,688	4,002	27,508
Lead (recoverable content of ores, etc.)	41,522	10,879	44,972	12,322	50,452	15,035	49,555	15,560
Lime	(4)	(4)	30,428	432	38,710	583	55,110	830
Manganese ore (35 percent or more Mn)—gross weight	550	(4)	25	(4)		6		
Manganiferous ore (5 to 35 percent Mn)—do	5,155	82	97	(4)				
Natural gas—million cubic feet	7,075	807	16,024	2,259	17,163	2,386	17,268	2,435
Perlite	(4)	(4)	(4)	(4)	(4)	(4)	2,271	9
Petroleum (crude)—thousand 42-gallon barrels	1,807	(4)	1,905	4,480	2,227	5,140	2,466	5,302
Phosphate rock—thousand long tons	(4)	(4)	(4)	(4)	(4)	(4)	125	772
Pumice	3,880	4	3,588	4	2,041	20	44,769	330
Salt (common)—thousand short tons	154	772	167	1,020	196	1,339	184	1,471
Sand and gravel—do	4,628	3,180	5,328	3,592	5,158	3,309	5,836	4,476
Silver (recoverable content of ores, etc.)—troy ounces	6,725,807	6,087	6,179,243	5,593	6,250,565	5,657	6,572,041	5,948
Stone (except limestone for cement and lime, 1953)—thousand short tons	997	1,447	1,127	1,546	1,926	2,650	2,322	3,298
Tungsten ore and concentrate—60-percent WO_3 basis	35	123	84	309	65	225	11	41
Uranium ore							927,850	22,500
Vanadium—pounds	385,038	(4)	575,884	(4)	995,873	(4)	1,098,802	(4)

See footnotes at end of table.

TABLE 5.—Mineral production [1] in the United States,[2] 1953–56, by States—Continued

UTAH—Continued

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Zinc (recoverable content of ores, etc.)	29,184	6,712	34,031	7,351	43,556	10,715	42,374	11,610
Value of items that cannot be disclosed: Carbon dioxide, cement, clay (kaolin 1956), gypsum, molybdenum, natural gasoline, potassium salts, and values indicated by footnote 4. Excludes value of clays used for cement (1953)		28,692		26,203		28,733		33,249
Total Utah		298,589		[13] 255,495		[13] 331,929		[13] 396,942

VERMONT

Clays—thousand short tons	(4)	(4)	(4)	(4)	14	14	(4)	(4)
Copper (recoverable content of ores, etc.)	3,947	2,265	4,352	2,568	4,305	3,212	3,403	2,893
Gold (recoverable content of ores, etc.)—troy ounces	171	6	185	6	181	6	(4)	(4)
Pyrites—long tons	19,486	(4)	20,713	(4)	21,685	(4)	22,537	107
Sand and gravel—thousand short tons	1,114	690	1,482	1,111	1,763	1,169	1,910	905
Silver (recoverable content of ores, etc.)—troy ounces	43,128	39	48,572	44	50,447	46	(4)	(4)
Slate	(4)	(4)	(4)	(4)	(4)	(4)	162,239	3,722
Stone (except limestone for lime, 1953)—thousand short tons	527	8,860	437	8,178	582	11,061	621	11,622
Talc	80,209	241	66,195	199	(4)	(4)	(4)	(4)
Value of items that cannot be disclosed: Asbestos, gem stones (1955), lime, and values indicated by footnote 4		8,201		8,401		8,400		3,915
Total Vermont		20,302		[13] 20,483		[13] 23,884		[13] 23,131

VIRGINIA

Beryllium concentrate—gross weight			(4)	(3)	(4)	(3)	1	(3)
Clays—thousand short tons	952	928	705	723	936	874	1,000	1,033
Coal—do	19,119	102,022	16,387	72,901	23,508	108,174	28,063	138,127
Lead (recoverable content of ores, etc.)	2,788	730	4,320	1,184	2,997	893	3,035	953
Lime	477,384	4,947	445,158	4,611	494,293	5,049	512,346	5,926
Manganese ore (35 percent or more Mn)—gross weight	8,454	636	22,678	1,781	32,654	2,779	20,231	1,902
Marl, calcareous (except for cement)	(4)	(4)	33,174	21	(4)	(4)	10,522	12
Mica, sheet—pounds	(4)	(4)	(4)	(4)	(4)	(4)	396	6

Natural gas—million cubic feet	3,697	954	1,401	380	968	259	2,926	810
Petroleum (crude)—thousand 42-gallon barrels	8	(4)	7	(4)	4	(4)	(4)	(4)
Sand and gravel—thousand short tons	5,276	5,161	7,115	8,658	6,461	8,076	7,783	9,240
Silver (recoverable content of ores, etc.)—troy ounces	1,169	1	1,773	2	1,850	2	1,874	2
Slate	(4)	(4)	17,410	469	31,536	820	31,894	1,035
Stone (except limestone for cement and lime, 1953)—thousand short tons	9,092	16,259	10,894	18,138	11,966	19,870	14,082	23,076
Zinc (recoverable content of ores, etc.)	16,676	3,835	16,738	3,615	18,329	4,509	19,196	5,181
Value of items that cannot be disclosed: Aplite, cement, feldspar, gem stones (1955), gypsum, iron ore (1953–54), iron oxide pigments (1954–56), kyanite, manganiferous ore (1956), mica (scrap 1953–55), pyrites, salt, ground sand and sandstone (1953), talc and soapstone, titanium concentrate and minerals indicated by footnote 4. Excludes value of clays used for cement (1953)		17,506		19,403		24,046		24,931
Total Virginia		152,979		r 129,603		r 172,541		r 208,806

WASHINGTON

Abrasive stone: Pebbles (grinding)	(4)	(4)	(4)	(4)	(4)	(4)	25	(5)
Barite			(4)	(4)	25	(5)		
Chromite—gross weight					22	2	30	3
Clays—thousand short tons	259	312	261	318	365	412	320	440
Coal—do	690	5,048	619	4,478	610	4,263	473	3,432
Copper (recoverable content of ores, etc.)	3,740	2,147	3,636	2,145	3,958	2,953	2,926	2,487
Epsomite	200	8	(4)	(4)	100	5	(4)	(4)
Gem stones	(5)	(4)	(5)	(4)	(5)	(4)	(5)	75
Gold (recoverable content of ores, etc.)—troy ounces	62,560	2,189	66,740	2,336	74,360	2,602	70,669	2,473
Gypsum	3,800	14	(4)	(4)	3,500	14	(4)	(4)
Iron ore—thousand long tons					2	(4)	2	(4)
Lead (recoverable content of ores, etc.)	11,064	2,899	9,938	2,723	10,340	3,081	11,657	3,660
Peat	32,107	104	43,134	153	37,640	113	37,043	129
Pumice	(4)	(4)	(4)	(4)	(4)	(4)	5,291	15
Sand and gravel—thousand short tons	11,183	9,318	16,045	13,595	21,645	19,351	16,842	15,037
Silver (recoverable content of ores, etc.)—troy ounces	321,202	290	313,735	284	436,348	395	448,442	406
Stone (except limestone for cement and lime, 1953)—thousand short tons	4,438	5,891	5,367	9,527	6,593	10,580	8,057	11,660
Talc and soapstone	5,351	29	(4)	(4)	(4)	(4)	(4)	(4)
Tungsten ore and concentrate—60-percent WO_3 basis	5	20	18	66	12	46	2	(4)
Zinc (recoverable content of ores, etc.)	32,786	7,541	22,304	4,818	29,536	7,266	25,609	7,017
Value of items that cannot be disclosed: Carbon dioxide, cement, diatomite, lime, magnesite, manganese ore (1953), olivine, quartz (1953), ground sand and sandstone (1953), strontium minerals (1956), uranium ore (1956), and values indicated by footnote 4. Excludes value of clays used for cement (1953)		18,767		16,924		19,765		17,678
Total Washington		54,577		r 53,300		r 67,334		r 61,665

See footnotes at end of table.

TABLE 5.—Mineral production[1] in the United States,[2] 1953–56, by States—Continued

WEST VIRGINIA

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Clays—thousand short tons	969	2,489	587	1,451	707	2,563	770	2,449
Coal—do	134,105	693,594	115,996	541,370	139,168	653,388	155,890	824,043
Marl, calcareous	(4)	(4)	(4)	(4)	(4)	(4)	1,685	1
Natural gas—million cubic feet	186,477	44,009	191,601	45,601	212,403	49,915	204,717	48,518
Natural-gas liquids:								
Natural gasoline—thousand gallons	44,352	3,245	41,076	2,593	35,756	2,352	35,728	2,594
LP-gases—do	153,090	6,743	142,884	5,035	286,871	6,376	240,989	12,031
Petroleum (crude)—thousand 42-gallon barrels	3,038	11,570	2,902	8,500	2,320	7,080	2,179	8,411
Salt (common)—thousand short tons	420	1,490	472	2,886	638	3,477	681	3,453
Sand and gravel—do	3,163	6,071	4,074	8,351	5,171	9,779	5,110	10,711
Stone (except limestone for cement and lime, 1953)—thousand short tons	[6] 5,501	[6] 8,924	7,315	11,743	5,899	9,714	6,579	10,765
Value of items that cannot be disclosed: Abrasive stone (1953, 1955), bromine, calcium-magnesium chloride, cement, lime, ground sand and sandstone (1953), stone (dimension limestone (1953)), recovered elemental sulfur, and values indicated by footnote 4. Excludes value of clays used for cement (1953)		11,975		10,504		12,930		14,590
Total West Virginia		790,110		[7] 636,311		[7] 755,512		[7] 935,074

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Abrasive stone: Pebbles (grinding)	(4)	(4)	(4)	(4)	(4)	(4)	1,093	31
Clays—thousand short tons	175	175	180	174	165	166	163	172
Iron ore (usable)—thousand long tons, gross weight	1,655	(4)	1,429	(4)	1,886	(4)	1,488	(4)
Lead (recoverable content of ores, etc.)	2,094	549	1,261	346	1,948	581	2,582	811
Lime	123,997	1,566	115,397	1,558	134,635	1,768	(4)	(4)
Marl, calcareous (except for cement)	15,871	7	19,607	10	14,087	7	11,074	6
Peat	366	(4)	(4)	(4)				
Sand and gravel—thousand short tons	23,664	16,253	23,979	17,396	27,978	19,958	27,715	19,097
Stone (except limestone for cement and lime, 1953)—thousand short tons	7,450	15,980	8,289	16,188	12,180	18,843	11,126	20,402
Zinc (recoverable content of ores, etc.)	16,830	3,871	15,534	3,355	18,326	4,508	23,890	6,546
Value of items that cannot be disclosed: Abrasive stone (tube-mill liners), cement, quartz (1953), ground sand and sandstone (1953), stone (crushed basalt 1955), and values indicated by footnote 4		16,811		15,840		20,528		19,451
Total Wisconsin		55,212		[6] 54,286		[6] 65,813		[6] 65,860

Clays	thousand short tons	853	10,037	944	9,534	10,036	10,924	1,053	11,832
Coal	do	5,245	23,744	2,831	11,541	2,927	11,845	2,553	9,920
Copper (recoverable content of ores, etc.)		1	(8)	1	1			3	3
Feldspar	long tons	(4)	(4)					1,201	8
Gem stones		(9)	(4)	(9)	(4)	(9)	57	(9)	75
Gold (recoverable content of ores, etc.)	troy ounces	1	(8)	407	14	52	2	762	27
Gypsum		5,493	22	7,403	30	22,373	89	11,380	46
Iron ore (usable)	thousand long tons, gross weight	654		458	(4)	749	(4)	650	(4)
Natural gas	million cubic feet	76,262	6,025	71,068	5,970	77,819	6,615	84,398	7,258
Natural-gas liquids:									
Natural gasoline	thousand gallons	(4)	(4)	47,082	3,137	40,290	2,775	48,859	3,160
LP-gases	do	(4)	(4)	46,084	2,128	46,106	1,961	49,838	2,337
Petroleum (crude)	thousand 42-gallon barrels	82,618	195,800	93,533	229,160	99,483	239,750	104,830	255,785
Phosphate rock	thousand long tons	(4)	(4)	(4)	(4)	55	345	119	721
Pumice		648	2	(4)	(4)	(4)	(4)	45,517	38
Sand and gravel	thousand short tons	3,149	2,001	4,164	2,682	3,952	3,978	3,904	2,935
Silver (recoverable content of ores, etc.)	troy ounces	11	(8)	74	(8)	20	(8)	154	(8)
Sodium carbonate (natural)		(4)	(4)	(4)	(4)	(4)	(4)	337,851	8,345
Stone (except limestone for cement, 1953)	thousand short tons	1,431	1,840	1,616	1,665	1,303	2,034	1,333	2,076
Sulfur, recovered elemental	long tons	(4)	(4)	113,101	2,978	120,697	3,206	121,161	3,214
Tungsten ore and concentrate	60 percent WO_3 basis							2	(4)
Uranium ore								107,400	2,100
Vermiculite		403	2						
Value of items that cannot be disclosed: Beryllium concentrate (1956), cement, manganiferous ore (1953), sodium sulfate, sulfur ore (1953), vanadium (1954–56), and values indicated by footnote 4. Excludes value of clays used for cement (1953)			16,433		12,827		14,983		7,831
Total Wyoming			255,906		[7] 281,306		[7] 297,752		[7] 316,897

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Includes Alaska and Hawaii.
[3] Excludes pozzolan cement, value for which is included with "Items that cannot be disclosed."
[4] Figure withheld to avoid disclosing individual company confidential data.
[5] Excludes certain clays, value for which is included with "Items that cannot be disclosed."
[6] Excludes certain stone, value included with "Items that cannot be disclosed."
[7] Total adjusted to eliminate duplicating the value of clays and stone.
[8] Less than $1,000.
[9] Weight not recorded.
[10] Less than 1,000 short tons.
[11] Revised figure.
[12] Sheet mica only.
[13] Total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and/or lime.
[14] Beginning with 1954 sand and sandstone (ground) included with sand and gravel or stone.
[15] Includes value of nonmetals; excludes value of clays used for cement.
[16] Excludes natural cement, value for which is included with "Items that cannot be disclosed."
[17] Final figure. Supersedes preliminary figure given in commodity chapter.
[18] Excludes masonry cement, value for which is included with "Items that cannot be disclosed."
[19] Recoverable zinc valued at the yearly average price of Prime Western slab zinc, East St. Louis market. Represents value established after transportation, smelting, and manufacturing charges have been added to the value of ore at mine.
[20] Less than 1 ton.
[21] Grinding pebbles and tube-mill liners, weight of millstones not recorded.
[22] Includes 45,710 short tons of concentrate produced in 1955 and 1956 from low-grade ore and concentrate stockpiled near Coquille, Oreg., during World War II.

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TABLE 6.—Mineral production [1] in the Canal Zone and islands administered by the United States,[2] 1953–56

	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
American Samoa:								
Sand and gravel—thousand short tons	1	[3]	2	1	1	1	----------	----------
Stone—do	75	17	58	15	9	4	2	6
Total American Samoa	----------	17	----------	16	----------	5	----------	6
Canal Zone:								
Sand and gravel—thousand short tons	86	95	----------	----------	36	47	40	48
Stone (crushed)—do	172	232	187	245	169	240	177	230
Total Canal Zone	----------	327	----------	245	----------	287	----------	278
Canton: Stone (crushed)—thousand short tons	4	9	3	5	1	2	2	5
Guam:								
Sand and gravel—do	----------	----------	----------	----------	----------	----------	19	24
Stone—do	2,081	5,573	843	2,275	1,241	3,352	341	311
Total Guam	----------	5,573	----------	2,275	----------	3,352	----------	335
Johnston: Stone—thousand short tons	----------	----------	[4]	[3]	12	33	----------	----------
Midway: Stone (crushed)—do	[4]	1	[4]	2	----------	----------	203	304
Virgin Islands: Stone (crushed)—do	11	46	4	17	1	5	12	32
Wake: Stone (crushed)—do	12	21	1	1	1	3	22	22

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Production data for Canton and Wake furnished by the U. S. Department of Commerce, Civil Aeronautics Administration; Midway and Johnston, by the U. S. Department of the Navy; Guam by the Government of Guam; American Samoa, by the Government of American Samoa.
[3] Less than $1,000.
[4] Less than 1,000 short tons.

TABLE 7.—Mineral production [1] in the Commonwealth of Puerto Rico, 1953–56

Mineral	1953		1954		1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Cement.....thousand 376-pound barrels	3,641	9,335	3,682	9,663	4,117	12,507	4,255	14,065
Clays.....thousand short tons	[2]	[2]	[2]	[2]	137	122	143	129
Iron ore (usable).....thousand long tons, gross weight	143	245						
Lime	7,338	158	8,384	199	10,392	254	[2]	[2]
Salt (common).....thousand short tons	14	132	9	98	10	112	10	101
Sand and gravel.....do	227	250	375	834	433	679	183	192
Stone (except limestone for cement and lime, 1953).....thousand short tons	[3] 648	[3] 1,237	[3] 1,752	[3] 2,493	1,784	2,516	2,076	2,556
Value of items that cannot be disclosed: Other nonmetals and values indicated by footnote 2		44		154				195
Total Puerto Rico		11,401		[4] 12,381		[4] 14,917		[4] 16,395

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Excludes certain stone, value for which is included with "Items that cannot be disclosed."
[4] Total has been adjusted to eliminate duplicating the value of stone.

TABLE 8.—Principal minerals imported for consumption in the United States, 1955–56

[Compiled by Mae B. Price and Elsie D. Page, Division of Foreign Activities, Bureau of Mines, from records of the Bureau of the Census]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
METALS				
Aluminum:				
Metal	177,652	[1] 74,695	216,401	100,137
Scrap	[2] 40,851	[1 2] 16,393	25,992	[1] 10,770
Plates, sheets, bars, etc	20,972	[1] 13,973	22,582	[1] 16,480
Antimony:				
Ore (antimony content)	[2] 7,514	[2] 1,877	6,572	1,762
Needle or liquated	46	19	46	23
Metal	3,667	1,860	4,321	2,245
Oxide	2,210	926	1,479	636
Arsenic: White	7,222	765	6,422	745
Bauxite:				
Crude	[3] 4,882,373	[3] 36,656	[3] 5,670,013	44,414
Calcined:				
When imported for manufacture of firebrick (long tons)	107,694	2,453	138,716	3,198
Other (do)	(4)	(4)	9,960	221
Beryllium ore	6,037	2,226	12,371	4,459
Bismuth (pounds)	603,649	1,128	924,614	1,830
Boron carbide (do)	40,837	75	93,675	172
Cadmium:				
Metal (do)	927,495	1,320	3,115,638	4,640
Flue dust (cadmium content) (do)	1,832,827	1,146	1,451,889	876
Calcium:				
Metal (do)	699,799	835	8,387	10
Chloride	1,844	58	1,855	60
Chromate:				
Ore and concentrates (Cr_2O_3 content)	[2] 765,280	[2] 38,063	919,255	49,350
Ferrochrome (chromium content)	19,397	8,011	25,969	11,347
Metal	268	434	409	[1] 687
Cobalt:				
Alloy (cobalt content) (pounds)	2,464,336	(4)	2,013,463	(4)
Ore (do)	223	(5)	5,839	3
Metal (do)	15,535,040	38,585	12,974,393	32,910
Oxide (gross weight) (do)	1,072,950	1,792	828,450	[1] 1,413
Salts and compounds (gross weight) (do)	361,600	249	397,711	247
Columbium ore (do)	9,612,576	[2] 19,912	5,699,553	8,387
Copper: (copper content)				
Ore	7,476	4,948	6,089	4,049
Concentrates	105,045	68,406	74,651	54,514
Regulus, black, coarse	6,386	4,515	5,198	4,395
Unrefined, black, blister	253,693	182,073	276,085	[1] 225,932
Refined in ingots, etc	[2] 202,312	[2] 154,137	191,812	157,944
Old and scrap	[2] 12,577	[2] 9,030	5,410	[1] 3,463
Old brass and clippings	[2] 8,295	[1 2] 5,170	4,310	[1] 3,003
Ferroalloys: Ferrosilicon (silicon content)	5,963	[1] 1,993	5,005	1,737
Gold:				
Ore and base bullion (troy ounces)	1,071,270	37,340	1,197,136	41,785
Bullion (do)	1,858,736	67,080	2,532,611	90,882
Iron ore:				
Ore (long tons)	[3] 23,471,956	[2] 177,457	30,431,152	250,527
Pyrites cinder (do)	3,879	[1] 16	1,430	6
Iron and steel:				
Pig iron	283,559	14,564	326,700	17,842
Iron and steel products (major):				
Semimanufactures	[2] 393,919	[1 2] 34,750	382,769	[1] 44,005
Manufactures	[2] 676,170	[1 2] 91,043	1,094,796	[1] 161,089
Scrap	[2] 196,372	[1 2] 6,150	222,936	[1] 10,381
Tin-plate scrap	32,167	839	32,633	[1] 932
Lead:				
Ore, flue dust, matte (lead content)	156,433	[1] 38,143	191,302	50,621
Base bullion (lead content)			31	11
Pigs and bars (lead content)	263,977	73,032	262,204	[1] 77,719
Reclaimed, scrap, etc. (lead content)	18,944	[1] 3,931	20,464	[1] 5,268
Sheets, pipe, and shot	2,048	535	7,654	[1] 2,017
Babbitt metal and solder (lead content)	[2] 1,283	[1 2] 1,911	2,526	[1] 3,381
Type metal and antimonial lead (lead content)	13,213	4,379	8,500	2,763
Manufactures	250	[1] 164	235	[1] 184

See footnotes at end of table.

TABLE 8.—Principal minerals imported for consumption in the United States, 1955–56—Continued

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
Magnesium:				
Metallic and scrap	1,844	1,034	630	304
Alloys (magnesium content)	9	52	24	203
Sheets, tubing, ribbons, wire and other forms (magnesium content)	4	24	2	8
Manganese:				
Ore (35 percent or more manganese) (manganese content)	[2] 1,047,152	69,821	1,005,998	69,653
Ferromanganese (manganese content)	[2] 52,236	[2] 11,898	123,953	28,512
Spiegeleisen, less than 30 percent manganese, more than 1 percent carbon	----------	----------	234	18
Mercury:				
Compounds—pounds	20,408	77	27,985	[1] 100
Metal—flasks	20,354	5,149	47,316	11,010
Minor metals: Selenium and salts—pounds	191,928	[1 2] 1,483	234,969	[1] 3,452
Molybdenum: Ore and concentrates (molybdenum content)—pounds	134,395	142	----------	----------
Nickel:				
Ore and matte	9,088	3,264	12,820	4,592
Pigs, ingots, shot, cathodes	109,404	148,925	106,534	[1] 152,409
Scrap	[2] 464	[2] 693	1,078	[1] 1,479
Oxide	32,896	[2] 29,894	32,955	31,776
Platinum group:				
Unrefined materials:				
Ore and concentrates—troy ounces	407	29	----------	----------
Grain and nuggets, including crude, dust, and residues—troy ounces	40,713	2,787	34,016	2,854
Sponge and scrap—do	8,362	[1] 653	8,204	764
Osmiridium—do	1,471	115	971	56
Refined metal:				
Platinum—do	450,270	[1] 34,419	433,872	40,628
Palladium—do	487,174	8,185	530,686	[1] 10,958
Iridium—do	271	24	2,323	203
Osmium—do	528	38	347	25
Rhodium—do	17,783	1,787	20,323	2,039
Ruthenium—do	2,961	124	2,220	87
Radium:				
Radium salts—milligrams	65,545	975	43,221	633
Radioactive substitutes	(6)	189	(6)	[1] 514
Rare earths: Ferrocerium and other cerium alloy—pounds	6,234	25	12,536	40
Silver:				
Ore and base bullion—troy ounces	55,658,175	45,755	63,125,065	52,900
Bullion—do	28,861,015	25,413	99,706,716	75,209
Tantalum: Ore—pounds	1,907,686	[2] 4,820	1,312,865	1,180
Tin:				
Ore (tin content)—long tons	20,112	[1] 36,773	16,688	32,317
Blocks, pigs, grains, etc—do	[2] 64,815	[2] 131,606	62,590	136,412
Dross, skimmings, scrap, residues, and tin alloys, n. s. p. f.—pounds	[2] 13,702,355	[1 2] 10,383	11,364,288	[1] 9,430
Tinfoil, powder, flitters, etc	(6)	[1] 559	(6)	[1] 605
Titanium:				
Ilmenite	353,351	7,031	359,281	[1] 9,198
Rutile	19,526	1,984	48,906	7,148
Metal—pounds	1,134,098	[1] 3,433	4,095,621	9,509
Ferrotitanium—do	63,400	27	225,967	92
Compounds and mixtures—do	338,061	83	1,387,548	[1] 354
ungsten (tungsten content):				
Ore and concentrates—do	20,699,528	56,155	20,860,153	[1] 58,011
Metal—do	89,221	[1] 241	37,456	119
Ferrotungsten—do	676,988	1,276	870,621	1,945
Other—do	44,861	152	146,653	[1] 328
Vanadium: Ore (vanadium content)—do	[7] 184,737	[7] 104	----------	----------
Zinc:				
Ores (zinc content)	[2] 384,648	[2] 36,811	462,379	49,231
Blocks, pigs, and slabs	195,059	46,452	244,726	65,034
Sheets	431	[1] 148	454	172
Old, dross, and skimmings	284	32	602	97
Dust	72	[1] 18	72	[1] 18
Manufactures	(6)	[1] 190	(6)	[1] 287
Zirconium: Ore, including zirconium sand	29,091	813	31,140	792

See footnotes at end of table.

TABLE 8.—Principal minerals imported for consumption in the United States, 1955–56—Continued

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
NONMETALS				
Abrasives: Diamonds (industrial)—carats	[2] 15,108,085	[2] 66,312	16,401,781	[1] 74,295
Asbestos	740,423	[1] 60,958	689,034	[1] 61,829
Barite:				
Crude and ground	359,931	[1] 2,191	583,597	[1] 3,577
Witherite	2,363	78	2,934	110
Chemicals	[2] 4,466	458	4,956	[1] 467
Bromine—pounds	692	118	2,918	135
Cement—376-pound barrels	5,219,700	[1] 14,354	4,456,120	[1] 14,189
Clays:				
Raw	189,138	[1] 2,857	172,244	[1] 2,873
Manufactured	3,244	[1] 86	3,617	[1] 98
Cryolite	21,980	3,190	23,122	2,901
Feldspar: Crude—long tons	105	9	258	9
Fluorspar	363,420	[1] 8,540	485,552	[1] 11,225
Gem stones:				
Diamonds—carats	[2] 1,774,496	[1] [2] 151,633	1,881,474	[1] 162,039
Emeralds—do	45,235	1,565	50,931	[1] 1,688
Other	(6)	[1] 22,127	(6)	[1] 24,009
Graphite	48,800	2,387	47,888	[1] 2,594
Gypsum:				
Crude, ground, calcined	[2] 3,978,042	[1] [2] 6,331	4,336,650	[1] 7,853
Manufactures	(6)	943	(6)	[1] 693
Iodine, crude—pounds	1,231,994	1,513	1,704,868	2,180
Jewel bearings—number, thousands	66,100	[1] 2,875	54,800	[1] 2,456
Kyanite	7,581	339	6,951	306
Lime:				
Hydrated	1,359	[1] 18	757	12
Other	30,264	559	31,903	549
Dead-burned dolomite	7,993	558	9,031	587
Magnesium:				
Magnesite	106,253	6,873	102,765	6,446
Compounds	12,357	[1] 396	13,423	[1] 497
Mica:				
Uncut sheet and punch—pounds	1,747,106	3,334	1,958,907	[1] 3,748
Scrap	9,461	121	7,218	79
Manufactures	6,156	[1] 7,814	5,411	[1] 7,926
Mineral-earth pigments:				
Iron oxide pigments:				
Natural	3,702	161	3,168	138
Synthetic	6,394	[1] 850	5,997	[1] 879
Ocher, crude and refined	218	15	206	12
Siennas, crude and refined	840	[1] 80	722	[1] 71
Umber, crude and refined	2,654	[1] 79	2,762	89
Vandyke brown	151	9	200	12
Nitrogen compounds (major)	[2] 1,584,831	[1] [2] 75,285	1,473,260	[1] 67,431
Phosphate, crude—long tons	117,256	2,703	109,891	2,626
Phosphatic fertilizers—do	29,239	[1] 1,788	32,251	1,906
Pigments and salts:				
Lead pigments and salts	1,146	267	5,851	[1] 1,530
Zinc pigments and salts	4,749	904	5,793	[1] 1,146
Potash	[2] 330,563	11,769	333,952	[1] 12,018
Pumice:				
Crude or unmanufactured	29,938	[1] 165	19,487	111
Whole or partly manufactured	1,497	[1] 39	1,315	51
Manufactures, n. s. p. f.	(6)	[1] 4	(6)	[1] 8
Quartz crystal (Brazilian pebble)—pounds	[2] 932,075	[1] [2] 1,429	1,166,460	1,249
Salt	185,653	[1] [2] 1,162	368,212	[1] 2,354
Sand and gravel:				
Glass sand	170	172	478	393
Other sand	317,947	[1] 385	332,031	[1] 454
Gravel	1,680	(18)	179	(18)
Sodium sulfate	124,474	2,530	103,249	2,174
Stone	(6)	[1] 5,579	(6)	7,609
Strontium: Mineral	6,125	128	9,439	192
Sulfur and pyrites:				
Sulfur:				
Ore—long tons	24,152	595	14,750	359
Other forms, n. e. s.—do	[2] 10,475	[2] 264	188,550	4,975
Pyrites—do	[8] 80,305	[1] [8] 520	[8] 73,296	[1] [8] 480
Talc: Unmanufactured	29,079	[1] 986	23,351	[1] 749

See footnotes at end of table.

TABLE 8.—Principal minerals imported for consumption in the United States, 1955–56—Continued

Minera	1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
COAL, PETROLEUM, AND RELATED PRODUCTS				
Asphalt and related bitumen	4,988	116	4,116	99
Carbon black:				
Acetylene black—pounds	8,097,358	[1] 1,331	8,373,224	1,383
Gas black and carbon black—do	53,600	11	69,890	[1] 8
Coal:				
Anthracite	170	1	46	(5)
Bituminous, slack, culm, and lignite	337,145	[1] 2,640	355,701	[1] 2,885
Briquets			318	4
Coke	126,342	[1] 1,405	130,955	[1] 1,471
Peat:				
Fertilizer grade	217,624	[1] 8,683	233,394	[1] 9,764
Poultry and stable grade	11,686	[1] 579	14,295	[1] 766
Petroleum:				
Crude—thousand barrels	[2] 294,096	[2] 654,787	354,727	[1] 837,686
Gasoline [9]—do	[2] 5,348	[1 2] 27,317	9,311	[1] 40,506
Kerosine—do	44	166	231	[1] 896
Distillate oil [10]—do	5,089	[1] 15,550	5,572	[1] 17,908
Residual oil [11]—do	[2] 155,458	[1 2] 305,456	165,761	366,458
Unfinished oils—do	6,616	15,540	4,561	12,499
Asphalt (liquid and solid)—do	3,324	7,571	3,602	8,768
Miscellaneous—do	(5)	[1] 36	(5)	[1] 34

[1] Owing to changes in tabulating procedures by the Bureau of the Census data known to be not comparable with years before 1954.
[2] Revised figure.
[3] Adjusted by Bureau of Mines.
[4] Data not available.
[5] Less than 1,000.
[6] Weight not recorded.
[7] Includes 92,594 pounds of concentrate containing 29,804 pounds of vanadium, valued at $16,811, received but not reported by the Bureau of the Census until 1956.
[8] In addition to data shown an estimated 277,860 long tons ($711,740) were imported in 1955 and 292,520 long tons ($865,020) in 1956.
[9] Includes naphtha but excludes benzol: 1955—764,000 barrels ($7,168,000); 1956—1,656,000 barrels ($17,813,000).
[10] Includes quantities imported free of duty for supplies of vessels and aircraft.
[11] Includes quantities imported free for manufacture in bond and export, and for supplies of vessels and aircraft.

TABLE 9.—Principle minerals and products exported from the United States, 1955–56

[Compiled by Mae B. Price and Elsie D. Page, Division of Foreign Activities, Bureau of Mines, from records of the Bureau of the Census]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
METALS				
Aluminum:				
Ingots, slabs, crude	5,969	2,773	34,563	19,078
Scrap	18,290	6,501	19,329	8,127
Plates, sheets, bars, etc	8,009	7,518	12,493	13,093
Castings and forgings	1,139	2,425	1,247	3,094
Antimony: Metals and alloys, crude	204	71	33	24
Arsenic: Calcium arsenate—pounds	1,885,582	115	628,020	52
Bauxite, including bauxite concentrates—long tons	14,117	528	14,921	834
Aluminum sulfate	19,594	733	16,130	583
Other aluminum compounds	8,497	1,974	22,452	3,183
Beryllium—pounds	36,124	155	89,558	260
Bismuth:				
Metals and alloys—do	203,667	363	287,092	559
Salts and compounds—do	59,638	218	51,251	182
Cadmium—do	1,393,915	1,938	1,284,248	1,932
Calcium chloride	20,743	608	32,523	1,057
Chrome:				
Ore and concentrates:				
Exports	1,341	76	1,727	99
Reexports	2,950	87	12,990	502
Chromic acid	701	374	637	351
Ferrochrome	4,693	2,267	5,538	2,891
Cobalt—pounds	3,823,167	1,231	3,025,142	1,820
Columbium metals, alloys, and other forms—do	6,370	10	10,500	9
Copper:				
Ores, concentrates, composition metal, and unrefined copper (copper content)	[1] 12,897	[1] 9,479	13,717	11,648
Refined copper and semimanufactures	259,942	207,742	280,575	253,615
Other copper manufactures	234	309	185	291
Copper sulfate or blue vitriol	37,382	8,382	30,177	8,036
Copper base alloys	(2)	46,976	(2)	54,847
Ferroalloys:				
Ferrosilicon—pounds	3,377,349	308	4,229,074	483
Ferrophosphorus—do	106,109,167	1,346	150,821,010	2,339
Gold:				
Ore and base bullion—troy ounces	11,206	392	19,962	710
Bullion, refined—do	151,008	6,561	713,900	25,851
Iron ore—long tons	4,516,828	36,993	5,491,246	48,646
Iron and steel:				
Pig iron	34,989	1,918	267,175	14,872
Iron and steel products (major):				
Semimanufactures	[1] 3,315,683	[1] 483,367	3,025,957	496,544
Manufactured steel mill products	[1] 1,124,299	[1] 255,278	1,721,222	395,422
Advanced products	(2)	[1] 144,473	(2)	167,004
Iron and steel scrap: Ferrous scrap, including rerolling materials	[1] 5,171,774	[1] 178,560	6,404,140	298,489
Lead:				
Ore, matte, base bullion (lead content)	[1] 1,334	[1] 408	1,055	340
Pigs, bars, anodes	403	154	4,628	1,300
Scrap	2,983	1,340	2,136	578
Magnesium:				
Metal and alloys	[1] 8,230	[1] 4,556	3,388	2,240
Semifabricated forms, n. e. c	236	515	487	902
Powder	14	34	56	99
Manganese:				
Ore and concentrates	6,279	612	6,133	664
Ferromanganese	1,789	643	2,248	682
Mercury:				
Exports—76 pound flasks	451	155	1,080	284
Reexports—do	267	78	2,025	476
Molybdenum:				
Ores and concentrates—pounds	14,580,358	15,783	17,981,007	21,296
Metals and alloys, crude and scrap—do	22,564	19	35,240	21
Wire—do	11,482	177	11,440	202
Semifabricated forms, n. e. c—do	3,952	12	4,853	28
Powder—do	21,173	57	20,735	44
Ferromolybdenum—do	349,193	353	944,671	1,052

See footnotes at end of table.

TABLE 9.—Principal minerals and products exported from the United States 1955–56—Continued

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
METALS				
Nickel:				
Ore			27,331	556
Alloys and scrap (including Monel metal), ingots, bars, sheets, etc	19,964	15,610	16,361	18,019
Nickel-chrome electric resistance wire	208	773	208	836
Semifabricated forms, n. e. c	429	1,481	626	1,878
Platinum:				
Bars, ingots, sheets, wire, sponge, and other forms including scrap, troy ounces	17,073	1,306	23,823	2,383
Palladium, rhodium, iridium, osmiridium, ruthenium and osmium metals and alloys, including scrap, do	11,895	470	18,249	634
Platinum-group manufactures except jewelry	(2)	[1] 1,209	(2)	2,489
Radium metal (radium content), milligrams	366	14		
Rare earths:				
Cerium ores, metal and alloy, pounds	19,296	75	23,784	79
Lighter flints, do	10,772	83	16,303	110
Silver:				
Ore and base bullion, troy ounces	71,074	63	2,058,401	1,868
Bullion, refined, do	4,821,635	4,378	3,442,479	3,154
Tantalum:				
Ore, metal, and other forms, pounds	3,390	107	3,647	115
Powder, do	594	25	6,080	245
Tin:				
Ingots, pigs, bars, etc:				
Exports, long tons	254	504	667	1,013
Reexports, do	853	1,748	451	1,018
Tin scrap and other tin bearing material except tinplate scrap, do	6,190	2,441	4,396	2,130
Tin cans finished or unfinished, do	26,490	11,517	30,502	13,245
Tin compounds, pounds	311,005	547	375,021	672
Titanium:				
Ores and concentrates	1,143	194	1,838	312
Sponge (including iodide titanium) and scrap	10	36	14	60
Intermediate mill shapes	4	106	469	5,509
Mill products n. e. c	31	1,105	90	2,796
Ferrotitanium	245	65	364	148
Dioxide and pigments	54,353	18,333	64,766	25,137
Tungsten: Ore and concentrates:				
Exports	34	65	117	225
Reexports	283	527	349	778
Vanadium ore and concentrates (vanadium content), pounds	1,729,103	3,768	1,789,634	3,899
Zinc:				
Ores and concentrates (zinc content)			854	162
Slabs, pigs or blocks	[1] 18,069	[1] 4,175	8,813	2,465
Sheets, plates, strips or other forms, n. e. c	3,657	2,193	4,444	3,031
Scrap (zinc content)	21,612	2,250	14,921	1,540
Dust	445	162	372	136
Semifabricated forms, n. e. c	651	296	582	301
Zirconium:				
Ores and concentrates	779	58	1,048	90
Metals and alloys and other forms, pounds	106,778	101	18,987	200
NONMETALLIC MINERALS				
Abrasives:				
Grindstones and pulpstones, pounds	904,683	85	859,231	64
Diamond dust and powder, carats	215,787	516	210,841	616
Diamond grinding wheels, do	180,405	850	187,438	948
Other natural and artificial metallic abrasives and products	(2)	23,409	(2)	25,217
Asbestos: Unmanufactured:				
Exports	2,161	236	2,797	338
Reexports	626	31	153	37
Boron: Boric acid, borates, crude and refined, pounds	445,176,000	14,533	487,450,563	16,596
Bromine, bromides, and bromates, do	3,649,861	1,656	6,111,363	2,557
Cement, 376-pound barrels	1,795,448	7,067	1,973,221	7,250
Clay:				
Kaolin or china clay	49,830	1,017	59,138	1,298
Fire clay	109,312	1,358	152,037	1,561
Other clays	247,397	8,515	299,641	9,717

See footnotes at end of table.

TABLE 9.—Principal minerals and products exported from the United States, 1955–56—Continued

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
NONMETALS—continued				
Cryolite	173	54	213	58
Fluorspar	873	65	197	31
Graphite:				
Amorphous	1,141	130	790	90
Crystalline flake, lump, or chip	141	48	147	47
Natural, n. e. c.	112	22	125	24
Gypsum:				
Crude, calcined, crushed	22,539	738	20,757	711
Plasterboard, wallboard, and tile—square feet	8,686,854	412	7,026,932	364
Manufactures, n. e. c.	(2)	198	(2)	141
Iodine, iodide, iodates—pounds	243,686	357	505,274	750
Kyanite and allied minerals	1,716	87	1,331	63
Lime	82,461	1,464	82,737	1,546
Mica:				
Unmanufactured—pounds	447,491	35	546,673	92
Manufactured:				
Ground or pulverized—do	5,808,347	332	8,901,497	486
Other—do	372,548	1,340	343,159	1,139
Mineral-earth pigments: Iron oxide, natural and manufactured	4,744	894	5,071	909
Nitrogen compounds (major)	828,117	44,795	1,038,307	53,090
Phosphate rock—long tons	[1] 2,267,648	[1] 20,301	2,880,484	25,704
Phosphatic fertilizers—do	[1] 381,537	[1] 12,140	504,612	17,885
Pigments and salts (lead and zinc):				
Lead pigments	2,774	998	3,000	1,116
Zinc pigments	4,541	1,073	4,135	1,087
Lead salts	540	215	1,282	576
Potash:				
Fertilizer	222,499	7,959	390,716	13,705
Chemical	6,804	1,244	6,839	1,232
Quartz crystal (raw)	(2)	66	(2)	65
Radioactive isotopes, etc.	(2)	1,288	(2)	906
Salt:				
Crude and refined	407,131	3,023	336,320	2,464
Shipments to noncontiguous Territories	10,019	721	11,649	881
Sodium and sodium compounds:				
Sodium sulfate	24,561	870	29,784	1,033
Sodium carbonate	[1] 153,257	[1] 4,933	239,743	8,151
Stone:				
Limestone, crushed, ground, broken	936,766	1,149	1,060,560	1,359
Marble and other building and monumental—cubic feet	437,644	1,024	344,210	976
Stone, crushed, ground, broken	169,074	2,924	175,364	2,890
Manufactures of stone	(2)	394	(2)	377
Sulfur:				
Crude—long tons	[1] 1,600,951	[1] 48,708	1,651,325	48,304
Crushed, ground, flowers of—do	34,701	2,454	24,006	1,775
Talc:				
Crude and ground	35,230	859	42,333	1,009
Manufactures, n. e. c.	135	102	69	74
Powders—talcum (face and compact)	(2)	1,246	(2)	1,371
COAL, PETROLEUM, AND RELATED PRODUCTS				
Asphalt and bitumen, natural:				
Unmanufactured	32,723	1,444	30,844	1,845
Manufactures, n. e. c.	(2)	714	(2)	937
Carbon black—thousand pounds	454,181	40,735	425,328	36,105
Coal:				
Anthracite	3,152,213	48,429	5,244,349	73,535
Bituminous	[1] 51,277,256	[1] 436,559	68,546,290	658,472
Briquets	106,294	1,564	107,452	1,716
Coke	530,505	8,238	655,717	11,468

See footnotes at end of table.

TABLE 9.—Principal minerals and products exported from the United States, 1955–56—Continued

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value (thousand dollars)	Short tons (unless otherwise stated)	Value (thousand dollars)
COAL, PETROLEUM, AND RELATED PRODUCTS—continued				
Petroleum:				
Crude—thousand barrels	[1] 11,570	[1] 38,650	28,515	90,013
Gasoline [3]—do	[1] 25,992	[1] 177,471	28,202	191,233
Kerosene—do	2,497	10,215	2,876	12,323
Distillate oil—do	[1] 21,854	[1] 80,068	31,820	121,740
Residual oil—do	[1] 27,725	[1] 55,470	22,147	53,553
Lubricating oil—do	13,663	188,933	13,217	193,579
Asphalt—do	1,477	8,024	1,294	7,478
Liquefied petroleum gases—do	4,231	15,649	4,274	16,214
Wax—do	1,248	24,253	920	20,851
Coke—do	4,463	15,647	6,376	20,323
Petrolatum—do	330	6,304	307	6,195
Miscellaneous products—do	830	16,310	851	16,967

[1] Revised figure.
[2] Weight not recorded.
[3] Includes naphtha but excludes benzol: 1955—59,000 barrels ($990,000); 1956—64,740 barrels ($1,114,968).

TABLE 10.—Comparison of world and United States [1] production of principal metals and minerals, 1955–56

[Compiled under the supervision of Berenice B. Mitchell, Division of Foreign Activities, Bureau of Mines]

Mineral	1955			1956		
	World	United States		World	United States	
	Thousand short tons		Percent of world	Thousand short tons		Percent of world
Coal:						
Bituminous	1,615,480	461,468	29	1,701,720	497,996	29
Lignite	592,720	3,166	(2)	624,680	2,878	(2)
Pennsylvania anthracite	144,600	26,205	18	155,700	28,900	19
Coke (excluding breeze):						
Gashouse [3]	49,500	(4)	(4)	50,800	182	(2)
Oven and beehive	265,900	75,302	28	279,400	74,454	27
Fuel briquets and packaged fuel	114,600	1,699	1	118,400	1,584	1
Natural gas—million cubic feet	(5)	9,405,351	(5)	(5)	10,081,923	(5)
Peat	65,580	274	(2)	58,340	292	(2)
Petroleum (crude)—thousand barrels	5,626,225	2,484,428	44	6,125,425	2,617,283	43
Nonmetals:						
Asbestos	1,730	45	3	1,705	41	2
Barite	2,600	1,114	43	3,000	1,352	45
Cement—thousand barrels	1,275,100	314,913	25	1,379,900	333,472	24
Corundum	8			11		
Diamonds—thousand carats	17,500			18,300		
Feldspar [6]—thousand long tons	970	465	48	1,155	622	54
Fluorspar	1,460	280	19	1,720	330	19
Graphite	290	(4)	(4)	270	(4)	(4)
Gypsum	34,080	10,684	31	34,200	10,316	30
Magnesite	4,700	486	10	5,200	687	13
Mica (including scrap)—thousand pounds	330,000	191,506	58	310,000	173,506	56
Nitrogen, agricultural [6 7]	6,945	1,998	29	7,496	2,240	30
Phosphate rock—thousand long tons	29,800	12,265	41	33,500	15,747	47
Potash—K_2O equivalent	7,900	2,080	26	8,300	2,172	26
Pumice	3,800	1,804	47	3,600	1,482	41
Pyrites—thousand long tons	16,000	1,007	6	16,300	1,070	7
Salt	68,000	22,704	33	70,700	24,216	34

See footnotes at end of table.

TABLE 10.—Comparison of world and United States [1] production of principal metals and minerals, 1955–56—Continued

Mineral	1955			1956		
	World	United States		World	United States	
	Thousand short tons		Percent of world	Thousand short tons		Percent of world
Nonmetals—Continued						
Sulfur, native—thousand long tons	7,000	5,800	83	8,000	6,484	81
Talc, pyrophyllite, and soapstone	1,770	726	41	1,830	739	40
Vermiculite [6]	263	204	78	254	193	76
Metals, mine basis:						
Antimony (content of ore and concentrate) [6]	51	([8])	1	54	([8])	1
Arsenic [6]	46	11	24	44	13	30
Bauxite—thousand long tons	16,400	1,788	11	17,400	1,743	10
Beryllium concentrates	9	([9])	6	13	([9])	4
Bismuth—thousand pounds	4,000	([4])	([4])	4,900	([4])	([4])
Cadmium—do	17,900	9,754	54	19,020	10,414	55
Chromite	3,800	153	4	4,200	208	5
Cobalt (contained)—short tons	14,800	926	6	16,000	1,269	8
Columbium-tantalum concentrates—thousand pounds	11,560	13	([2])	9,640	217	2
Copper (content of ore and concentrate)	3,400	999	29	3,750	1,106	29
Gold—thousand fine ounces	36,400	1,877	5	38,400	1,865	5
Iron ore—thousand long tons	365,700	102,999	28	388,000	97,849	25
Lead (content of ore and concentrate)	2,370	338	14	2,420	353	15
Manganese ore (35 percent or more Mn)	11,715	287	2	12,145	345	3
Mercury—thousand 76-pound flasks	185	19	10	197	24	12
Molybdenum (content of ore and concentrate)—thousand pounds	67,900	61,781	91	63,200	57,462	91
Nickel (content of ore and concentrate)	215	4	2	231	7	3
Platinum group (Pt, Pd, etc.)—thousand troy ounces	950	23	2	975	21	2
Silver—thousand fine ounces	223,400	36,470	16	222,400	38,739	17
Tin (content of ore and concentrate) [6]—thousand long tons	180	([10])	([5])	180	----------	--------
Titanium concentrates:						
Ilmenite	1,405	583	41	1,789	685	38
Rutile	76	9	12	122	12	10
Tungsten concentrate—60 percent WO_3 (short tons)	81,600	16,412	20	81,400	14,737	18
Vanadium (content of ore and concentrate) [6]—(short tons)	4,004	3,286	82	4,236	3,868	91
Zinc (content of ore and concentrate)	3,180	515	16	3,330	542	16
Metals, smelter basis:						
Aluminum	3,470	1,566	45	3,710	1,679	45
Copper	3,640	1,107	30	3,955	1,231	31
Iron, pig (incl. ferroalloys)	212,200	79,263	37	222,300	77,667	35
Lead	2,220	479	22	2,370	542	23
Magnesium	143	61	43	157	68	43
Steel ingots and castings	297,700	117,036	39	312,700	115,216	37
Tin—thousand long tons	181	22	12	181	18	10
Zinc	2,970	964	32	3,110	984	32

[1] Including Alaska and noncontiguous Territories.
[2] Less than one percent.
[3] Includes low- and medium-temperature and gashouse coke.
[4] Bureau of Mines not at liberty to publish United States figure separately.
[5] Data not available.
[6] World total exclusive of U. S. S. R.
[7] Year ended June 30 of year stated (United Nations).
[8] In 1955 United States production of antimony was 633 short tons, and 590 short tons in 1956.
[9] In 1955 United States production of beryl was 500 short tons, and 460 short tons in 1956.
[10] In 1955 United States production of tin was 99 long tons.

Employment and Injuries in the Mineral Industries

By John C. Machisak[1]

THIS CHAPTER of the Minerals Yearbook (volume III) contains overall injury experience and employment data at bituminous-coal, lignite, and anthracite mines, coking plants, metal and nonmetal mines, metallurgical plants, and stone quarries in the United States for the calendar year 1956. Volume I of the Yearbook includes injury experiences and related employment data in the metal, nonmetal, and quarrying industries, and in the milling operations connected with the mining of those commodities. Volume II contains the injury and related employment experience of the coal mining, coking, and oil and gas industries.

Reporting is voluntary on the surveys conducted by the Bureau of Mines to collect injury and employment data in the mineral industries, except in the coal-mining industry, where operators are required by Federal law to furnish the information requested.

These figures may not be complete for all the mineral industries; however, every effort has been made to make the coverage complete, and it is believed that the data presented here represent the hazards to which workers in these industries were exposed.

Employment in the mineral industries declined 4 percent in 1956. Reports from operators revealed an average employment of 471,386 men in 1956 and 489,064 in 1955. The number of days worked per man per year increased slightly, although the man-days and man-hours decreased approximately 1 percent. The length of shift worked per day in 1956 averaged 7.98 hours, compared with 7.97 in 1955. The average employee worked 1,995 hours in 1956 and 1,944 hours in 1955, an approximate increase of 3 percent.

The average injury-frequency rate in the mineral industries was most favorable in 1956, with an approximate 5-percent decrease in the total number. Fourteen more fatal injuries were reported in 1956 than in 1955, for 603 and 589, respectively. The overall injury-frequency rate (fatal and nonfatal combined) showed a reduction of 4 percent.

The fatal rate for 1956 was 0.64 per million man-hours of work; for 1955, a comparable rate of 0.62 was reported.

The number of nonfatal injuries reported for 1956 was 31,034, with a frequency rate of 33.00. In 1955, 32,861 nonfatal injuries were reported, with a frequency rate of 34.57.

No major disaster (a single accident in which 5 or more men are killed) occurred in the mineral industries in 1956.

[1] Acting chief, Branch of Accident Analysis, Division of Safety.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1952–56, by industry groups.

	1952	1953	1954	1955[1]	1956[1]
Average number of men working daily:[2]					
Coal mines	401,329	351,126	283,705	258,003	238,693
Metal mines	74,626	72,529	66,610	62,744	57,739
Nonmetal mines (except stone quarries)[3]	12,447	12,765	12,810	13,740	14,681
Stone quarries	81,879	83,641	78,910	75,980	78,701
Coke plants	25,241	23,440	19,209	20,681	20,205
Metallurgical plants	49,032	55,283	54,396	49,892	44,697
Nonmetal mills[4]				8,024	16,670
Total	644,554	598,784	515,640	489,064	471,386
Average number of active mine-days:					
Coal mines	189	187	175	207	216
Metal mines	265	270	245	264	262
Nonmetal mines (except stone quarries)[3]	288	292	284	267	271
Stone quarries	279	278	273	275	272
Coke plants	315	345	342	352	347
Metallurgical plants	319	318	307	309	313
Nonmetal mills[4]				282	279
Total	226	230	222	244	250
Man-days worked, in thousands:					
Coal mines	76,003	65,688	49,598	53,278	51,579
Metal mines	19,770	19,559	16,294	16,550	15,118
Nonmetal mines (except stone quarries)[3]	3,588	3,727	3,637	3,669	3,980
Stone quarries	22,844	23,248	21,506	20,864	21,439
Coke plants	7,939	8,086	6,567	7,279	7,017
Metallurgical plants	15,628	17,603	16,713	15,416	13,999
Nonmetal mills[4]				2,264	4,648
Total	145,772	137,911	114,315	119,320	117,780
Man-hours worked, in thousands:					
Coal mines	593,698	513,594	387,950	417,473	404,723
Metal mines	158,649	156,605	130,489	132,317	121,259
Nonmetal mines (except stone quarries)[3]	28,955	30,488	29,564	29,733	32,351
Stone quarries	186,552	189,776	175,817	170,808	175,424
Coke plants	62,803	64,677	52,482	58,164	56,038
Metallurgical plants	124,967	138,811	133,675	123,524	111,981
Nonmetal mills[4]				18,537	38,616
Total	1,155,624	1,093,951	909,977	950,556	940,392
Number of injuries:					
Fatal:					
Coal mines	548	461	396	417	445
Metal mines	117	92	86	79	67
Nonmetal mines (except stone quarries)[3]	14	22	9	18	14
Stone quarries	74	43	34	53	49
Coke plants	8	8	8	9	9
Metallurgical plants	16	12	16	10	13
Nonmetal mills[4]				3	6
Total	777	638	549	589	603
Nonfatal:					
Coal mines	30,074	24,258	17,718	19,013	18,934
Metal mines	6,684	6,164	4,994	5,795	4,443
Nonmetal mines (except stone quarries)[3]	1,171	1,419	956	1,155	915
Stone quarries	4,503	4,450	3,834	3,778	3,701
Coke plants	546	425	254	325	302
Metallurgical plants	2,853	2,824	2,578	2,346	1,755
Nonmetal mills[4]				449	984
Total	45,831	39,540	30,334	32,861	31,034

See footnotes at end of table.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1952–56, by industry groups—Continued

	1952	1953	1954	1955 [1]	1956 [1]
Injury rates per million man-hours:					
Fatal:					
Coal mines	0.92	0.90	1.02	1.00	1.10
Metal mines	.74	.59	.66	.60	.55
Nonmetal mines (except stone quarries) [2]	.48	.72	.30	.61	.43
Stone quarries	.40	.23	.19	.31	.28
Coke plants	.13	.12	.15	.15	.16
Metallurgical plants	.13	.09	.12	.08	.12
Nonmetal mills [4]				.16	.16
Total	.67	58	.60	.62	.64
Nonfatal:					
Coal mines	50.66	47.23	45.67	45.54	46.78
Metal mines	42.13	39.36	38.27	43.80	36.64
Nonmetal mines (except stone quarries) [2]	40.44	46.54	32.34	38.85	28.28
Stone quarries	24.14	23.45	21.81	22.12	21.10
Coke plants	8.69	6.57	4.84	5.59	5.39
Metallurgical plants	22.83	20.34	19.29	18.99	15.67
Nonmetal mills [4]				24.22	25.48
Total	39.66	36.14	33.33	34.57	33.00

[1] Preliminary figures.
[2] Men at work each day mine was active.
[3] Clay mines included beginning with 1955.
[4] Not previously shown separately.

Work Stoppages.—In 1956, according to the Bureau of Labor Statistics, 349 work stoppages occurred in the mineral industries. Most of these stoppages (266) were in the bituminous-coal industry, where 377,000 man-days of work was lost. The anthracite industry lost 56,000 man-days from 18 work stoppages during the year. The metal-mining industry, with 16 stoppages, and nonmetal mining and quarrying, with 23 stoppages, lost 812,000 and 75,000 man-days, respectively. The remaining 26 work stoppages occurred as follows: Cement plants, 14; coke and byproduct plants, 3; and petroleum refineries, 9—an overall loss of 214,000 additional man-days. There were 10 fewer work stoppages in the mineral industries in 1956 than in 1955, with approximately 400,000 more man-days lost or an increase of 36 percent over 1955.

Average Earnings.—Increased average hourly earnings were reported in all mineral industries for 1956, an overall increase of 6 percent.

Labor Turnover.—Accession rates were lower in all industries, according to a report issued by the Bureau of Labor Statistics. Declines were also reported in separation rates, except in the iron and cement-industry groups, where increases were noted.

TABLE 2.—Work stoppages, average earnings, and labor turnover in certain mineral industries in the United States, 1952–56

[U. S. Department of Labor]

Industry and year	Work stoppages		Average earnings [1]		Labor-turnover rates [2]	
	Number	Man-days lost (thousand)	Weekly	Hourly	Accession	Separation
Coal mining:						
Anthracite:						
1952	41	104	71.19	2.26	1.4	2.2
1953	24	108	72.91	2.48	1.4	3.1
1954	19	76	[3] 75.05	2.51	1.3	5.2
1955	17	9	84.50	2.53	1.8	4.5
1956	18	56	87.58	2.63	(4)	(4)
Bituminous:						
1952	560	2,760	78.09	2.29	1.9	2.8
1953	392	418	85.31	2.48	1.3	2.6
1954	208	344	80.85	2.48	1.2	3.2
1955	292	273	96.26	2.56	1.6	1.5
1956	266	377	105.94	2.81	.8	.6
Metal mining:						
1952	29	1,300	81.65	1.86	5.8	5.7
1953	15	255	88.54	2.04	4.3	4.7
1954	9	392	84.46	2.07	3.2	4.1
1955	19	638	92.42	2.19	4.5	3.9
1956	16	812	97.52	2.30	1.5	2.9
Iron:						
1952	(4)	(4)	80.34	1.83	2.9	2.9
1953	(4)	(4)	90.74	2.14	1.9	2.1
1954	(4)	(4)	82.03	2.17	1.6	4.3
1955	(4)	(4)	92.46	2.30	2.8	1.6
1956	(4)	(4)	97.44	2.43	.6	3.1
Copper:						
1952	(4)	(4)	85.73	1.88	5.4	5.1
1953	(4)	(4)	91.60	2.00	4.8	4.8
1954	(4)	(4)	[3] 87.13	2.05	3.6	3.9
1955	(4)	(4)	95.70	2.17	5.2	4.5
1956	(4)	(4)	100.95	2.31	1.6	1.7
Lead-zinc:						
1952	(4)	(4)	81.60	1.92	4.4	4.5
1953	(4)	(4)	80.06	1.92	2.7	4.9
1954	(4)	(4)	[3] 76.92	1.89	2.1	2.2
1955	(4)	(4)	83.82	2.01	2.5	2.1
1956	(4)	(4)	89.67	2.13	1.6	1.4
Nonmetal mining and quarrying:						
1952	17	94	71.10	1.58	(4)	(4)
1953	26	63	75.99	1.70	(4)	(4)
1954	14	33	77.44	1.76	(4)	(4)
1955	18	164	80.99	1.82	(4)	(4)
1956	23	75	85.63	1.92	(4)	(4)
Cement:						
1952	(4)	(4)	67.72	1.62	2.7	2.6
1953	5	20	73.39	1.76	2.5	2.6
1954	20	113	75.71	1.82	1.6	1.5
1955	4	4	78.85	1.90	2.0	1.7
1956	14	68	84.04	2.03	.4	1.8
Coke and byproducts:						
1952	(4)	(4)	73.74	1.76	(4)	(4)
1953	2	1	78.81	1.89	(4)	(4)
1954	1	7	[3] 80.93	1.95	(4)	(4)
1955	1	(5)	86.31	2.06	(4)	(4)
1956	3	56	90.91	2.18	(4)	(4)
Petroleum refining:						
1952	4	46	88.44	2.20	1.0	.8
1953	9	50	94.19	2.32	.8	.9
1954	10	36	96.22	2.37	.5	.7
1955	8	43	100.37	2.46	.7	.8
1956	9	90	108.39	2.65	.6	.6

[1] Production and related workers only.
[2] Averages expressed as the number per 100 employees.
[3] Revised figure.
[4] Data not available.
[5] Less than 1,000 man-days.

NATIONAL SAFETY COMPETITION

Safety competitions, sponsored and conducted annually by the Bureau of Mines, have proved effective in promoting accident-prevention work in the mineral industries. An encouraging number of mineral plants (679) enrolled in the National Safety Competition and the National Sand and Gravel Competition and reported outstanding safety records in 1956. Of the operations enrolled in these 2 contests, 274 (40 percent) attained injury-free records. The aggregate worktime of these injury-free operations was a little less than 23 million man-hours or 17 percent of the total time worked at all participating plants in these 2 national competitions. The man-hours worked in 1956 totaled 135,674,880. In addition, the Bureau of Mines conducted three other competitions, sponsored annually by national associations connected with the mineral industries. These associations were: National Lime, National Crushed Stone, and National Slag. In these contests, of the 167 plants enrolled in 1956, 71 (42.5 percent) had injury-free records during an aggregate worktime of more than 21 million man-hours.

Trophy awards for the best safety record in each of these six groups of the 1956 National Safety Competition were made to the following:

Anthracite Underground Mines.—Goodspring mine, Penag Coal Co., Goodspring, Pa.

TABLE 3.—Employment and injury experience of the United States mineral industries, 1931–56

Year	Men working daily	Average active days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
1931	784,347	188	147,602,799	1,288,135,808	1,707	94,021	1.33	72.99
1932	671,343	165	110,655,616	962,924,915	1,368	66,028	1.42	68.57
1933	677,722	181	122,787,658	1,058,245,650	1,242	70,158	1.17	66.30
1934	739,817	195	144,566,133	1,167,723,543	1,429	79,211	1.22	67.83
1935	783,139	195	152,354,170	1,215,316,764	1,495	80,070	1.23	65.88
1936	824,514	216	177,920,334	1,426,233,543	1,686	90,608	1.18	63.53
1937	859,951	217	186,790,283	1,482,241,908	1,759	94,466	1.19	63.73
1938	774,894	187	145,056,875	1,144,137,296	1,369	69,940	1.20	61.13
1939	788,925	202	159,388,490	1,251,169,210	1,334	73,253	1.07	58.55
1940	801,926	219	175,663,792	1,385,128,234	1,716	80,856	1.24	58.37
1941	835,095	234	195,425,228	1,541,335,277	1,621	87,911	1.05	57.04
1942	802,640	260	208,739,906	1,653,284,620	1,862	91,675	1.13	55.45
1943	747,486	277	207,350,643	1,668,340,394	1,799	88,449	1.08	53.02
1944	676,938	287	194,512,359	1,618,479,042	1,571	83,451	.97	51.56
1945	637,220	271	172,672,431	1,437,533,530	1,270	73,411	.88	51.07
1946	676,254	240	162,630,674	1,354,822,190	1,167	72,805	.86	53.74
1947	721,792	256	185,076,018	1,496,101,097	1,407	76,919	.94	51.41
1948	740,988	249	184,551,937	1,457,690,518	1,227	70,939	.84	48.67
1949	723,390	205	148,304,347	1,170,590,880	760	51,576	.65	44.06
1950	719,862	221	159,443,478	1,259,436,140	843	53,229	.67	42.26
1951	684,544	235	160,558,417	1,270,186,435	980	52,155	.77	41.06
1952	644,554	226	145,771,805	1,155,623,605	777	45,831	.67	39.66
1953	598,784	230	137,910,860	1,093,950,835	638	39,540	.58	36.14
1954	515,640	222	114,314,878	909,977,122	549	30,334	.60	33.33
1955 [1]	489,064	244	119,319,952	950,556,247	589	32,861	.62	34.57
1956 [1]	471,386	250	117,780,478	940,391,527	603	31,034	.64	33.00

[1] Preliminary figures.

Bituminous-Coal Underground Mines.—Edgewater mine, Tennessee Coal and Iron Division, United States Steel Corp., Wylam, Ala.

Metal Underground Mines.—Buck mine, Pickands Mather & Co., (Verona Mining Co.), Caspian, Mich.

Nonmetal Underground Mines.—Bell mine, Warner Co., Bellefonte Division, Bellefonte, Pa.

Open-Pit Mines.—Embarrass mine, Pickands Mather & Co. (Lake Mining Co.), Biwabik, Minn.

Quarries.—Alpena quarry, Wyandotte Chemicals Corp., Alpena, Mich.

The Mineral Industry of Alabama

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Alabama.

By Avery H. Reed, Jr.,[1] and Walter B. Jones[2]

RECORD production of cement, clays, salt, sand and gravel, and stone highlighted the mineral industry of the State in 1956. Coal and iron-ore production declined owing to increased imports of foreign iron ore and decreased demand for metallurgical coke. Alabama ranked second in production of bauxite and of native asphalt, and third in output of iron ore.

New developments in the State included the Citronelle oilfield and its 97 wells, which more than doubled the total production of petroleum compared with 1955. There is no question about the impetus that field has given to the oil and gas industry in Alabama, now 13 years old. The State's 4 oilfields are in southwest Alabama and its 1 gasfield is in Marion County, in the Warrior coal basin.

TABLE 1.—Mineral production in Alabama, 1955–56[1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated	Value
Cement:				
Masonry 376-pound barrels	1,938,520	$6,832,671	1,753,201	$6,584,774
Portland do	11,782,095	31,517,373	12,311,520	35,255,585
Clays	(2)	(2)	[3] 1,594,159	[3] 2,146,680
Coal	13,088,477	79,337,006	12,663,344	79,322,439
Iron ore (usable) long tons, gross weight	6,813,670	44,657,215	5,632,708	34,824,465
Lime	462,194	5,185,706	466,399	5,088,695
Mica (sheet) pounds	(2)	(2)	1,122	6,812
Natural gas million cubic feet	282	20,000	42	3,000
Petroleum (crude) thousand 42-gallon barrels	1,411	2,910,000	3,069	7,335,000
Sand and gravel	3,680,173	3,523,524	4,998,888	4,621,469
Stone	8,269,355	11,867,191	[4]12,342,635	[4] 14,702,153
Talc	1,500	8,000	2,200	4,500
Value of items that cannot be disclosed: Asphalt (native), bauxite, pozzolan cement, mica (scrap), salt, stone (dimension limestone and dimension marble, 1956), and values indicated by footnote 2	----------	4,325,207	----------	4,083,161
Total Alabama [5]	----------	186,453,000	----------	189,186,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Excludes kaolin; value included with "Items that cannot be disclosed."
[4] Incomplete figure; excludes dimension limestone and dimension marble.
[5] The total has been adjusted to eliminate duplications in the value of clays and stone.

[1] Chief, Field Office, Region V, Bureau of Mines, Knoxville, Tenn.
[2] State geologist, Alabama Geological Survey, Tuscaloosa, Ala.

TABLE 2.—Average unit value of minerals produced in Alabama, 1947–51 (average) and 1952–56 [1]

Mineral		1947–51 (average)	1952	1953	1954	1955	1956
Bauxite	long dry ton	$5.82	$6.20	$7.31	$6.50	$6.31	$10.51
Cement:							
Portland	376-pound barrel	2.09	2.36	2.46	2.57	2.68	2.86
Masonry	do	(2)	(2)	(2)	(2)	3.52	3.76
Pozzolan	do	3.02	2.96	3.16	3.30	2.90	3.16
Clays:							
Fire	short ton	2.24	3.44	2.88	4.18	5.10	3.26
Kaolin	do	8.38	5.00	9.67	9.94	10.45	10.49
Miscellaneous	do	.75	1.07	.99	1.04	.90	.90
Coal	do	5.99	6.22	6.33	6.23	6.06	6.26
Graphite	do	88.16	117.92				
Iron ore:							
Hematite	long ton	3.67	5.16	7.70	5.74	6.86	6.49
Limonite	do	3.21	5.71	5.35	5.12	4.70	5.23
Lime	short ton	8.82	10.51	10.66	10.64	11.22	10.91
Mica:							
Scrap	do		16.55		20.00	21.10	27.00
Sheet	pound		1.41	6.09	2.75	14.44	6.07
Natural gas	million cubic feet	50.00	40.00	48.78	60.00	70.92	71.43
Oystershell	short ton	(2)	(2)	(2)	(2)	(2)	1.27
Petroleum	42-gallon barrel	(3)	2.02	1.94	2.33	2.06	2.39
Salt	short ton		1.08	1.08	1.08	3.11	3.11
Sand and gravel:							
Sand	do	.77	.71	.76	.87	.84	.81
Gravel	do	.72	.86	.84	.87	1.05	1.04
Stone:							
Limestone:							
Crushed	do	1.47	1.57	1.51	1.28	1.12	1.07
Dimension	do	46.61	47.90	145.14	43.75	38.96	44.03
Marble:							
Crushed	do	(3)	(3)	9.02	4.83	6.34	5.72
Dimension	do	150.87	112.04	98.14	124.09	97.53	177.47
Sandstone:							
Crushed	do	5.96	8.90	9.09	5.64	1.90	1.46
Dimension	do		15.85	13.46	17.43	15.52	16.93
Talc	do					5.33	2.05

[1] For greater detail on prices by grades and markets, see volume 1, Minerals Yearbook, 1956.
[2] Data not available.
[3] Figure withheld to avoid disclosing individual company confidential data.

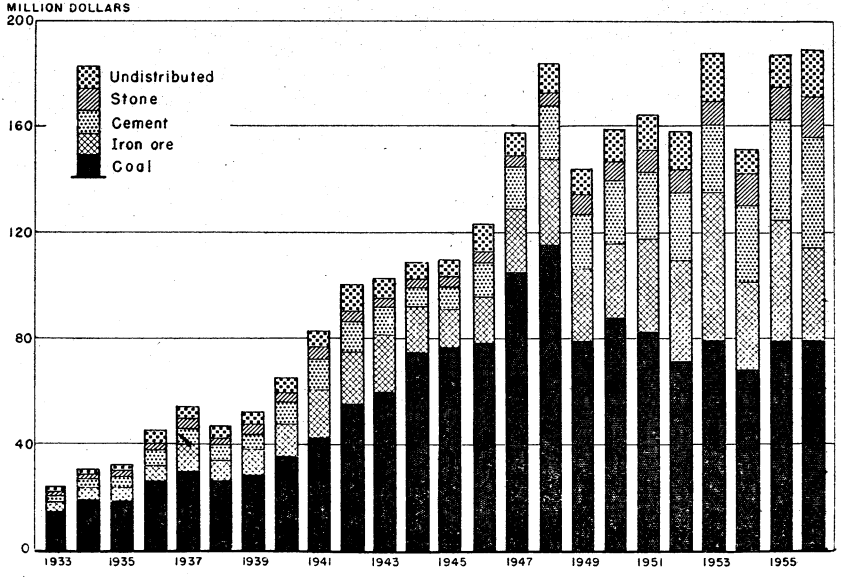

FIGURE 1.—Value of mineral production in Alabama, 1933–56.

The mineral industry was dominated by the mining and processing of coal and iron near Birmingham. Leading companies were Tennessee Coal & Iron Division of United States Steel Corp., Woodward Iron Co., Alabama Power Co., Southern Cement Division of American Marietta Co., and Ideal Cement Co.

Total value of production increased 1 percent above 1955 and was less than 1 percent below 1953, the record year.

EMPLOYMENT AND INJURIES

Employment in the mineral industries increased 10 percent over 1955. Employment decreased 14 percent at coal mines, rose 95 percent at metal mines, expanded 74 percent at quarries and mills, declined 26 percent at coke ovens and smelters, increased 18 percent at sand and gravel mines, and was more than 3 times as high as in 1955 at nonmetal mines.

Injury experience was better than in 1955, as the frequency rate decreased 5 percent. The frequency rate declined 7 percent at coke ovens and smelters, decreased 44 percent at metal mines, increased 90 percent at nonmetal mines, decreased 2 percent at coal mines, and increased 27 percent at quarries and mills. Nineteen fatal injuries occurred, compared with 16 in 1955.

TABLE 3.—Employment in the mineral industries, 1955–56 [1]

Industry	1955			1956 [2]		
	Men working daily	Average active days	Man-days worked	Men working daily	Average active days	Man-days worked
Coal mines	9,074	211	1,915,180	7,978	208	1,655,974
Metal mines	1,872	242	452,286	3,836	230	883,231
Quarries and mills	1,607	283	454,054	2,835	279	792,119
Coke ovens and smelters	2,064	365	753,372	1,535	366	561,693
Sand and gravel mines [3]	349	263	91,852	419	259	108,502
Nonmetal mines	78	212	16,564	304	175	52,830
Total	15,044	245	3,683,308	16,907	240	4,054,349

[1] Excluding oil and gas.
[2] Preliminary figures.
[3] Excluding Government-and-contractor operations.

TABLE 4.—Injuries in the mineral industries, 1955–56 [1]

Industry [2]	1955				1956 [3]			
	Fatal	Nonfatal	Total	Injuries per million man-days	Fatal	Nonfatal	Total	Injuries per million man-days
Coke ovens and smelters		35	35	46	2	22	24	43
Metal mines	4	37	41	91	2	43	45	51
Nonmetal mines		1	1	60		6	6	114
Coal mines	11	207	218	116	15	173	188	114
Quarries and mills	1	51	52	114		115	115	145
Total	16	331	347	98	19	359	378	93

[1] Excluding oil and gas.
[2] Sand and gravel mines not canvassed.
[3] Preliminary figures.

REVIEW BY MINERAL COMMODITIES

METALS

Bauxite.—Two companies mined crude bauxite in Barbour and Henry Counties for chemicals and refractories; the leading producer was R. E. Wilson. Production increased 6 percent over 1955 and was 67 percent above 1954.

Iron Ore.—Shipments of iron ore decreased 17 percent below 1955 and 5 percent below 1954 to the lowest quantity since 1938. This decrease was mainly due to replacing domestic ore with foreign imports rather than a declining iron and steel industry. Of the total shipments, 50 percent was direct shipping ore, 40 percent was concentrates, and 10 percent was sinter, compared with 55, 32, and 13 percent in 1955. The number of active mines increased from 32 to 46; average usable production per mine decreased from 212,000 tons to 122,000 tons.

Seven companies mined red iron ore at 8 mines near Birmingham, and 1 company mined red iron ore near Gadsden. The leading producer was Tennessee Coal & Iron Division of United States Steel Corp., at the Wenonah mines. Shipments declined 26 percent below 1955 and 13 percent below 1954 to the lowest quantity since 1938.

Twenty-six producers mined brown iron ore at 37 mines in 12 counties; the leading company was Shook & Fletcher Supply Co. at mines

TABLE 5.—Mine production and shipments of crude iron ore, 1955–56

	1955		1956	
	Number of mines	Long tons	Number of mines	Long tons
Mine production—				
By varieties:				
Hematite	7	6,165,458	9	4,506,076
Brown ore	25	3,802,275	37	5,164,863
By mining methods:				
Open-pit	27	3,892,766	41	5,274,327
Underground	5	6,074,967	5	4,396,612
Shipments from mines:				
Direct to consumers	8	3,773,781	11	2,825,867
To benefication plants	24	6,184,108	35	6,817,750

TABLE 6.—Production and shipments of usable iron ore, 1955–56

	1955		1956	
	Long tons	Iron content, natural (percent)	Long tons	Iron content, natural (percent)
Production:				
Hematite	5,819,568	36	4,279,157	38
Brown ore	970,699	47	1,347,435	46
Shipments:				
Direct shipping ore	3,773,781	36	2,825,867	38
Concentrate	2,157,889	39	2,255,841	39
Sinter	882,000	42	551,000	43

in Bibb, Blount, and Franklin Counties. Shipments (the greatest since 1942) expanded 43 percent over 1955 and 41 percent over 1954, owing to increased demand from iron and steel plants.

TABLE 7.—Shipments of usable iron ore, 1947–51 (average) and 1952–56

Year	Long tons	Value	Year	Long tons	Value
1947–51 (average)	7,625,951	$29,453,252	1954	5,913,462	$33,327,083
1952	7,243,214	37,940,412	1955	6,813,670	44,657,215
1953	7,446,130	55,640,338	1956	5,632,708	34,824,465

Pig Iron and Steel.—Republic Steel Corp. (Thomas and Gulfsteel plants), U. S. Pipe & Foundry Co. (Birmingham and North Birmingham plants), Woodward Iron Co. (Woodward plant) and Tennessee Coal & Iron Division of United States Steel Corp. (Fairfield & Ensley plants) produced 4,167,000 tons of foundry, basic, and direct casting pig iron. Value of shipments was $217,315,000. Steel was produced by Tennessee Coal & Iron Division of United States Steel Corp. at the Ensley & Fairfield plants. Iron ore consumed was 72 percent domestic, and 28 percent was imported, mainly from Venezuela, Labrador, and Peru. Imports of iron ore exceeded those of any previous year.

Ferroalloys.—Shipments of ferromanganese, ferrophosphorus, ferrosilicon, silicomanganese, and spiegeleisen totaled 145,900 tons valued at $29,978,000.

NONMETALS

Cement.—Masonry cement was produced by 7 companies at 7 plants in Blount, Jefferson, and St. Clair Counties. The leading producer was Southern Cement Division, American Marietta Co., in Jefferson County. Shipments decreased 10 percent below 1955.

Portland cement was produced by 7 companies at 9 plants in Jefferson, Marengo, Mobile, St. Clair, and Shelby Counties. The leading producer was Ideal Cement Co. in Mobile County, Shipments increased 4 percent above 1955 and 11 percent above 1954—a new record for the State.

Pozzolan cement was produced by Southern Cement Division, American Marietta Co., in Jefferson County and by Cheney Lime & Cement Co. in Blount County. Shipments decreased 21 percent below 1955.

TABLE 8.—Shipments of portland cement, 1947–51 (average) and 1952–56

Year	376-pound barrels	Value	Year	376-pound barrels	Value
1947–51 (average)	10,002,885	$20,964,645	1954	11,121,599	$28,582,683
1952	10,642,409	25,084,379	1955	11,782,095	31,517,373
1953	10,427,542	25,701,421	1956	12,311,520	35,255,585

Clays.—Thirteen companies mined fire clay at 15 mines in 8 counties. The leading producer was Natco Corp. in Walker County. Production expanded 40 percent over 1955 and 29 percent over 1954—a record for the State.

Thomas Alabama Kaolin Co. mined kaolin in Marion County for floor and wall tile, fire brick and block, high-alumina brick, fertilizer filler, and insecticide filler.

Nineteen companies mined miscellaneous clay at 20 mines in 12 counties. The leading producer was Ideal Cement Co. in Mobile County. The clay was used to manufacture cement and heavy clay products. Production increased 3 percent above 1955 and 19 percent above 1954 and established a new record for the State. Production was 1,291,000 tons valued at $1,156,000.

TABLE 9.—Fire clay sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	161,661	$374,194	1954	235,731	$985,960
1952	220,009	757,451	1955	216,289	1,102,776
1953	252,926	727,439	1956	303,329	990,240

TABLE 10.—Fire clay sold or used by producers, 1955–56, by uses

Use	1955	1956	Use	1955	1956
	Short tons	Short tons		Short tons	Short tons
Firebrick and block	(1)	149,890	Stoneware	----	20
Heavy clay products	95,864	92,387	Other	70,096	----
Foundries and steelworks	50,329	55,405	Total	216,289	303,329
Fire-clay mortar	(1)	5,627			

1 Figure withheld to avoid disclosing individual company confidential data. Included with "Other."

Lime.—Eight companies produced lime at 9 plants in Jefferson, Mobile, and Shelby Counties. The leading producer was Southern Cement Division, American Marietta Co., in Shelby County. During the year American Marietta purchased Keystone Lime Works. United Cement Co. constructed a new limekiln in Shelby County and began operating. Production increased 1 percent over 1955 and 11 percent over 1954 and was only 1 percent below 1953, the record year.

TABLE 11.—Lime sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	387,565	$3,346,040	1954	421,807	$4,488,167
1952	424,028	4,458,604	1955	462,194	5,185,706
1953	470,541	5,018,156	1956	466,399	5,088,695

TABLE 12.—Lime sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Chemical and industrial	374,369	$4,014,365	372,738	$4,094,340
Other	87,825	1,171,341	93,661	994,355
Total	462,194	5,185,706	466,399	5,088,695

Mica.—Crude mica was mined by five companies or individuals in Clay, Cleburne, Coosa, and Randolph Counties. The leading producer was Dixie Mines, Inc., in Randolph County, which opened the Micaville mine during the year; it produced considerable scrap mica and shipped it to Texas for grinding. Sheet-mica production was shipped to the Spruce Pine (N. C.) Government Purchasing Depot—1,100 pounds valued at $6,800.

Salt.—Mathieson Chemical Corp. increased production of salt from brine at its plant in Washington County 3 percent over 1955 and 5 percent over 1954, a new record for the State.

Sand and Gravel.—Twenty-eight companies mined sand and gravel at 40 mines in 26 counties. The leading producer was Montgomery-Roquemore Gravel Co. in Elmore and Montgomery Counties. Production expanded 36 percent over 1955 and 26 percent over 1954 and established a new record for the State. This expansion was due to increased building construction and highway work throughout the State.

TABLE 13.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Sand		Gravel		Total	
	Thousand short tons	Value	Thousand short tons	Value	Thousand short tons	Value
1947–51 (average)	(1)	(1)	(1)	(1)	3,514	$2,443,142
1952	(1)	(1)	(1)	(1)	3,723	2,955,630
1953	1,571	$1,196,831	2,140	$1,805,852	3,711	3,002,683
1954	1,517	1,316,769	2,449	2,134,089	3,966	3,450,858
1955	1,652	1,384,113	2,028	2,139,411	3,680	3,523,524
1956	2,436	1,964,458	2,563	2,657,011	4,999	4,621,469

[1] Figure withheld to avoid disclosing individual company confidential data.

TABLE 14.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Structural sand and gravel	1,843,913	$1,747,724	2,184,541	$2,176,906
Paving sand and gravel	1,314,203	1,314,651	2,054,780	1,761,478
Railroad ballast sand and gravel	(1)	(1)	249,071	168,020
Molding sand	41,958	74,616	(1)	(1)
Other	480,099	386,533	510,496	515,065
Total	3,680,173	3,523,524	4,998,888	4,621,469

[1] Figure withheld to avoid disclosing individual company confidential data. Included with "Other."

Stone.—Alabama Asphaltic Limestone Co. mined native asphalt in Colbert County for roads.

Crushed limestone was produced by 28 companies at 36 quarries in 15 counties. The leading producer was Lone Star Cement Corp. in Jefferson, Marengo, and Washington Counties. Production increased 20 percent over 1955 and 32 percent over 1954 and established a new record for the State. This increase was due mainly to expanded highway construction throughout the State.

TABLE 15.—Crushed limestone sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	2,517,131	$3,717,654	1954	7,195,748	$9,237,726
1952 [1]	2,936,029	6,051,287	1955	7,943,152	8,888,665
1953 [1]	3,815,076	5,779,804	1956	9,516,938	10,213,821

[1] Except for cement and lime.

TABLE 16.—Crushed limestone sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Cement manufacture	3,676,392	$2,485,459	3,784,284	$2,610,098
Concrete and roads	1,145,037	1,316,905	2,818,013	3,441,290
Fluxing stone	1,859,090	2,926,606	1,661,590	2,228,118
Lime manufacture	511,059	809,124	521,356	619,744
Agstone	329,389	473,425	409,255	531,587
Rock dusting (coal mines)	63,492	265,414	(1)	(1)
Riprap	(1)	(1)	90,138	130,088
Other	358,693	611,732	232,302	652,896
Total	7,943,152	8,888,665	9,516,938	10,213,821

[1] Figure withheld to avoid disclosing individual company confidential data. Included with "Other."

Alabama Limestone Co. quarried dimension limestone in Franklin County. Production increased 15 percent over 1955 and 61 percent over 1954.

Three companies crushed marble at 3 quarries in Talladega County. The leading producer was Moretti-Harrah Marble Co.

Two companies quarried dimension marble at 2 quarries in Talladega County. The leading producer was Moretti-Harrah Marble Co. Production declined 39 percent below 1955 and 15 percent below 1954.

Radcliff Gravel Co. produced oystershell by dredging from Mobile Bay.

Four companies crushed sandstone at 4 quarries in Jackson and Jefferson Counties. The leading producer was Jackson County Highway Department. Production was 188,000 tons valued at $275,000—an expansion of 38 percent over 1955 and considerably more than was produced in 1954. The crushed stone was employed for refractory purposes, concrete and roads, foundry use, and cement manufacture.

Two companies quarried dimension sandstone at 3 quarries in Blount and De Kalb Counties. The leading producer was De Kalb Stone Co., in De Kalb County. Production decreased 19 percent below 1955 and 41 percent below 1954 and amounted to 3,200 tons valued at $53,000. The stone was used for rough construction, rough architectural building stone, and flagging.

Talc.—American Talc Co. mined crude talc in Talladega County. Production expanded 47 percent over 1955. The crude talc was ground for filler in insecticides.

MINERAL FUELS

Coal.—Coal was mined at 225 mines in 12 counties. Leading counties were Jefferson, Walker, and Tuscaloosa. The leading producer was Tennessee Coal. & Iron Division, United States Steel Corp., in Jefferson County. Production decreased 3 percent below 1955 but was 23 percent above 1954. This decrease was due mainly to lowered demand for coke for iron and steel plants.

TABLE 17.—Coal production, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	15,760,360	$93,967,017	1955	13,088,477	$79,337,006
1952	11,383,427	70,759,815	1956	12,663,344	79,322,439
1953	12,532,061	79,370,036			
1954	10,282,506	64,029,502	Earliest record to date	910,246,000	(1)

[1] Data not available.

Natural Gas.—The State's only producing gasfield was near Hamilton in Marion County. Three wells have been completed, but only 2 have been on production. Allowable production was 1 million cubic feet per day.

In addition to the above, there were shut-in discoveries at East Bankston, Fayette County, and near Poplar Springs, Winston County. Further development was taking place in both areas, and there was exploration activity in other parts of the Warrior Coal Basin. The shut-ins, like the Hamilton wells, are minimum wells.

Production in all gas wells came from beds of Mississippian age at comparatively shallow depths.

TABLE 18.—Marketed production of natural gas, 1950–51 (average) and 1952–56

Year	Thousand cubic feet	Value	Year	Thousand cubic feet	Value
1950–51 (average)	1,500	$75	1954	87,000	$5,000
1952	4,000	160	1955	282,000	20,000
1953	41,000	2,000	1956	42,000	3,000

Petroleum.—Oil production increased, owing entirely to the increased yield from the Citronelle field in northern Mobile County. Producing horizons were the Rodessa and Bailey sands of Lower Cretaceous age at depths ranging from 10,850 to 11,500 feet. The oil was 42 to 45 gravity. Allowable production was 200 barrels per day from the Rodessa and 150 barrels per day from the Bailey, or 350 barrels per day from dually completed wells. Most wells were on pump, because the gas-oil ratio was too low (about 150 : 1) to force the oil into surface tanks. The field was about two-thirds developed at the year end. The discovery well was brought in August 16, 1955.

Alabama's first commercial field, Gilbertown (discovery well February 17, 1944), was declining as expected. Many of the producing wells were "strippers." Production came from Upper Cretaceous beds at 2,800 to 3,500 feet. The oil was heavy (18°) and

asphalt base. The wells are strung out along a fault plane reaching from the Mississippi line almost to the Tombigbee River. It seemed unlikely that secondary recovery could be successfully applied to this field.

The South Carlton field, in adjacent parts of Clarke and Baldwin Counties, was only partly developed. The oil is heavy (14°). Production was from the Lower Tuscaloosa formation of Upper Cretaceous age at about 6,200 feet.

The State's second largest producing field, Pollard, in Escambia County was holding up well. Discovery was January 19, 1952, in Lower Tuscaloosa sands at about 6,100 feet. There were three different producing sands in the field, all fairly close together. Gravity of the oil ranges from 25° to 30°. Many of the wells flowed for a few months even though the gas-oil ratio was only 50 : 1. All were on pump in 1956. The number of producing wells in 1956, by counties, was as follows:

County:	*Number of wells*
Baldwin	3
Clarke	8
Choctaw	61
Escambia	36
Mobile	97
Total for State	205

At the end of the year 166 wells were producing.

TABLE 19.—Production of crude petroleum, 1947–51 (average) and 1952–56

Year	Thousand 42-gallon barrels	Year	Thousand 42-gallon barrels
1947–51 (average)	616	1955	1,411
1952	1,279	1956	3,069
1953	1,694		
1954	1,584	1944–56 (total to date)	9,653

REVIEW BY COUNTIES

Jefferson County again dominated the mineral industry of the State and supplied 59 percent of the total value of production.

In addition to the listing for each county, production of natural gas and petroleum and of a small quantity of engine sand produced by the Atlanta & West Point Railroad Co. is of undetermined county origin.

Baldwin.—Fairhope Clay Products Co. mined 5,200 tons of miscellaneous clay for heavy clay products. Hinote Sand Supply Co. mined 9,700 tons of structural sand.

Barbour.—D. M. Wilson Bauxite Co. and R. E. Wilson mined bauxite for chemicals and refractories. Glenwood Mining Co., Inc., opened a new mine and shipped 57,000 tons of brown iron ore to iron and steel plants. Alabama State Highway Department mined 54,000 tons of paving sand.

Bibb.—Shook & Fletcher Supply Co. (Adkins mine) mined brown iron ore for sale to iron and steel plants. Coal production from 8

active mines was 88,000 tons; H. E. Hicks Coal Co. (Belle Ellen No. 9 mine) and Black Diamond Coal Co. (Blocton No. 9 mine) were the leading producers.

TABLE 20.—Value of mineral production in Alabama, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Baldwin	$12,232	$11,920	Sand and gravel, miscellaneous clay.
Barbour	(2)	(2)	Bauxite, iron ore, sand and gravel.
Bibb	(2)	(2)	Iron ore, coal.
Blount	(2)	2,430,768	Coal, limestone, iron ore, cement, fire clay, sandstone.
Butler	(2)	253,677	Iron ore.
Calhoun	282,198	320,720	Sand and gravel, fire clay, miscellaneous clay, iron ore.
Cherokee	(2)	(2)	Iron ore.
Chilton	(2)	100	Fire clay.
Clarke		16,982	Sand and gravel.
Clay	(2)	2,065	Mica.
Cleburne	(2)	(2)	Do.
Colbert	(2)	(2)	Asphalt (native), limestone, sand and gravel.
Coosa	1,933	(2)	Mica.
Covington		67,500	Sand and gravel.
Crenshaw	(2)	(2)	Iron ore.
Cullman	257,731	564,870	Limestone, coal.
Dallas	408,816	607,124	Sand and gravel.
De Kalb	488,425	405,138	Coal, limestone, sandstone.
Elmore	(2)	(2)	Sand and gravel.
Escambia	(2)	(2)	Sand and gravel, miscellaneous clay.
Etowah	(2)	566,971	Limestone, sand and gravel, iron ore.
Fayette	1,616	30,930	Sand and gravel, miscellaneous clay.
Franklin	(2)	4,777,804	Iron ore, limestone, sand and gravel, fire clay.
Greene	(2)	(2)	Sand and gravel.
Henry		63,024	Bauxite, sand and gravel.
Houston		52,891	Sand and gravel, iron ore.
Jackson	197,976	580,257	Limestone, sandstone, coal.
Jefferson	120,034,968	111,865,272	Coal, iron ore, cement, limestone, lime, miscellaneous clay, fire clay, sandstone.
Limestone	56,000	44,800	Limestone.
Macon	104,718	56,348	Sand and gravel.
Madison	(2)	(2)	Limestone, miscellaneous clay.
Marengo	(2)	(2)	Cement, limestone.
Marion	(2)	(2)	Coal, kaolin, sand and gravel.
Mobile	(2)	(2)	Cement, oystershell, lime, miscellaneous clay, sand and gravel.
Monroe	5,450	4,930	Sand and gravel.
Montgomery	(2)	(2)	Sand and gravel, miscellaneous clay.
Morgan	(2)	985,840	Limestone, sand and gravel.
Pike	402,725	552,041	Iron ore, sand and gravel.
Randolph	(2)	(2)	Mica.
Russell	(2)	581,460	Miscellaneous clay, sand and gravel.
St. Clair	(2)	(2)	Cement, limestone, miscellaneous clay, fire clay, sand and gravel, coal.
Shelby	(2)	8,731,359	Lime, limestone, cement, coal, iron ore, miscellaneous clay, fire clay.
Sumter	801	75,000	Sand and gravel.
Talladega	(2)	1,924,731	Marble, iron ore, talc.
Tuscaloosa	3,110,000	3,203,744	Coal, sand and gravel.
Walker	17,923,175	18,014,235	Coal, fire clay.
Washington	(2)	(2)	Limestone, salt, miscellaneous clay.
Wilcox	312		
Winston	6,000	92,618	Coal.
Undistributed [3]	43,157,924	32,300,881	
Total Alabama	186,453,000	189,186,000	

[1] Individual county figures exclude petroleum and natural gas. The following counties are not listed because no production was reported: Autauga, Bullock, Chambers, Choctaw, Coffee, Conecuh, Dale, Geneva, Hale, Lamar, Lauderdale, Lawrence, Lee, Lowndes, Marshall, Perry, Pickens, and Tallapoosa.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes natural gas, petroleum, and values indicated by footnote 2.

Blount.—Coal produced from 7 active mines totaled 224,000 tons. Robbins Coal Co., Inc. (Southview Strip mine), and Alabama Coal & Ore Co., Inc. (Hopewell Strip mine), were the leading producers. Stockbridge Stone Co. (No. 609 quarry) opened a new quarry and

crushed 260,000 tons of limestone for concrete and roads. Shook & Fletcher Supply Co. (Taits Gap mine) mined brown iron ore for sale to iron and steel plants. Cheney Lime & Cement Co. produced masonry and pozzolan cement at the Graystone mill. Harbison-Walker Refractories Co. (Nyota and Thermal mines) and Lehigh Coal Co. (Trafford mine) mined fire clay for firebrick and block and for heavy clay products. A. O. Brown quarried 500 tons of dimension sandstone for rough construction building stone.

Butler.—Carroll Mining Co., Conners & Archer Mining Co., Southern Iron Corp., and E. L. Speed mined brown iron ore for sale to iron and steel plants.

TABLE 21.—Shipments of brown iron ore in Butler County, 1952–56

Year	Long tons	Value	Year	Long tons	Value
1952	2,749	$15,065	1955	(1)	(1)
1953	71,732	404,011	1956	41,861	$253,677
1954	66,530	409,006			

[1] Figure withheld to avoid disclosing individual company confidential data.

Calhoun.—John B. Lagarde mined 116,000 tons of paving sand and gravel. Donoho Foundry Co. mined 35,000 tons of fire clay for foundries and steelworks. Agricola Brick Co. mined miscellaneous clay for use in making brick. Price & Jackson and B. F. Sweet mined brown iron ore for the iron and steel industry.

Cherokee.—Baker & Howell (Baker-Howell mine), Erwin & Mashburn (Spring Garden mine), and Margemma Mining Co. (Laney Hollow mine) mined brown iron ore for iron and steel.

Chilton.—Norman E. Smith mined 20 tons of fire clay for stoneware.

Clarke.—Alabama State Highway Department and Jackson Sand & Gravel Co. mined 15,000 tons of structural and paving sand and structural, paving, and other gravel.

Clay.—S. P. Lett (Bob Lee mine) mined 103 pounds of sheet mica.

Cleburne.—McDowell Mining Co. (Cavers mine) mined sheet mica.

Colbert.—Alabama Asphaltic Limestone Co. (Margerum quarry) mined native asphalt for roadstone. Alabama Asphaltic Limestone Co. and Tri-State Limestone Co. crushed limestone for concrete and roads and for agstone. Tennessee Valley Sand & Gravel Co. (Sheffield mine) mined structural and paving sand and gravel.

The capacity of the Reynolds Listerhill plant was increased in 1956 by 27,500 tons a year to bring the total plant capacity to 77,500 short tons of aluminum a year.

In January, Reynolds announced that work was to begin on constructing a new primary aluminum plant near its present plant at Listerhill, Ala. The new facility, costing between $75 and $80 million and having an annual capacity of 100,000 tons, was to use power supplied by the Tennessee Valley Authority. Initial production was scheduled for the end of 1957. Reynolds also had a contract providing for shipment of an average of 32,000 tons of metal a year, over a 10-year period, to a new foundry of the Ford Motor Co., which was to

be constructed adjacent to the Reynolds' plant. Most of the metal was to be shipped in the molten state. Later in the year the capacity of the new plant was revised to 112,500 tons.

Coosa.—Norris Mica Co. (Smith mine) mined sheet mica.

Covington.—Alabama State Highway Department mined 121,000 tons of paving sand.

Crenshaw.—Arrington Mining Co., Carroll Mining Co., and Glenwood Mining Co., Inc., mined brown iron ore for iron and steel.

Cullman.—Alabama State Highway Department, and Stockbridge Stone Co. (No. 610 quarry) crushed 220,000 tons of limestone for concrete and roads. Coal produced from 4 active mines totaled 41,000 tons. H. E. Drummond Coal Co. (Arkadelphia No. 2 strip mine) was the leading producer.

Dallas.—C. Pierson Cosby, Dallas Sand & Gravel Co., Inc., and Southeastern Sand & Gravel Co. mined molding, structural, paving, engine, and railroad ballast sand, and structural, paving, railroad ballast and other gravel.

TABLE 22.—Sand and gravel production in Dallas County, 1953–56

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1953	326,971	$164,629	243,938	$225,002	570,909	$389,631
1954	364,432	201,076	329,774	343,518	694,206	544,594
1955	194,671	113,336	265,891	275,480	460,562	408,816
1956	394,193	259,638	339,551	347,486	733,744	607,124

De Kalb.—Georgia-Alabama Ore Co. (Gibson's Gap strip mine) mined 55,000 tons of coal. Miller Limestone Co. crushed 46,000 tons of limestone for concrete and roads. De Kalb Stone Co. (Gorham and Skirum quarries) quarried 2,600 tons of dimension sandstone for rough architectural building stone and for flagging.

Elmore.—Alabama Gravel Co., Alabama State Highway Department, and Montgomery-Roquemore Gravel Co. (No. 3 mine) mined molding, structural, paving, blast, and engine sand and structural, paving, railroad ballast, and other gravel.

Escambia.—Dixie Sand & Gravel Co. and Flomaton Gravel Co. mined structural and paving sand and gravel. Keego Clay Products Co. mined 800 tons of miscellaneous clay for heavy clay products.

Etowah.—Alabama Aggregate Co. (Cobb City quarry) and Gadsden Stone Co. crushed 248,000 tons of limestone for riprap, fluxing stone, concrete and roads, agstone, and asphalt filler. Milner Sand Co. mined molding, structural, and paving sand and structural and paving gravel. Bowen Construction Co. mined red iron ore for sale to iron and steel plants.

Fayette.—Fayette Concrete Pipe Co. mined 30,000 tons of structural sand and structural and paving gravel. Columbus Brick Co. mined 4,700 tons of miscellaneous clay for use in making brick.

Franklin.—A. G. Britton (Britton mine), Robert Fuller (Fuller mine), Hester & Farned, Shook & Fletcher Supply Co. (Blackburn and Warner mines), U. S. Pipe & Foundry Co. (Russellville No. 15, No. 16 and No. 17 mines), and F. F. Wilson & Sons mined brown

iron ore for iron and steel. Alabama Limestone Co. (Rockwood quarry) quarried dimension limestone for rubble, rough architectural, and dressed building stone, and crushed limestone for concrete and roads, agstone, rock dust for coal mines, filter beds, mineral food, and other uses. Alabama State Highway Department and Tennessee Valley Sand & Gravel Co. (Spruce Pine mine) mined structural and paving sand and gravel. Tennessee Valley Sand & Gravel Co. mined fire clay for fire-clay mortar.

Greene.—Akron Sand Co. mined structural and paving sand and gravel.

Henry.—D. M. Wilson Bauxite Co. (Cleveland Stanley mine) mined bauxite for refractories. Alabama State Highway Department mined 54,000 tons of paving sand.

Houston.—L. C. Smith Sand & Gravel Co. and Speigner Concrete Block Co. mined 34,000 tons of structural sand. L. V. Chandler mined brown iron ore for iron and steel.

Jackson.—Alabama State Highway Department (Paint Rock Creek quarry) and Jackson County Highway Department crushed 237,000 tons of limestone for concrete and roads. Jackson County Highway Department crushed 162,000 tons of sandstone for concrete and roads. Coal production of 19,000 tons came from 3 active mines; Widows Creek Coal Co. (Armstrong mine) was the leading producer.

Jefferson.—Coal production of 8,532,000 tons came from 69 active mines; United States Steel Corp. (Concord No. 1 mine), Alabama By-Product Corp. (Maxine mine), United States Steel Corp. (Edgewater mine), Woodward Iron Co. (Mulga mine), and U. S. Pipe & Foundry Co. (Flat Top mine) were the chief producers.

E. C. Bookout, Republic Steel Corp. (Edwards mine), Shelby Coal Co., Southeastern Coal & Iron Co. (Trussville mine), Tennessee Coal & Iron Division, United States Steel Corp. (Wenonah mines), U. S. Pipe & Foundry Co. (Sloss Red Ore mine), and Woodward Iron Co. (Songo and Pyne mines) mined red iron ore for use in iron and steel plants.

Masonry cement was produced by Alpha Portland Cement Co. (Phoenixville mill), American Marietta Co. (North Birmingham mill), Lehigh Portland Cement Co. (Birmingham mill), Lone Star Cement Corp. (Birmingham mill), and Univeral Atlas Cement Co. (Leeds mill). Portland cement was produced by Alpha Portland Cement Co., American Marietta Co., Lehigh Portland Cement Co., Lone Star Cement Corp., and Universal Atlas Cement Co. Pozzolan cement was produced by American Marietta Co. Alpha Portland Cement Corp., Dolcito Quarry Co., Lehigh Portland Cement Co., Lone Star Cement Corp., Tennessee Coal & Iron Division, United States Steel Corp. (Dolonah quarry and No. 5 Limestone mine), Universal Atlas Cement Co. and U. S. Pipe & Foundry Co. (Sloss North Birmingham quarry) crushed limestone for fluxing stone, refractory purposes, concrete and roads, railroad ballast, agstone, rock dust for coal mines, cement, and lime. Tennessee Coal & Iron Division of United States Steel Corp. (Ensley Works) produced lime for refractory, chemical, and industrial use. Lehigh Portland Cement Co., Lone Star Cement Corp., Stephenson Brick Co., Universal Atlas Cement Co., and Watkins Brick Co. mined miscellaneous clay for cement and for heavy clay products. Bibby Coal, Shale & Clay Co.,

Dixie Fire Brick Co., Inc., and J. E. Moore mined fire clay for fireclay mortar and for foundries and steelworks. Sam P. Acton, Universal Atlas Cement Co., and Enos E. Vann crushed sandstone for refractory purposes, concrete and roads, foundry uses, and cement.

TABLE 23.—Portland-cement shipments in Jefferson County, 1948–51 (average) and 1952–56

Year	376-pound barrels	Value	Year	376-pound barrels	Value
1948–51 (average)	6,068,224	$13,269,889	1954	6,577,320	$16,865,621
1952	6,289,918	15,007,623	1955	6,784,814	18,155,302
1953	6,090,801	15,255,438	1956	6,796,991	19,706,508

TABLE 24.—Miscellaneous clay sold or used by producers in Jefferson County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average) [1]	152,425	$131,548	1954	285,255	(2)
1952 [1]	111,373	207,995	1955	299,004	$259,685
1953 [1]	87,508	87,508	1956	257,531	195,920

[1] Except clay for cement.
[2] Figure withheld to avoid disclosing individual company confidential data.

Limestone.—Limestone County Board of Revenue crushed 32,000 tons of limestone for concrete and roads.

Macon.—Sharpe Sand & Gravel Co. mined 50,000 tons of structural and paving sand and gravel.

Madison.—Madison Limestone Co. crushed limestone for concrete and roads, agstone, asphalt filler, and cement. Alabama Brick & Tile Co., and Huntsville Brick & Title Co., Inc., mined miscellaneous clay for heavy clay products.

Marengo.—Lone Star Cement Corp. produced portland cement at the Spocari mill throughout the year. The Lone Star Cement Corp. crushed limestone for use in making cement.

Marion.—Coal production was 379,000 tons at 47 active mines; Liberty Coal Co. (Liberty mine) was the leading producer. Thomas Alabama Kaolin Co., the State's only kaolin producer, mined kaolin for floor and wall tile, fire brick and block, high-alumina brick, fertilizers, and insecticides. Alabama State Highway Co. mined 32,000 tons of paving sand and gravel.

Mobile.—Aluminum Company of America operated the largest alumina plant in the United States at Mobile, using bauxite imported from Surinam. Throughout the year, Ideal Cement Co., the leading cement producer in the State, produced portland cement from oystershell at the Mobile mill, manufactured lime for chemical and industrial uses from oystershell, at the Mobile limekiln, and mined miscellaneous clay for use in making cement. Radcliff Gravel Co. dredged oystershell from Mobile Bay for sale to cement and lime plants, and for concrete, agriculture, and poultry grit.

Monroe.—Excel Sand & Gravel Co. and Mannings Sand & Gravel Co. mined 6,000 tons of structural sand and structural and paving gravel.

Montgomery.—Alabama Gravel Co., Belser Brothers, City Sand & Gravel Co., Inc., Montgomery County Highway Department, and Montgomery-Roquemore Gravel Co. (No. 1 and No. 2 mines) mined molding, structural, paving, blast, and engine sand and structural, paving, railroad ballast, and other gravel. Excelsior Brick Co. and Jenkins Brick Co. mined miscellaneous clay for heavy clay products.

Morgan.—Alabama State Highway Department, Holland & Woodward Co., Trinity Stone Co., and Waters Construction Co. crushed 659,000 tons of limestone for riprap, concrete and roads, and agstone. Decatur Sand & Gravel Co. mined structural and paving sand and gravel.

Pike.—Arrington Mining Co., Big Creek Mining Co., Carroll Mining Co., Conners & Archer, Glenwood Mining Co., Inc., Luverne Mining Co., Pike County Mining Co., Pike County Mining Corp., and Smith Mining Co. mined brown iron ore for sale to iron and steel plants. Alabama State Highway Department mined 54,000 tons of paving sand.

TABLE 25.—Shipments of brown iron ore in Pike County, 1953–56

Year	Long tons (gross weight)	Value	Year	Long tons (gross weight)	Value
1953	10,652	$51,969	1955	96,214	$402,725
1954	117,836	574,826	1956	103,754	522,041

Randolph.—Dixie Mines, Inc. (Shefner, Silver Leaf, and Liberty mines), and J. J. New (Randolph mine) mined sheet mica for sale to the Government. Dixie Mines, Inc. (Micaville mine), mined scrap mica, which was shipped to Texas for grinding. J. J. New produced a small quantity of scrap mica.

Russell.—Bickerstaff Brick Co., Bickerstaff Co., Inc., and Dixie Brick Co. mined miscellaneous clay for use in making brick. Consolidated Gravel Co., Inc., and Jones Sand & Gravel Co. mined paving sand and structural and paving gravel.

St. Clair.—National Cement Co. produced masonry and portland cement at the Ragland Mill throughout the year. National Cement Co. crushed limestine for use in making cement and for asphalt filler and mined miscellaneous clay for use in cement. Riverside Clay Co. mined 10,000 tons of fire clay for foundries and steelworks. Wolf Creek Sand Co. mined 7,000 tons of molding sand. Armstrong & Armstrong (A & A Strip mine) mined 3,000 tons of coal.

Shelby.—Alabaster Lime Co. (Scotrock limekiln), Cheney Lime & Cement Co. (Landmark limekiln), Dixie Lime & Manufacturing Co., Inc. (Pelham limekiln), Longview Lime Corp. (Saginaw limekiln), Southern Cement Division, American Marietta Co. (Keystone and Roberta limekilns), and United Cement Co. produced lime for building, agricultural, and chemical and industrial uses. Alabama Aggregate Co. (Pelham quarry), Alabaster Lime Co. (Scotrock quarry),

Cheney Lime & Cement Co. (Landmark quarry), Dixie Lime & Manufacturing Co., Inc., Longview Lime Corp. (Saginaw A quarry), Montevallo Limestone Co., Southern Cement Division, American Marietta Co., and Stockbridge Stone Co. (Calera quarry), crushed 2,001,000 tons of limestone for riprap, fluxing stone, concrete and roads, railroad ballast, agstone, paper filler, rock dust for coal mines, cement, lime, and other uses. Southern Cement Division, American Marietta Co. produced portland cement at the Calera mill throughout the year. Coal production was 86,000 tons at 19 active mines; River Valley Coal Co. (No. 3 and No. 8 mines) was the leading producer. Shelby Sand & Ore Co. mined brown iron ore for iron and steel. Southern Cement Division, American Marietta Co. mined miscellaneous clay for cement. Montevallo Clay Co. mined fire clay for foundries and steelworks.

TABLE 26.—Lime sold or used by producers in Shelby County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average) [1]	194,204	$1,895,621	1954	287,912	$3,125,013
1952 [1]	274,842	2,914,493	1955	312,645	3,661,509
1953	303,303	3,281,875	1956	329,283	3,612,159

[1] Sales only.

Sumter.—Alabama State Highway Department mined 101,000 tons of paving sand.

Talladega.—Alabama Marble Co., Moretti-Harrah Marble Co., and Thompson-Weinman & Co. crushed 185,000 tons of marble for terrazzo, whiting, and other uses. Alabama Marble Co. and Moretti-Harrah Marble Co. quarried dimension marble for interior, cut, dressed building stone, rough monumental, and cut, dressed monumental stone. De Shor Mining Co. Inc. (Parker No. 1 mine) and Rucker Mining Co. (Munford mine) mined brown iron ore for iron and steel. American Talc Co. (Winterboro mine), Alabama's only talc producer, mined 2,200 tons of talc.

Tuscaloosa.—Coal production was 686,000 tons from 12 active mines; Twin Seam Mining Co. (Kellerman No. 4 Strip mine), Mitchell Brothers Construction Co. (Mitchell No. 2 and No. 3 Strip mines), and Center Coal Co. (Brookwood Strip mine) were the leading producers. Yazoo Gravel Co., Inc., mined 140,000 tons of structural sand and gravel.

Walker.—Coal production was 2,532,000 tons at 52 active mines; Alabama Power Co. (Gorgas mine), DeBardeleben Coal Corp. (Empire No. 3 mine), McCoy Coal Co. (Mary Lee No. 7 Strip mine), Bankhead Mining Co., Inc. (Aldridge Strip mine), and DeBardeleben Coal Corp. (Empire Strip mine) were the leading producers. Harbison-Walker Refractories Co., Harris Coal & Clay Co., Natco Corp., and Russell Coal & Clay Co. mined fire clay for firebrick and block and for heavy clay products.

TABLE 27.—Fire clay sold or used by producers in Walker County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	81,974	$237,846	1954	141,190	$714,604
1952	105,407	500,194	1955	111,297	798,125
1953	126,492	330,779	1956	190,797	642,670

Washington.—Lone Star Cement Corp. crushed limestone and mined miscellaneous clay for use in making cement. Mathieson Chemical Corp., the only salt producer, recovered salt from brine at its plant near McIntosh.

Winston.—Charles Wheeler Coal Co. (No. 1 Strip mine) and Twin Arrows Coal Co. (No. 1 mine) mined 18,000 tons of coal.

The Mineral Industry of Alaska

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Department of Mines, Territory of Alaska.

By Alvin Kaufman,[1] Anthony Evans,[2] Phil R. Holdsworth,[3] and May G. Downey[4]

THE VALUE of Alaskan mineral production declined 8 percent in 1956 compared with 1955, primarily as a result of a decrease in sand and gravel output. Coal output increased in quantity and value; completion of military projects (such as construction of powerhouses), which resulted in a decline in sand and gravel production, was largely responsible for the increased demand for coal.

In value of output, gold mining remained first, despite a substantial decline in quantity produced; coal mining ranked second; and sand and gravel (second in 1955) was third. Output of these three commodities comprised 84 percent of the total value of minerals produced in 1956.

TABLE 1.—Mineral production in Alaska, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Chromite—gross weight	7,082	$625,340	7,193	$711,481
Clays	1,112	3,836	----------	----------
Coal, bituminous	639,696	5,759,000	726,801	6,373,976
Copper (recoverable content of ores, etc.)	1	746	(2)	(3)
Gold (recoverable content of ores, etc.)—troy ounces	249,294	8,725,290	209,296	7,325,360
Lead (recoverable content of ores, etc.)	1	298	1	314
Mercury—76-pound flasks	(3)	(3)	3,280	852,538
Sand and gravel	9,793,214	8,242,344	5,955,105	5,879,799
Silver (recoverable content of ores, etc.)—troy ounces	33,693	30,494	28,360	25,667
Stone	265,740	289,589	194,864	594,894
Tin (content of concentrate)—long tons	86	182,484	----------	----------
Value of items that cannot be disclosed: Antimony (1956), gem stones, platinum-group metals, and values indicated by footnote [3]	----------	1,552,428	----------	1,643,937
Total Alaska	----------	25,412,000	----------	23,408,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Less than 1 ton; value not included in total.
[3] Figure withheld to avoid disclosing individual company confidential data.

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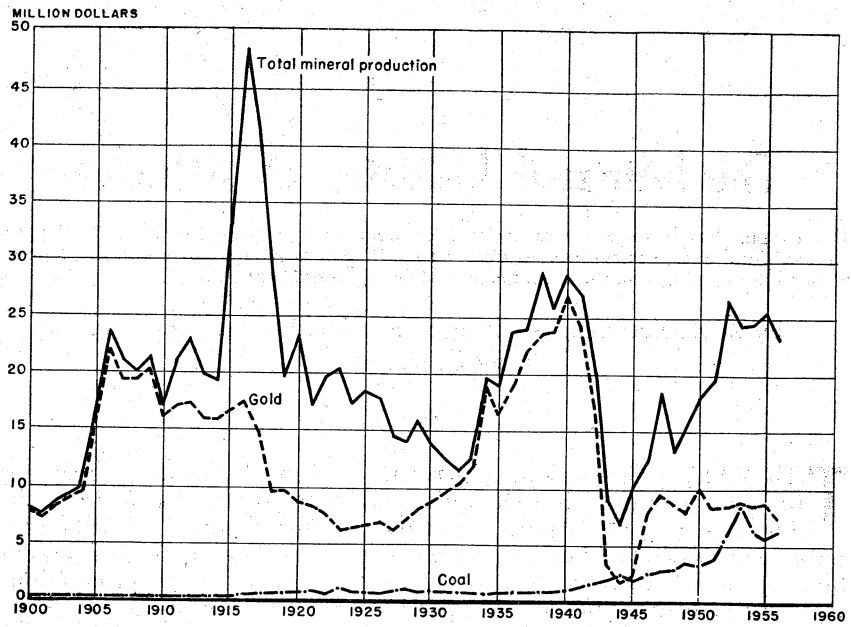

FIGURE 1.—Value of total mineral production, gold, and coal in Alaska, 1900–56. From 1911–31 copper production accounted for most of the value of minerals other than gold and coal.

Mercury production in 1956 more than doubled the cumulative output of the preceding 9 years, principally because the Red Devil mine resumed full operation after replacing its furnace, which was destroyed by fire in October 1954. Chromite output remained virtually stable. Platinum-group metals and small quantities of antimony, copper, gem stones, lead, silver, stone, and tungsten also were produced during the year. No production of clays or tin was recorded in 1956.

Prospecting and Exploration.—Prospecting and exploration in Alaska remained active in 1956. According to the Territorial Department of Mines, nearly $4 million was spent by major companies in a search for mineral deposits in Alaska, an 18-percent increase over 1955. Several large American oil companies continued drilling in the Birchwood, Icy Bay, and Goose Bay areas.

A molybdenum prospect near Canyon Creek in the Nizina district, Copper River region, was staked and explored. Interest in prospecting for radioactive minerals continued high; activity was concentrated in the Southeastern Alaska region, where two major discoveries were made on Prince of Wales Island.

Two companies searched for nonmetallic-mineral deposits. Northern Pyrites Co. drilled a promising sulfide body at Latouche Island in the Prince William Sound district, Copper River region. British Columbia Mica Co. was developing mica deposits on Sitklan Island, south of Ketchikan, Southeastern Alaska region and reported that results of the work were favorable.

TABLE 2.—Expenditures for exploration and prospecting by major companies in Alaska, 1955–56 [1]

Type and region	Expenditures	
	1955	1956
Metals exploration:		
Southeastern	$280,000	$656,000
Copper River	75,000	245,000
Kuskokwim and Yukon River	140,000	95,000
Northwestern	10,000	
Oil and gas exploration:		
All areas	2,865,000	2,980,000
Total	3,370,000	3,976,000

[1] Compiled by Phil R. Holdsworth, Commissioner of Mines, Territory of Alaska.

Government Programs.—The Defense Minerals Exploration Administration (DMEA) continued to participate in exploration for mercury, copper, nickel-copper, tungsten-lead-zinc, and tungsten deposits in Alaska in 1956. Total Government assistance to Alaska's mineral industry through DMEA contracts dropped to $764,000 in 1956 from $1.1 million in 1955. The decrease resulted from termination or completion of contracts with United States Tin Corp., A. L. Howard, and Earl R. Pilgrim for tin, platinum, and antimony, respectively; remaining contracts were increased $79,000. Alaska's only chromite producer—Kenai Chrome Co.—again sold its output to the General Services Administration (GSA).

Transportation.—Lack of commodities to provide a back haul to the United States kept Alaska's transportation rates among the highest in the world in 1956. Air transportation was highly developed but economically feasible only for ores and minerals having high unit value. Steamship-rail rates for mining machinery, explosives, diesel oil, and food remained stable compared with 1955.

The Alaska Road Commission continued work on the Denali Highway, a 102-mile route that will connect Mount McKinley Park with the Richardson Highway at Paxson; at present, access to the park is by railroad or airplane only. The Taylor Highway, also under construction in 1956, will open new areas between Tetlin Junction on the Alaska Highway and Eagle to motor transportation and will provide a connection with Canadian routes through Dawson, Yukon Territory.

In September the Alaska Road Commission was absorbed by the Bureau of Public Roads, United States Department of Commerce. This action will permit the Territory of Alaska to benefit from the Federal Highway Aid Act, Public Law 672. It is anticipated that the new law will result in an expanded road system, which in turn will open additional land to more thorough mineral examination.

The high cost of transportation has been a major deterrent to development of a mining industry in Alaska and is illustrated by two shipments of antimony ore made by Earl R. Pilgrim from his Stampede mine, Kantishna district, Yukon River region. The first shipment—30 tons—was hauled over snow by tractor sleds to Lignite, on the Alaska Railroad; 700 gallons of diesel fuel was consumed on this

TABLE 3.—Defense Minerals Exploration Administration activities in Alaska, 1956

Region and contractor	District	Location	Property	Commodity [1]	Contract		Government participation (percent)
					Date	Total amount	
BRISTOL BAY							
Moneta Porcupine Mines, Ltd	Bristol Bay	Marsh Mountain	Red Top	Mercury	Aug. 18, 1955	$118,720	75
COOK INLET-SUSITNA							
Alaska Copper Mines, Inc	Valdez Creek	MacLaren River	Kathleen-Margaret	Copper	Apr. 2, 1954	41,530	50
KUSKOKWIM RIVER							
DeCoursey Mountain Mining Co	Aniak	North of Crooked Creek.	DeCoursey	Mercury	June 2, 1953	81,000	75
Do	do	West of Sleitmute	Red Devil	do	June 2, 1953	231,232	75
SOUTHEASTERN ALASKA							
Admiralty-Alaska Gold Mining Co	Admiralty	Funter Bay	Mertie Lode	Nickel-copper	Sept. 14, 1951	[2] 142,692	90
Hyder Mines, Inc	Hyder	North of Hyder	Riverside	Tungsten-lead-zinc	May 3, 1954	[3] 96,120	62½
YUKON RIVER							
Alaska Metals Mining Co., Inc	Fairbanks	Gilmore Dome	Yellow Pup	Tungsten	Sept. 28, 1954	52,308	75

[1] All contracts were for lode deposits. [2] Contract closed April 1956. [3] Inactive entire year.

50-mile trip. The combined rail-steamship charge from Lignite to Seattle, Wash., was $36.67 per net ton; the rate from Seattle to Kobe, Japan, including terminal charges at Kobe, $32.33; and delivery to the steamer from the original carrier and outboard charges at Seattle, $3.70—a total cost of $72.70 per ton, excluding tractor-sled expenses.

The second shipment was made to the eastern United States at transportation costs as follows: Air transportation from the mine at Stampede to Nenana (on the Alaska Railroad), $37.57 per net ton; trucking from plane to railroad plus rail and steamship charges from Nenana to San Francisco, $40.87; and trucking from San Francisco to Oakland plus steamship charges from Oakland to Baltimore, Md., $30.78—a total cost from Stampede to the east coast of $122.22 per ton. The cost from Nenana to San Francisco—a distance of approximately 3,000 miles—was 55 percent more than the cost for the trip from Oakland, Calif., to the east coast—a distance of approximately 6,000 miles.

Labor.—During 1956, 170 mines (exclusive of sand and gravel pits) and 2 ore-dressing plants, employing 1,591 men, were active. The mines operated an average of 196 days. The short working period resulted from climatic conditions and necessitated working the men as many or more overtime hours at premium pay as at regular pay. In industries covered by the Employment Security Act (companies having 4 or more employees working at least 20 weeks during the year), the average work week ranged from 48 hours in the coal mines of the Anchorage area to 63 hours in the gold mines of the Fairbanks area. Most coal mines operate throughout the year.

TABLE 4.—Employment and injuries in Alaska mines, 1956, by types of mines [1]

Type of mine	Number of men working (average)	Average number of days worked [2]	Man days	Injuries (number)	
				Fatal	Nonfatal
Metal mines:					
Lode	90	132	11,910	1	28
Mills	39	335	13,075	----	16
Placer:					
Dredges	767	224	171,889	----	[3] 100
Nonfloat	273	104	28,383	----	9
Hydraulic	29	92	2,659	----	----
Small-scale hand	17	61	1,035	----	----
Quarries and mills	61	83	5,058	----	4
Coal mines	315	246	77,432	----	72
Total	1,591	196	311,441	1	229

[1] Excludes prospecting, purely investigational work, and sand and gravel operations but includes assessment and development work.
[2] Calculated.
[3] Includes 3 permanent partial injuries.

The mining industry competed for manpower with the construction industry, which operated during the same season. Wages paid to mining personnel were governed largely by wages agreed upon by Associated General Contractors of America and international and local trade unions affiliated with the building and construction trades, CIO–AFL. A few mining companies that have provided steady (although seasonal) employment were able to obtain labor at substantially lower wages than construction-industry wages. One com-

TABLE 5.—Wage rates in selected occupations, 1956 [1]

Occupation	Wage rates [2]	
	Interior	Southeastern Alaska
Bulldozer operator	$3.98	$3.98
Drilling-machine operator (core)	4.33	4.33
Shovel and dragline operators	$4.38–4.69	$4.38–4.69
Miners (tunnel)	3.80–3.85	3.62–3.67
Powderman	3.54–3.95	3.36–3.77
Timberman	3.80	3.62
General labor	3.48	3.29

[1] Agreement between Associated General Contractors of America and the building trades unions, CIO-AFL.
[2] In addition, the employer must pay 10 cents per hour to the union welfare fund; food and lodging must be provided at a charge not to exceed $5.75 per day.

pany, which has been a steady employer for more than 20 years, obtained personnel at wages ranging from $1.63 per hour for stripping-crew laborers to $2.24 per hour for dredge winchmen. This company also used some of its labor force to maintain and repair equipment during the winter.

Wages in Alaska were higher than in the United States because of the higher cost of living. The Alaska Agricultural Experiment Station and Alaska Extension Service reported that the cost of a typical market basket, as of December 1956, was $10.65 in Seattle (100 percent), $13.31 in Juneau (125 percent), $15.19 in Anchorage (143 percent), and $16.24 in Fairbanks (152 percent).

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—Earl R. Pilgrim continued to be the only Alaskan antimony producer. He reported 2 shipments of ore from his Stampede mine during 1956—1 to Kobe, Japan, and the other to Baltimore, Md. The ore was mined before 1956.

Chromium.—Kenai Chrome Co. produced shipping-grade crude ore from the Star Four mine on Red Mountain in the Homer district, Kenai Peninsula region, at about the same rate as in 1955. The company began constructing a mill to treat lower grade ore, but heavy snows prevented its completion before the end of 1956.

The chromite deposits in the Kenai Peninsula have been known at least since 1906, but production has been sporadic. In 1917—under the stimulus of World War I prices—approximately 1,000 short tons of ore averaging 46 to 49 percent Cr_2O_3 was mined, and in 1918 an additional 1,000 tons averaging 40 percent Cr_2O_3 was produced. Most of this output was sold to refractory companies. In 1931 approximately 10 tons of ore was sent to the United States for test purposes. No further activity was noted until 1942, when the Chrome Queen Mining Co. of Seldovia constructed bunkhouses, cookhouses, and shops and began development work on the Chrome Queen mine. In 1943–44 this mine produced 7,400 short tons of crude ore, which was delivered to a Government stockpile on Jackalof Bay; the ore was still there in 1956.

The Kenai Chrome Co. began development work on the Star Four mine in 1953 and production in 1954.

Copper.—Less than 1 ton of copper, recovered as a secondary metal from a shipment of gold ore and from concentrates shipped in previous years, was marketed from Alaska in 1956. The gold ore was produced during exploration and development at the East Point mine in Kenai Peninsula region.

Several mining companies continued prospecting and exploration in search of commercial copper deposits. Bear Creek Mining Co. (Kennecott Copper Co. subsidiary) used a helicopter to prospect the Prince William Sound area. Texas Gulf Sulfur Co. resumed geophysical and diamond-drill investigations of copper-bearing iron sulfide deposits on Latouche Island. The Federal Bureau of Mines did diamond drilling on a similar deposit at Ellamar. Kodiak Exploration Co. accomplished assessment work and prospected 15 copper claims on Sitkalidak Island near Kodiak. Exploration, partly under a DMEA contract, was continued on the Admiralty-Alaska Gold Mining Co. nickel-copper lode deposit at Funter Bay.

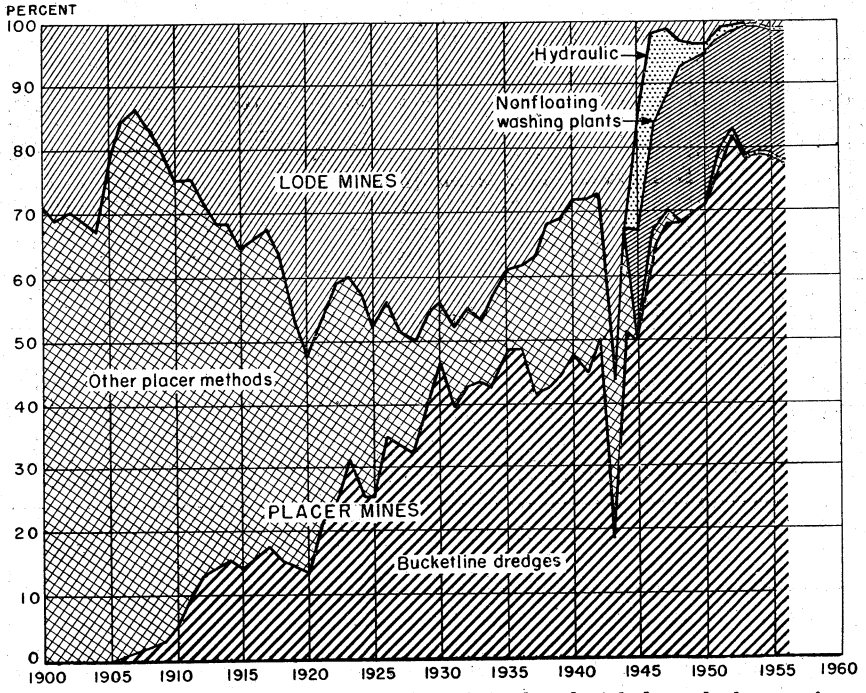

FIGURE 2.—Percentage of total Alaska gold produced at lode and placer mines and by various methods of placer mining, 1900–1956; "other placer methods" includes hydraulic and nonfloating washing plants for which separate data are not available before 1943.

The Bureau of Mines completed laboratory investigation of copper-bearing ores from the Moth Bay, Threeman, and Golden Zone mines and the Kathleen-Margaret prospect.[5] These ores proved amenable to beneficiation, primarily by flotation methods.

[5] Wells, R. R., Laboratory Concentration of Various Alaska Copper Ores: Bureau of Mines Rept. of Investigations 5245, 1956, 9 pp.

Gold.—The mines of Alaska yielded 16 percent less gold in 1956 than in 1955. The decline in output resulted from a steady rise in operating costs and a consequent drop in the number of nonfloating placer plants from 91 in 1955 to 76 in 1956. The quantity of gold produced by nonfloating operations decreased 13 percent compared with 1955. A nonfloating placer plant is one in which the gravel is delivered to sluiceboxes on bedrock or to elevated sluiceboxes with bulldozer or dragline excavation equipment. To compensate for increased costs, operators mined more selectively, and the average value of the ground worked rose from 53 cents per cubic yard in 1955 to 68 cents in 1956. Many operators who had exhausted higher grade material ceased operations, as they were unwilling to assume the expense of preparing additional ground or moving equipment to new working sites.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total 1880–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	16	223	34,256	257,342	$9,006,970	51,011	$46,168
1952	6	119	11,459	240,557	8,419,495	32,986	29,854
1953	3	148	475	253,783	8,882,405	35,387	32,027
1954	5	146	19,747	248,511	8,697,885	33,697	30,497
1955	4	142	3,884	249,294	8,725,290	33,693	30,494
1956	3	120	265	[3] 209,296	7,325,360	[3] 28,360	25,667
1880–1956			([4])	28,644,251	714,580,841	20,188,579	14,457,425

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	8	$3,308	163	$51,485	11	$2,893	$9,110,824
1952			1	322			8,449,671
1953			9	2,358			8,916,790
1954	4	2,360					8,730,742
1955	1	746	1	298			8,756,828
1956	([5])	([5])	[3] 1	314			7,351,341
1880–1956	685,910	226,889,964	25,753	3,029,366	56	14,466	958,972,062

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore shipped to smelters during calendar year indicated.
[2] Does not include gravel washed.
[3] Includes 901 fine ounces of gold, 211 fine ounces of silver, and 1,147 pounds of lead recovered from a mill cleanup and from ore and concentrates at 3 inactive properties.
[4] Figures not available.
[5] Less than 1 ton; quantity and value not included in total.

The number of active dredges rose from 17 in 1955 to 22 in 1956 and the number of dredge operators from 10 to 13. Although the quantity of gravel washed by dredges increased 12 percent in 1956, the quantity of gold recovered declined 17 percent. The value of ground handled by dredges dropped from 62 cents per cubic yard in 1955 to 46 cents in 1956.

TABLE 7.—Fifteen leading gold-producing mines in 1956, in order of output

Rank	Mine	District	Region	Rank in 1955	Operator	Source of gold
1	Fairbanks unit	Fairbanks	Yukon River	1	United States Smelting, Refining & Mining Co	Dredges (6).
2	Nome unit	Nome	Seward Peninsula	2	do	Do. (2).
3	Nyac	Aniak	Kuskokwim River	3	New York Alaska Gold Dredging Corp	Do. (3).
4	Coal Creek	Circle	Yukon River	4	Gold Placers, Inc	Do.
5	Flat Creek	Iditarod	do	6	North American Dredging Co	Do. (2).
6	Eureka Creek	Hot Springs	do	15	Strandberg & Sons	Nonfloat.
7	Colorado Creek	Innoko	do	11	do	Do.
8	Livengood Creek	Tolovana	do	(1)	Yukon Placer Mining, Inc	Do.
9	Wolf Creek	Fairbanks	do	(1)	Wolf Creek Mining Co	Do.
10	Poorman Creek	Ruby	do	12	Miscovich Bros	Do.
11	Otter Creek	Iditarod	do	(1)	Otter Dredging Co	Dredge.
12	Fairbanks Creek	Fairbanks	do	9	Alder Creek Mining Co	Nonfloat.
13	Olive Creek	Tolovana	do	13	Olive Creek Mines	Do.
14	Candle Creek	Fairhaven	Seward Peninsula	7	Havenstrite Oil Co	Do.
15	Colorado Creek	McGrath	Kuskokwim River	(1)	Colorado Creek Mining Co	Do.

[1] Not among the 15 highest in 1955.

TABLE 8.—Gold produced at placer mines 1947–51 (average), 1952–56, and total, 1880–1956, by classes of mines and methods of recovery

Class and method	Mines producing [1]	Washing plants	Material treated (cubic yards)	Gold recovered		
				Fine ounces	Value	Average value per cubic yard
Surface placers:						
Gravel mechanically handled:						
Bucketline dredges:						
1947–51 (average)	20	27	12,295,000	182,025	$6,370,875	$0.518
1952	14	23	13,470,000	198,524	6,948,340	.516
1953	14	23	14,080,000	197,701	6,919,535	.491
1954	14	24	11,936,100	196,028	6,860,980	.575
1955	10	17	11,030,100	194,131	6,794,585	.616
1956	13	22	12,350,400	161,410	5,649,350	.457
Dragline dredges:						
1947–51 (average)	(2)	(2)	29,600	743	26,005	.879
Nonfloating washing plants: [3]						
1947–51 (average)	100	100	3,608,500	55,098	1,928,430	.534
1952	78	78	2,137,000	39,661	1,388,135	.650
1953	87	87	3,591,000	53,991	1,889,685	.526
1954	85	85	2,866,300	48,880	1,710,800	.597
1955	90	91	3,390,000	51,023	1,785,805	.527
1956	76	76	2,295,200	44,533	1,558,655	.679
Gravel hydraulically handled:						
1947–51 (average)	54	----	829,060	12,249	428,715	.517
1952	9	----	39,000	660	23,100	.592
1953	14	----	36,000	820	28,700	.797
1954	17	----	97,400	1,481	51,835	.532
1955	15	----	58,900	908	31,780	.540
1956	14	----	24,100	866	30,310	1.258
Small-scale hand methods (wet):						
1947–51 (average)	45	----	38,050	946	33,110	.870
1952	17	----	16,400	422	14,770	.901
1953	33	----	17,000	604	21,140	1.244
1954	29	----	30,400	1,106	38,710	1.273
1955	25	----	35,200	898	31,430	.893
1956	17	----	22,000	724	25,340	1.152
Underground placers (drift):						
1947–51 (average)	4	----	790	134	4,690	5.937
1952	1	----	600	23	805	1.342
1953	----	----	----	----	----	----
1954	1	----	200	14	490	2.450
1955	2	----	400	42	1,470	3.675
1956	----	----	----	----	----	----
Grand total placers:						
1947–51 (average)	223	----	16,801,000	251,194	8,791,790	.523
1952	119	----	15,663,000	239,390	8,375,150	.535
1953	148	----	17,724,000	253,116	8,859,060	.500
1954	146	----	14,930,400	247,509	8,662,815	.580
1955	142	----	14,514,600	247,002	8,645,070	.596
1956	120	----	14,691,700	207,533	7,263,655	.494
1880–1956	----	----	(4)	(4)	[5] 496,549,407	(4)

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] No dragline dredges reported 1948–56; data shown separately for 1945–47 only and for previous years included under "Other placers."
[3] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable outfit is termed "dryland dredge."
[4] Complete data not available.
[5] Data for 1880–1936 from published records of the Federal Geological Survey.

TABLE 9.—Mine production of gold, silver, copper, and lead in 1956, by months, in terms of recoverable metals [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)	Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)
January				August	44,096	6,115	
February				September	39,670	5,566	
March	431	47		October	35,326	4,906	
April	42	7		November	26,855	3,538	
May	7,813	1,013		December	6,636	963	[2] 1
June	17,852	2,224					
July	30,575	3,981		Total	209,296	28,360	1

[1] Derived mostly from mint and smelter receipts; data are adjusted to exclude receipts during the first part of 1956 previously credited to 1955 production and to include expected receipts in 1957 which are part of actual output in 1956; no zinc produced in 1956; data for copper (less than 1 ton) not included in totals.
[2] Includes all smelter receipts of lead produced in 1956.

TABLE 10.—Mine production of gold, silver, and lead in 1956, by regions, in terms of recoverable metals [1]

Region	Mines producing		Gold (lode and placer)		Silver (lode and placer)		Lead		Total value
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	Pounds	Value	
Cook Inlet-Susitna	1	7	1,684	$58,940	269	$243	[3]	[3]	$59,183
Copper River		1	81	2,835	15	14			2,849
Kenai Peninsula	1		815	28,525	226	205			28,730
Kuskokwim River and Northwestern Alaska		10	17,812	623,420	1,870	1,692			625,112
Seward Peninsula		22	28,000	980,000	3,106	2,811			982,811
Southeastern Alaska [3]	[4]	3	872	30,520	209	189	[5] 2,000	[5] $314	31,023
Yukon River	1	77	160,032	5,601,120	22,665	20,513	[3]	[3]	5,621,633
Total	3	120	209,296	7,325,360	28,360	25,667	2,000	314	7,351,341

[1] No zinc produced in 1956; quantity and value of copper (less than 1 ton) not included in region or Alaska totals.
[2] Quantity and value of lead included with Southeastern Alaska region.
[3] Includes 901 fine ounces of gold, 211 fine ounces of silver, and 1,147 pounds of lead recovered from a mill cleanup and from ore and concentrate shipped in 1956 from 3 inactive properties.
[4] No producing mine; mill cleanup at 1 inactive property.
[5] Includes quantity and value of lead from Cook Inlet-Susitna and Yukon River regions.

The increase in the number of dredges and dredging operations apparently reflected the judgment of some companies that gold could be mined profitably by handling larger quantities of lower grade material. However, one major dredging company reported that it continued operations only because the heavy capital investment in equipment, flumes, powerhouses, and development made it more economical to take a small operating loss than to shut down and absorb a heavy maintenance cost.

In all, 120 placer mines and 3 lode mines were active in 1956 compared with 142 and 4, respectively, in 1955. Placer mines continued to be the major source of gold in Alaska. The 76 mines utilizing nonfloating washing plants produced 21 percent of the gold output, dredge operations yielded 77 percent, and 14 hydraulic and 17 small-

TABLE 11.—Mine production of gold, silver, copper, and lead in 1956, by regions and districts, in terms of recoverable metals [1]

Region and district [2]	Mines producing [3]		Ore and old tailings (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total			
Cook Inlet-Susitna region:												
Valdez Creek	1		52	113		113	18		18	[4]	[5]	[6] $3,971
Yentna		7			1,571	1,571		251	251			55,212
Copper River region:												
Nelchina		1			81	81		15	15			2,849
Kenai Peninsula region:												
Hope	1		194	815		815	226		226	[4]		28,730
Kuskokwim River region:												
Aniak		5			16,465	16,465		1,694	1,694			577,808
Seward Peninsula region:												
Council		2			971	971		101	101			34,076
Fairhaven		6			2,296	2,296		320	320			80,650
Kougarok		6			609	609		47	47			21,358
Koyuk		1			66	66		9	9			2,318
Nome		7			24,058	24,058		2,629	2,629			844,409
Southeastern Alaska region:												
Juneau	[6]	2	[7]	834	37	871	200	8	208	[4]	[6] 2,000	[6] 30,987
Ketchikan		1			1	1		1	1			36
Yukon River region:												
Circle		10			8,411	8,411		1,143	1,143			295,419
Eagle		1			371	371		40	40			13,021
Fairbanks	1	13	1	1	115,174	115,175	122	15,918	16,040		[5]	[6] 4,045,642
Fortymile		10			1,230	1,230		241	241			43,268
Hot Springs		6			4,217	4,217		1,164	1,164			148,648
Iditarod		7			8,784	8,784		1,225	1,225			308,549
Innoko		8			6,887	6,887		882	882			241,843
Kantishna		1			308	308		223	223			10,982
Koyukuk		3			364	364		32	32			12,769
Marshall		[9]			85	85		11	11			2,985
Melozitna		[9]			842	842		78	78			29,541
Rampart		6			773	773		57	57			27,107
Ruby		4			4,761	4,761		753	753			167,317
Tolovana		5			4,883	4,883		444	444			171,307
Other districts [10]		8			4,288	4,288		508	508			150,539
Total [11]	3	120	247	1,763	207,533	209,296	566	27,794	28,360	[4]	2,000	7,351,341

[1] No zinc produced in 1956; quantity and value of copper not included in district or Alaska totals (see footnote 4).
[2] Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; others producing are listed in footnote 10 and their output included with "Other districts."
[3] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property. [4] Less than 1 ton (see footnote 1).
[5] Quantity and value of lead included with Juneau district, Southeastern Alaska region. [6] No producing mine; mill cleanup at 1 inactive mine.
[7] Ore reported in prior years; concentrates and bullion shipped in 1956. [8] Includes quantity and value of lead from Cook Inlet-Susitna and Yukon River regions.
[9] No producing mine; production was before but not reported until 1956.
[10] Includes the following districts for which quantities and values cannot be shown separately (number of operations in parenthesis): Bethel (1), Goodnews Bay (2), McGrath (1), Kuskokwim River region; Shungnak (1), Northwestern Alaska region; Chandalar (1), Chisana (1), Hughes (1), Yukon River region.
[11] Includes quantities and values of gold, silver, and lead recovered from properties that were inactive mines in 1956, as indicated in footnotes 6 and 9.

TABLE 12.—Equipment used at placer-gold mines in Alaska, 1956, by regions

Region	Number of operations	Gravel washed (cubic yards) [1]	Equipment used (number)				
			Bulldozers	Dragglines	Hydraulic giants	Dredges	Other [2]
Cook Inlet-Susitna	7	77,800	6	1	5		
Copper River	1	300	1				
Kuskokwim River	9	1,334,400	5	3	3	3	
Northwestern Alaska	1	18,400	1				
Seward Peninsula	22	2,869,800	38	4	23	8	4
Southeastern Alaska [3]	3	1,200					
Yukon River	77	10,389,800	103	24	213	11	10
Total	120	14,691,700	154	32	244	22	14

[1] Partly estimated.
[2] Includes hydraulic elevators, power shovels, pumping units, and dryland dredges.
[3] All small-scale hand operations; no mechanical equipment required.

scale hand operations (no drift placers were active) 1 percent. In 1955 there were 15 hydraulic, 25 small-scale hand, and 2 drift placer mines. The remaining 1 percent of the 1956 production was contributed by lode mines.

Output from lode mines included small quantities of gold from the East Point mine of Patrick W. Bogan and George Massoz, Hope district, Kenai Peninsula region; Black Creek mine of Bott Bros. & Coffield, Valdez Creek district, Cook Inlet-Susitna region; and Alaska Juneau Gold Mining Co., Juneau district, Southeastern Alaska region (mill cleanup). The Black Creek mine of Bott Bros. & Coffield may increase its output upon completion of the Denali Highway connecting the mine to the Richardson Highway and tidewater at Valdez. A small recovery of gold also was reported by Fred M. Wackwitz from lead ore produced at the Flume Creek-Fox Gulch mine, Fairbanks district, Yukon River region.

The Fairbanks district, Yukon River region, continued to be the major gold-producing area in Alaska. United States Smelting, Refining & Mining Co., was again the largest gold producer in Alaska, operating 6 dredges at Fairbanks and 2 at Nome. The company continued reassembling its dredge on the Hogatza River, a tributary of the Koyukuk River, Koyukuk district; it planned to operate its new dredge at Nome, completed by the Yuba Manufacturing Co., in 1957. The company also continued stripping, preparatory to dredging, on Chicken Creek, Fortymile district, Yukon River region.

Placer-mine operators reported that 1,405 ounces of natural gold (nuggets, grains, and dust that had not been melted or amalgamated) was sold to buyers and jewelers. Prices were reported to be $3 to $5 an ounce above the mint price. The major nugget-producing areas were the Fortymile district, Yukon River region, and the Yenta district, Cook Inlet-Susitna region.

Iron Ore.—No commercial iron ore was shipped from Alaska in 1956. The tempo of exploration remained at a high level, however, because of the proximity of Alaska iron deposits to the United States west coast and the Orient.

Columbia Iron Mining Co., a subsidiary of United States Steel Corp., constructed a pilot mill for testing and concentrating placer material at Klukwan, near Haines. The company shipped 1,500

tons of ore for use in metallurgical tests during the year. Columbia Iron Mining Co. operated the deposit under an agreement with Klukwan Iron Ore Co., owner of more than 100 unpatented claims near Klukwan Indian Village, 23 miles north of Haines. The United States Steel Corp. subsidiary also drilled at Union Bay, at Cleveland Peninsula, and on Duke Island.

Owen Ore Co., Utah Company of the Americas, J. R. Simplot Co., and others were active in exploration, primarily in the Southeastern Alaska region.

The Bureau of Mines published a report on the magnetite deposits of the Snettisham Peninsula, 30 miles southeast of Juneau. The Bureau's study indicated a substantial reserve of titanium-bearing iron ore from which a concentrate meeting blast-furnace specifications could be produced by beneficiation.[6]

Alaska Juneau Gold Mining Co., the Alaska Railroad, and General Metals of the Aleutians, Inc., shipped scrap metal.

Lead.—A shipment of sulfide concentrate, recovered from gold ore milled in previous years by the Alaska Juneau Gold Mining Co., yielded a small quantity of lead. In addition, Fred M. Wackwitz shipped a small quantity of lead ore from Flume Creek in the Fairbanks district, Yukon River region. The concentrate and ore were sent to smelters in the United States. Little prospecting or exploration for lead deposits was done in Alaska in 1956.

Mercury.—DeCoursey Mountain Mining Co., Inc., resumed production at the Red Devil mine near Sleitmute, Aniak district, Kuskokwim River region, in March 1956, after repairing damage caused by a fire late in 1954. The only other mercury producer in Alaska was Russel R. Schaefer, operator of the Broken Shovel mine, also in the Aniak district. Production from these mines was sold to buyers in the United States and to local gold-placer operators.

Exploration for mercury was continued by Moneta Porcupine Mines, Ltd., with DMEA cooperation at the Red Top Mercury property in the Bristol Bay region. DeCoursey Mountain Mining Co. also had an active DMEA contract to conduct exploration at the DeCoursey Mountain and Red Devil mines. George H. Willis and Robert Lyman continued prospecting and exploration at the Alice and Bessie mine, Aniak district.

TABLE 13.—Production of mercury, 1947–51 (average) and 1952–56

Year	Producing mines	76-pound flasks	Price [1] (per flask)	Value
1947–51 (average) [2]	1	65	$106.22	$6,904
1952	1	28	199.10	5,575
1953	2	40	193.03	7,721
1954	2	1,046	264.39	276,552
1955	1	[3]	290.35	[3]
1956	2	3,280	259.92	852,538

[1] Value calculated at average New York price.
[2] No production in 1950–51.
[3] Figure withheld to avoid disclosing individual company confidential data.

[6] Thorne, R. L., and Wells, R. R., Studies of the Snettisham Magnetite Deposit, Southeastern Alaska: Bureau of Mines Rept. of Investigations 5195, 1956, 41 pp.

The Bureau of Mines released a report containing the results of tests of cinnabar-stibnite ore from the Red Devil mine in 1956.[7]

Nickel.—Admiralty-Alaska Gold Mining Co. continued development at a nickel-copper deposit at Funter Bay, Admiralty Island, Southeastern Alaska region. This work, which had been financed under the DMEA program, proceeded with private capital after completion of the DMEA contract. Equipment was purchased to continue several thousand feet of diamond drilling and 5,000 feet of drifts, an aerial magnetometer survey was conducted over adjacent property, and applications were filed for patents on additional claims.

Platinum-Group Metals.—The Goodnews Bay Mining Co. recovered platinum-group metals by placer-mining methods on the Salmon River, Kuskokwim River region.

Silver.—All of the silver produced in Alaska in 1956, as in previous years, was a byproduct of gold output; 98 percent of the silver came from placer-gold operations and the remainder from lode mines. Production of silver from Alaska mines in 1956 declined 16 percent as a result of the decline in gold production. The leading gold producers were also the major silver producers; United States Smelting, Refining & Mining Co., the principal producer, recovered silver as a byproduct of gold dredging in the Fairbanks district, Yukon River region, and in the Nome district, Seward Peninsula region.

Tungsten.—No tungsten ore or concentrate was shipped from Alaska mines in 1956. During the year, Alaska Metals Mining Co. installed a 25-ton mill at the Yellow Pup mine, Fairbanks district, Yukon River region. The mill was operated 2 weeks on ore mined in 1955. A small quantity of tungsten concentrate also was recovered as a byproduct of gold placer mining by Rocky Mountain Mining Co., Nome district, Seward Peninsula region. Early in October Kodiak Exploration Co. began diamond drilling on its properties on Kodiak Island.

Uranium.—Interest in uranium prospecting remained high during the year. Much prospecting was preceded by aerial reconnaissance with radiation detection equipment. Ground parties then attempted to confirm airborne anomalies and to stake claims.

Exploration and development continued on several promising prospects. Climax Molybdenum Co. did diamond drilling on the Ross-Adams property, Prince of Wales Island, Ketchikan district. This property and the I & L Co. group of claims explored by the Union Carbide Nuclear Co. are reported to show considerable promise.

MINERAL FUELS

Coal.—Production of bituminous coal in Alaska in 1956, increased 14 percent over 1955, as a result of increased use by military installations. Most of the coal was used for heat and power at Ladd and Eielson Air Force bases near Fairbanks and at Fort Richardson and Elmendorf Air Force Base in the Anchorage area. The Air Force operated two new powerplants in 1956; the north plant at Ladd Air Force Base and the west plant at Elmendorf Air Force Base. In

[7] Erspamer, E. G., and Wells, R. R., Selective Extraction of Mercury and Antimony From Cinnabar-Stibnite Ore: Bureau of Mines Rept. of Investigations 5243, 1956, 15 pp.

addition, a new Air Force hospital and numerous small installations were supplied with heat and power by Fort Richardson. Production not used by military establishments was sold to local utilities for the production of heat and power and for domestic heating and cooking. Retail prices in Anchorage and Fairbanks were approximately $24 per ton.

In 1956, 7 coal companies operated 5 underground and 5 strip mines. Production continued to come from three fields: Matanuska, Cook Inlet-Susitna region; Nenana, Yukon River region; and Point Barrow, Northern Alaska region. Most of the underground production was shot from the solid or cut by hand. Two continuous miners were used in 1956, one by Usibelli mine of the Usibelli Coal Mines, Inc., and the other by the Jonesville mine of the Evan Jones Coal Co.

TABLE 14.—Production of coal, 1955–56, by fields

Field	Short tons	
	1955	1956
Matanuska	257, 548	269, 067
Nenana	381, 048	456, 533
Barrow	1, 100	1, 201
Total	639, 696	726, 801

Mechanization of coal loading increased in 1956; 53 percent of the underground production was mechanically loaded, compared with 27 percent in 1955. Six mobile loaders, 13 scraper loaders, 5 duckbills or self-loading conveyors, and 6 hand-loaded conveyors were used in 1956, compared with 5 mobile loaders, 2 scraper loaders, and 6 hand-loaded conveyors in 1955.

The average value at the tipple of coal mined underground was $9 per ton, compared with $9.94 per ton in 1955. The average value of strip-mined coal increased from $8.44 per ton in 1955 to $8.64 per ton in 1956.

Despite the decrease in the number of active strip pits in Alaska, surface mining accounted for 64 percent of the total coal produced in the Territory, compared with 63 percent in 1955. Of total coal output, 47 percent was cleaned. Cleaning plants were operated by Evans Jones Coal Co., Mrak Coal Co., and Pioneer Mining Co., Inc., all in the Matanuska field, and by Usibelli Coal Mining Co., Inc., Nenana field.

Petroleum and Natural Gas.—No commercial production of crude petroleum or natural gas was reported in Alaska in 1956; however, the naval base at Point Barrow continued to use a small quantity of natural gas from one of the wells drilled during the Navy's exploration program on Naval Petroleum Reserve No. 4, Northern Alaska region.

Increased activity was noted in the search for oil in 1956. Major American oil companies and groups of individuals obtained leases that brought the total acreage under exploration and prospecting near the 5-million mark. Several companies continued drilling programs, but no conclusive results were announced. Phillips Petroleum Co. drilled in the Katalla area; Anchorage Gas & Oil Development Co., near

Houston, 30 miles north of Anchorage; and Havenstrite Oil Co. at Iniskin Bay, Cook Inlet-Susitna region.

Considerable interest was shown by major American oil companies in the Moose Range area of the Kenai Peninsula. A total of nearly 2 million acres was leased by Phillips Petroleum Co., Union Oil Co., Ohio Oil Co., Sunray Mid-Continent Oil Co., Shell Oil Corp., Standard Oil of California, General Petroleum Corp., and Richfield Oil Co. Special agreements were made with the Secretary of the Interior, stipulating the conditions governing prospecting and exploration, by companies leasing more than 100,000 acres. The Kateel River area, 300 miles west of Fairbanks, also was the scene of increased prospecting for oil. Texota Oil Co. completed geologic reconnaissance and mapping of 1 million acres in the area in preparation for drilling in 1957. To facilitate the filing of leases, the Bureau of Land Management established a new guide meridian, the Kateel River meridian.

NONMETALS

Clays.—Basic Building Products, Inc., did not operate its Eagle River and Sheep Mountain clay pits in 1956. The shutdowns resulted from an excessive raw-material stockpile at the company Anchorage brick plant, reported to be caused by operational difficulties rather than decreased demand for brick.

Gem Stones.—The Alaska gem-stone industry reported difficulty in obtaining gem-quality jade in 1956. Jade suitable for the manufacture of bookends was plentiful.

Shungnak Jade Products, Shungnak, Kobuk River district, Northwestern Alaska region, continued to purchase jade from the Eskimos. The project, Eskimo-operated but sponsored by the Alaska Native Service, continued to cut, polish, and shape jade for souvenirs and jewelry. The entire output was marketed through the Alaska Native Arts and Crafts Association, a Native Service affiliate. During 1956 the association announced its incorporation into a private organization for marketing art pieces and souvenirs produced by the Alaskan Eskimo and Indian population. Empire Jade Co., Kotzebue, continued to send part of its raw jade to Germany for cutting and polishing. The company reportedly found a jade nugget estimated at 20 tons; disposition of the nugget was undetermined at the end of 1956. Alaska Jade Co., Fairbanks, formerly Alaska Handicrafters, cut and polished jade purchased in previous years.

Plasma and petrified wood from the Aleutian Islands were processed by Norton's Gem Shop in Seward. Small quantities of agate and petrified wood were collected, cut, and polished for jewelry by Alaska Lapidary Service in Baranof, Southeastern Alaska region.

Sand and Gravel.—Production of sand and gravel declined 39 percent in 1956 compared with 1955. The completion of many building projects by the United States Army Corps of Engineers, as well as a reduction in road construction by the Bureau of Public Roads and the Alaska Road Commission, appreciably lowered requirements for sand and gravel.

Seven commercial and five Government or contractor producers were active in Alaska in 1956. The major producers were the Bureau of Public Roads (including the Alaska Road Commission) and the

United States Army Corps of Engineers. The Alaska Road Commission was absorbed by the Bureau of Public Roads in September 1956; this step will permit the Territory of Alaska to benefit from the provisions of the Federal Road Building Act. Of the total sand and gravel output, 87 percent was produced by Government agencies or their contractors, compared with 85 percent in 1955. The production of special paving materials increased the average value of sand and gravel from 84 cents in 1955 to 99 cents per ton in 1956.

TABLE 15.—Sand and gravel sold or used by producers, 1955–56, by uses

	1955		1956	
	Short tons	Value	Short tons	Value
Sand:				
Structural	166,363	$360,740	104,115	$298,376
Paving	228,119	361,850	187,567	344,843
Blast	270	300	----------	----------
Engine	405	1,800	----------	----------
Filter	40	45	----------	----------
Other	3,780	6,450	4,800	44,150
Gravel:				
Structural	612,995	856,401	148,593	406,754
Paving	7,880,784	6,097,048	5,012,339	4,268,516
Railroad ballast	384,121	285,359	131,356	117,572
Other	516,337	272,351	366,335	399,588
Total	9,793,214	8,242,344	5,955,105	5,879,799

Stone.—All of Alaska's stone quarries were operated by Government agencies or their contractors. Major producers were the United States Army Corps of Engineers, the 17th Naval District, and the Alaska Railroad which is an agency within the United States Department of the Interior.

Stone output declined 27 percent in 1956 compared with 1955, primarily because of a decline in heavy construction which used riprap for breakwaters, causeways, and foundations.

The decrease in output was not paralleled by a corresponding decrease in total value. The average value of stone produced in Alaska jumped from $1 per ton in 1955 to $3.05 per ton in 1956, resulting in a 105 percent increase in total value. The rise in average value was due to production from isolated, high-cost installations, such as the Adak Naval Station in the Aleutian Islands.

TABLE 16.—Stone sold or used by producers, 1955–56, by uses

	1955		1956	
	Short tons	Value	Short tons	Value
Crushed and broken:				
Riprap	229,011	$248,029	148,103	$350,591
Concrete and road stone	8,726	17,000	36,457	215,525
Other	28,003	24,560	10,304	28,778
Total	265,740	289,589	194,864	594,894

REVIEW BY REGIONS

Regions and districts used in this report conform to a pattern previously established; boundaries are defined in a report published in 1954.[8]

Alaska Peninsula, Aleutian Islands, Bering Sea.—Mineral-industry activity increased in the Aleutian Islands during 1956. Sand and gravel produced by personnel of the 17th Naval District was used for military projects. Construction of an early warning radar system in 1957 on the island chain was expected to augment the demand for these products still more. General Metals of the Aleutians, Inc., recovered scrap metal from military supplies left on the islands during World War II. Exploration for oil was begun by Shell Oil Corp. on 100,000 acres leased in 1955 near Wide Bay, Alaska Peninsula region. No mineral-industry activity was reported in the Bering Sea region during 1956.

Bristol Bay.—Moneta Porcupine Mines, Ltd., continued exploration on Red Top Mercury Mines property near Aleknagik. The mercury deposits were leased in 1955 from the owners, Frank Waskey, Clarence Wren, James Putvin, and Charles Wolfe. Moneta Porcupine Mines, Ltd., completed nearly 500 feet of drifts and crosscuts during the year under a DMEA contract. It was anticipated that known reserves would be increased by future development on another level. Sand and gravel produced by the United States Army Corps of Engineers was the only mineral commodity marketed in the region in 1956.

Cook Inlet-Susitna.—The value of coal produced in the Cook Inlet-Susitna region increased 7 percent over 1955. The rise in value was due to a 4-percent increase in tonnage mined and an increase in value per ton ($12.16 per ton in 1956, compared with $11.86 per ton in 1955).

The Havenstrite Oil Co. concluded an unsuccessful drilling program at Iniskin Bay, Redoubt district. The company planned further exploration in the same area. Anchorage Gas & Oil Development Co. continued drilling an 86,000-acre block of leases near Houston, 30 miles north of Anchorage.

Production of sand and gravel increased 8 percent in quantity and 11 percent in value over 1955. Nearly two-thirds of the output was produced under Government contract for use in military construction by the United States Army Corps of Engineers. The balance was produced for commercial consumption in building, railroad ballast, and unspecified uses.

Basic Building Products Co., a subsidiary of Anchorage Sand & Gravel Co., manufactured building and refractory brick from clay mined in previous years. No clay was mined from the company's Sheep Mountain and Eagle River deposits in 1956.

The construction of the Denali Highway (75 percent complete) through the Valdez Creek district was expected to stimulate prospecting in this heavily mineralized area. Bott Bros. and Coffield partnership milled 50 tons of gold ore in a 2-ton Gibson prospect mill. The ore was mined from the Denali lode claim at Black Creek mine.

[8] Ransome, Alfred L., Kerns, William H., Names and Definitions of Regions, Districts, and Subdistricts in Alaska: Bureau of Mines Inf. Circ. 7679, 1954, 91 pp.

TABLE 17.—Value of mineral production in Alaska, 1955–56, by regions [1]

Region	1955	1956	Minerals produced in 1956 in order of value
Aleutian Islands		$152,000	Stone, sand and gravel.
Bristol Bay	$10,200	88,800	Sand and gravel.
Cook Inlet-Susitna	5,115,559	5,229,028	Coal, sand and gravel, gold, stone, silver.
Copper River	3,163,758	1,586,282	Sand and gravel, stone, gold, silver.
Kenai Peninsula	833,618	976,871	Chromite, sand and gravel, gold, silver.
Kodiak	141,360	248,538	Sand and gravel, stone.
Kuskokwim River	2,256,397	3,079,009	Platinum-group metals, mercury, gold, silver, stone, sand and gravel.
Northern Alaska	14,400	46,000	Coal.
Northwestern Alaska	81,030	152,831	Sand and gravel, gold, gem stones, silver.
Seward Peninsula	1,200,770	982,811	Gold, silver.
Southeastern Alaska	229,667	580,106	Stone, sand and gravel, gold, gem stones, silver, lead.
Yukon River	12,365,089	10,285,690	Gold, coal, sand and gravel, silver, antimony.
Total Alaska	25,412,000	23,408,000	

[1] No mineral production from Alaska Peninsula and Bering Sea regions.

Preliminary investigation by the Federal Bureau of Mines of the Beluga River coal deposit near Tyonek in the Redoubt district indicated a large reserve of coal. The feasibility of strip-mining the coal, using it for power generation at the mine, and transmitting the power to the Anchorage area was being studied by Territorial agencies.

Willow Creek District.—Evan Jones Coal Co. continued to be the leading coal producer in the Matanuska field. Underground and strip mines, operated by the company at Jonesville, yielded 29 percent of the coal produced in Alaska. Pioneer Mining Co., Inc., did not operate its underground mine; production by the company came from the Premier strip mine. Mrak Coal Co. contributed a substantial percentage of the district's coal production from surface operations at the Eska mine.

Brown & Renshaw partnership did not operate the Gold Cord mine in 1956. The only activity at this lode was assessment work on unpatented claims.

Yentna District.—The quantity of gold recovered by Collinsville Mines at the Mills Creek nonfloating placer decreased to 1,216 fine ounces in 1956 from 4,267 fine ounces in 1955. The company was forced to shut down in midseason because the tenor of the ground being worked dropped below the cutoff point. The future of the company was undecided. Smaller quantities of gold were produced at placer mines operated by Robert Dahl, Cache Creek; Gagnon Placers and J. F. Nasenius, Big Willow Creek; Harold Stanton, Upper Falls Creek; and Hickok-Engelhorn, Thunder Creek. Depletion of profitable placer ground and rising costs of labor and equipment contributed to the decline in gold production in the district. At many mines only the assessment work required to hold claims was done.

Copper River.—The value of minerals produced in the Copper River region decreased 50 percent from the 1955 output. The value of sand and gravel used by the construction industry dropped 89 percent below that reported in 1955. Gold output in the region was the lowest in more than 10 years; only 1 mine (5 in 1955) produced gold. George Belanger and Jack Cameron partnership recovered 81 fine ounces of gold by placer mining at Albert Creek, Nelchina district,

using a bulldozer to move 300 cubic yards of gold-bearing gravel through a nonfloating washing plant. Other placer mines in the region did only assessment or development work.

Phillips Petroleum Co. began to drill its third exploratory well in the Icy Bay area, Yakataga district. Two other wells drilled in the same area were not commercially productive and were capped. Interest in potential oil deposits in the area was shown by Colorado Oil & Gas Co., which completed seismic and gravimetric surveys on leases near the Phillips property in 1956. Equipment required for drilling in 1957 was moved into the area.

Kenai Peninsula.—Chromite mined by the Kenai Chrome Co. continued to be the leading mineral, in value, produced in the Kenai Peninsula region. The value of chromite shipments represented 73 percent of the value of all minerals produced in the region. Increased production at one lode-gold mine in the Hope district more than doubled the 1955 output.

Many major American oil companies explored for oil in the Kenai-Moose Range. Nearly 2,225,000 acres is leased by Phillips Petroleum Co., Union Oil Co., Ohio Oil Co., Sunray-Midcontinent Oil Co., Shell Oil Corp., Standard Oil of California, General Petroleum Co., and Richfield Oil Co. The last-named company began building a 20-mile road into the Swanson River area to its drilling site.

Homer District.—Mining by the Kenai Chrome Co. at Star 4 mine produced 6,422 long tons of chromite. The ore was purchased by GSA and shipped by barge to Seattle, destined for the Grants Pass (Oreg.) Depot. The mining property on Red Mountain near Seldovia was operated a short season because of heavy snow accumulation and inclement weather; the mine produced from July 1 to October 30. Plans to complete and operate a $70,000 mill were interrupted by an extremely heavy snowfall. The company intended to complete the mill by mid 1957 and to stockpile enough ore to keep it operating in the winter.

Hope District.—Patrick W. Bogan and George Massoz shipped 174 short tons of gold ore from their East Point lode mine. The ore, treated by the American Smelting and Refining Co. smelter at Tacoma, yielded 760 fine ounces of gold, 210 fine ounces of silver, and 220 pounds of copper. Additional gold was recovered by amalgamation and deposited with the Denver Mint. The value of minerals recovered from ore mined by drifting and stoping increased 240 percent over 1955.

Kodiak.—The only mineral commodities produced in the Kodiak region were sand and gravel and stone. The output came from pits and quarries of the 17th Naval District at Adak and Kodiak, worked by contractors for the United States Army Corps of Engineers.

Kodiak Exploration Co., formed in 1955 by G. H. Cornelius and H. Lawhead, began what was believed to be the first diamond drilling on Kodiak Island. The company explored tungsten and copper properties on Kodiak and Sitkalidak Islands, respectively.

Kuskokwim River.—Platinum-group metals mined by Goodnews Bay Mining Co., Goodnews Bay district, continued to rank first in value of all minerals produced in the region. Full-scale mercury production was resumed by the DeCoursey Mountain Mining Co., Aniak

district, in March, after replacement of the roasting plant and other surface buildings destroyed by a fire in late 1954. Output was expected to set a new production record for Alaska mercury. Approximately 17,200 fine ounces of gold was produced by 9 operations in the region. New York-Alaska Gold Dredging Co., Aniak district, was again the region's largest producer.

The Federal Bureau of Mines investigated mercury deposits in the Kuskokwim River basin. The project, recessed because of inclement weather, was to be resumed when the weather permitted.

Aniak District.—Over 3,000 flasks of mercury were produced at the DeCoursey Mountain Mining Co. Red Devil mine from ore processed in a 40-ton Herreshoff-type roasting plant. The mercury was sold to Mercantile Metal & Ore Corp., New York, and Otter Dredging Co., Flat, Alaska. Russel R. Schaefer recovered a small quantity of mercury from ore mined at Broken Shovel mine, Cinnabar Creek. A total of 16,465 fine ounces of gold was recovered by New York-Alaska Gold Dredging Co., Nyac; Marvel Creek Mining Co., Marvel Creek; Ralph Garrison, Granite Creek; Donlin Placers, Snow Gulch; and Jens Kvamme, Canyon Creek.

Goodnews Bay District.—Goodnews Bay Mining Co., the only primary producer of platinum-group metals in the United States or its Territories, operated a bucketline dredge and a nonfloating washing plant on Salmon River near Platinum. Gold and silver were recovered as byproducts of platinum production.

McGrath District.—Leonard Zaiser, Birch Gulch, was the only active gold producer in the district.

Northern Alaska.—Coal and a small quantity of natural gas were produced in the Northern Alaska region. Meade River coal mine, operated by Ed Burnell, sold 1,201 tons of coal to residents of Barrow for use in heating and cooking. The coal was transported to the town by "cat train." A small quantity of natural gas from a well on the naval petroleum reserve also was used in Barrow.

Northwestern Alaska.—Dahl Creek Mines (C. E. Stout) was the only gold producer in the Northwestern Alaska region. The company used nonfloating methods to recover gold at its Dahl Creek placer. The gold was sold to Northern Commercial Co., Fairbanks. Small quantities of jade were selected from detritus in the Shungnak district. The jade was used in manufacturing jewelry.

Seward Peninsula.—Gold production in the Seward Peninsula region declined approximately 1,000 fine ounces compared with 1955. The Nome district, as in previous years, yielded the largest percentage (86 percent) of the gold output of the region. Yuba Manufacturing Co. completed rebuilding the United States Smelting, Refining & Mining Co. dredge that overturned in 1954. The Federal Bureau of Mines searched for the lode source of placer tin in the Brooks Mountain-Potato Mountain area. Work on the project was recessed late in the year because of inclement weather. Silver, recovered as a byproduct of gold placer operations, was the only other mineral produced in the region.

Council District.—Last Chance Mining Co., idle in 1955, operated a bucketline dredge on Eldorado Creek. During the mining season—August 12 to October 2—the company recovered 111 fine ounces of

gold from 3,500 cubic yards of gravel. Northern Mining Co. operated its dredge on the Niukluk River and recovered 860 fine ounces of gold and 90 fine ounces of silver. Development work was done by Ralph Murane on the Golden Nugget claims on Daniels Creek. Pancake Mining Co. did assessment and stripping on placer claims on Pancake Creek.

Fairhaven District.—Havenstrite Oil Co., Mining Division, operated a nonfloating placer mine on Candle Creek and recovered a substantial quantity of gold. Inmachuck Mining Co. (Grant H. Nelson, owner) extracted 303 fine ounces of gold from 75,000 cubic yards of gold-bearing gravel processed by dredging. The company purchased the Casa DePaga Gold Co. dredge, which it expected to operate in 1957. The other gold producers in the district were Otto F. Weinard, Mud Creek; Paul Beshore & Associates, Kugruk River; Roy Mendenhall, Milroy Creek; and Jack Hoogendorn, Inmachuck River.

Kougarok District.—N. B. Tweet & Sons, largest gold producer in the district, extracted 508 fine ounces of gold from gravel treated in a nonfloating washing plant. Gold was recovered at placer operations of Atlas Mines, Dahl Creek; George Bodis, Bryan Creek; Midnight Sun Mines, Miller Creek; Rainbow Mining Co., Grouse Creek; and Andrew Wirum, Dome Creek. Lucky Syndicate of Portland, Oreg., purchased a dredge from the Gold Dust Mining Co., which had been idle for several years.

Koyuk District.—Patrick J. Bliss and Carl Swanson operated placer mines at Sweepstakes and Dime Creeks, respectively. Patrick J. Bliss also purchased the Ungalik Syndicate placer claims on Ungalik River. Oscar Swanson did assessment work on his placer claims at Dime Creek.

Nome District.—United States Smelting, Refining & Mining Co., Nome unit, operated two dredges from May 8 to November 8 and extracted the largest quantity of gold produced in the district. The company planned to operate a third dredge in the district in 1957.

Lee Bros. Dredging Co., second ranking producer in the Nome district in 1956 (idle in 1955), operated a bucketline dredge on Solomon Creek and recovered a substantial quantity of gold.

On Basin Creek, Herbert Engstrom used a power shovel to deliver gold-bearing gravel to elevated sluiceboxes. Mining yielded 252 fine ounces of gold and 143 ounces of natural gold, which was sold on the open market.

Kougarok Freight & Mining Co., on Buster Creek, recovered gold from old placer tailing with a homemade flume-type dredge; 234 fine ounces of gold was extracted during the mining season.

Other gold producers in the district were Bale & Lindfors, Iron Creek; Rocky Mountain Mining Co., Rocky Mountain Creek; and Jack John Titus, Penny Creek.

Southeastern Alaska.—The total value of mineral production in the region in 1956 was 2½ times that in 1955 and, in order of value, comprised stone, sand and gravel, gold, gem stones, lead, silver, and copper. A noteworthy increase in stone production was due to riprap produced by the United States Army Corps of Engineers at Metlakatla and Petersburg for use in the development of small boat basins. Although the quantity of sand and gravel produced in the region decreased 53 percent, the value increased 34 percent compared

with 1955. A special preparation used for seal coat in asphalt paving largely explained the increase in value. Most of the production was used in Government-financed projects. Besides gem stones and a small quantity of gold recovered by two placer operators near Haines, gold, silver, copper, and lead were produced by the Alaska Juneau Gold Mining Co. from a mill cleanup and from a shipment of concentrate (recovered in previous years).

Nearly $750,000 was reported to have been spent on prospecting and exploration in the Southeastern Alaska region in an accelerated search for iron, nickel, copper, uranium, molybdenum, barite, limestone, and oil. Active among the mining and oil companies were Union Carbide Nuclear Co. and Climax Molybdenum Co., searching for uranium; Columbia Iron Mining Co. (United States Steel Corp. subsidiary), Quebec Metallurgical Industries, Ltd., and Owen Ore Co. (W. S. Moore subsidiary), searching for iron ore; and Colorado Oil & Gas Corp. and Phillips Petroleum Co., searching for oil.

Admiralty District.—Diamond drilling was done by Admiralty-Alaska Gold Mining Co. on nickel-copper deposits at Funter Bay, Admiralty Island. The exploration, partly financed under the DMEA program, was being expanded to include 4,000 feet of drifting on the 1,425- and 1,700-foot levels. New equipment was ordered to support the enlarged program.

Juneau District.—The year marked the end of a gold producer known throughout the mining world. The new management of Alaska Juneau Gold Mining Co. voted to cease all operations at the Juneau property. Plans were made to dismantle mine and mill equipment for sale to foreign markets. The company plans to retain title to its mining claims. From 1893 until it shut down in 1944, the Alaska Juneau mine yielded nearly $81 million in gold, silver, copper, and lead. The company was famous for its profitable, mass-production method of mining low-grade gold ore.

Alaska Juneau Gold Mining Co. was formed on the basis of lode discoveries on placer claims staked by Joe Juneau and Richard Harris, the founders of the present city of Juneau. These two men discovered placer gravels at the mouth of Gold Creek in 1880.

Ketchikan District.—Exploration and development activity in the Ketchikan district increased during 1956. Union Carbide Nuclear Co. leased the I and L uranium prospect at Kendrick Bay. The company completed a 1½-mile road from the beach to the property and did diamond drilling to check mineralization. Climax Molybdenum Co. continued investigating uranium property leased from Ross & Adams. Kendrick Bay Mining Co. was formed by Climax Molybdenum Co., Ross, and Adams to exploit the deposit near Moira Sound. Development outlined enough reserves to warrant mining.

Aluminum Company of America leased its Edna Bay limestone holdings to Edna Bay Pure Stone Co., a Texas corporation. The new company planned to quarry the limestone and ship it to a lime plant to be constructed near Vancouver, Wash. Northwest Ventures, Ltd., of Vancouver, British Columbia, did diamond drilling on copper deposits on Gravina Island near Ketchikan.

Totem Exploration Co., Inc., was formed by a group of Ketchikan residents. The company planned to prospect and do diamond drilling

for contracted prices or for a percentage of the profits of future operations.

British Columbia Mica Mines explored on Sitklan Island, east of Ketchikan.

Yakutat District.—Colorado Oil & Gas Co., Denver, Colo., purchased the oil leases of Yakutat Development Co. along the Gulf of Alaska, enlarging its holdings to 1.2 million acres in the Yakutat area. Preparations were being made for drilling.

Yukon River.—The total value of mineral commodities produced in the Yukon River region declined 17 percent compared with 1955. Lower output of sand and gravel and gold (46 and 17 percent, respectively) caused the decline in value. The value of coal produced increased 14 percent, partly offsetting the loss. Because of the lower tenor of available placer ground, mechanized mining methods were necessary to increase the quantity of gravel processed. In 1956 an average of 67 cubic yards of gravel was treated to yield 1 fine ounce of gold; 50 cubic yards yielded 1 ounce in 1955.

The quantity of gold produced by 77 placer mines (94 in 1955) comprised 76 percent of the total value of gold recovered in Alaska. Five companies operated 11 bucketline dredges to recover 75 percent of the gold marketed from the region.

Earl R. Pilgrim & Co. resumed mining at its antimony mine in the Kantishna district. Pilgrim's Stampede mine made two shipments of high-grade antimony ore mined in previous years.

In the Bonnifield district 2 strip and 2 underground mines produced 63 percent of the coal mined—48 percent of the value of coal sold in Alaska.

Considerable interest was shown in potential oil deposits in the Kateel River area, 300 miles northwest of Fairbanks. During the year, applications for oil leases on 1,225,000 acres were filed by companies and individuals. Texota Oil Co. planned drilling on oil lands leased in the area.

Bonnifield District.—The coal output in the Yukon River region came from mines operated by 3 companies (4 in 1955). Usibelli Coal Mine, Inc., largest coal producer in the Nenana field, operated a strip and an underground mine on Healy River. Coal mined by the company was cleaned in a dense-medium cleaning plant. Suntrana Mining Co., the second ranking coal producer in the field, operated an underground mine at Healy; the third operator, Arctic Coal Co., produced coal from a strip mine at Lignite. Lack of a military contract forced the Cripple Creek Coal Co. to remain idle.

Chandalar District.—Chandalar Mining Co., the only active placer in the district, recovered a substantial quantity of gold from gravel processed in a nonfloating washing plant at Big Creek.

Chisana District.—A new mine operated by Hobb Enterprises extracted considerable gold by nonfloating placer methods on Slate Creek. This mine was the only gold producer in the district.

Circle District.—Gold Placers, Inc. (Ernest N. Patty, president), operated a bucketline dredge on Coal Creek and was the major gold producer in the district. A bulldozer removed overburden in advance of the dredge. P. R. & H. Mining Co., second-ranking gold producer, operated nonfloating washing plants at Mastodon and Mammoth

Creeks. Walter Roman operated the Lucky Seven Mining Co. placer mine on Mastodon Creek and recovered 495 fine ounces of gold and 138 fine ounces of silver. Bulldozers delivered gravel to bedrock sluiceboxes. John Frasca and W. L. Hering recovered 227 fine ounces of gold from 20,000 cubic yards of gravel. The gold was recovered in bedrock sluiceboxes on Eagle Creek claims.

Other placer operators in the Circle district were Paul Bittner, Deadwood Creek; Heine C. Carstens and Delta Alaska Co., Portage Creek; Jens Langlow, Switch Creek; and Miller Creek Mining Co. and Robert R. Wilkinson, Miller Creek. Timberline Placers (K. C. Spaid and H. L. Stout), a substantial gold producer in 1955, was idle.

Eagle District.—The only active mine operator in Eagle district, Lucky 8 Mining Co., recovered gold by placer mining at Crooked Creek. Wallace T. Brown and Burnett F. Hansen recovered 371 fine ounces of gold and 40 fine ounces of silver from the company sluiceboxes. Bulldozers delivered gravel and stacked tailing at the nonfloating operation.

Fairbanks District.—Although the number of placer mines decreased from 22 in 1955 to 13 in 1956, the quantity of gold produced in the Fairbanks district was 55 percent (59 percent in 1955) of the total Alaska output.

The Fairbanks unit of United States Smelting, Refining & Mining Co. (six bucket line dredges) continued to be the leading gold producer in Alaska. The company operated dredges at Gold Hill and on Cripple, Engineer, Pedro, Fairbanks, Dome, and Chatinika Creeks.

Wolf Creek Mining Co. used nonfloating equipment to mine 10 placer claims on Wolf Creek. This company ranked second in output of gold from the Fairbanks district. Alder Creek Mining Co., Fairbanks Creek, recovered 2,022 fine ounces of gold and 280 fine ounces of silver from 35,500 cubic yards of gravel delivered to elevated sluiceboxes by 2 dragline excavators. Dragline excavators and bulldozers stripped overburden and removed tailing.

Cliff Mining Co. operated a diesel-powered dredge on Caribou Creek during the mining season, June 1 to September 16. The company recovered 511 fine ounces of gold and 45 fine ounces of silver from 200,000 cubic yards of gravel. Chatham Creek Mining Co., Chatham Creek, recovered a substantial quantity of gold from placer mines.

Hassel Mining Co. used hydraulic giants, bulldozers, and dragline excavators to move 16,296 cubic yards of gravel; 1,002 fine ounces of gold and 226 fine ounces of silver were recovered from the placer mine on Ready Bullion Creek.

Gold was recovered by nonfloating placer-mining methods by Robert V. Watkins at Hope Mine, Faith Creek; Ketchum Creek Mining Co. (Al Swatch), Ketchum Creek; Bill Lawrence, Nugget Creek; Ernest L. Maurer, First Chance Creek; No Grub Mining Co., No Grub Creek; and Sleeper & McCharles, Buckeye Creek.

Placer operations that yielded gold in 1955 but were inactive in 1956 included Gold Stream Mining Co. (Denny G. Breaid), Goldstream Creek; Helmer Johnson, Cleary Creek; Albert Patrick, Ester Creek; and Fred Wackwitz, Bedrock Creek, who made a test shipment

of lead-silver ore to the Selby smelter in California from his Flume Creek lode mine.

Alaska Metals Mining Co. installed a small mill at the Gilmore Dome tungsten property near Fairbanks. The mill operated 2 weeks before an early freeze curtailed activity. During the 2-week period, 1,800 pounds of tungsten concentrate was extracted from 47 tons of ore mined in 1955. The company worked under a DMEA contract.

Fortymile District.—Rambaud & Hank (Rambaud & Weaver in 1955) recovered 112 fine counces of gold from placer mines on Napoleon Creek. Hydraulic giants removed 11,555 cubic yards of overburden during the mining season, April 20, to September 12. Gold was recovered from 4,340 cubic yards of gravel delivered to sluiceboxes by bulldozers. In addition to selling 112 fine ounces of gold to the San Francisco Mint, the partnership sold 423 ounces of natural gold on the open market.

Placer mining by William Meldrum on Stonehouse Creek yielded 172 fine ounces of gold and 36 fine ounces of silver. Hydraulic giants were used to strip 8,000 cubic yards of overburden, and a bulldozer delivered 4,000 cubic yards of gold-bearing gravel to the sluiceboxes.

Engbret Johansen operated a placer mine on Ingle Creek and recovered 59 fine ounces of gold during the mining season. Two hydraulic giants washed gold-bearing gravel through bedrock sluiceboxes and removed tailing.

Other placer operators in the district were Purdy Bros., Myers Fork; Al Cunningham, Rock Creek; Franklin Mining Co. (Roberts Bros.), Chicken Creek; Jack LaCross & Fred Whitehead, Poker Creek and Walker Fork; Squaw Creek Mining Co., Canyon Creek; George F. Robinson, Jack Wade Creek; and Dan Manske, Ingle Creek.

United States Smelting, Refining & Mining Co. continued preparatory work on dredging ground at Mosquito Fork. Robert McComb started stripping on gold claims near the South Fork of Fortymile River.

Hot Springs District.—Strandberg & Sons, principal gold producer in the Hot Springs district, operated a placer mine on Eureka Creek. Johnson & Isaacson, also on Eureka Creek, used hydraulic giants and bulldozers to deliver gold-bearing gravel to a 24-inch by 60-foot bedrock sluicebox; the partnership operated from May 1 to September 20.

Tony Lanning & Stanley Dayo operated nonfloating placer mines on Omega and Thanksgiving Creeks. Gravel processed at both mines yielded 186 fine ounces of gold. The partnership stripped overburden with a hydraulic giant and delivered gravel to the sluiceboxes with a TD–14 bulldozer.

Other placer mines in the district were operated by Oscar Enstrom (formerly Enstrom & McDougall), New York Gulch, and A. W. Pringle, Rhode Island Creek. Both used nonfloating placer-mining methods to recover gold.

Hughes District.—Strandberg & Sons, the only active placer operator in the Hughes district in 1956, used nonfloating methods to recover considerable gold on Indian River. The company also leased the L. J. James mining claims on Felix Fork.

Iditarod District.—North American Dredging Co. (Alex Mathiesen, owner), the leading producer of gold in the district, operated two

bucketline dredges at Glen Association claims on Flat Creek. Otter Dredging Co., also using a dredge on Otter Creek, ranked second in gold production in the district. Miscovich Bros. recovered gold by nonfloating methods from a placer mine on Otter Creek.

Gust Backstrom operated Idaho mine on Flat Creek from May 15 through August 15, using 2 hydraulic giants to wash 1,300 cubic yards of gravel, which yielded 92 fine ounces of gold. The property was sold to John S. Stevens at the end of the mining season.

Prince Creek Mining Co., Prince Creek, stripped overburden and delivered gravel to sluiceboxes with 1 bulldozer and 3 hydraulic giants. A substantial quantity of gold was recovered from 13,000 cubic yards of gravel. Other gold placers in the district were the hydraulic operations of Julian Stuver on Happy and Alpha Creeks.

Innoko District.—The Fullerton Bros.' Colorado Creek Mining Co. washed 75,000 cubic yards of gravel through elevated sluiceboxes to recover 1,405 fine ounces of gold. The mine on Colorado Creek was operated from June 1 to September 27. A dragline excavator and 2 D–8 bulldozers removed 150,000 cubic yards of overburden ahead of washing.

Strandberg & Sons also mined on Colorado Creek. This company used its dryland dredge (a portable, nonfloating washing plant) to extract the largest quantity of gold recovered by any mine in the district.

On Little Creek, Ivor C. Carlson washed 5,000 cubic yards of gravel through sluiceboxes from June 1 to September 27; the gold-bearing gravel yielded 268 fine ounces of gold and 50 fine ounces of silver. Degnan Mining Co., Esperanto Creek, and Uotila & Hard, Ophir Creek, recovered considerable gold by nonfloating methods.

A placer mine operated by Hjalmer Lindquist on Bedrock and Ester Creeks yielded 171 fine ounces of gold. The gold was extracted from 3,700 cubic yards of gravel washed through a bedrock sluicebox by 3 hydraulic giants. The hydraulic giants and a TD–18 bulldozer were used to strip overburden. Eric Hard operated Humming Bird Creek placer mine; this nonfloating operation produced a small quantity of gold. Waino Puntila, Little Creek, used a combination of a dragline excavator and hydraulic giants to wash 5,000 cubic yards of gold-bearing gravel through bedrock sluiceboxes.

Ophir Mining Co., which recovered more than 1,000 fine ounces of gold from dredge operations in 1955, was idle. The dredging ground leased by the company reverted to the owners, Ganes Mining Co. and Innoko Dredging Co.

Kantishna District.—Earl R. Pilgrim made two shipments of antimony ore from Stampede mine. Considerable difficulty was encountered in transporting the ore by tractor-drawn sleds to the railhead at Lignite. Underground mining, recessed since 1954, was resumed late in the year. The only gold-producing property in the district was the placer mine operated by Paul Omlin on Little Moose Creek. Dewey Burnette and M. Hunter did assessment work on their Crooked Creek placer claims.

Koyukuk District.—Gold recovered in the district came from gravel processed by three placer-mine operators. Emma Mining Co. (Gus Uotila, Guy Rivers, Carl Poorman, and Weldon McIntosh) used two

D–8 bulldozers to deliver gold-bearing gravel to sluiceboxes. The company recovered 306 fine ounces of gold, which was sold to the San Francisco Mint. In addition, 115 ounces of natural gold was sold on the open market. Other gold placers in the district were operated by Harry Leonard, Smith Creek; and Stanich Bros. (Sam and Obren), Porcupine Creek. Myrtle Creek Mining Co. leased its placer claims to Prospectors, Inc.

Melozitna District.—Gold produced in the Melozitna district came from the Grant Creek placer mine operated by Grant Mining Co. Gold recovered in the nonfloating washing plant was deposited in the San Francisco Mint.

Rampart District.—Melo Jackovich recovered 151 fine ounces of gold from a placer mine on Hunter Creek. Two bulldozers stripped overburden, delivered gravel to sluiceboxes, and stacked tailing. Other active mine operators in the district included the T & T Mining Co., Hunter Creek, and Weisner Trading Co., Little Minook Jr. Creek (bulldozers delivered gravel to sluiceboxes and hydraulic giants or removed overburden and stacked tailing); and Harry F. Havrilack (nonfloating placer); and Sam Barton (prospecting), Little Minook Jr. and Big Minook Creeks.

Little Minook Mining Co. was idle in 1956; the company leased its gold placer claims at Little Minook to Albin Martin, Rampart, Alaska, who made a small recovery panning bedrock from old workings. Swanson Brothers Mining Co. sold its mine and equipment to William Thomas, former operator of Kobuk Mines.

Ruby District.—Miscovich Bros. recovered a substantial quantity of gold from an opencut placer on Poorman Creek. The rest of the gold recovered in the district was extracted from gravel treated in nonfloating washing plants by Northern Lights Mining Co. and Long Creek Mining Co., Long Creek, and Clarence Zaiser, Greenstone Creek. These placer mines used combinations of hydraulic pumps, bulldozers, dragline excavators, and sluiceboxes to recover gold.

Tolovana District.—Olive Creek Mines used bulldozers to remove overburden and deliver gravel to sluiceboxes. From May 26 to October 6 the company recovered 1,638 fine ounces of gold from 80,000 cubic yards of gravel washed at its placer mine on Olive Creek. A dragline excavator stacked tailing and helped to remove overburden.

Yukon Placer Mining, Inc., leading gold producer in the Tolovana district, used a nonfloating washing plant to recover 3,022 fine ounces of gold during the mining season. A dragline excavator stacked tailing and removed 200,000 cubic yards of overburden at the Livengood Creek mine. Gold was recovered from 260,000 cubic yards of gravel delivered to a 4- by 60-foot sluicebox by 3 bulldozers. Other placer operations that produced gold in the district were Wilbur Creek Mines (Bentley Falls), Wilbur Creek; John Radak, Livengood Creek; and Mandich, Jurich & Car, Lillian Creek.

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The Mineral Industry of Arizona

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AN ALLTIME record high value of mineral production of $485.8 million was established in Arizona in 1956. This was 28 percent above the previous record of $378.3 million set in 1955. The gain resulted primarily from an increased value of copper output brought about by the combined factors of a greater tonnage of copper produced and a higher price for copper. Major credit for the increased output goes to the San Manuel Copper Corp., the State's newest large-scale copper producer. As it had since 1910, Arizona continued to lead the United States in copper output; its production was more than double that of the second highest producer, Utah.

The value of the copper output ($430 million) was 89 percent of Arizona's total value of mineral production in 1956. Other metals, mainly gold, silver, lead, zinc, manganese ore and concentrate, molybdenum, and uranium accounted for an additional $35.5 million (6 percent of the total). Uranium ore production was included in the mineral production data for the first time in 1956. Nonmetals, chiefly sand and gravel, stone, lime, and cement, supplied $20.2 million, whereas fuels, coal and natural gas, were valued at $69,000. Increased production was reported for each of these commodities mentioned above. Gypsum output increased by five times as a result of the opening of a new gypsum-products plant. Mercury output was only a fraction of what it was in 1955 primarily because of a drop in price for mercury.

Commodities that were produced in 1955 but not produced in 1956 included columbium (niobium)-tantalum concentrate, mica, barite, and diatomite. Decline in output was reported for clays, asbestos, and feldspar. Output of vanadium, recovered as a byproduct of the treatment of uranium ores from Apache County, was greater in 1956.

Data released by the Atomic Energy Commission (AEC) indicated that, as of November 1, 1956, Arizona had 4 percent of the United States uranium-ore reserves and 3 percent of the milling capacity; for the fiscal year 1956 (July 1, 1955, to and including June 30, 1956), it furnished 10 percent of the national uranium-ore production.

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TABLE 1.—Mineral production in Arizona, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate—gross weight	(2)	(2)	6	$2,614
Clays	254,443	$868,664	[3] 111,737	[3] 167,600
Coal	8,898	59,286	10,060	66,019
Copper (recoverable content of ores, etc.)	454,105	338,762,330	505,908	430,021,800
Gem stones	(4)	97,000	(4)	104,000
Gold (recoverable content of ores, etc.)—troy ounces	127,616	4,466,560	146,110	5,113,850
Gypsum (crude)	(2)	(2)	95,666	366,115
Lead (recoverable content of ores, etc.)	9,817	2,925,466	11,999	3,767,686
Lime	112,028	1,437,632	126,876	1,755,774
Manganese ore and concentrate (35 percent or more Mn)—gross weight	1,444	(2)	42,008	3,468,299
Mercury—76-pound flasks	477	138,497	(2)	(2)
Mica (scrap)	1,353	8,742		
Molybdenum (content of ore and concentrate)—thousand pounds	1,497	1,510,521	2,392	2,670,457
Natural gas—million cubic feet	(2)	(2)	21	3,000
Perlite	10,568	83,956	15,928	108,404
Pumice	92,136	372,735	114,609	366,095
Rare-earth metals concentrates—pounds			150	450
Sand and gravel	7,755,347	6,518,905	7,932,500	6,166,750
Silver (recoverable content of ores, etc.)—troy ounces	4,634,179	4,194,166	5,179,185	4,687,424
Stone	1,600,939	2,328,566	1,623,029	2,474,519
Tungsten concentrate—60-percent WO_3 basis	181	676,389	186	636,686
Zinc (recoverable content of ores, etc.)	22,684	5,580,264	25,580	7,008,920
Value of items that cannot be disclosed: Asbestos, barite (1955), cement, columbium-tantalum concentrate (1955), diatomite (1955), feldspar, vanadium, uranium ore (1956), and values indicated by footnote 2		9,201,394		17,900,579
Total, Arizona [5]		378,277,000		485,751,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration purchase depots is excluded. Excludes uranium ore for 1955, data not available.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Excludes bentonite; value included with "Items that cannot be disclosed."
[4] Weight not recorded.
[5] The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.

TABLE 2.—Average unit value of selected mineral commodities in Arizona, 1955–56 [1]

Commodity	1955	1956	Commodity	1955	1956
Clays—short ton	$3.414	$3.431	Pumice—short ton	$4.045	$3.194
Coal—do	6.663	6.563	Sand and gravel—do	.841	.777
Copper [2]—pound	.373	.425	Silver [5]—troy ounce	.905+	.905+
Gold [3]—troy ounce	35.000	35.000	Stone—short ton	1.455	1.525
Lead [2]—pound	.149	.157	Tungsten—short ton unit	62.300	57.138
Molybdenum—do	1.009	1.116	Zinc [2]—pound	.123	.137
Perlite—short ton	[4] 7.944	6.806			

[1] Average value f. o. b. mines or mills reported by the producers, except as otherwise noted.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Revised figure.
[5] Treasury buying price for newly mined silver, July 1, 1946, to date—$0.9050505.

New Plants and Construction.—Several New plants for treating or processing ores and commodities were completed in Arizona in 1956, and construction was begun on others. In the copper industry the 30,000-ton-per-day concentrator and smelter at the San Manuel mine were placed in operation in January.

At Ray the program of expansion of the leaching facilities and construction of the plant for producing sulfuric acid and iron residue

from byproduct pyrite for use in the leaching operation was completed; also at Ray a $40-million program for increasing production capacity by 20,000 tons of copper annually by enlargement of the pit and mill and the construction of a smelter was begun. The $6.5 million project of rehabilitation and reequipment of the Inspiration concentrator, in preparation for conversion to the dual metallurgical process, was completed; the 3,000-ton-per-day flotation plant was placed in operation in December.

A new pilot plant for the producing of electrolytic copper with a byproduct of sulfuric acid began production in the spring at Bagdad. The acid will be used to recover copper from oxide copper ore which comprises one-third of the copper reserve at Bagdad that is not recoverable by present milling methods.

At the Silver Bell mine a section to recover the molybdenum content of the copper ore was added to the 7,500-ton-per-day mill. The construction program of the Pima Mining Co. 3,000-ton-per-day flotation plant was carried to completion in 1956 and test runs were made in December.

A 250-ton-per-day mill for treating uranium ore, Arizona's first, was placed in operation in July at Tuba City. A new gypsum-products plant was installed at Phoenix by the Union Gypsum Co.

Employment and Earnings.—Detailed data on employment and earnings in Arizona, procured from publications of the United States Department of Labor and Arizona Employment Security Commission, are given in tables 3 and 4. Annual average employment in the mining industry in Arizona composed 6.5 percent of the total nonagricultural employment in 1956 and increased 13 percent over 1955. Average hourly earnings for employees in copper mining rose from $2.35 in January to $2.42 in December 1956 and averaged $2.38 for the year. Average weekly earnings for copper mining was $111.65.

Injuries.—The Arizona State mine inspector reported [2] that there were 10 fatal accidents in underground and none in open-pit mines in Arizona for the fiscal year ended November 30, 1956. In addition, 269 serious accidents resulting in loss of 14 days or more occurred in underground mines and 43 in open-pit mines.

TABLE 3.—Nonagricultural employment, 1955–56 [1]

[United States Department of Labor]

Industry	Annual average employment		Percent of total nonagricultural	
	1955	1956	1955	1956
Mining [2]	13,900	15,700	6.3	6.5
Contract construction [3]	19,400	20,100	8.8	8.3
Manufacturing	31,300	35,700	14.2	14.7
Transportation and public utilities	20,800	21,000	9.4	8.6
Wholesale and retail trade	55,400	59,900	25.0	24.6
Finance, insurance, and real estate	8,500	9,500	3.8	3.9
Service and miscellaneous	27,800	30,800	12.6	12.7
Government	44,100	50,400	19.9	20.7
Total nonagricultural	221,200	243,100	100.0	100.0

[1] Excludes administrative and nonworking supervisory personnel.
[2] Includes extraction of minerals occurring naturally, quarrying, well operation, milling, exploration and development of mineral properties, and removal of overburden.
[3] Includes some employees engaged in mining and quarrying where work is done by contractors and separate records are not kept.

[2] Massey, Edward (Ed.), State mine inspector, 45th Annual Report of the State Mine Inspector, for Year Ending November 30, 1956: 26 pp.

Defense Minerals Exploration Administration (DMEA) Program.—During 1956 2 DMEA contracts were executed for a total of $115,568, compared with 5 in 1955 for a total of $269,650. One contract (for $26,788, of which 75 percent was financed by the Government and 25 percent by Big Six Explorations, Inc.) was for the exploration for uranium on the Sorrell Horse and Citation claims in Gila County. A second contract (for a total of $88,780, with equal financial participation by the Government and Lewisohn Copper Corp.) was for a copper-exploration program at the Peach mine in Pima County.

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METALS

Beryllium.—Three operations in Arizona in 1956 produced 6 tons of beryllium concentrate (beryl) valued at $2,614, all sold to Beryl Ores Co., Arvada, Colo. The beryl was recovered from pegmatite by hand sorting. The Federal Bureau of Mines conducted research at experiment stations at Rapid City, S. Dak., and University, Ala., to improve the processes to recover beryl from pegmatite and to extract beryllium from concentrate. The Government purchase program for beryl, administered by the General Services Administration (GSA), was extended to June 30, 1962, or to when deliveries total 4,500 short tons, whichever occurs first.

Copper.—Arizona continued to rank first in the United States in copper output—a position it has held since 1910. In 1956 the lead over Utah, the second-ranking copper producer, was increased to 102 percent from 95 percent in 1955. An alltime record production of 505,900 short tons of copper valued at $430 million was established in Arizona in 1956. Compared with 1955, this represented an 11-percent increase in quantity and a 27-percent increase in value. Nine-tenths of the total value of the mineral production in the State in 1956 was supplied by copper.

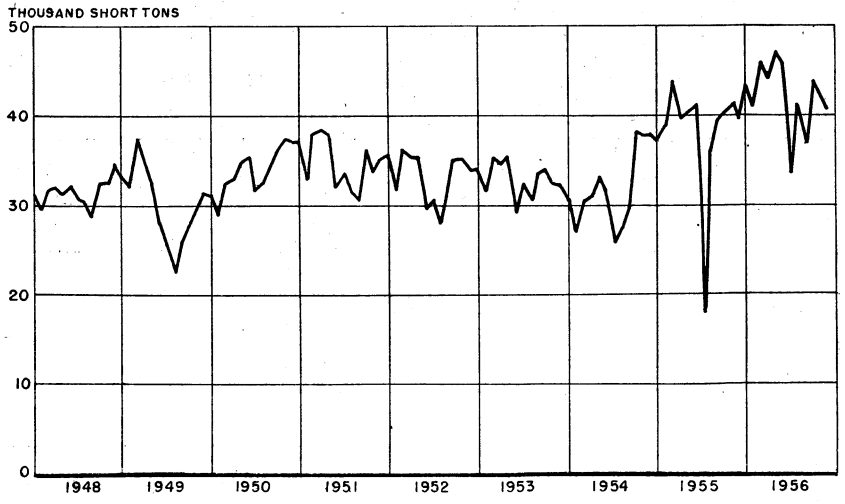

FIGURE 1.—Mine production of copper in Arizona, 1948–56, by months, in terms of recoverable metal.

The 15 leading copper-producing mines in Arizona in 1956 contributed 99 percent of the total copper output in the State; the first 5 mines supplied 71 percent. The Morenci Branch of the Phelps Dodge Corp. continued to be Arizona's largest copper producer. Output from this source was three-quarters larger than the next highest producer, Copper Queen Branch of the Phelps Dodge Corp. The Copper Queen Branch showed a 24-percent gain in production, partly as a result of advanced output from the Copper Queen underground mine but mostly as a result of a major increase in output from the Lavender open-pit mine. Ray Mines Division of Kennecott Copper Corp. reported a 9-percent increase in copper output in 1956, compared with 1955.

Part of Arizona's increased copper output in 1956 resulted from gains from several of the principal copper producers, including Morenci, Copper Queen, Lavender, Ray, and Copper Cities. However, the major credit for the overall increase in copper output for the State goes to Arizona's newest large-scale producer—San Manuel mine operated by the San Manuel Copper Corp., a Magma Copper Co. wholly owned subsidiary.

TABLE 4.—15 leading copper-producing mines in Arizona in 1956, in order of output

Rank in 1956	Rank in 1955	Mine	District	County	Operator	Source of copper in 1956
1	1	Morenci	Copper Mountain.	Greenlee	Phelps Dodge Corp.	Copper ore.
2	3	Copper Queen-Lavender pit.	Warren	Cochise	do	Do.
3	2	New Cornelia	Ajo	Pima	do	Do.
4	4	Ray pit	Mineral Creek.	Pinal	Kennecott Copper Corp.	Do.
5	(1)	San Manuel	Old Hat	do	San Manuel Copper Corp.	Do.
6	5	Inspiration	Globe-Miami	Gila	Inspiration Consolidated Copper Co.	Do.
7	6	Copper Cities	do	do	Copper Cities Mining Co.	Do.
8	7	Magma	Pioneer	Pinal	Magma Copper Co.	Do.
9	8	Silver Bell Unit.	Silver Bell	Pima	American Smelting and Refining Co.	Do.
10	9	Miami	Globe-Miami	Gila	Miami Copper Co.	Do.
11	10	Bagdad	Eureka	Yavapai	Bagdad Copper Corp.	Do.
12	11	Mineral Hill, etc.	Pima	Pima	Banner Mining Co.	Do.
13	13	Castle Dome dump.	Globe-Miami	Gila	Castle Dome Copper Co., Inc.	Copper precipitates.
14	12	Johnson Camp Unit-Moore shaft.	Cochise	Cochise	Coranado Copper & Zinc Co.	Copper, copper-zinc ores.
15	14	United Verde	Verde	Yavapai	Big Hole Mining Co. Leach Copper Co. Milo E. Stoney.	Copper, copper precipitates, copper-smelter cleanings.

[1] Did not produce in 1955.

TABLE 5.—Ore mined, waste and leach material removed, and total copper production at principal copper open-pit and underground mines in Arizona, 1955–56 [1]

Mine	Ore mined (short tons)		Waste and leach material removed (short tons)		Total copper produced from all sources [2] (short tons)	
	1955	1956	1955	1956	1955	1956
Open pit:						
Morenci	15,899,410	16,794,287	33,148,792	37,788,263	124,413	127,156
New Cornelia	10,274,836	10,112,434	14,663,772	14,504,201	70,222	66,432
Lavender	4,433,218	5,069,049	8,013,961	6,544,497	29,931	40,153
Ray	4,818,358	5,852,742	[3] 10,204,329	[4]	48,983	53,248
Inspiration	3,731,027	3,709,789	11,517,613	11,456,577	38,114	37,083
Copper Cities	4,004,052	4,167,147	3,347,720	3,869,132	27,549	27,826
Bagdad	1,352,230	1,363,505	[3] 9,175,745	12,765,358	10,892	6,734
Castle Dome dump					[5] 1,115	[5] 2,617
Pima			[3] [6] 624,000	[3] [6] 8,849,000		
Underground:						
San Manuel		5,539,581				39,076
Copper Queen	546,001	632,088			28,213	31,927
Magma	458,488	453,683			23,945	23,885
Miami	3,721,675	3,812,165			19,495	19,282

[1] Source: Company annual reports.
[2] Includes copper recovered from leaching of material in place or on dumps.
[3] Source: Mining World Catalog, Survey and Directory Number, Apr. 15, 1957, p. 94.
[4] Data not available.
[5] Recovered from water leaching of mine dumps only.
[6] Cubic yards.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Arizona, 1947–51 (average), 1952–56, and total, 1860–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	318	29	40,692,894	109,749	$3,841,222	4,964,797	$4,493,346
1952	187	7	45,385,327	112,355	3,932,425	4,701,330	4,254,941
1953	163	6	45,700,618	112,824	3,948,840	4,351,429	3,938,263
1954	164	5	43,460,477	114,809	4,018,315	4,298,811	3,890,641
1955	173	7	52,710,060	127,616	4,466,560	4,634,179	4,194,166
1956	194	5	61,044,282	146,110	5,113,850	5,179,185	4,687,424
1860–1956			[3]	12,030,619	308,566,820	340,676,334	260,696,864

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	383,904	$165,423,662	27,162	$8,536,014	58,652	$16,341,227	$198,635,471
1952	395,719	191,527,996	16,520	5,319,440	47,143	15,651,476	220,686,278
1953	393,525	225,883,350	9,428	2,470,136	27,530	6,331,900	242,572,489
1954	377,927	222,976,930	8,385	2,297,490	21,461	4,635,576	237,818,952
1955	454,105	338,762,330	9,817	2,925,466	22,684	5,580,264	355,928,786
1956	505,908	430,021,800	11,999	3,767,686	25,580	7,008,920	450,599,680
1860–1956	15,224,796	5,545,567,518	566,016	107,821,422	715,127	174,288,193	6,396,940,817

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-retreated, and ore, old tailings, or copper precipitates shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed or tonnage of precipitates shipped.
[3] Figure not available.

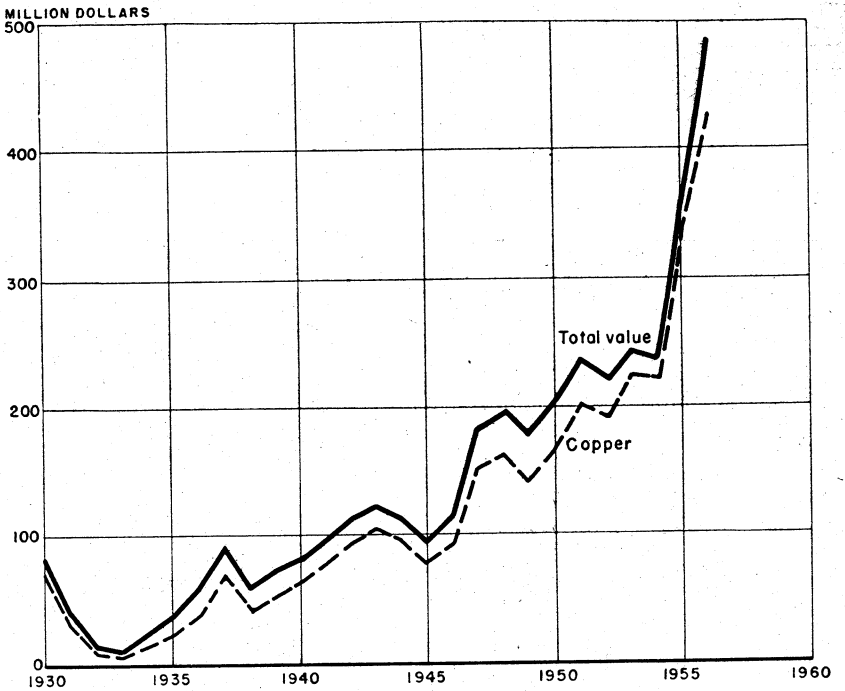

FIGURE 2.—Value of mine production of copper and total value of mineral production in Arizona, 1930–56.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	12,040	464,237	43,411	959	1,822
February	13,027	459,765	41,054	1,004	2,094
March	13,478	499,712	45,679	1,125	2,293
April	12,274	457,495	44,079	1,005	2,154
May	13,377	477,741	46,981	967	2,194
June	12,733	445,270	45,544	1,009	2,204
July	9,751	328,760	33,526	851	1,943
August	11,834	410,118	41,141	1,000	2,088
September	12,020	377,875	37,742	976	2,073
October	12,285	422,532	43,561	1,089	2,271
November	11,681	418,495	42,472	965	2,074
December	11,610	417,185	40,708	1,049	2,370
Total	146,110	5,179,185	505,908	11,999	25,580

TABLE 8.—Gold and silver produced at placer mines, 1947–51 (average) and 1952–56, in fine ounces, in terms of recoverable metals

Year	Small-scale hand methods [1]		Gravel mechanically handled				Underground placers		Total	
			Nonfloating washing plants [2]		Bucketline and dragline dredges		Drift			
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
1947–51 (average)	139	7	247	39	--------	--------	18	(3)	403	46
1952	11	--------	58	10	--------	--------	1	--------	70	10
1953	60	--------	--------	--------	49	7	--------	--------	109	7
1954	78	6	--------	--------	--------	--------	--------	--------	78	6
1955	79	5	4	--------	--------	--------	--------	--------	83	5
1956	92	8	2	--------	--------	--------	--------	--------	94	8

[1] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
[2] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[3] Less than 1.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals

County and district	Mines producing [1] (lode and placer)	Lode material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)		Copper		Lead		Zinc		Total value
			Fine ounces	Value	Fine ounces	Value	Pounds	Value	Pounds	Value	Pounds	Value	
Apache County	1	5					300	$128					$128
Cochise County:													
Cochise (Dragoon)	1	76,668			31,147	$28,190	3,337,400	1,418,395			5,590,200	$765,857	2,212,442
Golden Rule	1	45			41	37	100	43	10,300	$1,617	1,700	233	1,930
Smelter and Turquoise [3]	4	16,156	954	$33,390	24,615	22,278	1,356,000	576,300	303,700	47,681			679,649
Swisshelm	1	43	4	140	147	133			4,700	738			1,011
Tombstone	1	15			9	8	200	85	2,400	377			470
Warren (Bisbee)	2	5,701,075	45,088	1,578,080	1,267,315	1,146,984	144,160,200	61,268,085					63,993,149
Whetstone (Benson)	1	731	3	105	343	310	19,500	8,287					8,702
Total	11	5,794,733	46,049	1,611,715	1,323,617	1,197,940	148,873,400	63,271,195	321,100	50,413	5,591,900	766,090	66,897,353
Coconino County:													
Francis	1	879					63,800	27,115					27,115
Grand Canyon	1	449			4	4	20,600	8,755					8,759
Hualpai Indian Reservation	2	804			196	177	74,400	31,620					31,797
Jacob Canyon and Warm Springs	1	1,855			204	185	175,000	74,375					74,560
White Mesa	1	365			270	244	28,100	11,943					12,187
Total	6	4,352			674	610	361,900	153,808					154,418
Gila County:													
Banner (Christmas)	2	9,034	3	105	293	265	241,400	102,595					102,965
Globe-Miami	10	11,712,273	1,517	53,095	128,785	116,557	173,893,400	73,904,695					74,074,347
Green Valley	1	202	1	35	42	38	10,300	4,378					4,451
Pioneer (Superior) [4]	1	32			37	33	4,000	1,700					1,733
Sierra Ancha	1	1	6	210	2	2							212
Total	15	11,721,542	1,527	53,445	129,159	116,895	174,149,100	74,013,368					74,183,708

See footnotes at end of table.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals—Continued

County and district	Mines producing [1] (lode and placer)	Lode material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)		Copper		Lead		Zinc		Total value
			Fine ounces	Value	Fine ounces	Value	Pounds	Value	Pounds	Value	Pounds	Value	
Graham County:													
Aravaipa	1	18,449			11,118	$10,062	125,900	$53,507	832,000	$130,624	2,370,500	$324,759	$518,952
Clark	1	4			10	9	200	85					94
Lone Star	2	98	3	$105	35	32	3,700	1,573					1,710
Stanley Butte	2	23			14	13	2,800	1,190					1,203
Total	6	18,574	3	105	11,177	10,116	132,600	56,355	832,000	130,624	2,370,500	324,759	521,959
Greenlee County:													
Copper Mountain (Morenci)	2	16,799,770	9,527	333,445	800,468	724,464	254,699,800	108,247,415					109,305,324
Maricopa County:													
Agua Fria	3	105	4	140	34	31	8,200	3,485					3,656
Cave Creek & Camp Creek	3	125	1	35	72	65	3,100	1,317					1,417
Ellsworth [5]	1	13	2	70	3	3	900	383					456
New River	1	24			7	6	5,100	2,167					2,173
Vulture	2	41			21	19	1,200	510					529
Wickenburg [7]	1		2	70									70
Total	11	308	9	315	137	124	18,500	7,862					8,301
Mohave County:													
Cedar Valley	2	800	1	35	680	615	34,800	14,790	4,000	628			16,068
Lost Basin [7]	1		6	210	1	1							211
Minnesota	1	259	4	140	240	217	14,100	5,992					6,349
Owens	4	618	37	1,295	151	137	17,600	7,480			100	14	8,926
Wallapai (Chloride, Cerbat, Stockton Hill)	4	2,499	11	385	1,020	923	212,800	90,440	27,400	4,302	55,800	7,644	103,694
Total	12	4,176	59	2,065	2,092	1,893	279,300	118,702	31,400	4,930	55,900	7,658	135,248
Pima County:													
Ajo	1	10,115,754	39,040	1,366,400	508,483	466,203	132,863,800	56,467,115					58,293,718
Amole and Helvetia (Rosemont) [3]	6	6,223	1	35	3,453	3,125	394,100	167,493	1,000	157	1,400	192	171,002

Arivaca	1	37			51	46			700	110			156
Baboquivari	1	1,898	26	910	3,065	2,774	34,800	14,790					18,474
Bronnel	1	586	3	105	2,496	2,259	11,600	4,930					7,294
Cerro Colorado	1	37	1	35	743	672	200	85					792
Fresnal	1	3,324	381	13,335	5,436	4,920							18,255
Meyer (Gunsight)	1	13	6	210	2	2							212
Old Hat [6]	3	171	1	35	255	231	9,400	3,995	8,800	1,382	2,700	370	6,013
Pima (Sierritas, Papago, Twin Buttes)	9	223,428	8	280	225,567	204,150	9,679,800	4,113,915	3,620,700	568,450	5,571,700	763,323	5,650,118
Quijotoa [7]	2	733	7	245	846	766	27,600	11,730					12,741
Silver Bell	6	2,755,570	372	13,020	171,909	155,586	39,949,300	16,978,452	13,800	2,166	656,300	89,913	17,239,137
Total	33	13,107,774	39,846	1,394,610	922,306	834,734	182,970,600	77,762,505	3,645,000	572,265	6,232,100	853,798	81,417,912
Pinal County:													
Bunker Hill (Copper Creek)	1	50			25	23	3,400	1,445					1,468
Casa Grande	2	546	8	280	545	493	39,600	16,830	12,200	1,915			19,518
Crozier Peak	1	25			143	129	2,300	978					1,107
Mineral Creek (Ray)	6	5,879,050	1,632	57,120	261,426	236,604	107,036,400	45,490,470	212,500	33,363			45,817,557
Mineral Hill	4	157	16	560	91	82	2,500	1,063	13,100	2,057			3,762
Old Hat (Oracle, Mammoth) [6]	2	5,539,617	9,719	340,165	136,090	123,168	78,156,100	33,216,342					33,679,675
Owl Head	3	90	1	35	15	14	3,200	1,360					1,409
Picacho	2	77			19	17	6,000	2,550					2,567
Pioneer (Superior) [4]	3	453,876	11,648	407,680	491,498	444,831	47,777,000	20,305,225					21,157,736
Pipsey	1	25	2	70	26	24	2,100	892					986
Riverside	2	182			164	148	5,300	2,252					2,400
Total	27	11,873,695	23,026	805,910	890,042	805,533	233,033,900	99,039,407	237,800	37,335			100,688,185
Santa Cruz County:													
Harshaw and Tyndall [3]	7	55,448	153	5,355	172,869	156,455	239,000	101,575	6,652,000	1,044,364	7,949,200	1,089,040	2,396,789
Oro Blanco (Ruby)	1	35	1	35	463	419	1,700	723	1,200	188			1,365
Palmetto	1	413					29,100	12,367	1,000	157	1,200	164	12,688
Patagonia (Duquesne)	12	10,402	6	210	57,867	52,373	497,500	211,437	652,100	102,380	1,085,500	148,714	515,114
Red Rock	1	330			220	199	3,700	1,573					1,772
Total	22	66,628	160	5,600	231,419	209,446	771,000	327,675	7,306,300	1,147,089	9,035,900	1,237,918	2,927,728
Yavapai County:													
Agua Fria	6	639	31	1,085	448	405	77,800	33,065					34,555
Big Bug	2	253,971	25,327	886,445	799,858	723,912	484,800	206,040	11,552,400	1,813,727	27,867,100	3,817,792	7,447,916
Black Hills	1	168	2	70	54	49	6,700	2,848					2,967
Bullard or Pierce	1	34	4	140	14	13	2,000	850					1,003
Castle Creek	1	38	2	70	16	14	8,300	3,528					3,612
Copper Basin	1	14,774					703,200	298,860					298,860
Copper Creek	1	271	3	105	193	175	17,600	7,480					7,760
Eureka (Bagdad)	3	1,363,882	13	455	53,167	48,119	13,504,700	5,739,497			6,100	836	5,788,907

See footnotes at end of table.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals—Continued

County and district	Mines producing [1] (lode and placer)	Lode material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)		Copper		Lead		Zinc		Total value
			Fine ounces	Value	Fine ounces	Value	Pounds	Value	Pounds	Value	Pounds	Value	
Yavapai County—Con.													
Hassayampa (Prescott, Groom Creek)[7]	4	49	8	$280	65	$59	1,600	$680	700	$110			$1,129
Kirkland	1	5	2	70									70
Tiger and Tip Top [3]	3	167	13	455	1,180	1,068	14,700	6,247	100	15			7,785
Verde (Jerome) and Walnut Grove [3]	3	15,432	89	3,115	11,648	10,542	1,536,600	653,055	14,600	2,292	400	$55	669,059
Weaver	1	302	195	6,825	108	98							6,923
White Picacho	2	113	6	210	155	140	6,200	2,635					2,985
Total	30	1,649,845	25,695	899,325	866,906	784,594	16,364,200	6,954,785	11,567,800	1,816,144	27,873,600	3,818,683	14,273,531
Yuma County:													
Castle Dome	1	300			526	476			56,600	8,886	100	14	9,376
Cienega	4	162	30	1,050	40	36	10,700	4,547					5,633
Ellsworth [5]	7	315	61	2,135	314	284	10,200	4,335					6,754
Harcuvar	3	173	30	1,050	23	21	7,100	3,018					4,089
La Paz	1	105			30	27	3,200	1,360					1,387
Plomosa	1	58	2	70	8	7	2,400	1,020					1,097
Santa Maria	4	1,730	7	245	47	43	124,900	53,082					53,370
Thumb Butte	1	37	1	35	194	176	2,900	1,233					1,444
Trigo [7]	1		78	2,730	6	5							2,735
Total	23	2,880	209	7,315	1,188	1,075	161,400	68,595	56,600	8,886	100	14	85,885
Grand total: 1956	199	61,044,282	146,110	5,113,850	5,179,185	4,687,424	1,011,816,000	430,021,800	23,998,000	3,767,686	51,160,000	7,008,920	450,599,680
1955	180	52,710,060	127,616	4,466,560	4,634,179	4,194,166	908,210,000	338,762,330	19,634,000	2,925,466	45,368,000	5,580,264	355,928,786

[1] All lode mines except for 5 placer mines as indicated in footnote reference 7. Operations at miscellaneous cleanups not counted as a producing mine.
[2] Does not include precipitates shipped.
[3] Combined to avoid disclosing individual company confidential data.
[4] Pioneer district lies in both Gila and Pinal Counties.
[5] Ellsworth district lies in both Maricopa and Yuma Counties.
[6] Old Hat district lies in both Pima and Pinal Counties.
[7] Includes placer production by districts as follows: Wickenburg—2 fine ounces gold (value, $70); Lost Basin—6 fine ounces gold ($value, $210) and 1 fine ounce silver (value, $1); Quijotoa—2 fine ounces gold (value, $70); Hassayampa—6 fine ounces gold (value, $210) and 1 fine ounce silver (value, $1); Trigo—78 fine ounces gold (value, $2,730) and 6 fine ounces silver (value $5).

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	23	1,459	355	478	31,600	100	----------
Dry gold-silver	10	88,709	649	15,237	1,542,400	3,200	----------
Dry silver	34	40,528	13	22,224	778,100	11,400	700
Total	66	130,696	1,017	37,939	2,352,100	14,700	700
Copper	104	60,468,580	119,435	3,963,579	935,039,400	12,600	38,100
Copper-lead-zinc	7	4,309	3	46,354	198,100	600,200	890,100
Copper-zinc	3	75,957	----------	31,231	3,183,400	5,000	5,722,300
Lead	20	5,977	114	27,543	31,000	2,224,100	147,400
Lead-zinc	9	356,283	25,437	1,071,595	1,298,000	21,141,400	43,705,100
Zinc	1	2,132	8	523	38,600	----------	656,300
Total	135	60,913,238	144,997	5,140,825	939,788,500	23,983,300	51,159,300
Other "lode" material:							
Copper smelter cleanings and cleanings	2	348	2	90	24,700	----------	----------
Copper precipitates	9	53,505	----------	----------	69,637,200	----------	----------
Tungsten ore	1	----------	----------	323	13,500	----------	----------
Total	12	53,853	2	413	69,675,400	----------	----------
Total "lode" material	194	61,097,787	146,016	5,179,177	1,011,816,000	23,998,000	51,160,000
Gravel (placer operations)	5	----------	94	8	----------	----------	----------
Total, all sources	199	61,097,787	146,110	5,179,185	1,011,816,000	23,998,000	51,160,000

[1] Detail will not necessarily add to totals because some mines produce more than 1 class of material.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation [1]	9	2	----------	----------	----------
Cyanidation [1]	3,866	46,490	----------	----------	----------
Total recoverable in bullion	3,875	46,492	----------	----------	----------
Concentration, and smelting of concentrates [1 2]	108,695	3,978,131	820,489,500	21,807,100	50,974,900
Direct-smelting:					
Ore	33,444	1,154,464	62,680,600	2,190,900	185,100
Smelter cleanings, etc	2	90	24,700	----------	----------
Copper precipitates [3]	----------	----------	69,637,200	----------	----------
Total	33,446	1,154,554	132,342,500	2,190,900	185,100
Other: Straight leaching of copper ore [4]	----------	----------	58,984,000	----------	----------
Placer	94	8	----------	----------	----------
Grand total	146,110	5,179,185	1,011,816,000	23,998,000	51,160,000

[1] Ore only; no old tailings, etc., processed by this method in 1956.
[2] Includes tungsten-ore concentrate.
[3] Distributed as follows: Cochise County, 7,355,600 pounds; Gila County, 26,262,300 pounds; Greenlee County, 6,739,100 pounds; Pinal County, 29,270,200 pounds; Yavapai County, 10,000 pounds.
[4] All from 1 plant in Gila County.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For ore treated at mills

	Ore treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Cochise	5,289,548			370,580	14,442	291,927	90,853,000		5,570,900
Gila	8,211,803	6	2	141,247	1,516	126,826	88,367,100		
Graham	18,449			3,354		11,118	125,900	832,000	2,370,500
Greenlee	16,736,483			449,386	9,465	796,290	246,563,100		
Mohave	1,000		6	245	12	1,637	35,900	26,300	55,900
Pima	13,054,286			319,165	39,249	882,549	180,545,800	3,619,700	6,229,400
Pinal	11,774,381	1		432,429	22,448	861,925	199,588,800		
Santa Cruz	56,516			13,160	108	199,665	457,400	5,723,900	8,883,700
Yavapai	1,617,452	3,868	46,484	76,736	21,455	805,668	13,952,500	11,548,600	27,864,400
Yuma	300			57		526		56,600	100
Total: 1956	56,760,218	3,875	46,492	1,806,359	108,695	3,978,131	820,489,500	21,807,100	50,974,900
1955	48,537,958	2,720	31,733	1,619,458	92,218	3,474,383	746,829,600	17,729,700	45,078,800
BY CLASSES OF ORE TREATED									
Dry gold	7	9	2						
Dry silver	14		6	1		62			100
Copper	56,321,220			1,720,329	87,113	2,874,010	815,757,900	5,000	1,400
Copper-lead-zinc	4,309			1,607	3	46,354	198,100	600,200	890,100
Copper-zinc	75,957			11,088		31,231	3,183,400	5,000	5,722,300
Lead	300			57		526		56,600	100
Lead-zinc	356,279	3,866	46,484	72,526	21,571	1,025,102	1,298,000	21,140,300	43,704,600
Tungsten				42		323	13,500		
Zinc	2,132			709	8	523	38,600		656,300
Total: 1956	56,760,218	3,875	46,492	1,806,359	108,695	3,978,131	820,489,500	21,807,100	50,974,900
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS									
Copper				[1]1,725,696	87,118	[1]2,899,004	[1]818,722,500	8,600	63,400
Copper-lead				1,432		40,777	203,700	1,206,700	49,300
Copper-lead-zinc				3,763	3	115,733	485,300	3,640,500	598,600
Copper-zinc				16		35	10,200		2,600
Iron (from lead-zinc ore)				14	1	25		100	
Lead				24,799	19,467	800,611	428,600	15,903,500	3,507,200
Zinc				50,639	2,106	121,946	639,200	1,047,700	46,753,800
Total: 1956				1,806,359	108,695	3,978,131	820,489,500	21,807,100	50,974,900

[1] Includes concentrate and contained recoverable metal from tungsten ore.

B. For copper ore treated by straight leaching

	Ore treated (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Gila	3,480,652	--------	--------	58,984,000	----------	----------
Total: 1956	3,480,652	--------	--------	58,984,000	----------	----------
1955	3,491,853	--------	--------	59,517,500	----------	----------

C. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Apache	5	--------	--------	300	----------	----------
Cochise	510,279	31,607	1,031,690	58,020,400	321,100	21,000
Coconino	4,352	--------	674	361,900	----------	----------
Gila	54,613	5	2,331	26,798,000	----------	----------
Graham	125	3	59	6,700	----------	----------
Greenlee	68,029	62	4,178	8,136,700	----------	----------
Maricopa	308	7	137	18,500	----------	----------
Mohave	3,176	41	448	243,400	5,100	----------
Pima	53,488	595	39,757	2,424,800	25,300	2,700
Pinal	117,449	577	28,117	33,445,100	237,800	----------
Santa Cruz	10,112	52	31,754	313,600	1,582,400	152,200
Yavapai	32,401	366	14,753	2,411,700	19,200	9,200
Yuma	2,580	131	656	161,400	----------	----------
Total: 1956	856,917	33,446	1,154,554	132,342,500	2,190,900	185,100
1955	713,404	32,595	1,128,058	101,862,900	1,904,300	289,200
BY CLASSES OF MATERIAL						
Dry gold: Crude ore	1,452	346	476	31,600	100	----------
Dry gold-silver: Crude ore	88,709	649	15,237	1,542,400	3,200	----------
Dry silver: Crude ore	40,514	13	22,156	778,100	11,400	600
Copper:						
Crude ore	666,708	32,322	1,089,569	60,297,500	7,600	36,700
Cleanings and smelter cleanings [1]	348	2	90	24,700	----------	----------
Precipitates	53,505	--------	--------	69,637,200	----------	----------
Lead: Crude ore	5,677	114	27,017	31,000	2,167,500	147,300
Lead-zinc: Crude ore	4	--------	9	----------	1,100	500
Total: 1956	856,917	33,446	1,154,554	132,342,500	2,190,900	185,100

[1] Combined to avoid disclosing individual output.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Material shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Copper	[1] 1,725,696	88,874	[1] 2,909,489	[1] 844,501,048	14,206	1,137,110
Copper-lead	1,432		40,777	254,596	1,231,378	63,286
Copper-lead-zinc	3,763	3	115,733	606,514	3,714,828	767,499
Copper-zinc	16		54	12,684	163	2,871
Iron (from lead-zinc ore)	14	1	25	50	128	355
Lead	24,799	19,467	800,611	535,797	16,228,081	4,498,647
Zinc	50,639	3,190	185,174	833,226	1,888,835	53,166,002
Total: 1956	1,806,359	111,535	4,051,863	846,743,915	23,077,619	59,635,770
1955	1,619,458	94,442	3,642,375	767,647,793	18,898,221	52,016,751
ORE TO STRAIGHT LEACHING PLANT						
Copper	3,480,652			66,624,771		
Total: 1956	3,480,652			66,624,771		
1955	3,491,853			67,714,874		
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold: Crude ore	1,452	346	476	32,915	180	16
Dry gold-silver: Crude ore	88,709	655	15,608	1,668,544	5,288	
Dry silver: Crude ore	40,514	13	22,156	799,221	12,090	798
Copper:						
Crude ore	666,708	32,323	1,089,662	64,874,339	12,680	271,506
Cleanings and smelter cleanings [2]	348	2	90	25,245		
Precipitates	53,505			74,482,859		
Lead: Crude ore	5,677	114	27,017	39,067	2,212,005	188,968
Lead-zinc: Crude ore	4		9	18	1,111	631
Total: 1956	856,917	33,453	1,155,018	141,922,208	2,243,354	461,919
1955	713,404	32,630	1,130,685	107,328,167	1,951,420	663,260

[1] Includes concentrate and contained metal from tungsten ore.
[2] Combined to avoid disclosing individual output.

Mining was begun at the San Manuel mine in January 1956, and the rate of production increased gradually through the first 9 months of operation. Mining problems encountered slowed the anticipated rate of increase in output. In October, trouble with the electrical equipment of 1 of the 2 main ore hoists forced a shutdown of that hoist early in November and delayed further production increase. It was anticipated that full production (900,000 tons of ore per month) would be reached by July 1957. The concentrating plant, operated throughout the year, proved its ability to handle full ore production from the mine. The smelter produced its first copper on January 8, 1956. Short runs on accumulated concentrate were made to test the capacity and recover at the smelter.

Production of low-cost precipitate copper at the Ray mine in 1956 (14,934 tons) doubled the 1955 output (7,546 tons), as a result of an expanded leaching program involving the caved areas of the old underground mine. A program begun in December 1955 for increasing the recovery of copper from the ore was completed and ready for

operation at the close of the year. The leaching precipitating, and flotation sections of the mill, were improved and the plants for producing, from pyrite, the iron residue and sulfuric acid needed in the process were completed. The iron residue is obtained by roasting and reducing pyrite recovered from the mill tailings. The sulfur dioxide gas generated in this process of roasting the pyrite is used for producing the sulfuric acid.

Progress was made on the $40 million program announced at the last annual meeting of stockholders of this company for increasing the productive capacity of the Ray Mines Division 20,000 tons of copper annually. Construction contracts were being let for relocating the various surface facilities to permit enlarging the pit and expanding the capacity of the mill. Construction of the new company smelter at Hayden, scheduled for completion in 1958, to process the copper concentrate and precipitate produced at this division, was underway at the close of the year. Smelting had previously been done by a custom smelter on a cost-plus basis.

The $6.5 million improvement project begun in 1955 by Inspiration Consolidated Copper Co. to rehabilitate and convert the Inspiration concentrator to the dual metallurgical process was nearly completed in 1956, and preparations were made to make the change early in January 1957. The dual process involves extraction by sulfuric-acid leaching of copper from the oxide fraction of the ore. The washed and drained tailing from this operation is then treated by fine grinding and flotation concentration to recover the copper occurring in sulfide form. This change will release a large portion of the capacity of the tankhouse (formerly used exclusively for deposition of the copper extracted from the sulfide-ore fraction by ferric sulfate leaching) for electrolytic refining of anode copper produced by smelting concentrate from the rehabilitated mill on a toll basis.

Pima Mining Co. continued to develop its property as an open pit throughout the year. The conversion from an underground mine to an open pit called for removal of overburden to a depth of 200 feet. Test runs were made at the new 3,000-ton-per-day flotation plant in December 1956. This property will become one of the major copper producers in the State when the anticipated capacity of the mine and mill is reached.

Development at the Christmas mine by the owner, Inspiration Consolidated Copper Co., continued throughout 1956. After the development shaft was deepened from the 900-foot to the 1,400-foot level, intermediate levels were established. Development openings were driven into the O'Carroll bed ore. Diamond drilling was continued, with emphasis on short underground holes.

A DMEA contract for a total of $88,780, with equal participation between Government and the Lewisohn Copper Corp., was executed in October 1956 for exploration for copper at the Peach mine in Pima County.

Gold.—A 14-percent increase in the gold output in Arizona in 1956 over 1955 reflected directly the increased production of copper. Eighty-two percent of the gold was recovered as a byproduct of the treatment of copper ore, 17 percent from lead-zinc ore, and the remaining 1 percent mostly from ores of gold and silver.

Six mining operations—Copper Queen and New Cornelia Branches of the Phelps Dodge Corp., Iron King, Magma, San Manuel, and

Morenci (in order of output)—furnished 96 percent of the total gold produced in Arizona in 1956. Production gains were reported in 1956 from each of these mines except the New Cornelia Branch. San Manuel was a new producer in 1956 and therefore an addition to Arizona's major gold producers. Substantial outputs of gold recovered from copper ore were reported from the Ray and Copper Cities mines.

Lead.—The 22-percent increase in Arizona's lead output in 1956, compared with 1955, resulted primarily from substantial gains in lead production from the Iron King and San Xavier mines. With an output of 5,774 tons of lead in 1956, the Iron King lead-zinc mine, operated by Shattuck Denn Mining Corp., continued to be the leading lead producer in the State. Early in the year additional flotation units were installed in the company 900-ton-per-day mill to improve recovery.

A gain in lead production was also reported by the second-ranking lead producer in Arizona—the Flux lead-zinc mine, operated by the American Smelting and Refining Co. The San Xavier mine, owned by Eagle-Picher Co. and operated by McFarland & Hullinger, reopened in February 1955, remained active throughout that year, and was in continuous operation in 1956. As in 1955, it ranked third in lead output in the State in 1956.

These mines—Iron King, Flux, and San Xavier—together with the Glove (operated by Sunrise Mining Co.) and the Head Center (operated by Athletic Mining Co.) produced 96 percent of the total lead output for Arizona in 1956.

Manganese Ore and Concentrate.—The output of manganese ore and concentrate in Arizona increased from 1,444 short tons (gross weight) in 1955 to 42,008 tons in 1956 and had a value of $3.5 million. All of the ore and concentrate produced in 1956 was shipped under the "carlot" program administered by the GSA. Under this program, the minimum acceptable manganese content of the ore or concentrate was 40 percent.

Manganese ore and concentrate production shipped under this program was supplied by 21 operations in 6 counties in Arizona in 1956. Maricopa County, with 9 establishments, was the largest source of production, followed by Mohave County with 6, Yuma County with 3, and Pima, Coconino, and Yavapai Counties with 1 each. The five major producers in the State were Big Horn Mining Co., Herald Mining Corp., Herbert K. Cameron, C. F. Heise, and Mohave Mining and Milling Co.

In addition to this ore produced and marketed under the "carlot" program, one shipment of manganese ore from James D. Akins Co. under the "low-grade" program went to the Butte (Mont.) Government (GSA) Purchase Depot from the Confusion No. 1 mine in Yuma County. Requirements governing the purchase of ore under this program were that it be of domestic origin, be amenable to beneficiation, and have a manganese content of 15 percent or more. Ore valued at $5.3 million was shipped from Arizona deposits to the Deming, N. Mex., and Wenden, Ariz., Government (GSA) Purchase Depots under this program in 1955 until the 6-million recoverable long-ton-unit quota for each depot was filled. This ore will be recorded as production in the year in which it is treated and a useful product shipped.

Mercury.—Mercury output in Arizona in 1956 was only a fraction of that in 1955. This drop resulted partly from the decline in the market price for mercury. Production in 1956 came from 2 operations in Gila County and 4 in Maricopa County. The major part of the total output was produced by Arizona Mining & Development Co., Inc., and Oneida Mining Co., with operations in Gila and Maricopa Counties, respectively.

Molybdenum.—Molybdenum production in Arizona in 1956—all recovered as a byproduct of copper ores—was 60 percent above that in 1955. The value of the output had an even greater increase (77 percent) owing to a rise in price of molybdenum in 1956. Output in 1955 came from three mines—Bagdad, Miami, and Morenci. Two mines were added to the Arizona molybdenum producers' list in 1956, when the Silver Bell unit installed a molybdenum section in its 7,500-ton flotation mill at Silver Bell and began producing molybdenum, and when the first production was reported from the San Manuel mine—a new copper producer in 1956. The molybdenum production from these two new sources, with increased output from both the Miami and the Morenci mines, explained the substantially increased output in the State in 1956. Morenci continued to be by far the leading molybdenum producer in Arizona.

Rare-Earth Metals.—For the first time in the history of Arizona production and sale of rare-earth metals was recorded; 150 pounds of euxenite was produced at Ed's Camp, Aquarius district, Mohave County, by Lowell L. Edgerton. This material was sold to the Federal Bureau of Mines for research at the Rare and Precious Metals Experiment Station, Reno, Nev.

Silver.—Like gold, the 12-percent increase in silver output in 1956 over 1955 directly reflected the gain in copper production in Arizona. Seventy-six percent of the silver output in 1956 was recovered from material classed as copper ore, 21 percent from lead-zinc ore, and 2 percent from copper-lead-zinc, copper-zinc, lead, and zinc ores. Over half of the remaining 1 percent of the total silver output in Arizona came from silver and gold ores. The Copper Queen Branch operation at the Copper Queen underground and the Lavender open-pit copper mine continued to be by far the largest silver producers in the State, followed (in order of output) by the Iron-King lead-zinc mine and the Morenci, New Cornelia, Magma, and Ray copper mines.

Tungsten.—Tungsten-concentrate (60-percent WO_3 equivalent) production in Arizona in 1956 virtually equaled the output in 1955 despite a 3-month interruption in the Government tungsten-purchase program. Quotas under this program were filled about June 1, 1956. In July Public Law 733 was enacted, extending the program under a limitation of the purchase of 5,000 short-ton units per month from any 1 mine district, with the reduced price of $55 per short-ton unit of WO_3, compared with $60 under the original program. Actual acceptance of concentrate under the new program did not begin until August 31.

Tungsten concentrate was produced in six counties—Cochise, Mohave, Pima, Pinal, Yavapai, and Yuma. The value of output from two of these counties—Mohave and Yavapai—together represented 73 percent of the total value of the tungsten produced in the State. The Dye & Bathrick operation at the Boriana mine in Mohave County and Hillside Mining & Milling Co. operations at the

Black Pearl and Tungstona mines in Yavapai County were by far the leading tungsten producers in the State. Other major tungsten producers were Hual Pai Co. in Mohave County, Tideland Oil Co. in Pima County, and the Don Leiberman Enterprises, Inc., in Pinal County.

Uranium.—Production of uranium ore from Arizona mines between July 1955 and June 1956 amounted to 212,000 tons, with an average grade of 0.25 percent contained U_3O_8. The State tonnage for the period represented 10 percent of the domestic total. Production information is based on data supplied to the Bureau of Mines by the AEC. Ore production, by counties, is shown in table 14.

Arizona-ore reserves, as of November 1, totaled 2.6 million tons, with an average grade of 0.30 percent contained U_3O_8.[3] The reserves given included measured, indicated, and inferred ore. All but a small percentage of the ore was in Apache and Coconino Counties.

TABLE 14.—Mine production of uranium ore July 1955–June 1956 [1]

County	July–December 1955			January–June 1956		
	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)
Apache	59	81,645	424,489	40	77,787	412,322
Cochise				1	(2)	(2)
Coconino	3	(2)	(2)	42	33,127	145,812
Gila	14	3,809	11,461	10	3,758	12,652
Graham	1	(2)	(2)			
Maricopa	3	(2)	(2)	1	(2)	(2)
Mohave	1	(2)	(2)			
Navajo	3	(2)	(2)	8	4,620	29,664
Pima	1	(2)	(2)	2	(2)	(2)
Santa Cruz	1	(2)	(2)			
Yavapai	2	(2)	(2)			
Undistributed		7,111	33,798		122	177
Total	88	92,565	469,748	104	119,414	600,627

[1] Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

In July a 250-ton-per-day uranium mill was placed in operation at Tuba City, Coconino County, by Rare Metals Corp. of America. The new mill (Arizona's first) treated uranium ores from the nearby Cameron area and alleviated the district's major problem of long haulage to other processing plants.

One buying station operated in conjunction with the mill at Tuba City, and a second operated at Cutter, near Globe, in Gila County.

Uranium ore from Arizona mines, particularly those in Apache County, also supplied a substantial portion of the material fed to the mills at Durango, Colo., and Shiprock, N. Mex.

Exploration and development-drilling activity in the State declined markedly during the year, dropping to one-fifth of the 1955 footage.

A DMEA contract, amounting to $26,788, for uranium exploration in Gila County was executed. Government participation was 75 percent.

According to the State mine inspector's report for 1956, approximately 400 men were mining uranium ore in Arizona; the employment figure given excludes men employed at the Tuba City mill.

[3] AEC, Statistics on Domestic Uranium Production and Ore Reserves: Press Release 178 (Grand Junction, Colo., office), Dec. 13, 1956.

Vanadium.—Vanadium recovered from uranium ores originating in Apache County were processed at the mill in Durango, Colo. Most of this ore was derived from the Monument No. 2 mine. Ores from other counties in Arizona or ores processed at Shiprock, N. Mex. and at Monticello, Utah, were not treated for vanadium recovery during 1956.

Zinc.—In 1956 zinc production continued the upward trend begun in 1955 following the low point reached in 1954. Output in 1956 was 13 percent above 1955, and value of zinc output showed a 26-percent increase because of the rise in price. Zinc production from the State's leading producer in 1956—Iron King mine operated by Shattuck Denn Mining Corp.—was increased 2,698 tons, or 24 percent above the 1955 output. Other major zinc producers that ranked second and third in output, respectively, were the Flux mine, operated by American Smelting and Refining Co., and the Johnson Camp Unit-Moore Shaft mine, operated by Coronado Copper & Zinc Co.

The number four zinc producer—San Xavier mine, owned by the Eagle-Picher Co. and operated by McFarland & Hullinger—had a substantial gain in zinc output in 1956 (2,786 tons) compared with 1955 (1,310 tons). Although its zinc output dropped considerably in 1956, the Athletic Mining Co. Head Center mine was the fifth ranking zinc producer in the State.

NONMETALS

Asbestos.—In the production of asbestos Arizona ranks second among the States and is exceeded only by Vermont. There were only three States that produced chrysotile in 1956—Vermont, Arizona, and California—and only North Carolina reported production of amphibole.

Total sales of asbestos in Arizona during 1956 dropped 24 percent below 1955, owing largely to a reduction in the output of short-fiber material. On the other hand, the overall shipments of the better grades gained. Grade 1 increased 38 percent over 1955; and, although Grade 2 declined moderately, Grade 3 increased 30 percent.

The overall decline in total output can be attributed largely to withdrawal of the Western Chemical Co. from asbestos production in Arizona. The company sold its holdings at the Chrysotile mines to American Fiber Corp. in May, and the output from the mill, which reprocessed tailings and low-grade rock for several years, was curtailed. On the other hand, the increases in sales of Grades 1 and 3 resulted from larger shipments, chiefly by Metate Asbestos Corp., American Fiber Corp., Jaquays Mining Corp., and Kyle Asbestos Mines of Arizona. In order of importance, the major producers were American Fiber Corp., Jaquays Mining Corp., Metate Asbestos Corp., and Western Chemical Co.

A local outlet for the mine and mill production of the region continued with operation of the Government Globe, Ariz., Purchasing Depot operated by GSA which bought Grades 1, 2, and 3 fiber. The results of an extensive field survey of all known occurrences of chrysotile asbestos deposits in Arizona were summarized and published during the year.[4]

Cement.—As a result of demand for cement by the Arizona construction industry, shipments of Types I and II portland cement advanced 31 percent over 1955. In the 2-year period 1955–56 the

[4] Stewart, L. A., Chrysotile-Asbestos Deposits of Arizona: Bureau of Mines Inf. Circs. 7706, 124 pp., and 7745, 41 pp.

Rillito plant of the Arizona Portland Cement Co. increased its shipments 52 percent. To supply raw materials for manufacturing cement the company quarried a significant tonnage of limestone and purchased gypsum, iron ore, and iron slag. Three kilns were in operation for 335 days, and all electrical energy was generated at the plant site. Thirty-five men were engaged in limestone quarrying and crushing, and 83 men were utilized in cement, auxiliary, and administrative operations at the plant.

Reportedly the Arizona Portland Cement Co. planned to shut down 1 of its 3 kilns because the State's cement shortage was near an end. The company had constructed a third kiln during the summer of 1955 to boost daily production to meet this demand. It was also reported that by year end the company was purchasing 1,000 to 1,500 tons of reverberatory slag per month from the Phelps Dodge copper smelter at Douglas. The slag was used as a source of iron for making cement clinker and replaced purchases from out-of-State sources. Construction of a 5,000-barrel-per-day cement plant reportedly was planned for the Clarkdale area by the Verde Valley Industries. The new plant was planned partly in anticipation that demand for cement would be increased by construction of the Glen Canyon Dam in northern Arizona.

Clays.—The total output of clays in Arizona during 1956 declined from 1955 owing mainly to decreased production of bentonite and miscellaneous clay. Although, in terms of tonnage, miscellaneous clay ranked first, production of bentonite at the Cheto open pit produced the greater proportion of the total value. The Alba Mining Corp. (subsidiary of Filtrol Corp.) and Silicates Corp. continued to be the only bentonite producers in the State; Arizona ranked fifth out of 14 States reporting bentonite production in the United States. Bentonite from Apache and Yavapai Counties was used in oil refining, filtering and decolorizing, and cosmetics. Miscellaneous clay was produced because of the need for clay for manufacturing building brick and other heavy clay products. Wallapai Brick & Clay Products, Inc., and Western Clay Products Co., Inc., in Maricopa County and Grabe Brick Co., Louis DeVry & Son, and Tucson Pressed Brick Co. in Pima County were the only producers of miscellaneous clay. A small quantity of fire clay was mined by the Gila Pottery Co., Gila County, for use in manufacturing art pottery and floor and wall tile.

Diatomite.—Diatomite deposits near Mammoth, Pinal County, operated by Superlite Builders Supply Co. in 1955, were not worked during 1956.

Feldspar.—The production of crude feldspar in 1956 by the International Minerals & Chemical Corp. near Kingman remained about the same as in 1955. Crude ore was ground at the company plant at Kingman and used in producing pottery and enamel. The ground product was shipped to California, Colorado, Louisiana, New York, Pennsylvania, and Washington and exported to Canada and Mexico.

Gem Stones.—The value of collected gem or ornamental stones in Arizona in 1956 rose to $104,000 and outranked, in terms of value, the output of beryl, coal, feldspar, mercury, and natural gas. Gem or ornamental stones were reported in 12 counties, with Gila County heading the list of important producing areas. Navajo County ranked second, followed by Yuma, Greenlee, and Yavapai Counties.

In terms of value, petrified wood was the most important item, followed by turquois and jasper. Chalcedony, chrysocolla, amethyst, serpentine, peridot, jasper, sagenite, fluorite, obsidian, rhyolite, and white jade also were reported.

Gypsum.—Owing largely to the January 1956 opening of a new gypsum-products plant by the Union Gypsum Co. of Phoenix, output of crude gypsum in Arizona jumped to 96,000 tons valued at $366,000—the highest in the history of the State. Crude ore continued to be mined by the Arizona Gypsum Corp. mainly as a cement retarder, and agricultural gypsum production was reported by Garcia & Peters Gypsum Co. All mines were open pits, and all were in Pinal County.

Lime.—Production of lime in Arizona in 1956 paced the overall industrial growth and development of natural resources. Total output of quick and hydrated lime rose to 127,000 tons, a 13-percent increase over 1955. The entire output came from four plants—Paul Lime Plant (Cochise County), Hoopes & Co. (Gila County), Phelps Dodge Corp. (Greenlee County), and United States Lime Products Corp. (Yavapai County). Quicklime production was the bulk of the output. The quicklime output of Phelps Dodge Corp. was used in treating base-metal ores. The remainder was sold by producers and also used in milling base-metal ores, steel blast and open-hearth furnaces, water purification, paints, manufacture of silica brick, insecticides, fungicides, and disinfectants, and treatment of sewage and other wastes. Seven rotary kilns and 2 continuous and 1 batch hydrator were fired by natural gas and fuel oil during 1956, and the annual lime-burning capacity of the industry was approximately 150,000 tons.

Mica.—What little remained of the mica industry in 1955 dissolved in 1956, when the mines and grinding plant of Buckeye Mica Co. ceased operation. The dry-grinding plant at Buckeye, Maricopa County, operated for many years on ore extracted from its own mines as well as scrap mica purchased from independent operators. Increasing production costs both at the mine and mill, and the cost of shipping ground mica to west coast markets caused the shutdown.

Perlite.—Production of crude perlite in Arizona in 1956 increased 51 percent over 1955, continuing the ascent begun in 1955. As in 1955, Perlite Industries of Arizona, Inc., was the mainstay of the industry, reporting a 47-percent increase in crude output. The bulk of the company mine production from Maricopa County was sold to the Sil-Flo Corp. of Fort Worth, Tex., but a company-owned expanding plant at Phoenix produced 1,000 tons of expanded perlite used in plaster aggregate and concrete roof decks. Increased crude production was also reported by Superior Industries, Inc., which operated the Mary T open pit near Superior, Pinal County. After crushing at the mine, crude perlite was shipped to Lake Zurich, Ill., where it was expanded on a toll basis by the Lake Zurich Concrete Products Co. The expanded material was then manufactured into a filter-aid product and distributed by Superior Industries, Inc., at Lake Zurich, Ill. Expanded perlite produced from ore extracted from the Kermit Lee mine operated by Lee's Perlite Industries, Inc., of Casa Grande was sold locally for use as plaster and concrete aggregate and for insulation purposes.

Pumice.—Superlite Builders Supply Co. continued to operate the Cruise cinder pit near Ashfork, Yavapai County, and was the principal

producer of volcanic scoria in 1956. The total output reached 115,000 tons in 1956 and represented a 25-percent increase over 1955. Crude production also was reported by Christensen Construction Co. in Maricopa County and Gila Valley Block Co. in Graham County. All scoria mined in 1956 was utilized in manufacturing concrete block or as concrete aggregate.

Sand and Gravel.—In terms of value sand and gravel produced in Arizona ranked fourth among all minerals produced compared with second place in 1955 due to an increase in the value of zinc and cement in 1956. However, the output of sand and gravel in 1956 rose to 7.9 million tons valued at $6.2 million, a 2-percent gain. Commercial production was recorded at 3.6 million tons, whereas Government-and-contractor output was 4.3 million tons. Building construction—industrial and residential—as well as highway construction, continued at a high level and was responsible for the sustained productive activity in this industry. Maricopa County continued to be the leading producing region accounting for 35 percent of the total output. Pima was second, followed by Gila, Pinal, and Coconino, The five leading commercial producers were Glendale & Superior Sand & Gravel Divisions of Fisher Contracting Co., Union Rock & Materials Co., Acme Materials Co., Arizona Sand & Rock Co., and San Xavier Rock & Sand Co. An average of 413 men was employed by commercial producers, and the average length of employment was 225 days.

Stone.—Stone production in Arizona increased from 1,601,000 tons in 1955 to 1,623,000 tons in 1956 and consisted of 1,067,000 tons of crushed limestone, 346,000 tons of crushed sandstone, 95,000 tons of crushed miscellaneous stone, 91,000 tons of crushed granite, 21,500 tons of dimension sandstone, 2,000 tons of crushed marble, and 600 tons of crushed basalt.

The end uses which consumed 98 percent of the total production were cement, flux, lime, concrete aggregate, and riprap. Additional end uses reported were refractories, enamel, pottery, porcelain and tile, terrazzo, roof granules, and plaster. Dimension sandstone was used for rough construction and architectural building stone, dressed stone, flagging, and rubble. The major producing areas were Pima, Cochise, Greenlee, Yavapai, and Maricopa Counties.

Vermiculite.—The continued operation of the Glendale plant of Ari-Zonolite Co. resulted in the production of a significant quantity of exfoliated vermiculite during 1956. The crude ore was from out-of-State sources.

MINERAL FUELS

Two mines, 1 each in Coconino and Navajo Counties, reported coal production totaling 10,060 tons in 1956.

Five wells were drilled for oil and gas in the State during 1956—3 in Apache County and 1 each in Mohave and Navajo Counties. Two of the wells in Apache County were successful and resulted in discovery of the Bita Peak and North Toh-Atin gasfields.

REVIEW BY COUNTIES

Apache.—Apache County furnished almost all of Arizona's bentonite production in 1956. The major producer continued to be the Alba Mining Corp. (Filtrol Corp.), which operated the Cheto mine near

Sanders. Crushed granite produced by Wylie Bros. as contractor for the Federal Bureau of Indian Affairs was the second most important mineral commodity, followed by agate collected by the Peridot Gem Shop from the St. Johns region. A small quantity of copper was recovered from ore shipped from the Navajo Reservation claim by Rodgers Mining Co. to the International Smelting and Refining Co. smelter at Miami.

Three wildcat wells were completed in Apache County in 1956 and resulted in discovery of two gasfields. El Paso Natural Gas Co. and Stanolind Oil & Gas Co. were credited with discovery of the Bita Peak gasfield, which yielded a daily flow of 20 million cubic feet of gas on initial testing. Production was from the Paradox formation.

Gas flow from two zones of the Paradox formation was also reported by Franco Western Oil Co. at the North Toh-Atin field discovery.

Farther westward a dry hole was completed by Hancock Oil Co.

During the first 6 months of the year, shipments of uranium ore were made from 40 properties in Apache County. The more important

TABLE 15.—Value of mineral production in Arizona, 1955–56, by counties

County	1955 [1]	1956	Minerals produced in 1956 in order of value
Apache	$731,066	$594,583	Clays, stone, gem stones, copper.
Cochise	49,677,664	68,344,273	Copper, gold, silver, zinc, stone, lime, lead, tungsten concentrate, gem stones.
Coconino	64,045	338,869	Copper, stone, manganese ore and concentrate, sand and gravel, coal, silver.
Gila	66,684,347	76,692,000	Copper, asbestos, molybdenum, lime, sand and gravel, silver, gold, stone, gem stones, mercury clays.
Graham	674,745	531,609	Zinc, lead, copper, silver, pumice and pumicite, gem stones, gold.
Greenlee	95,328,130	111,374,672	Copper, molybdenum, silver, lime, gold, stone, gem stones, sand and gravel.
Maricopa	3,315,210	3,959,377	Sand and gravel, manganese ore and concentrate, clays, stone, pumice and pumicite, mercury, copper, gem stones, gold, silver.
Mohave	427,067	1,873,189	Manganese ore and concentrate, tungsten concentrate, stone, copper, feldspar, zinc, lead, gold, silver, rare-earth minerals, gem stones.
Navajo	104,443	125,819	Sand and gravel, coal, gem stones.
Pima	82,748,688	91,431,712	Copper, cement, gold, sand and gravel, zinc, silver, stone, lead, manganese ore and concentrate, molybdenum, clays, tungsten concentrate, gem stones.
Pinal	56,209,900	101,723,680	Copper, gold, silver, molybdenum, gypsum, perlite, sand and gravel, tungsten concentrate, lead, stone, gem stones.
Santa Cruz	2,324,005	2,927,728	Zinc, lead, copper, silver, gold.
Yavapai	16,510,609	16,063,526	Copper, zinc, lead, gold, silver, lime, stone, pumice and pumicite, manganese ore and concentrate, tungsten concentrate, molybdenum, sand and gravel, beryllium concentrate, gem stones, clays.
Yuma	99,088	[1] 331,363	Manganese ore and concentrate, copper, tungsten concentrate, sand and gravel, lead, gold, gem stones, silver, zinc.
Undistributed	4,332,066	[2] 10,544,641	
Total [3]	378,277,000	485,751,000	

[1] Excludes value of manganese ore sold and blended at Government low-grade stockpiles for future beneficiation. (All counties except Navajo had shipments to General Services Administration Purchase Depots in 1955.)

[2] Includes sand and gravel, vanadium, stone, gem stones, natural gas, and uranium.

[3] Total has been adjusted to eliminate duplication in the value of raw materials used in the manufacture of cement and lime.

of these properties, in terms of production, were the following:

Property:	*Operator*	*Area*
AT-49-1-305	Benally, Pettigrew, Simpson, and VCA.	Southwestern Carrizo Mountain.
Cisco No. 1	Walter Duncan	Southern Lukachukai Mountain.
Frank No. 1	Frank Nacheenbetah	Northern Lukachukai Mountain.
Mesa No. 3	Kerr-McGee Oil Industries, Inc.	Do.
Monument No. 2.	Vanadium Corp. of America.	Comb Ridge.
Tract No. 1	Cato Sells	Do.

These 6 properties produced 91 percent of the county total for the 6-month period. Ore from Apache County was shipped primarily to Durango, Colo., and Shiprock, N. Mex. Ore shipped to Durango was also treated to recover vanadium.

Approximately 230 men were actively engaged in mining uranium ore in Apache County during 1956, according to the State mine inspector's annual report.

Cochise.—Cochise was the largest gold- and silver-producing county in Arizona; it was also fourth in zinc and fifth in lead and copper production. The value of the copper output was 95 percent of the total value of the mineral production in the county. Production of copper advanced 23 percent, compared with 1955. This increase caused a proportional gain in gold and silver production because these metals were recovered primarily as byproducts of copper mining. Lead production dropped slightly, but the decline in zinc output was significant (21 percent).

The Copper Queen Branch of the Phelps Dodge Corp. continued to rank first, in terms of total value of mineral output, in the county and held first place in gold and silver production and second in copper output in the State. Its copper production was up 24 percent above 1955. Part of this increase came from a gain in output from the Copper Queen underground mine, but most of it resulted from an advance from the Lavender open-pit mine. Production data for each mine are shown in table 4. According to the company annual report, the concentrator at the Copper Queen Branch treated 145,163 tons of ore from the underground mine and 5,068,987 tons of ore from the open-pit mine. This ore yielded 359,699 tons of concentrate, which was shipped to the corporation Douglas reduction works for smelting. The precipitation plant, built to treat the liquors from the leach dumps, was put in operation during the early part of the year, and 4,810 tons of precipitates was shipped for smelting.

The Johnson Camp mine produced the second largest quantity of copper in the county and was the 14th ranking copper and 3d ranking zinc producer in the State in 1956. The Cyprus Mines Corp., in its annual report to stockholders for 1956, reported that the Coronado Copper & Zinc Co., which it solely owned, mined and milled 75,398 tons of ore at the Johnson Camp mine. This ore yielded 5,268 tons of copper concentrate and 5,629 tons of zinc concentrate. In addition, 1,281 tons of oxidized copper ore averaging 7.9 percent copper was mined and shipped direct to smelter. Recalculations of the ore reserve at year end indicated an estimated 135,000 tons of ore averaging 2.5 percent copper and 6.4 percent zinc.

In addition to the larger quantities of gold, silver, copper, lead, and zinc recovered from the two major mining operations—Copper Queen Branch and Johnson Camp—smaller quantities of these metals came

from nine other active mines in the county in 1956. Of these, the Shannon mine, operated by the Shannon Mining Co., produced the largest quantity. A total of 13,626 tons of ore containing 874 ounces of gold, 21,478 ounces of silver, and 648 tons of copper was mined and shipped directly to the smelter. The Costello, Great Western, and Nevada-Mascot mines were other outstanding producers.

Nonmetal production in Cochise County reached a value of $1.4 million in 1956, compared with $1.1 million in 1955. This continued rise in value of output can be attributed mainly to increased production of lime and stone. Paul Lime Plant at Douglas reported a 10-percent rise in the output of hydrated lime and quicklime. The bulk of the plant production was hydrated lime and quicklime for chemical and industrial purposes for use by consumers in Arizona, California, New Mexico, and Texas and for export to Mexico. A variety of stones was quarried in the county in 1956. Crushed sandstone produced from the Ricketts claims by Phelps Dodge Corp. and used as flux at its copper smelter was the most important type. Output of sandstone was also reported by Paul Lime Plant for use as a refractory. This plant crushed limestone and used it in manufacturing lime, as a flux, and as concrete aggregate and roadstone. Crushed marble used as terrazzo and roof granules and in plaster was produced by Ligier Arizona Marble Quarries, Inc., and $50 worth of gem or ornamental stone was reported by the Desert Rose Gift Shop at Eckert.

R. L. Brown and Standard Tungsten Corp. were the two principal tungsten producers in the county in 1956. R. L. Brown sold his product to the International Metals Corp., while Standard Tungsten Corp. sold directly to GSA.

A shipment of uranium ore was made from the Windmill No. 1 claim, operated by Smith & Royston, during the first half of the year.

Coconino.—The recorded production of gold and copper, whose combined value was $154,000 or 45 percent of the total value of mineral production in the county in 1956, came from 6 active mines. The largest producer—Petoskey group operated by Jacob Lake Mining Co. from May 1 to October 1—shipped to the smelter 1,855 tons of copper ore that contained 204 ounces of silver and 90 tons of copper.

Nonmetals (sand and gravel and stone) composed only 32 percent of the total value of mineral production in 1956, and dimension sandstone was the only stone recorded as production. Andy Anderson, Joe Ashby, Howard Gray, L. C. Henriken, and G. A. Kopenhefer were the quarry operators, and output consisted entirely of flagging and rubble. Sand and gravel production in 1956 resulted from contract-construction activities of the Federal Bureau of Reclamation, which reported production of 50,000 tons of paving gravel by Ford-Fielding and Union Construction Co.

A substantial quantity of manganese concentrate with a manganese content of more than 40 percent was shipped from the county to the GSA depot under the Government "carlot" program in 1956.

The Cow Springs No. 2 mine, operated by the Lawrence Isaac Coal Co., reported coal production in 1956.

Uranium mining in the Cameron area took a sharp upswing in 1956, with installation of a buying station at Tuba City in January and initial operation of the Rare Metals Corp. of America mill, also at Tuba City, in July. Although exploration activity was intense during the previous year, production had remained relatively small, as

operators preferred to delay production until opening of the local buying station rather than face high freight charges inherent in shipping to mills in New Mexico.

Major operations for the first 6 months of the year, in terms of production, were as follows:

Property:	*Operator*
Charles Huskon No. 4	Utco Uranium Corp.
Huskon No. 1	Arrowhead Uranium Co.
Huskon No. 2	Do.
Huskon No. 3	Do.
Jack Daniels No. 1	Marcy Exploration & Mining Co.
Murphy No. 13	Glasscock, Howell & Riley.
Paul Huskon No. 3	Utco Uranium Corp.
Ramco No. 20	Rare Metals Corp. of America.
Yazzie No. 101	Chessher & Co.

These nine properties, all in the Cameron area, produced 90 percent of the county total for the half-year period. In all, 42 properties in the county reported shipments during the period.

Men engaged in uranium mining in Coconino County during 1956 numbered 130, and over 50 men were employed at the Tuba City mill in the latter portion of the year.

A description of the 250-ton-per-day mill at Tuba City was published in September.[5]

Gila.—The value of minerals produced in Gila County in 1956 increased 15 percent above 1955. Most of this gain resulted from a 15-percent advance in the value of copper production, because copper represented 97 percent of the total value of the mineral output in the county. Four of the 1956 leading copper-producing mines in Arizona, Inspiration (6th), Copper Cities (7th), Miami (10th), and Castle Dome dump (13th) were in Gila County. In addition to copper, other metals produced in the county included gold, silver, and molybdenum, most of which were recovered as byproducts of copper mining. A small quantity of mercury also was produced.

The Inspiration mine, operated by the Inspiration Consolidated Copper Co., continued to be the major copper producer in the county. Mine data are shown in table 4. As in 1955, all ore came from the Live Oak and Thorton pits. Underground activity was limited to ore transportation and collection and pumping leaching-in-place solutions. The ore mined in 1956 contained an average of 0.976 percent copper, of which 0.496 percent was oxide copper and 0.480 percent sulfide copper, according to the company annual report. In 1956, 3.09 tons of overburden was stripped for each ton of ore mined. The most notable feature of the year at this operation was the rehabilitation and reequipment of the concentrator, in preparation for conversion to the dual metallurgical process.

The Copper Cities mine, operated by the Copper Cities Division of Miami Copper Co., was the second ranking copper producer in Gila County in 1956. According to the company report, 27,632 tons of copper was produced from open-pit mining of 4,167,147 tons of ore with a copper content of 0.795 percent. In addition, 194 tons of copper was recovered from precipitate produced at the Burch water-treatment plant, where certain company industrial waters were treated before being used. Precious metal credits from the ore

[5] Argall, George O., Jr., How Rare Metals' New Mill Recovers U_3O_8 From Arizona's Painted Desert: Mining World, vol. 18, No. 10, September 1956, pp. 68-73.

amounted to $39,379. The waste-to-ore ratio was 0.93 to 1.00 in 1956. Ore reserve was increased to 36.6 million tons, as of January 1, 1957, according to the company, by the addition of 9.5 million tons proved by drilling during the year. This addition slightly lowered the average grade of the reserve.

The Miami mine of the Miami Copper Division of Miami Copper Co. was again the third ranking copper producer in Gila County. Mine data are shown in table 4. Transition of operations from the old section of the mine to the low-grade ore body was nearly completed during the year; all but a small fraction of the ore mined in 1956 came from the low-grade ore body. Copper recovered from acid leaching of previously mined areas of the Miami mine composed 17 percent of the division output. The production of low-cost copper by this method had been carried on for many years and was to be continued long after underground mining is ended. Enlargement and modernization of the precipitation plant to be used in this connection began in 1956, and one section of the new plant was placed in service in March 1957. The company stated that the ore reserve at the close of the year was estimated to be 12.8 million tons. Molybdenum concentrate, recovered by re-treating the copper sulfide concentrate, was marketed by this division. It ranked second in the State as a molybdenum producer.

Activities of the Castle Dome Division of Miami Copper Co. (the fourth ranking copper producer in the county in 1956) were confined to water leaching of the mine dumps left from open-pit operations, which ceased in December 1953.

In addition to these 4 mines, 11 smaller mines reported active in the county produced gold, silver, and copper. Many of these yielded less than 100 tons of ore, and most were operated as part or spare-time jobs or as assessment work only on the claims. Larger producers were Chillito and Copper Hill mines and Interloper and Old Dominion dumps.

Mercury was produced by two operators in Gila County in 1956, Arizona Mining & Development Co., Inc., and Eureka Mining Co. All mercury recovered was sold to Chemical Manufacturing Co., Inc.

Nonmetal mineral commodities produced in 1956 were asbestos, lime, sand and gravel, stone, gem stones, and clays and accounted for 3 percent of the total value of mineral output. Gila County continued to be the only asbestos-producing area in the State; output came from 14 mines and was processed in 4 mills in the vicinity of Globe. Although shipments consisted largely of shorts (Grade 4 and smaller) in 1956, significant gains in the sale of Grades 1 and 3 fiber were noted. The purchase of Grades 1, 2, and 3 by the GSA depot at Globe continued and was the only local outlet for good-quality material. Total shipments for the year were 24 percent below 1955, but the value rose 29 percent. This apparent independent movement of tonnage and value was due to the decline in the quantity of lower priced short fiber produced. The Western Chemical Co., operator of the Chrysotile mines and the major producer of shorts, discontinued mining activity during the year.

The Globe plant of Hoopes & Co. continued to be the only source of lime in the county during 1956. Although the total output in 1956 was slightly below that in 1955, the value of quicklime sold was higher because of increased average price. All production from the one

gas-fired kiln was sold for use in the concentration of base-metal ores. Of the 171,000 tons of sand and gravel produced in 1956, 132,000 tons was paving sand and gravel produced by H. J. Hagen Construction Co., John Mercer, and construction and maintenance crews of the county highway department. The remainder was structural sand and gravel, railroad ballast (sand), oil-mix sand, and miscellaneous gravel. The remainder of the county nonmetal output consisted of crushed limestone used in the manufacture of lime and dimension sandstone used as building stone, flagging, and rubble. Gila County continued to be the major producer of gem and ornamental stone in Arizona during 1956. Peridot, agate, chrysocolla, turquois, serpentine, amethyst, and apache tears were collected throughout the county but principally in the Globe-Miami area. Thirteen tons of fire clay was quarried and used in manufacturing pottery and tile by the Gila Pottery Co. of Globe.

During the first 6 months of the year, shipments of uranium ore were made to the Globe buying station from 10 properties in Gila County. More productive of the properties were the Hope No. 3 (Arizona Continental Uranium, Inc.), Lost Dog (Bluebonnet Uranium Corp.), and Lucky Stop No. 2 (Lucky Stop Mining Co.). These three properties produced two-thirds of the ore credited to Gila County in the half year.

Graham.—Lead-zinc ore from the Head Center mine in the Aravaipa district, operated by the Athletic Mining Co., continued to be the main source of the value of the mineral production in Graham County in 1956. The company reported that 18,449 tons of ore, containing 1,172,296 pounds of lead and 3,550,770 pounds of zinc, was mined. The ore was treated in the company 100-ton-per-day selective flotation mill and yielded 890 tons of copper-lead concentrate and 2,464 tons of zinc concentrate, which together contained 478 tons of lead, 1,385 tons of zinc, and some silver. Development at the mine in 1956 included 35 feet of shaft, 400 feet of drift, and 350 feet of diamond drilling. Small quantities of gold, silver, and copper were produced by five other active mines in the county in 1956.

Production of volcanic scoria in Graham County during 1956 was only slightly below the 3,400 tons reported in 1955. The Gila Valley Block Co. was the only mine operator, and all output was used by this company in producing concrete block. Three hundred pounds of chalcedony was collected by the Desert Rose Gift Shop and Peter's Rock Shop and was valued at $150.

Greenlee.—The value of the copper output in Greenlee County increased from $93 million in 1955 to $108 million in 1956. It accounted for 97 percent of the total value of mineral production in the county in 1956. Substantial quantities of gold, silver, and molybdenum, recovered entirely as byproducts of copper mining, with a combined value of $2.5 million, were produced.

The Morenci mine of the Morenci Branch of the Phelps Dodge Corp. supplied most of the copper, gold, silver, and all of the molybdenum output in the county and was first in copper and molybdenum, sixth in gold, and third in silver production in the State in 1956. Mine data are shown in table 4. The company stated, in its annual report to stockholders, that 16,735,218 tons of ore (an average of 52,135 tons per working day) was treated in its 45,000-ton-per-day concentrator in 1956. The smelter treated 490,501 tons of concentrates. A total

of 1,200 tons of molybdenite concentrate was recovered in the molybdenum plant as a byproduct of the copper concentrate.

In terms of value, lime was the most important nonmetal produced in Greenlee County during 1956, and the county continued to rank second in the State as a lime producer. Phelps Dodge Corp. operated a rotary kiln and a continuous hydrator during the year, and all output of quicklime was converted to milk of lime and used in concentrating copper ores. In addition to supplying limestone for manufacturing lime, this company also quarried a significant quantity of crushed limestone as smelter flux and quarried 2,000 tons of dimension sandstone for rubble.

The value of gem and ornamental stones collected in 1956 rose to $5,000 compared with $2,500 in 1955 and consisted of agate, chalcedony, geodes, and jasper. Sand and gravel output in 1956 resulted from quarrying operations of the S & E Truck Co., which reported the production of structural gravel.

Maricopa.—The value of output of nonmetals in Maricopa County in 1956 was $2.4 million (60 percent of the total value of mineral production in the county), compared with $3.2 million (96 percent of the total) in 1955. Output in 1956 resulted from shipments and sales of sand and gravel, clays, stone, pumice and pumicite, and gem stones.

Sand and gravel production amounted to 2.8 million tons, of which 2.7 million tons was commercial production and 130,000 tons Government-and-contractor output. In the commercial group Superior & Glendale Divisions of Fisher Contracting Co. and Union Rock & Materials Co. were the major producers. All Government-and-contractor production resulted from quarrying and preparation activities of the county highway department. Total output of miscellaneous clay declined from 78,000 tons in 1955 to 63,000 tons in 1956 as a result of a cutback in quarrying operations of Wallapai Brick & Clay Products, Inc., and Western Clay Products Co., Inc., the only mine operators in the county.

The shift in the location of highway construction resulted in a reduction in the output of stone in Maricopa County during the year. Crushed granite was quarried by Phil Allen Sand & Gravel Co. and South Mountain Granite & Equipment Co. and a small quantity of crushed basalt was quarried by the Arizona Sand & Rock Co.

The operation of the Pre Cast Claims by the Christensen Construction Co. represented the only volvanic-scoria-mining activity in the county during 1956. Output reached 9,200 tons and was used as concrete aggregate.

The collection of gem and ornamental stones in the Ellsworth and Superior districts and Saddle and Superstition Mountains areas was reported by a number of individuals and rock shops. In terms of quantity, agate comprised the bulk of the material collected but dendrite, chalcedony, sagenite, fluorite, and apache tears were also reported. An exfoliated-vermiculite plant continued in operation at Glendale, producing Zonolite for use as an insulating medium.

Manganese ore and concentrate shipped by nine individuals and companies from deposits in Maricopa County to the GSA under the Government "carlot" program was valued at $1.5 million. The four leading producers, which supplied most of the total output, were Big Horn Mining Co., Herald Mining Corp., Joe Gianero, and H. F. Lynn.

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A total of 308 tons of ore containing small quantities of gold, silver, and copper was shipped directly to smelters from 10 active mines in the county in 1956; each mine produced less than 100 tons of ore. Two fine ounces of gold was recovered by Carey Phillips by the dry-washing method of placer mining at the Old San Domingo mine.

International Ore Corp., Jesse H. Lochausen, Oneida Mining Co., and C. R. Robbins recovered small quantities of mercury from mines in the county and sold it to the Chemical Manufacturing Co., Inc., during 1956.

Mohave.—The value of manganese ore and concentrate output ($1.2 million) made up 66 percent of the total value of mineral production in the county in 1956. Other metals—gold, silver, copper, lead, zinc, tungsten, and rare-earth minerals—together supplied 20 percent of the total value. The remainder (14 percent) came from the nonmetal group—stone, feldspar and gem stones.

Manganese ore and concentrate was shipped from six operations in Mohave County in 1956 under the Government "carlot" program. The combined ore—15,291 short tons (gross weight)—contained an average of 41.4 percent manganese. The two major producers were C. H. Heise, who operated the Priceless mine, and Herbert K. Cameron, who operated the Profit mine.

Of the eight tungsten-producing mines in Mohave County in 1956, the principal one was the Boriana, operated by Dye & Bathrick. Only 1 other mine—the Old Boriana operated by Hual Pai Co.—had an output of WO_3 exceeding 100 units. The Wothree mine, one of the larger producers in1955, was active in 1956 on a smaller scale.

Gold, silver, copper, lead, and zinc with a combined value of $135,000 were produced by 11 active mines in the county in 1956. The Downie Lease and Emerald Isle mines, both operated by C. G. Patterson, and the Antler mine, operated by Yucca Mining & Milling Co., were the major producers and the only ones with an output of ore over 500 tons. Tom Godwin sold six fine ounces of gold recovered by placer mining in the county in 1956.

Crushed sandstone (silica quartz) produced by International Minerals & Chemical Corp. near Kingman represented total stone production. The same company accounted for all crude feldspar mined in 1956 and the ground output from the company Kingman mill was used in the manufacture of pottery and enamel. Shipments to California, Colorado, Louisiana, New York, Pennsylvania, and Washington, as well as exports to Canada and Mexico, were recorded. For the first time in the recorded history of the county rare-earth minerals were mined and sold. Lowell L. Edgerton reported the recovery of 150 pounds of euxenite from Ed's Camp, Aquarius district, which was shipped to the Federal Bureau of Mines Rare and Precious Metals Experiment Station at Reno, Nev., for use in research. Fifty pounds of chalk turquois was collected by Volney Striegler from outcrops northeast of Chloride.

Falcon-Seaboard Drilling Co. completed a well in the Antelope Springs area in 1956. It was a dry hole; however, traces of oil were reported from the Mississippian strata.

Navajo.—In terms of value, Navajo County was the second-ranking county in the collection of ornamental stone. With the location of the Petrified Forest National Monument within its boundaries, the county was a mecca for tourists and the collection of petrified wood

outside of the forest reached 176 tons in 1956. The major collector and dealer was Petrified Wood Products, west of the Petrified Forest near Holbrook. Sand and gravel was the only other nonmetal reported during the year, and output consisted of 25,000 tons of structural, paving, and fill sand and structural, paving, and other gravel produced by Ray Despain and Winslow Sand & Gravel Co.

The Keans Canyon No. 4 mine, operated by the Hopi Indian Agency, reported coal production in 1956.

One dry hole was drilled by Eisele Cronin. No further information was available, other than that the drilling was suspended at year end.

Uranium-ore shipments were reported from eight properties during the first half of the year. Most of the ore was produced from the Moonlight mine near Oljato Creek and the Monument No. 1 mine in the Agathla Peak area.

Pima.—The value of mineral production in Pima County in 1956 increased 10 percent ($8.7 million) above 1955. Most of this advance resulted from an 8-percent increase ($5.7 million) in the value of copper output. Copper composed 85 percent ($77.8 million) of the total value of mineral production ($91.4 million) in the county in 1956. Three mines—New Cornelia (third ranking copper producer in the State), Silver Bell (ninth ranking), and Mineral Hill-Daisy-Copper Glance-Bullion No. 2 (twelfth ranking) together supplied 99 percent of the total copper output in the county and 18 percent in the State.

Data on production from the New Cornelia open-pit mine at Ajo in 1955 and 1956 are given under copper in table 9. Additional data on the New Cornelia Branch were presented in the Phelps Dodge Corp. annual report as follows: The ratio of waste to ore was 1.43 : 1.0, the same as in 1955. The concentrator treated 10,092,469 tons of ore during the year—an average of 31,441 tons per working day. The smelter treated 216,402 tons of concentrate from the concentrator during the year.

The Silver Bell Unit (Oxide and El Tiro mines), second largest copper producer in the county, operated by the American Smelting and Refining Co., was active throughout the entire year. A molybdenite section was installed in the 7,500-ton-per-day flotation mill, and a substantial quantity of molybdenite concentrate was recovered and sold to various buyers, mainly for export. Exploration work during the year consisted of 10,536 feet of churn drilling.

The Banner Mining Co. operated the third largest copper producing group of mines in the county, Mineral Hill-Daisy-Copper Glance-Bullion No. 2, throughout the year. An addition was made to the mill to raise the capacity from 500 to 900 tons per day. An extensive exploration and development program, consisting of drifting and raising, and longhole, churn, and rotary drilling, was carried out during the year.

Most of the gold and more than half of the silver output in the county were recovered as byproducts of copper ore from the New Cornelia open-pit mine. The bulk of the lead and zinc output came from San Xavier mine, owned by the Eagle-Picher Co. and leased and operated by McFarland & Hullinger. It was the third-ranking lead- and fourth-ranking zinc-producing mine in the State in 1956. This mine was reopened in February 1955, following a 2-year period of inactivity. In 1956, 32,054 tons of lead-zinc ore was mined and treated in the company 500-ton-per-day flotation mill. The ore yielded 3,515 tons,

of copper-lead-zinc concentrate and 5,373 tons of zinc concentrate, which together contained 112,818 ounces of silver, 304 tons of copper, 1,923 tons of lead, and 3,293 tons of zinc.

In addition to the 3 copper mines (New Cornelia, Silver Bell, and Mineral Hill-Daisy-Copper Glance-Bullion No. 2), and the 1 lead-zinc mine (San Xavier) described, 28 lode mines active in the county produced smaller quantities of gold, silver, copper, lead, and zinc. Of this group, the 6 mines that produced over 1,000 tons of ore follow: Papago Chief, Allison, Narragansett, King-Exile, Strong & Harris, and Atlas.

Cement, clays, gem stones, sand and gravel, and stone were the nonmetals produced in Pima County in 1956 and were valued at $9.7 million—11 percent of the total value of all mineral production in the county. As in past years, cement composed the bulk of the value, and all output came from the Rillito plant of Arizona Portland Cement Co. The continued construction boom in this heavily populated county resulted in a continuing demand for sand and gravel and stone. As the second ranking producer of sand and gravel in the State, Pima County operators produced 944,500 tons of sand and gravel valued at $1,030,000. Of this amount, 782,500 tons was commercial production and 162,000 tons Government-and-contractor output. The principal commercial producers were San Xavier Rock & Sand Co., Tucson Rock & Sand Co., L. M. White Construction Co., and Wilmot Sand & Gravel, Inc. Government-and-contractor output was reported by the county highway department and by Flickinger Bros. Construction Co. as contractor for this highway department.

Despite the demand for building material by the construction industry, the output of miscellaneous clay used in manufacturing brick and other structural clay products declined slightly in 1956. The Grabe Brick Co., Louis DeVry & Son, and Tucson Pressed Brick Co., in addition to working open-pit clay mines, operated brick plants at Tucson to supply the needs of the community and surrounding region. Chalcedony was the only ornamental stone reported in 1956, and Allen's Minerals collected 300 pounds from the Tucson Mountains.

Gertrude M. Garen shipped a substantial quantity of manganese concentrate from the Stella Marris No. 1 in Pima County under the Government "carlot" program in 1956.

A total of 1,126 units of WO_3 valued at $62,000 was produced from 5 mines in the county; this was a 16-percent increase over 1955. The major producer in 1956 was the Tideland Oil Co. from the Big Banana mine. William Coplen, who operated the Jezebel No. 1 mine, was the next highest producer. The remaining three operators were Wayne Cable, Cordy C. Calvin, and I. M. Whitney.

Pinal.—Pinal County supplied 23 percent of the State copper output. Copper accounted for 97 percent ($99 million) of the total value of the mineral production of the county ($101.7 million). Most of this copper came from three mines—Arizona's fourth, fifth, and eighth ranking copper producers, Ray, San Manuel, and Magma, respectively. The remaining 3 percent of the total value of mineral production in the county came from the output of gold and silver (most of which was recovered as byproducts of copper ore), molybdenum (recovered entirely as a byproduct of copper ore), lead from 3 mines, tungsten from 1 operation, and the nonmetals gypsum, perlite, sand and gravel, stone, and gem stones.

The county's largest and the State's fourth ranking copper producer—Ray Mines Division of Kennecott Copper Corp.—has been described in detail in the copper section of this report. Table 4 shows the ore mined and copper produced at the Ray mine in 1956 compared with the same data for 1955. This also holds true for the county's second and third ranking copper producers—San Manuel and Magma, respectively. It should be noted that San Manuel was a new mine and new copper producer in 1956. Mining was begun in January 1956 but the year's ore production was below that anticipated because certain mining problems slowed output and trouble developed in the electrical equipment on 1 of the 2 main hoists that caused a shutdown of that hoist for repairs.

In addition to the 3 mines described (Ray, San Manuel, and Magma), 24 other mines active in the county produced smaller quantities of at least 1 of the following minerals—gold, silver, copper, and lead. With only a few exceptions, less than 100 tons of ore was produced from each of these mines. Mines with over 500 tons of ore output included the Prosperity, Copper Butte, and Monitor.

The role played by the mining industry in the production of nonmetals in Arizona was minor during 1956 in comparison to the output of metals. Pinal County was the only source of gypsum and perlite in the State, and sales in 1956 were considerably above those in 1955. The gain in gypsum production was brought about by the continued mining activities of Arizona Gypsum Corp. and the entrance of Union Gypsum Co. into this field. The latter company began operating its gypsum-products plant at Phoenix in January and worked throughout the year. As a result of these mining activities, output of crude gypsum was the highest in the history of the county.

Crude perlite was the second-ranking nonmetal in 1956, and the operation of three open-pit mines by Lee's Perlite Industries, Inc., Perlite Industries of Arizona, Inc., and Superior Industries, Inc., resulted in 51-percent increase in mine production.

Demand for sand and gravel and stone for use in industrial and residential construction remained strong in 1956. The bulk of the sand and gravel produced was reported by the Pinal County Highway Department and the remainder by the Coolidge Sand & Rock Co., which also quarried a small quantity of crushed basalt for use as road metal. On the other hand, all other stone production was quarried by a commercial producer. San Manuel Copper Corp. quarried crushed limestone and sandstone for fluxing purposes. Remaining nonmetal production consisted of chrysocolla, agate, and "apache tears" (volcanic glass), collected largely in the Superior region.

Santa Cruz.—Output of the metals, gold, silver, copper, lead, and zinc comprised the entire recorded mineral production in Santa Cruz County in 1956. The yield of each of these metals was greater in 1956 than in 1955, and the total value for all increased 26 percent. Lead and zinc were the most important mineral products; the county ranked second in lead and zinc output in the State in 1956.

The bulk of the lead and zinc came from the Flux mine operated by the American Smelting and Refining Co. The mine was the second ranking lead and zinc producer in the State. A substantial quantity of lead-zinc ore was mined and milled in the company 200-ton-per-day flotation mill. The lead and zinc concentrates were shipped to the company smelters at El Paso and Amarillo, Tex., respectively, where

in addition to lead and zinc, substantial quantities of silver and copper were recovered.

The Glove mine near Amado in Santa Cruz County also was an important producer of lead in the county and the State in 1956. The operating company (Sunrise Mining Co.) shipped a substantial quantity of ore from this mine directly to the American Smelting and Refining Co. smelter at El Paso, Tex. Other important gold, silver, copper, lead, and zinc mines included the Duquesne group of claims (operated by nine lessees), Three R, Copper Plate Nos. 1 and 2, Eyes of Ramona, and Alto & Victor.

Yavapai.—In 1956 Yavapai County was the leading producer of lead and zinc in Arizona and ranked second in tungsten, third in gold, fourth in silver, and sixth in copper production. Other metals produced in the county included manganese from 1 operation, molybdenum recovered as a byproduct of copper ore from 1 operation, tungsten from 4 mines, and beryl from 3 operations. The combined value of the copper, lead, and zinc output composed $12.6 million (78 percent) of the total value of mineral production in the county.

The Iron King mine—the leading lead and zinc producer in the State—accounted for the major part of the lead and zinc output in the county. According to the operator, Iron King Branch of Shattuck Denn Mining Corp., 253,942 tons of lead-zinc ore, containing 35,362 ounces of gold, 991,927 ounces of silver, 447 tons of copper, 7,230 tons of lead, and 18,984 tons of zinc, was mined and treated in the 900-ton-per-day flotation plant. This ore yielded 48,852 tons of lead and zinc concentrates containing 22,534 ounces of gold, 804,382 ounces of silver, 302 tons of copper, 6,128 tons of lead, and 16,054 tons of zinc. In addition to these lead and zinc concentrates, which were shipped to the American Smelting and Refining Co. El Paso and Amarillo (Tex.) smelters, respectively, precipitate containing 3,866 ounces of gold and 46,484 ounces of silver was recovered from the ore by cyanidation and shipped to the United States Smelting Refining and Mining Co. smelter at Salt Lake City, Utah.

The Bagdad open-pit copper mine, the 11th-ranking copper producer in Arizona, was another important producer in the county in 1956. Molybdenum concentrate was recovered as a byproduct of the copper ore. Data for the Bagdad mine in 1955 and 1956 are shown in table 4. During 1956, 10 tons of overburden was removed for each ton of ore put through the mill. This high ratio was brought about by concentrated effort on stripping to uncover new ore. Eventually this ratio will reduce to 2½ : 1 when the ore that was uncovered goes to the mill. The company reported that the cost of removing overburden was 17.39 cents per ton during 1956. The pilot plant for producing electrolytic copper was operated during the last 6 months of 1956 and at the close of the year was producing 3,000 pounds of electrolytic copper daily. The sulfuric acid, a byproduct of the plant, was used to produce several tons of cement copper from one of the dumps of oxide copper ore. It was planned to install additional ball mills to increase the capacity of the mill to 10,000 tons daily as soon as possible.

Smaller quantities of at least one of the metals (gold, silver, copper, lead, and zinc) were produced from 27 other lode mines in Yavapai County in 1956, in addition to the output of the Iron King lead-zinc

and Bagdad copper mines described. The Big Hole Mining Co. had a sizeable output of copper ore from the United Verde open-pit mine, as did Fred D. Schemmer from the Commercial mine. Of the remaining 25 small operations, only 8 produced over 100 tons of ore.

The Hillside Mining & Milling Co. had a substantial output of tungsten ore from two mines—Black Pearl and Tungstona—in the county. Two other tungsten mines (White Pearl and Narcolipsi) were active in the county in 1956.

The Dixie Queen mine, operated by the Dixie Queen Mines, Inc., was the major producer of beryl in the State and county in 1956. Earl F. & Sidney A. Anderson (partnership) and J. E. Boatwright also recovered beryl from pegmatite deposits in Yavapai County. All three producers sold their output to Beryl Ores Co., Arvada, Colo.

Except for gem stones, all nonmetal output in Yavapai County in 1956 was in the construction-materials group. Heading the list of important minerals, in terms of value, was lime manufactured by the United States Lime Products Corp. at Nelson. Both hydrated lime and quicklime were produced for the building and chemical industries. Stone ranked second and consisted of commercial crushed granite and limestone and dimension sandstone. The bulk of the crushed stone produced was used for road construction and the manufacture of lime, and the dimension sandstone as a building stone and for flagging. Volcanic scoria was the third most important construction material produced in 1956; the only producer was the Superlite Builders Supply Co., which operated its Cruise cinder pit. Sand and gravel output reached 35,000 tons, and all production was reported by the Verde Concrete Products, Inc. A small quantity of bentonite was mined by Silicates Corp. from its Curly Mud mine, and agate, white jade, petrified wood, chrysocolla, and jasper were collected from numerous outcrops and surface deposits throughout the county.

Yuma.—The value of the manganese ore and concentrate output constituted 60 percent of the total value of the mineral production in Yuma County in 1956. Three operators (Civola Mining Co., J. F. Power, and W. B. Tenney) shipped manganese ore and concentrate under the Government "carlot" program administered by the GSA. Combined, the 2,391 short tons (gross weight) of material averaged 41.4 percent manganese. In addition, one shipment of manganese ore was made by James D. Akins Co. under the "low-grade" program to the GSA, Butte, (Mont.) Purchase Depot, which will be recorded as production in the year it is treated and a useful product shipped.

The Mineral Hills mine, operated by R. A. De Lano Co., was the major producer of copper in the county. A total of 1,652 tons of ore containing 64 tons of copper and a few ounces of gold and silver was mined and shipped directly to the American Smelting and Refining Co. smelter at Hayden and Magma Copper Co. smelter at Superior. Production of 1 or more of the metals gold, silver, copper, lead, and zinc was reported from 21 other lode mines in the county. In addition, small quantities of gold and silver were produced from one placer mine in the county in 1956.

Tungsten output in the county in 1956 was virtually the same as in 1955, despite a decreased number of operations—from 21 in 1955 to 12 in 1956. All had an output of less than 100 units of WO_3 except L. C. Hutchmaker at the Pee Wee mine and John P. Brusco at the Three Musketeers mine.

The value of nonmetals—sand and gravel and gem stones—continued to decline and was only $19,000 in 1956 compared with $26,000 in 1955. Six thousand tons of structural sand and gravel was quarried by the Valley Sand & Gravel Co. Gem and ornamental stones valued at $6,700 were collected. Stones reported sold in 1956 included jasper, agate, obsidian, rhyolite, and quartz.

The Mineral Industry of Arkansas

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Arkansas Geological and Conservation Commission, Norman F. Williams, Director and State Geologist, Little Rock, Ark.

By Robert S. Sanford [1]

THE VALUE of Arkansas mineral production in 1956 reached an alltime high of $135.2 million—an increase of $2.4 million (1.8 percent) over the previous high in 1955. Severance tax collected on minerals was up 3.4 percent. Declines in bauxite, clays, and natural-gas liquids were more than offset by increases in barite, coal, cement, gem stones, iron ore, natural gas, petroleum, gypsum, lime, manganese, sand and gravel, and stone. Output of liquid, gaseous, and solid fuels, which comprised 67 percent of the total value of State mineral production, increased 2 percent from 1955. The State of Arkansas Oil and Gas Commission regulated petroleum production to prevent too rapid depletion of the State's declining reserves and to curtail overproduction.

Nonmetals, as a group, were valued at $29.5 million—22 percent of the State total in 1956 and an increase of nearly $1.0 million over the $28.7 million value in 1955. Barite, used principally as an additive to oil well drilling mud; and construction materials, principally stone, sand and gravel, cement, and lime, dominated these advances due to the need for these basic materials for increased oil well drilling, building, highway, and water resource developments within the State and in adjacent States. Consumption of lime produced from Arkansas limestone, for the aluminum, chemical, and construction industries, increased. Although byproduct sulfur decreased slightly in yield—paralleling the decline in extracted natural-gas liquids from natural gas—it increased in value.

Production value of metallic ores (bauxite, manganese, and iron) was $15.5 million (11 percent of the State's total) in 1956; this was a decrease of $294,000 from 1955. Production trends indicated a decrease for bauxite and an increase for manganese. Iron-ore mining was resumed during the year.

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TABLE 1.—Mineral production in Arkansas, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stone (whetstones)			35	$10,500
Barite	462,986	$3,755,094	486,254	4,255,982
Bauxite, long tons, dried equivalent	1,721,243	14,026,190	1,668,432	13,307,341
Clays	738,637	2,375,882	719,251	1,636,312
Coal	577,726	4,319,146	590,091	4,601,264
Gem stones		4,000		25,000
Manganese ore (35 percent or more Mn), gross weight	23,744	1,727,286	29,485	2,066,116
Natural gas, million cubic feet	32,123	1,799,000	30,162	1,810,000
Natural-gas liquids:				
Natural gasoline and cycle products, thousand gallons	47,483	3,239,000	41,529	2,541,000
LP-gases, do	57,088	2,169,000	56,146	2,293,000
Petroleum (crude), thousand 42-gallon barrels	28,369	76,880,000	29,355	78,965,000
Sand and gravel	9,003,162	7,662,942	10,199,515	8,729,402
Stone	6,176,313	8,025,634	6,324,819	8,112,989
Value of items that cannot be disclosed: Abrasive stone, portland cement, gypsum, iron ore (1956), lime, slate, soapstone, masonry cement, and recovered elemental sulfur		7,615,676		8,181,765
Total Arkansas [2]		132,822,000		135,210,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Value has been adjusted to eliminate duplicating the value of clays and stone.

TABLE 2.—Average unit value of mineral commodities produced in Arkansas, 1952–56

Commodity	1952	1953	1954	1955	1956
Abrasive stone, short ton	$180.94	$109.70	$301.54	$269.01	$245.57
Barite (crude), do	9.25	10.36	9.41	8.11	8.75
Bauxite (long tons, dried equivalent) [1]	6.38	8.48	8.20	8.15	7.98
Cement:					
Portland, 376-pound barrel	2.44	2.58	2.61	2.73	2.89
Masonry, do				3.70	3.68
Clays:					
Fire clay, short ton	3.46	4.60	4.99	2.61	4.33
Kaolin, do	(2)	(2)	10.00	10.00	10.00
Miscellaneous clay, do	1.06	1.06	2.18	1.36	1.00
Coal, do	7.83	7.93	7.52	7.48	7.80
Gypsum, do	2.75	3.27	3.27	2.89	2.89
Manganese ore (35 percent or more), do	(2)	86.01	74.36	72.75	70.07
Natural gas, thousand cubic feet	.041	.053	.055	.056	.060
Natural-gas liquids:					
Natural gas and cycle products, gallon	.074	.071	.064	.068	.061
LP-gases, do	.042	.046	.043	.038	.041
Petroleum (crude), 42-gallon barrel	2.46	2.60	2.73	2.71	2.69
Sand and gravel, short ton	.99	1.01	.99	.85	.86
Slate, do	(2)	9.15	9.06	9.07	9.25
Stone:					
Crushed limestone, do	1.17	1.71	1.34	1.08	1.16
Crushed sandstone, do	(2)	1.17	2.77	2.06	1.70
Dimension sandstone, do	4.07	(2)		15.42	12.36
Crushed granite, do			.99	1.00	1.33
Marble, do	45.45	27.22	50.18		
Miscellaneous stone, do	1.07	1.25	1.26	1.39	1.10
Soapstone, do	(2)	2.47	2.68	4.00	4.00
Sulfur, recovered elemental, do	(2)	23.08	26.75	26.49	29.34

[1] Value of production.
[2] Data not available.

EMPLOYMENT AND INJURIES

Employment.—Average annual employment in the mineral industries increased 3 percent over 1955. Metal-mining employment declined 5 percent, while nonmetal employment gained 3 percent. Coal-mining employment increased 5 percent but was 35 percent lower than in 1953. Employment in the crude-petroleum and natural-gas industries gained 5 percent over 1955 and comprised nearly half of the total mining employment.

Injuries.—No fatal accidents occurred in coal mines, but one fatal accident occurred in metal and nonmetal mines. Injury data on the petroleum industry were not available.

Wages.—The average weekly wage in the metal-mining industry was $84.42—a decrease of 2 percent; in the nonmetals industry $70.54—a gain of 1 percent; in the coal industry $78.19—an increase of 12 percent; and in the crude-petroleum industry $83.76—an increase of 4 percent from 1955.

TABLE 3.—Average annual employment in mining industries, 1953–56 [1]

Industry	1953 [2] Employment	1954 Employment	1955		1956	
			Employing units	Employment	Employing units	Employment
Metal mining	920	905	47	910	45	868
Bituminous-coal mining	860	464	39	536	37	561
Crude petroleum and natural gas	2,940	2,967	296	2,909	305	3,061
Nonmetallic mining and quarrying	1,920	1,845	90	2,089	99	2,159
Total	6,640	6,181	472	6,444	486	6,649

[1] Arkansas Department of Labor, Employment Security Division, Little Rock, Ark.
[2] Revised figures.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Production of coal in Arkansas totaled 590,000 short tons, increasing for the second year after a 4-year downward trend. Of the 22 mines operated, 15 were underground and 7 open-pit operations. Production was 43 percent from strip mines and 57 percent from underground mines. Coal-producing counties, in the order of importance, were: Sebastian, Johnson, Logan, and Franklin.

TABLE 4.—Coal production, 1947–51 (average) and 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1947–51 (average)	1,354,084	$10,091,644	$7.45	1954	477,268	$3,589,217	$7.52
1952	873,088	6,839,113	7.83	1955	577,726	4,319,146	7.48
1953	775,207	6,143,757	7.93	1956	590,091	4,601,264	7.80

Petroleum and Natural-Gas Exploration and Development.—Arkansas experienced an active year in 1956, as the petroleum industry completed 1,002 wells of all types, compared with 786 wells in 1955 and 617 wells in 1954. Despite this added effort reserves continued to decline. The proved reserve of petroleum decreased 4 percent and of natural-gas liquids decreased 6 percent; the natural-gas reserve gained only 0.6 percent during the year. Dry natural gas from relatively shallow sands of Pennsylvanian age was produced in northern Arkansas. Only 19 wells (which resulted in the discovery of 2 gas fields), were drilled in 1956 compared with 20 wells in 1955. In south Arkansas the major part of crude-petroleum and gas-condensate production was from Upper and Lower Cretaceous and Jurassic formations at depths of 6,000 to 8,000 feet. All of the increased drilling took place in southern Arkansas, where 983 holes

TABLE 5.—Oil and gas well drilling in 1956 [1]

County	Proved field wells			Exploratory wells			Total			Grand total
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	
Benton						1			1	1
Bradley						1			1	1
Calhoun						1			1	1
Clay						1			1	1
Columbia	19		6			12	19		18	37
Conway		1						1		1
Crawford						1			1	1
Faulkner						1			1	1
Franklin		3	3		1			4	3	7
Grant						1			1	1
Greene						1			1	1
Hempstead						2			2	2
Hot Spring						2			2	2
Lafayette	23		16			36	23		52	75
Little River						1			1	1
Madison			1			1			2	2
Miller	40	1	22			17	40	1	39	80
Nevada	80		45			21	80		66	146
Ouachita	246		29	1		8	247		37	284
Pope		1	1		1	2		2	3	5
Pulaski						1			1	1
Sebastian		2	1					2	1	3
Union	264	1	43		2	38	264	3	81	348
Total: 1956	672	9	167	1	4	149	673	13	316	1,002
1955	447	7	173	2	2	155	449	9	328	786

[1] Arkansas Oil and Gas Commission, Arkansas Oil and Gas Statistical Monthly Bulletins: Vol 25, Nos. 1–12, January–December 1956.

TABLE 6.—Estimated proved reserves of crude oil, natural-gas liquids, and natural gas, 1955–56 [1]

	Proved reserves, Dec. 31, 1955	Changes in proved reserves due to extensions and discoveries in 1956	Proved reserves, Dec. 31, 1956 (production was deducted)	Change from 1955, percent
Crude oil—thousand barrels	329,539	16,036	317,726	−4
Natural-gas liquids [2] do	45,124	356	42,467	−6
Natural gas—million cubic feet	1,164,367	41,447	1,171,527	+0.6

[1] American Gas Association, and American Petroleum Institute; Proved Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas: Vol. 11, Dec. 31, 1956, pp. 1–23.
[2] Includes condensate, natural gasoline, and LP-gases.

were completed. Of the 1,002 current-year completions in the State, 848 were in proved fields, including 672 oil wells, 9 gas wells, and 167 dry holes; of the 154 exploratory tests, 1 produced oil and 4 gas, and 149 were dry. Three dry gas fields were discovered in north Arkansas during the year, and 7 new oil pools in old fields were discovered in south Arkansas.

Natural Gas.—The marketed production of natural gas decreased 1 percent to 30,162 million cubic feet valued at $1.8 million in 1956. Of the 12 producing counties, the first 5, in order of productivity, were: Franklin, Lafayette, Columbia, Union, and Sebastian.

TABLE 7.—Marketed production of natural gas, 1947–51 (average) and 1952–56 [1]

Year	Million cubic feet	Value		Year	Million cubic feet	Value	
		Thousand dollars	Per thousand cubic feet			Thousand dollars	Per thousand cubic feet
1947–51 (average)	49,013	1,924	$0.039	1954	33,471	1,841	$0.055
1952	42,325	1,735	.041	1955	32,123	1,799	.056
1953	41,510	2,200	.053	1956	30,162	1,810	.060

[1] Comprises gas either sold or consumed by producers including losses in transmission, amounts added to storage, and increases in gas pipelines.

TABLE 8.—Gross withdrawals and disposition of natural gas, 1952–56

(Million cubic feet)

Year	Gross withdrawals [1]			Disposition		
	From gas wells	From oil wells	Total	Marketed production [2]	Repressuring	Vented and wasted [3]
1952	40,400	27,200	67,600	42,325	22,070	3,205
1953	38,100	27,000	65,100	41,510	20,003	3,587
1954	36,000	20,000	56,000	33,471	18.568	3,961
1955	19,000	36,000	55,000	32,123	16,649	6,228
1956	16,000	37,000	[4] 53,000	30,162	[4] 16,269	[4] 6,569

[1] Marketed production plus quantities used in repressuring, vented, and wasted.
[2] Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
[3] Includes direct waste on producing properties and residue blown to air.
[4] Arkansas Oil and Gas Commission, Arkansas Oil and Gas Statistical Bulletins: Vol. 25, Nos. 1–12, January–December 1956.

Natural-Gas Liquids.—Production of natural-gas liquids in Arkansas (97.7 million gallons with a value of $4.8 million) was 7 percent less in quantity and 11 percent less in value than in 1955. Of the total gallons, 42.5 percent was natural gasoline and cycle products, and 57.5 percent was LP-gases. The five producing counties, in order of their importance, were: Columbia, Lafayette, Union, Miller, and Hempstead. In 1956 Arkansas ranked eighth in the United States in the production of natural-gas liquids.

TABLE 9.—Natural-gas liquids produced, 1947–51 (average) and 1952–56

Year	Natural gasoline and cycle products		LP-gases		Total	
	Quantity (thousand gallons)	Value (thousand dollars)	Quantity (thousand gallons)	Value (thousand dollars)	Quantity (thousand gallons)	Value (thousand dollars)
1947–51 (average)	58,360	4,275	37,894	1,517	96,254	5,792
1952	61,782	4,580	49,098	2,079	110,880	6,659
1953	58,422	4,123	55,188	2,562	113,610	6,685
1954	50,778	3,234	58,506	2,521	109,284	5,755
1955	47,483	3,239	57,088	2,169	104,571	5,408
1956	41,529	2,541	56,146	2,293	97,675	4,834

Petroleum.—Petroleum produced in Arkansas in 1956 was 29.4 million barrels valued at $79 million—an increase of 3 percent in quantity and 3 percent in value compared with 1955. Petroleum was the leading mineral resource of Arkansas, and in 1956 the State ranked 11th in value of this fuel. Production was reported from eight counties, in the following order of importance: Union, Columbia, Ouachita, Lafayette, Miller, Nevada, Calhoun, and Bradley. Bradley County joined the ranks of petroleum producers for the first time.

Arkansas continued to hold its own as an important refining area. Over 86 percent of the crude petroleum produced was refined in the State. Runs to stills in 1956 amounted to 25.7 million barrels—an increase of 3 percent over 1955.

The Bureau of Mines, in cooperation with the Arkansas Oil and Gas Commission, investigated the potentialities of the Buckrange reservoir, Stephens oilfield, in Columbia, Nevada, and Ouachita Counties, Ark. The resulting report describes the production history and geology of the Buckrange reservoir; gives pertinent reservoir data;

TABLE 10.—Production of crude petroleum, 1947–51 (average) and 1952–56

Year	Thousand barrels	Value		Year	Thousand barrels	Value	
		Total (thousand dollars)	Average per barrel			Total (thousand dollars)	Average per barrel
1947–51 (average)	30,504	71,572	$2.35	1954	29,130	79,520	$2.73
1952	29,440	72,420	2.46	1955	28,369	76,880	2.71
1953	29,681	77,170	2.60	1956	29,355	78,965	2.69

and presents waterflood performance calculations, indicating that a maximum of 287 barrels of flood oil per acre-foot may be recovered by an efficient flood.[2]

TABLE 11.—Production of crude petroleum, 1952–56, by fields

(Thousand barrels)

Field	1952	1953	1954	1955	1956
Atlanta	810	649	554	483	438
Bradley West					499
Buckner	722	645	529	478	444
Dorcheat-Macedonia	877	841	624	617	632
El Dorado	649	711	838	857	923
Fouke	1,053	1,429	1,210	1,241	1,431
Horsehead	29	194	706	816	403
Magnolia	4,223	4,029	3,289	2,890	3,609
McKamie	1,446	1,369	1,480	1,331	1,349
Midway	2,674	2,642	2,262	2,048	2,238
Shuler	2,377	2,318	2,599	2,593	2,353
Smackover	3,814	3,892	4,370	4,678	4,466
Stephens	1,308	1,223	1,077	1,014	1,157
Village	1,018	840	850	846	811
Wesson	3,510	3,296	2,699	1,840	1,591
Other fields [1]	4,930	5,603	6,043	6,637	7,011
Total Arkansas	29,440	29,681	29,130	28,369	29,355

[1] Includes oil consumed on leases and net change in stocks held on leases for entire State.

TABLE 12.—Indicated demand, production, and stocks of crude petroleum in 1956, by months

(Thousand barrels)

Month	Demand	Production	Stocks (end of month)	Month	Demand	Production	Stocks (end of month)
January	2,396	2,356	2,183	September	2,296	2,394	2,849
February	2,165	2,229	2,247	October	2,124	2,468	3,193
March	1,867	2,401	2,781	November	2,620	2,508	3,081
April	1,944	2,379	3,216	December	2,430	2,763	3,204
May	2,797	2,478	2,897				
June	2,432	2,382	2,847	Total: 1956	28,164	29,355	
July	2,723	2,502	2,626	1955	28,987	28,369	
August	2,370	2,495	2,751				

Pipeline.—Oklahoma Mississippi River Products Line, Inc., completed a 22-mile, 6-inch products line from Conway, Ark., to Little Rock Air Force Base.[3]

[2] Meadows, Paul, and Hawkins, Murphy E., Secondary-Recovery Potentialities of the Buckrange Reservoir, Stephens Oilfield, Columbia, Nevada, and Ouachita Counties, Ark.: Bureau of Mines, Rept. of Investigations 5211, 1956, 40 pp.

[3] Oil and Gas Journal, vol. 55, No. 1, Jan. 7, 1957, p. 79.

TABLE 13.—Capacity of petroleum refineries and cracking plants, January 1, 1957

(Barrels per day)

Company	Location	Type of plant	Crude-oil capacity		Cracked-gasoline capacity	
			Operating	Building	Operating	Building
American Oil Co	El Dorado	Complete	38,400		14,930	5,000
Berry Asphalt Co	Stephens	Skimming and asphalt	2,000			
Do	Waterloo	Skimming, lube, and asphalt	1,500			
Henry H. Cross Co	Smackover	do	6,000			
Lion Oil Co., Division of Monsanto Chemical Co	El Dorado	Complete	28,000		5,500	
Macmillan Petroleum Corp	Norphlet	Skimming, lubing, and asphalt	4,000			
Total			79,900		20,430	5,000

TABLE 14.—Sales of petroleum products, 1952–56

(Thousand barrels)

Product	1952	1953	1954	1955	1956	Change from 1955, percent
Gasoline [1]	10,672	11,025	11,530	12,320	13,154	+7
Kerosine	1,736	1,390	1,394	1,216	1,289	+6
Range oil	1,051	876	830	674	777	+15
Distillate fuel oil	2,325	2,222	2,136	2,357	2,558	+9
Residual fuel oil	1,497	1,006	415	419	545	+30

[1] Consumption compiled by American Petroleum Institute.

METALS

Aluminum.—Arkansas again ranked fourth among the States in aluminum output. For the fifth consecutive year the aluminum industry set new records in primary production. By the end of 1956 the continuing program of expansion raised the supply of aluminum to the level of demand. As a result, the industry began to give more attention to new uses for the lightweight metal.

Bauxite.—Arkansas production of bauxite declined 3 percent from 1955 to 1.7 million long tons (dried equivalent) valued at $13.3 million. The State continued to be the leading producer of domestic bauxite, with 96 percent of the Nation's production; the remainder was mined in Alabama and Georgia. Domestic mines accounted for 24 percent of the total new bauxite supply.

Bauxite was used in a new alkylation-effluent treating process by the petroleum-refining industry. It was possible to remove 99 percent of acid and all acidic and neutral esters from alkylation-reactor effluent. The new treating process, developed jointly by D–X Sunray Oil Co. and M. W. Kellogg Co., used bauxite to absorb the troublesome byproducts of sulfuric acid alkylation. The first unit successfully reduced corrosion and fouling in alkylate fractionating equipment and improved lead susceptibility in motor alkylate by effective removal of sulfur. The 98- to 99-percent efficiency of this process compares with 65-percent removal of sulfur obtained in the conventional caustic wash system.[4]

TABLE 15.—Mine production of bauxite and shipments from mines and processing plants to consumer, 1947–51 (average) and 1952–56, in long tons

Year	Mine production			Shipments from mines and processing plants to consumers		
	Crude	Dried-bauxite equivalent	Value	As shipped	Dried-bauxite equivalent	Value
1947–51 (average)	1,602,362	1,353,287	$8,221,653	1,370,068	1,270,052	$9,362,201
1952	1,903,101	1,603,833	10,235,254	2,067,241	1,849,287	14,084,274
1953	1,802,797	1,529,976	12,975,992	1,889,206	1,689,207	15,042,236
1954	2,296,528	1,949,368	15,993,887	1,978,216	1,711,386	15,239,244
1955	2,049,623	1,721,243	14,026,190	1,938,811	1,660,263	14,844,798
1956	1,966,320	1,668,432	13,307,341	1,827,832	1,576,028	13,724,443

[4] Oil and Gas Journal, vol. 55, No. 12, Mar. 25 1957, p. 162

Iron Ore.—Three companies mined iron ore in 1956 in Baxter, Fulton, and Randolph Counties.

Manganese.—Manganese mining in Arkansas continued to increase; a new record was obtained—29,485 short tons of ore, which had a metal content of 12,525 short tons valued at $2.1 million—a gain of 24 percent in quantity, 7 percent in manganese content, and 20 percent in value over 1955. Of the 10 producers, 9 were in Independence County and 1 in Polk County.

The quota for the Government carlot purchase program for Metallurgical-grade manganese ore was increased, effective June 30, 1958, from 19 million to 28 million long-ton units of contained manganese, and the terminal date was advanced to January 1, 1961.

Exploration by mining companies was extending the manganese producing district in Independence County to the east, west, and north. The Minerva Oil Co. used a churn drill to explore manganiferous limestone in Independence County.

TABLE 16.—Manganese ores shipped from mines, 1947–51 (average) and 1952–56, in short tons

Year	Manganese ore [1]		Value	
	Gross weight	Mn content	Total	Average per ton
1947–51 (average)	1,769	743	(2)	
1952	2,246	1,007	(2)	
1953	6,123	2,812	$526,647	$86.01
1954	13,728	5,407	1,020,752	74.36
1955	23,744	11,685	1,727,286	72.75
1956	29,485	12,525	2,066,116	70.07

[1] Containing 35 percent or more manganese (natural).
[2] Data not available.

The Federal Bureau of Mines continued to sample, map, and correlate the data on manganese-ore deposits and manganiferous limestone in Arkansas and to obtain samples for mineral-dressing tests. Deposits of manganiferous limestone, estimated at 140 million tons, with an average manganese content of 5 percent, constitute the largest reserve of manganese in the Batesville district. As a result of mineral-dressing research on a group of Arkansas manganiferous limestones, a beneficiation process was developed that permitted recovery of ferrograde concentrates from four samples. Two other samples were quite unresponsive, and research on another is still under way.[5]

NONMETALS

Abrasive Stone.—Oilstones and whetstones produced in Arkansas increased 4 percent in quantity and decreased 5 percent in value during the year.

Barite.—Arkansas producers shipped 486,000 tons of barite in 1956, a new record. Barite ore containing approximately 50 percent barium sulfate ($BaSO_4$), was mined both by open-pit and underground

[5] Fine, M. M., and Frommer, D. W., A Mineral-Dressing Study of Manganese Deposits of West Central Arkansas: Bureau of Mines Rept. of Investigations 5262, 1956, 21 pp.
Fine, M. M., A Mineral-Dressing Study of Manganese Deposits of the Batesville, Ark., District: Bureau of Mines Rept. of Investigations 5301, 1957, 12 pp.

methods. The ore must be finely ground for flotation recovery. The ground barite was used mostly by the oil-well-drilling industry. As more oil wells were being drilled deeper, barite requirements for oil-well drilling also increased. Approximately 90 percent of the barite used in drilling muds goes to Louisiana and Texas Gulf coast.

Both world and domestic markets increased during the year.

TABLE 17.—Primary barite sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1947–51 (average)	370, 424	$3, 010, 302	$8. 13	1954	370, 621	$3, 488, 483	$9. 41
1952	428, 522	3, 963, 828	9. 25	1955	462, 986	3, 755, 094	8. 11
1953	380, 763	3, 945, 583	10. 36	1956	486, 254	4, 255, 982	8. 75

Cement.—Portland-cement shipments during the year decreased slightly from the Ideal Cement Co. plant near Okay in Howard County. Masonry-cement shipments showed a gain.

A contract was awarded in October 1956 by Ideal Cement Co. for improving existing facilities. The cost of improvements under contract was an estimated $1 million. Production after modernization will be 1,750,000 barrels annually.[6]

Clays.—The production of all types of clay in Arkansas was 719,251 short tons valued at $1.6 million—a decrease of 3 percent in quantity and 31 percent in value from 1955. The decrease in value resulted from a lower value assigned to clays used by a principal captive producer. The major uses of clays remained unchanged during the past several years.

According to the Arkansas Business Bulletin, published by the University of Arkansas, the production of unglazed brick in Arkansas rose from 107 million in 1952 to 170 million in 1956—an increase of 59 percent.

Roscolite Co., Fort Smith, completed enlargement of its facilities to increase the production of presized, expanded-shale aggregate for

TABLE 18.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds

Year	Miscellaneous clay		Fire clay		Total clay	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	186, 640	$185, 424	271, 202	$870, 164	457, 842	$1, 005, 588
1952	166, 465	176, 392	386, 111	1, 337, 542	552, 576	1, 513, 934
1953	197, 874	209, 549	331, 252	1, 524, 865	529, 126	1, 734, 414
1954	[1] 254, 490	[1] 555, 891	362, 960	2, 000, 476	617, 450	2, 556, 367
1955	[2]	[2]	[2]	[2]	738, 637	2, 375, 882
1956	[1] 444, 553	[1] 447, 469	274, 698	1, 188, 843	719, 251	1, 636, 312

[1] Kaolin and clay used for cement combined with miscellaneous clay to avoid disclosing individual company confidential data.
[2] Quantity and value included in total clay.

[6] Ideal Cement Co. 1956 Annual Report, p. 16.

manufacturing structural concrete and other concrete products. Installation of a new rotary kiln increased production 75 percent. Provision was made for additional capacity later.[7]

Gem Stones.—*Diamonds.*—Gem collectors were permitted to search in the "Crater of Diamonds," Murfreesboro, Ark., for 8 hours for a fee of $1.50 and could keep diamonds up to 5 carats in weight. Diamonds above 5 carats were appraised, and an additional fee was paid to the mine owner.

A gem collector found a 15.31-carat diamond that had an estimated value of $15,000 in March 1956 at the "Crater of Diamonds." The stone was the largest ever found on the North American Continent by an individual. A larger diamond was found at the "Crater of Diamonds" during mining operations. The site is part of a 72-acre tract which once boasted the only diamond-mining operation in North America. The first diamond was discovered there in 1906, but mining operations have been erratic and were suspended in 1930. Although production figures are incomplete, it has been estimated that the area produced 48,000 stones, with an average weight of one-fourth carat. About 10 percent of the stones were reported to be of gem quality; the rest were used for industrial purposes.

Gypsum.—Gypsum production, all from Pike County, Ark., increased 5 percent in quantity and value over 1955.

Lime.—Lime production increased 4 percent in quantity and 3 percent in value during the year. Lime was used by the aluminum industry of the State, and by the paper, petroleum, sugar-refining, and other industries. Lime also was used for water purification.

Perlite.—No crude perlite was mined in Arkansas; however, perlite was expanded and used for aggregate by the construction industry.

Phosphate Rock.—No phosphate rock was mined in Arkansas in 1956. The Bureau of Mines conducted a reconnaissance of the phosphate deposits in Arkansas, Kansas, Oklahoma, and Texas; samples of 33 deposits of phosphatic shales were collected and analyzed.[8]

Sand and Gravel.—Sand and gravel was produced in 43 of the State's 75 counties; in order of value, the leading counties were: Pulaski, Miller, Izard, Hot Spring, and Little River. Production of sand and gravel amounted to 10.2 million short tons valued at $8.7 million. This gain of 13 percent in quantity and 14 percent in value over 1955 was attributed to highway and building-construction programs.

Slate.—Slate production in Arkansas increased in quantity and value over the previous year.

Soapstone.—Output and value of soapstone decreased during 1956.

Stone.—Production and sale of stone continued an upward trend for the fifth successive year and attained a record high of 6.3 million short tons valued at $8.1 million. Crushed granite was quarried and used for concrete and road metal. Crushed sandstone used for concrete and road metal was 54 percent; for manufacture of refractories, 44 percent; and as riprap, 2 percent. Over 98 percent of the dimension sandstone was dressed and used for construction; the remainder

[7] Pit and Quarry, vol. 48, No. 9, March 1956, p. 66.
[8] Ryan, J. P., Reconnaissance of Phosphate-Rock Deposits in Arkansas, Kansas, Oklahoma, and Texas: Bureau of Mines Rept. of Investigations 5222, 1956, 8 pp.

TABLE 19.—Sand and gravel sold or used by producers, 1955–56, by class of operations and uses

	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Building	1,157,483	$811,942	$0.70	1,398,942	$1,122,097	$0.80
Paving	1,295,244	906,394	.70	1,205,435	881,866	.73
Gravel:						
Building	983,226	880,440	.90	1,453,913	1,507,585	1.04
Paving	2,873,730	2,535,240	.88	2,575,178	2,308,671	.90
Other	144,915	170,347	1.18	193,875	196,880	1.02
Undistributed	[1] 275,655	575,050	2.09	[2] 385,695	716,380	1.86
Total commercial sand and gravel	6,730,253	5,879,413	.87	7,213,038	6,733,479	.93
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Paving	178,462	156,918	.88			
Building				53,151	10,630	.20
Gravel:						
Paving	2,034,804	1,613,817	.79	2,709,326	1,865,293	.69
Building	59,643	12,794	.21	224,000	120,000	.54
Total Government-and-contractor sand and gravel	2,272,909	1,783,529	.78	2,986,477	1,995,923	.67
Grand total	9,003,162	7,662,942	.85	10,199,515	8,729,402	.86

[1] Includes glass, molding, engine and other sands, and railroad-ballast gravel; Bureau of Mines not at liberty to publish separately.
[2] Includes glass, molding, filter and other sands, and railroad-ballast sand and gravel; Bureau of Mines not at liberty to publish separately.

was utilized for rough construction. Crushed limestone used in manufacturing cement was 19 percent, for manufacturing lime 17 percent, for metallurgical flux 17 percent, for construction and road metal 42 percent, and as agricultural limestone 4 percent; the remainder was used for railroad ballast. Limestone used as a soil conditioner increased 9 percent to 105,000 short tons during the year. Miscellaneous stone used for concrete and road metal was 67 percent, for railroad ballast 26 percent, and for riprap 7 percent.

TABLE 20.—Stone sold and used by producers, 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1952	[1] 2,967,479	[1] $3,346,201	$1.13	1955	6,176,313	$8,025,634	$1.30
1953	3,545,350	5,069,750	1.43	1956	6,324,819	8,112,989	1.28
1954	4,604,067	5,929,638	1.29				

[1] Incomplete figure; excludes dimension miscellaneous stone.

Sulfur (Recovered Elemental).—Recovery of byproduct sulfur from gas cycle plants continued with only a slight decrease in quantity and a 9-percent increase in value from 1955. All of the recovered

elemental sulfur was produced at plants in Columbia and Lafayette Counties.

Talc.—Mineral-dressing investigations were conducted in the laboratory on talc-bearing samples from Arkansas and Texas under the Federal Bureau of Mines program for examinations and surveys.[9] This program is concerned, in part, with improvement, conservation, and utilization of the domestic mineral resources. Two soapstone samples were successfully upgraded by flotation. The process could enable the producers to meet more rigid specifications of higher priced talc commodities.

REVIEW BY COUNTIES

Mineral production was reported in 59 of the 75 counties in Arkansas (54 counties in 1955). Fourteen of these counties reported production of over $1 million. Petroleum was produced in 8 counties (7 in 1955); natural gas in 12; natural-gas liquids in 5; clay in 11 (12 in 1955); coal in 4; sand and gravel in 43 (45 in 1955); stone in 18 (12 in 1955); bauxite, sulfur, slate, lime, and manganese in 2; and gypsum, abrasive stone, barite, cement, and soapstone each in 1 county.

Ashley.—Sand and gravel for structural and paving purposes was produced by S. C. Chadwick. St. Francis Materials Co. produced structural sand and gravel at a stationary plant.

Baxter.—Oresco, Inc., started an iron mine at Mountain Home during the year. C. E. Sharp produced structural sand.

Benton.—Paul Davis produced gravel. Benton County Highway Department produced paving gravel. Independent Gravel Co. quarried and crushed limestone for use as a soil conditioner. One dry exploratory well was drilled.

Bradley.—Carter Lyon produced paving gravel. Earl Reynolds produced structural sand and gravel. Petroleum also was produced in Bradley County. One dry exploratory well was completed.

Calhoun.—W. W. Grant produced structural sand and gravel. Ouachita Aggregate Co. operated a fixed plant to produce structural sand and gravel and paving gravel. Pine Bluff Sand & Gravel Co. produced structural sand and gravel and railroad-ballast sand. St. Francis Materials Co. produced structural and paving sand and gravel at its fixed plant. Petroleum also was produced in the county. One dry exploratory well was completed.

Carrol.—Mrs. John Garrett produced some pit-run gravel at Kings River near Berryville.

Chicot.—Greenville Gravel & Dredging Co. produced structural and paving sand and gravel.

Clark.—Hope Brick Works mined miscellaneous clay for manufacturing heavy clay products. Arkadelphia Sand & Gravel Co. produced molding, paving, and other sand and structural, paving, and other gravel. R. and P. Barringer produced paving gravel at their fixed plant. W. R. Britt produced structural sand and gravel. Austin F. Freeman operated a fixed plant to produce paving gravel. Chas. McMillan produced building and paving gravel. Arlington

[9] Frommer, D. W., and Fine, M. M., Laboratory Flotation of Talc From Arkansas and Texas Sources: Bureau of Mines Rept. of Investigations 5241, 1956, 5 pp.

Waggoner operated a portable plant and produced paving sand and gravel. West Lake Quarry & Materials Co. quarried and crushed limestone for concrete and road stone.

TABLE 21.—Value of mineral production in Arkansas, 1955–56, by counties[1]

County	1955	1956	Minerals produced in 1956 in order of value
Ashley	(2)	(2)	Sand and gravel.
Baxter		(2)	Iron ore, sand and gravel.
Benton	$150,202	$52,903	Stone, sand and gravel.
Bradley	(2)	50,873	Sand and gravel, petroleum.
Calhoun	938,534	525,816	Do.
Carroll	(2)	972	Gravel.
Chicot	(2)	(2)	Sand and gravel.
Clark	51,983	321,397	Stone, sand and gravel, clays.
Clay	166,449	28,263	Sand and gravel.
Columbia	21,656,951	21,827,491	Petroleum, natural-gas liquids, natural gas, sulfur.
Conway	(2)		
Craighead	37,747	20,338	Sand and gravel, clays.
Crawford	29,669	29,879	Natural gas.
Crittenden	(2)	(2)	Sand and gravel.
Cross	142,566	321,209	Do.
Desha	57,401	116,864	Do.
Drew	(2)	(2)	Do.
Franklin	585,954	699,264	Natural gas, coal, stone.
Fulton		15,858	Iron ore.
Garland	53,932	90,570	Sand and gravel, grindstones, gem stones.
Grant	(2)	(2)	Sand and gravel.
Greene	372,229	230,363	Do.
Hempstead	248,538	271,352	Natural-gas liquids, sand and gravel, clays.
Hot Spring	5,807,661	5,814,046	Barite, clays, sand and gravel, stone, gem stones.
Howard	(2)	(2)	Cement, sand and gravel.
Independence	2,633,040	3,047,340	Manganese, lime, stone, sand and gravel.
Izard	1,066,332	1,261,368	Stone, sand and gravel.
Jackson	(2)	(2)	Sand and gravel.
Jefferson	(2)	(2)	Sand and gravel, stone.
Johnson	2,239,040	2,016,025	Coal, clays, natural gas, stone.
Lafayette	14,985,053	15,274,565	Petroleum, sulfur, natural-gas liquids, natural gas, sand and gravel.
Lawrence	(2)	(2)	Sand and gravel.
Lincoln	31,968	73,996	Do.
Little River	(2)	(2)	Sand and gravel, stone.
Logan	485,949	437,672	Stone, coal.
Lonoke		15,952	Stone.
Madison	(2)	(2)	Do.
Marion	10,645	(2)	Sand and gravel.
Miller	5,577,588	6,924,015	Petroleum, sand and gravel, natural-gas liquids, clays, natural gas.
Mississippi	100,877	(2)	Sand and gravel.
Montgomery	(2)	(2)	Slate, gem stones.
Nevada	2,967,325	3,241,619	Petroleum, sand and gravel, natural gas.
Newton	46,000		
Ouachita	14,834,985	15,468,557	Petroleum, sand and gravel, natural gas, clays.
Perry	(2)	(2)	Sand and gravel.
Phillips	(2)	(2)	Do.
Pike	(2)	(2)	Gypsum, gem stones, sand and gravel.
Poinsett	32,936	(2)	Sand and gravel.
Polk	24,323	122,336	Manganese, stone, clays.
Pope	149,153	(2)	Sand and gravel, natural gas, stone.
Pulaski	8,064,544	9,322,838	Stone, sand and gravel, bauxite, clays.
Randolph		34,196	Iron ore.
St. Francis	181,547	(2)	Sand and gravel.
Saline	14,053,992	12,076,860	Bauxite, lime, soapstone, slate, sand and gravel.
Sebastian	2,161,049	3,065,611	Coal, sand and gravel, clays, natural gas, stone.
Union	25,192,074	24,069,594	Petroleum, natural-gas liquids, natural gas, clays.
Washington	(2)	(2)	Stone, natural gas, sand and gravel.
White		(2)	Stone.
Yell	(2)		
Undistributed	7,683,764	7,807,901	
Total	132,822,000	135,210,000	

[1] The following counties are not listed, because no mineral production was reported: Arkansas, Boone, Cleburne, Cleveland, Dallas, Faulkner, Lee, Monroe, Prairie, Scott, Searcy, Sevier, Sharp, Stone, Van Buren, and Woodruff.

[2] Figures withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Clay.—Claude Bradford produced pit-run gravel. Buckskull Gravel Co. operated a fixed plant and produced paving sand and gravel. D. & W. H. Crockett produced pit-run paving gravel. Jess McKinney produced pit-run building gravel. One dry exploratory well was drilled.

Columbia.—The county ranked first in the State in the production of natural-gas liquids, second in crude petroleum, and third in natural gas. Lion Oil Co. recovered sulfur from natural gas by the modified Claus process. Olin Mathieson Chemical Corp. recovered sulfur by the Mathieson process. Columbia County ranked second in the State in total value of minerals produced. Twelve exploratory wells were drilled; all proved dry. Of the 25 field development wells drilled, 19 were oil productive and 6 were dry. Much of the gas obtained in Columbia County contained objectionable hydrogen sulfide.

Craighead.—Wheeler Brick Co., Inc., mined red clay for manufacturing face brick at its plant near Jonesboro. Cox Gravel Co. produced structural gravel. R. D. Davenport produced washed gravel for railroad ballast. Mississippi Valley Construction Co. produced washed structural sand and gravel.

Cross.—Cross County Gravel Co. produced structural and paving gravel, also a special gravel with a clay binder, which was used for constructing secondary roads. Humphries & Kail produced structural and paving sand and gravel. McGeorge Construction Co. produced structural and paving gravel. The three companies mentioned above operated washing plants.

Desha.—Sam Finley, Inc., produced structural sand and gravel. Greenville Gravel & Dredging Co. produced structural and paving sand and gravel. Linwood Smith operated a dredge and produced structural and paving sands and gravels.

Drew.—Mrs. R. F. Hyatt, Sr., trustee, operated a portable plant that produced paving gravel. O'Neill Bros. Sand & Gravel Co., Clyde Rogers, and Drew County Highway Department produced structural and paving sand and gravel.

Franklin.—The county continued to rank first in the State in the production of natural gas. Coal was produced by the Arnold Coal Co. strip mine and was used chiefly for generating steam. Arnold Stone Co. quarried dimension sandstone for construction and rubble. One exploratory well was completed as a gas producer. Six development wells were drilled; 3 were completed as gas producers, and 3 were dry.

Fulton.—Double E Mining Co. developed an iron mine and began to ship brown iron ore.

Garland.—Whetstones were produced by R. C. Neighbors from the Neighbors mine, David Helton from the Ketcham mine, and Marcellus Thomas from the South Five mine. Quartz crystals were produced by Charles Coleman near Mountain Valley and by Garland Milholen at Crystal Springs from the Crystal Mountain mine. L. C. Eddy & Son Construction Co. produced paving gravel. Malvern Gravel Co. produced glass sand. Smith Bros. Construction & Materials Co. produced structural sand and gravel at its fixed plant. United States Army Corps of Engineers contracted for paving gravel.

Grant.—Structural sand and gravel was produced by J. E. Hulse and Willie Keel.

Greene.—Structural and paving sand and gravel were produced by Arkansas Gravel Co., B. & S. Gravel Co., Ted Cline, and Mississippi Valley Construction Co. St. Francis Materials, Inc., operated a fixed plant and produced paving sand and gravel. One dry exploratory well was drilled.

Hempstead.—Natural-gas liquids were produced. Hope Brick Works mined clay for manufacturing heavy clay products. Paving gravel was produced by the portable plant of R. H. Davis. Two dry exploratory wells were drilled.

Hot Spring.—All barite produced in the State in 1956 was from Hot Spring County. Baroid Division of the National Lead Co. and Magnet Cove Barium Corp. were the producers. The county ranked first in the State in the production value of clay, third in stone, and fourth in sand and gravel. Acme Brick Co. and Malvern Brick & Tile Co. mined fire clay for use in refractories and miscellaneous clay for manufacturing heavy clay products. Freshour Bros. produced building and paving sand and gravel. Malvern Gravel Co. operated a fixed plant, producing paving sand and gravel. Crushed sandstone was crushed and used as refractory stone ganister by Harbison-Walker Refractories Co. and Coogan Gravel Co. Quartz crystals were produced by J. P. Bauer from deposits near Hot Springs. Two dry exploratory wells were drilled.

Howard.—The only cement-manufacturing plant in Arkansas was owned and operated by the Ideal Cement Co. near Okay, Ark. The company mined chalk, marl, and limestone for use in manufacturing cement. During the year the company signed a contract for work necessary to improve its facilities; the estimated cost of the improvements was about $1 million. Structural and paving sands and gravels were produced by the Mississippi Valley Construction Co. and John Watson.

Independence.—Manganese ore shipped by nine producers was the most important mineral commodity in Independence County. Lime for industrial use, chemicals, and building was produced by Batesville White Lime Co. Galloway Sand & Gravel Co. operated a dredge to produce structural sand. Limestone was quarried and crushed by the Batesville White Lime Co. for use in concrete, as roadstone, and as a soil conditioner. Dimension sandstone for rough construction was quarried by Bristow Stone Co. and Salado Stone Co.

Izard.—The county continued to rank second in the State in production value of stone and third in sand and gravel. Glass sand was produced by the Silica Products Co., Inc., plant near Guion. Crushed limestone for use as a metallurgical flux and for concrete aggregate, roadstone, soil conditioner, asphalt filler, poultry grit, and lime was produced by the Aluminum Company of America and the Arkansas Limestone Co.

Jackson.—Sand and gravel for structural and paving uses was quarried by Allbright Bros. Construction Co. and dredged by Mobley Construction Co., Inc., from deposits near Newport.

Jefferson.—Structural sand and gravel was produced by Pine Bluff Sand & Gravel Co. McGeorge Contracting Co. quarried crushed limestone for use as concrete aggregate and roadstone.

Johnson.—The county ranked second (first in 1955) in coal production during the year. Coal mined in the western part of the county was sold almost exclusively to steel mills because of its coking qualities. Coal from the eastern part of the county was destined chiefly for domestic consumption. Eureka Brick & Tile Co. mined clay for manufacturing heavy clay products. Dimension sandstone was quarried by the Texas Ledge Stone Co. near Lamar for dressed stone and by Clarksville Ledge Stone Co. for use as rubble. Natural gas also was produced.

Lafayette.—The county ranked first in the State in the production of byproduct elemental sulfur, second in natural gas and natural-gas liquids, and fourth in the value of total minerals produced and in the production of petroleum. Exploratory drilling for petroleum was disappointing, because 36 dry holes were drilled. Of 39 development wells drilled in 1956, 23 were completed as oil producers, and 16 were dry. Paving and structural sand and gravel were produced by Meriwether Gravel Co., Inc., Lambert & Barr, International Paper Co., and Graves Bros. Construction Co. Olin Mathieson Chemical Corp. recovered elemental sulfur from natural gas by the Mathieson process.

Lawrence.—Black Rock Sand & Gravel Co. operated a fixed plant to produce structural sand and gravel and also pea gravel.

Lincoln.—Structural and paving sand and gravel were produced by Glover Bros. at their fixed plant and by Willie Keel and Linwood Smith.

Little River.—Ark-La Lime Co. quarried, crushed, and ground limestone for use as soil conditioner. Structural and paving sand and gravel were produced by Braswell Sand & Gravel Co. One dry exploratory well was drilled.

Logan.—The county continued to rank third in the production of bituminous coal. Two mines used manual methods to mine coal, while 1 mine used machines. Dressed dimension sandstone was quarried by Logan County Building Stone Co. and Schwartz Bros. Sandstone was quarried and used for rubble and rough construction by the Arkansas Ledge Stone Co., Rainbow Stone Co., and Wurst & Vassaur.

Lonoke.—Granite was quarried and crushed for use as concrete aggregate and roadstone by the Lonoke County Highway Department.

Madison.—Limestone was crushed and used as soil conditioner by War Eagle Lime Co.

Marion.—Structural and paving sand and gravel were produced by Freshour Bros.

Miller.—The county was the second-ranking producer of sand and gravel, fourth-ranking producer of natural-gas liquids, and fifth-ranking producer of petroleum in the State. Seventeen dry exploratory wells were drilled. Development drilling of 63 wells resulted in 40 oil producers, 1 gas producer, and 22 dry holes. Gifford-Hill & Co., Inc., Graves Bros. Construction Co., General Construction Co., and Lambert & Barr produced sand and gravel for structural, paving, and railroad-ballast uses. W. S. Dickey Clay Manufacturing Co. mined fire and miscellaneous clays for manufacturing heavy clay

products at the company plant near Texarkana, Tex. Ark-La Oil Co. operated its natural-gasoline and cycle plant at Rodessa.

Mississippi.—Structural and paving sand and gravel were produced by the Mississippi Valley Construction Co. and Elliott Sartain & Co.

Montgomery.—Slate was quarried, ground, and crushed to form granules and flour by Bird & Son, Inc., for self use. Quartz crystal was produced by Coy Drain.

Nevada.—The county ranked sixth in petroleum production. Twenty-one dry exploratory wells were drilled. Development drilling resulted in 80 oil-productive wells and 45 dry holes. Structural and paving sand and gravel were produced by Graves Bros. Construction Co., Hignight Nursery, and Stevens Bros. Sand & Gravel Co. Natural gas was also produced.

Ouachita.—The county ranked third in the State in the value of total minerals produced and third in petroleum produced. Nine exploratory wells were drilled; 1 was completed as an oil producer, and 8 were dry. During the year 275 development wells were drilled, 246 were completed as oil producers, and 29 were dry holes. Structural and paving sand and gravel were produced by B. & G. Dredging & Towing Co., Graves Bros. Construction Co., Floyd Hughes, Pine Bluff Sand & Gravel Co., and Standard Gravel Co. Hope Brick Works mined clay for manufacturing brick and heavy clay products, including structural tile.

Perry.—Structural and paving sand and gravel were produced by Reynolds and Williams.

Phillips.—Paving sand and gravel was produced by Central State Dredging Co. and Sam Finley, Inc.

Pike.—All gypsum mined in Arkansas was from Pike County and was produced by Arkansas Gypsum Co.

Diamonds, with an estimated value of over $19,000, were found by gem collectors in "The Crater of Diamonds," which is operated by Howard A. Millar. Paving sand and gravel was produced by Arkansas Gypsum Co. and Lucille M. Frey.

Poinsett.—Pit-run paving gravel was produced by Nelson Crowder and W. G. Newberry.

Polk.—After a lapse of several years, Will H. Hargus started mining manganese ore in the county. W. S. Dickey Clay Manufacturing Co. mined shale for manufacturing of heavy clay products. Limestone was quarried and crushed for railroad ballast by Arkhola Sand & Gravel Co.

Pope.—Structural and paving sand and gravel were produced by Mobley Construction Co., Inc., and Pope County Highway Department. United States Army Corps of Engineers quarried sandstone for riprap. Three exploratory wells were drilled; 1 was completed as a gas producer, and 2 were dry holes. Two development wells were drilled; 1 was completed as a gas producer, and 1 was dry. Natural gas also was produced.

Pulaski.—The county ranked first in the State in the output of sand and gravel, first in stone, and second in high-alumina clays. Significant quantities of bauxite were produced during the year. Bauxite was mined by American Cyanamid Co., Dulin Bauxite

Co., and Reynolds Mining Corp. Several calcining, chemical, and activating plants in the county processed bauxite for abrasives, chemicals, and other industrial uses. Big Rock Stone & Material Co. quarried and processed quartzite sandstone and nepheline syenite for use as roofing granules, riprap, concrete aggregate, roadstone, and railroad ballast. Limestone was quarried and crushed for use as concrete aggregate and as roadstone by Ben Hogan, D. F. Jones, Reynolds & Williams, and Fell Vaughn. Sandstone was quarried and crushed for use as concrete and roadstone by United States Army Corps of Engineers. The State of Arkansas Highway Department quarried limestone and sandstone and processes these materials for use as concrete and roadstone. Artificially colored roofing granules were manufactured by the Minnesota Mining & Manufacturing Co. from nepheline syenite produced by Big Rock Stone & Material Co. Consolidated Chemical Industries, Inc., A. P. Green Fire Brick Co., and Dulin Bauxite Co. mined high-alumina bauxitic kaolinitic clay from large residual deposits south and southwest of Little Rock. Sand and gravel was quarried by Big Rock Stone & Material Co., Arkansas State Highway Department, Monroe Machinery Co., John D. Ott, and Horace A. Illing for structural, paving, and bank stabilization uses.

Vermiculite was exfoliated by the Zonolite Co. from crude vermiculite mined outside the State and processed in Arkansas. One dry exploratory well was drilled.

Randolph.—An iron mine was developed by A. J. Curry; the property was sold to Ray S. Pointer, who continued production during the year.

Saline.—Bauxite mining (85 percent of the Nation's total production) and aluminum production were the most important industries in the county. Bauxite deposits were mined either by open-pit or underground methods by Aluminum Company of America, Dulin Bauxite Co., Norton Co., and Reynolds Mining Corp. Approximately 85 percent of the bauxite was used for producing alumina in 2 large plants in the county. The remainder was processed by calcining and activating and by chemical plants. Lime for chemical and industrial uses was produced by Aluminum Company of America and Reynolds Metals Co. Milwhite Co., Inc., quarried and processed soapstone for use as asphalt filler, insecticide carrier, and roofing material and in manufacturing rubber. Structural and paving sand and gravel were produced by H. W. Ballard, H. L. Green, Mrs. Daisy Nalley, Newcomb & West Construction Co., Mrs. Kenneth Pelton, and Mike Richards Equipment Co. Slate was quarried and ground to produce slate flour by Milwhite Co., Inc. The county ranked fifth in the State in the total value of minerals produced.

Sebastian.—The county ranked first in production of coal, most of which was shipped to coking plants at steel mills. Natural gas, clay, sand and gravel, and stone also were produced commercially. Sand and gravel for construction, paving, and fill were dredged and processed by Arkhola Sand & Gravel Co. Acme Brick Co. mined clay for manufacturing brick and heavy clay products. Roscolite Co. mined clay for manufacturing lightweight aggregates. Dimension sandstone was quarried for rough construction by Dixie Stone Co. Limestone was quarried and crushed for concrete aggregate and roadstone

by Bob Dills. Of three gas-development wells drilled, 2 were completed as gas producers, and 1 was a dry hole. Athletic Mining & Smelting Co. operated a horizontal-retort zinc smelter at Fort Smith.

Union.—Union County ranked first in the State in total mineral production, which was valued at $24 million; it also ranked first in production of petroleum, fourth in natural gas, and third in natural-gas liquids. The county was the oldest and the most prolific gas producer in Arkansas. Exploratory drilling in 1956 resulted in only 2 gas wells and 38 dry holes. Development drilling of 308 wells resulted in 264 oil producers, 1 gas well, and 43 dry holes. Four petroleum refineries and 3 natural-gasoline and cycle plants were operated in the county. El Dorado Brick Works produced common and face bricks from clays mined near El Dorado.

Washington.—Stone, natural gas, and sand and gravel were produced commercially in the county. Limestone was quarried and crushed for use as concrete aggregate and roadstone by McClinton Bros. Paul Davis produced fill gravel.

White.—Sandstone was quarried and crushed by Acme Materials Co for use in manufacturing high-silica refractories.

The Mineral Industry of California

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the California Department of Natural Resources, Division of Mines.

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CALIFORNIA'S mineral production rose in value to a new peak of $1.6 billion dollars in 1956, exceeding the former high of 1955 by $100 million. This advance was not general; but most commodities shared in the increase. Gold, tungsten, natural gas, and natural-gas liquids were notable exceptions.

Owing to a sharp increase in its unit price, the greater value of the petroleum production alone contributed over $32 million of the rise. The quantity of petroleum produced dropped, however, below that in 1955, continuing a downward trend. This was attributed to gradual depletion of California's oil reserves despite intensive exploratory drilling and new production from minor fields. Also reflecting the waning reserves of mineral fuels, the total output of natural gas (of which 73 percent was wet gas), and natural-gas liquids fell below the previous year both in quantity and value, although 4 new dry-gas fields were discovered in 1956. The State's only producing carbon dioxide-gas well became inoperative in October.

The most noteworthy production advances among the nonmetallic minerals and commodities, both in quantity and value, were made by those utilized in the construction industry—cement, sand and gravel, and stone in particular. Gypsum and lime production also rose both in quantity and value. New home construction declined in 1956, but heavy construction activities and building repair and maintenance were sufficient to overshadow this slump. The demand for gypsum, limestone, lime, and industrial sands in other than the construction industry help to swell the outputs of these commodities. The quantity of crude perlite produced, as well as the total yield of pumice, pumicite, and volcanic cinder, dropped but higher unit prices for these materials (used largely in construction) resulted in increased values compared with 1955. The production of asbestos, slate, and mica continued to be minor.

California's salines industry prospered in 1956, and there were production increases, in both quantity and value of all minerals in this class. Value increases of boron minerals, sodium carbonate, salt,

[1] Commodity-industry analyst, Region II, Bureau of Mines, San Francisco, Calif.
[2] Supervisory statistical assistant, Region II, Bureau of Mines, San Francisco, Calif.

TABLE 1.—Mineral production in California, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Boron minerals	924,496	$33,816,464	944,950	$39,591,953
Cement—376-pound barrels	35,087,213	103,803,894	39,289,586	120,511,049
Chromite—gross weight	22,105	1,834,277	27,082	2,191,956
Clays	2,860,395	5,027,381	2,981,595	6,137,517
Coal (lignite)	7,650	76,500	12,000	120,000
Copper (recoverable content of ores, etc.)	613	457,298	859	730,150
Gem stones	[2]	[3]	[2]	90,000
Gold (recoverable content of ores, etc.)—troy ounces	251,737	8,810,795	193,816	6,783,560
Gypsum (crude)	1,307,625	3,273,724	1,399,390	3,401,606
Iron ore (usable)—long tons, gross weight	1,776,536	[3]	2,414,277	[3]
Lead (recoverable content of ores, etc.)	8,265	2,462,970	9,296	2,918,944
Lime	268,009	4,372,789	302,479	5,077,951
Magnesium compounds from sea water and bitterns (partly estimated) MgO equivalent	58,042	3,833,409	66,007	4,531,777
Manganese ore (35 percent or more Mn)[4]—gross weight	3,136	270,519	6,595	595,001
Mercury—76-pound flasks	9,875	2,867,206	9,017	2,343,699
Natural gas—million cubic feet	538,178	119,476,000	504,458	113,503,000
Natural-gas liquids:				
Natural gasoline and cycle products—thousand gallons	929,649	89,003,000	876,902	84,615,000
LP-gases—do	360,902	19,379,000	410,232	21,332,000
Peat	[3]	[3]	18,918	214,735
Perlite	15,653	125,113	15,119	134,861
Petroleum (crude)—thousand 42-gallon barrels	354,812	887,030,000	350,754	918,975,000
Pumice	797,306	1,099,459	634,356	2,333,809
Salt (common)	1,314,535	6,751,420	1,444,211	7,605,764
Sand and gravel	64,878,648	66,820,360	86,525,955	96,776,212
Silver (recoverable content of ores, etc.)—troy ounces	954,181	863,582	938,139	849,063
Stone	24,708,321	37,164,384	32,583,370	46,108,652
Strontium minerals	177	4,425	[3]	[3]
Sulfur ore—long tons	199,599	[3]	[3]	[3]
Talc, pyrophyllite, and soapstone	166,551	1,552,783	153,710	1,419,227
Tungsten concentrate—60-percent WO_3 basis	4,383	16,200,924	3,719	13,449,378
Zinc (recoverable content of ores, etc.)	6,836	1,681,656	8,049	2,205,426
Values that cannot be disclosed: Asbestos, barite, bromine, calcium-magnesium chloride, carbon dioxide, masonry cement (1956), diatomite, feldspar, abrasive garnet (1955), iodine, magnesite, mica, molybdenum, platinum group metals (crude), potassium salts, pyrites, rare-earth metal concentrate, slate, sodium carbonate and sulfate, recovered elemental sulfur, titanium iron concentrate (non-titanium use, 1955), uranium ore (1956), and values indicated by footnote 3	----------	[5] 55,689,169	----------	69,025,033
Total California [6]	----------	[5] 1,456,513,000	----------	1,555,263,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing company confidential data.
[4] Excludes shipments to Government low-grade depots and custom mills, but quantity and value for this material are as follows: 1955—manganese ore, 4,244 short tons, $292,637, and low-grade manganese ore, 18,395 short tons, $638,651 1956—manganese ore, 293 short tons, $19,630.
[5] Revised figure.
[6] Total has been adjusted to eliminate duplicating value of clays and stone included in cement and lime.

sodium sulfate, and magnesium compounds from sea water were the most outstanding. Gains were also made in yields of bromine, calcium chloride, and iodine. The increased tonnage of salt produced, due largely to greater use as a water softener and for chlorine manufacture, was noteworthy.

Although the total quantity and value of clays mined exceeded that in the preceding year, all classes of clays declined except miscellaneous clay used in cement and fireclay, which increased sharply owing to

TABLE 2.—Average unit value of selected mineral commodities produced in California, 1947–51 (average) and 1952–56 [1]

Commodity	1947–51 (average)	1952	1953	1954	1955	1956
Cement (average net mill realization) dollars per barrel	2.25	2.54	2.67	2.76	2.86	3.08
Copper [2] cents per pound	21.5	24.2	28.7	29.5	37.3	42.5
Gold [3] dollar per troy ounce	35.00	35.00	35.00	35.00	35.00	35.00
Iron ore (average value at mine) dollar per long ton	4.46	6.09	6.76	6.99	7.12	7.75
Lead [2] cents per pound	15.8	16.1	13.1	13.7	14.9	15.7
Mercury [4] dollars per 76-pound flask	106.22	199.10	193.03	264.39	290.35	259.92
Silver [5] cents per troy ounce	90.5	90.5+	90.5+	90.5+	90.5+	90.5+
Tungsten concentrate dollars per short-ton unit WO_3	33.54	63.44	[6] 62.46	[6] 62.61	61.79	57.90
Zinc [2] cents per pound	14.0	16.6	11.5	10.8	12.3	13.7

[1] Prices are discussed in detail in commodity chapters of volume I, Minerals Yearbook.
[2] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1947 includes bonus payments by Office of Metals Reserve for overquota production.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Average quoted price at New York.
[5] Treasury buying price for newly mined silver, July 1, 1946, to Dec. 31, 1947—$0.905; 1948–56—$0.9050505.
[6] Based on average of GSA purchases.

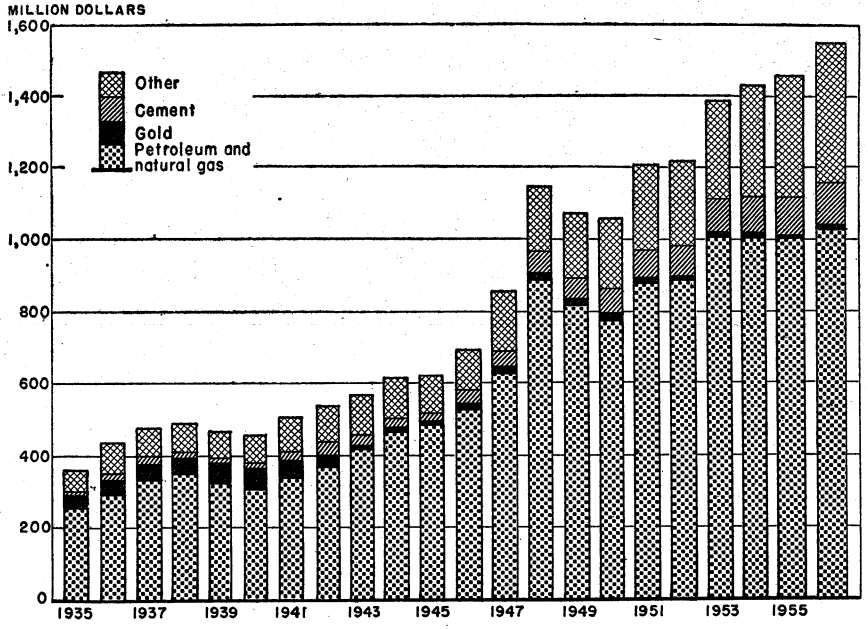

FIGURE 1.—Value of petroleum and natural gas, gold, cement, and total value of mineral production in California, 1935–56.

the sharp rise in demand for heavy clay products. The production of talc, pyrophyllite, and soapstone dropped moderately, because there was less demand for these materials as a carrier in insecticides and as a filler in rubber compared with 1955. The yield of feldspar had an apparent sharp rise owing to the classification of a large tonnage of feldspathic sand (produced in 1956) as crude feldspar. In 1955 a like tonnage of the material was produced and classified as glass sand.

The output of diatomite increased in 1956, continuing a trend. A new use—as lightweight aggregate—contributed to the rise. Only a small tonnage of barite was quarried during the year; however, relatively large shipments were made to grinding plants from mine stocks, largely for use in rotary-drilling fluids.

The tonnage of sulfur ore mined by California's only producer was below that in 1955. The magnitude of this output was controlled by the needs of the company copper-ore-leaching plant in Nevada. Conversely, the tonnage of sulfur recovered as a byproduct of petroleum refining increased over 1955 for this material. Pyrite production from the one active property lagged, as the operation was being converted from underground to open-pit mining. The output of strontium minerals was substantially above the small yield of 1955, filling the temporary needs of a Nevada manganese-ore concentrator. The small production of magnesite was below that in the preceding year, as demand lessened. The value of gem stones mined and collected in 1956, which was partly estimated, declined from 1955.

The producers of metals, with some notable exceptions, operated in a good climate in 1956, as prices and demand were generally favorable. Iron-ore production reflected California's record pig-iron output and rose to a new high. The output at smelters of lead and zinc from the State's ores increased, as did the shipments of molybdenum concentrate—a byproduct of tungsten milling. Copper production increased but continued to be minor, as there were no significant discoveries or developments of copper ore. The stability of Government purchasing was responsible for the increased production of chromite and manganese ores and concentrates. The added incentive of carlot purchases of chromite by the Government was instituted in

TABLE 3.—Principal custom mills, commercial grinding plants, and primary smelters in California in 1956

Name	County	Nearest city or town	Minerals processed	Remarks
Industrial Minerals & Chemical Co.	Alameda	Berkeley	Nonmetals	Contract grinding—minerals purchased.
Yuba Milling Co	do	Emeryville	do	Do.
American Smelting and Refining Co.	Contra Costa	Selby	Gold, silver, copper, zinc.	Smelter, refinery, and fuming plant.
El Diablo Mining Co	Inyo	Bishop	Tungsten ore and concentrates.	50-ton-a-day gravity concentrator.
Union Carbide Nuclear Co.	do	Pine Creek	do	1,000-ton-a-day flotation and chemical plant.
Macco Corp. (Champco)	Kern	Rosamond	Nonmetals	Commercial fine grinding.
Butte Lode Mining Co	do	Randsburg	Gold, silver, tungsten.	36-ton-a-day gravity concentrator.
American Minerals Co	Los Angeles	Los Angeles	Nonmetals	Commercial grinding.
Hill Bros. Chemical Co	do	do	do	Custom mill.
Southern California Minerals Co.	do	do	do	Contract grinding.
Kennedy Minerals Co	do	do	do	Commercial grinding.
Western Talc Co	do	do	do	Contract grinding.
Los Angeles Chemical Co.	do	do	do	Contract grinding—minerals purchased.
Piute Mining & Milling Co.	Mono	Bishop	do	50-ton-a-day gravity contractor.
Empire Star Mines Co., Ltd.	Nevada	Grass Valley	Gold and silver	500-ton-a-day amalgamation-cyanide mill.
Commercial Minerals Co.	San Francisco	San Francisco	Nonmetals	Contract grinding—minerals purchased.
Wildberg Bros. Smelting & Refining Co.	do	do	Gold, silver, platinum.	Smelting, refining, manufacturing.

1956. Tungsten-concentrate output slumped as the Government purchase program (in effect at the first of the year) came to a close in the latter part of 1956. Government buying paused during the interval while a new program was being drafted. Gold production fell sharply, primarily as a result of rising costs, which caused California's principal lode-gold mine to close. The mercury yield was below that in 1955, reflecting to some extent the lower average price but largely because two of the State's principal producers of the preceding year had curtailed output while exploring for new ore. Silver production, which normally reflects lead and zinc output, dropped in 1956—the result of lower silver content in the base-metal ores. The small yield of platinum from gold dredging was even below that in 1955. Production of rare-earth concentrates remained at about a par with the previous year, as the one producer sought a stable market. Uranium-ore production was reported for the first time, and shipments in the first 6 months of 1956 were below those in the latter half of 1955.

TABLE 4.—Sand and gravel, crushed stone, and portland cement sold or used in 1956, by method of transportation

Material	Tonnage transported, by method				
	Railroad	Motor truck	Waterway	Not stated[1]	Total
Sand and gravel (commercial)	6,640,105	66,006,260	----------	1,322,203	73,968,568
Crushed stone (commercial)	608,649	25,832,324	1,434,365	714,780	28,590,118
Portland cement	1,854,101	5,480,210	41,192	10,939	7,386,442
Total	9,102,855	97,318,794	1,475,557	2,047,922	109,945,128

[1] Includes interplant transfers to batching units, etc.

Government Programs.—There was increased activity under the Defense Minerals Exploration Administration (DMEA) program during the year. Twenty-three contracts were in effect during all or part of 1956, compared with 16 in 1955. Nine new contracts became active during 1956—4 for mercury and 1 each for copper-zinc, copper-nickel-cobalt, lead-zinc, tungsten, and uranium.

General Services Administration (GSA) initiated a Government carlot program for chromite in 1956—a program that was in effect for manganese ore in 1955. Shipments of chromite and manganese ores and concentrates and tungsten concentrates were accepted for payment by GSA and stockpiled at out-of-State depots. Only one California producer shipped manganese ore for stockpiling at a low-grade depot, and the tonnage was negligible compared with 1955. The Government purchase program included mercury, but the open-market value for this metal was above the purchase minimum throughout the year, and no purchases were made in 1956.

Employment in the Mineral Industries.—The number of workers employed by the mineral industries declined from 1955 figures; however, the number of employees engaged in nonmetal mining and quarrying rose substantially in line with California's greater nonmetal mineral production in 1956. Wages increased throughout all phases of the mineral industries during the year; metal-mining employees received the highest hourly advance. Although the employees in all segments of the industry enjoyed higher average weekly

TABLE 5.—Defense Minerals Exploration Administration contracts active during 1956

County and contractor	Property	Commodity	Contract		
			Date	Total amount	Government participation (percent)
ALPINE					
Wm. C. Morrison & Sons	Valpine	Tungsten	Sept. 22, 1954	16,000	75
BUTTE					
Helmke, Thomas & Janssen	Lambert	Chromite	Dec. 17, 1954	51,474	50
FRESNO					
Vance H. Hongola	Obelisk	Tungsten	Dec. 8, 1955	12,000	75
HUMBOLDT					
Providence Tuolumne Gold Mines, Inc.	Copper Bluff	Copper, zinc	June 18, 1953	58,820	50
INYO					
Harvey E. Briggs	Red Cloud	Lead, zinc	Mar. 24, 1952	23,980	50
Coso Uranium, Inc	White Swan	Uranium	Aug. 21, 1956	30,725	75
Helen & J. S. Wisdom	Bright Star	Tungsten	July 23, 1956	7,400	75
LAKE					
California Quicksilver Mines, Inc.	Abbott	Mercury	Sept. 15, 1951	163,540	75
MADERA					
Climax Molybdenum Co	Shadow Creek	Lead, zinc	May 28, 1956	100,040	50
NAPA					
Hugh M. Simmons	Granada	Mercury	June 28, 1955	17,800	75
Murray A. Schutz	Harrison	do	May 2, 1956	28,540	75
Toyon Mines Co	Toyon	do	Aug. 24, 1956	16,120	75
NEVADA					
Idaho-Maryland Mines Corp	Brunswick	Tungsten	Dec. 28, 1954	118,966	75
SAN BENITO					
New Idria Mining & Chemical Co.	West Idria	Mercury	July 18, 1952	265,126	75
Do	do	do	Apr. 4, 1955	129,331	75
SAN BERNARDINO					
Owl Springs Co., Inc	Owl's Head	Manganese	Jan. 17, 1956	32,800	75
SAN DIEGO					
Mac Afee & Co	Friday	Copper-nickel-cobalt.	Mar. 12, 1956	28,600	75
SAN LUIS OBISPO					
Smith & Biaggini	Buena Vista	Mercury	Oct. 18, 1956	11,060	75
Frank Vollmer	Oceanic	do	Feb. 28, 1955	6,639	75
SHASTA					
The Glidden Co	Bully Hill	Copper-zinc	Oct. 18, 1951	294,300	50
Shasta Copper & Uranium Co., Inc.	Shasta King	do	May 24, 1955	104,572	50
Shasta-Phelps Dodge Joint Venture.	Balaklala	do	Aug. 3, 1956	109,820	50
SONOMA					
Sonoma Quicksilver Mines, Inc.	Mount Jackson	Mercury	June 8, 1956	77,900	75
TRINITY					
Smith & Austin	Altoona	do	June 27, 1955	95,260	75

earnings, those engaged by the nonmetals industries received the greater gain because of a longer work week. The past several years (including 1956) have indicated a continuing trend toward a diminishing number of disabling work injuries in the mineral industries. This decline in fatal and nonfatal injuries has been less marked in metal mining due to the higher percentage of underground operations in this segment of the industry and the greater hazards involved. The influencing factors that have contributed most to the improved safety record have been: Enlarged and improved safety programs by most of the major producers of mineral commodities, better and more frequent coverage of operating facilities by State inspection agencies through a greater number of more technically trained personnel, and

TABLE 6.—Estimated number of nonsupervisory personnel in the mineral industry 1947–51 (average) 1952–56 [1]

Year	Metal mining	Mineral-fuel production	Nonmetallic mining and quarrying	Total
1947–51 (average)	3,400	24,700	5,600	33,700
1952	3,300	26,100	6,600	36,000
1953	3,200	27,400	6,600	37,200
1954	3,000	26,800	6,400	36,200
1955	3,300	27,400	6,600	37,300
1956	2,900	26,300	7,600	36,800

[1] Data from Division of Labor Statistics and Research, California Department of Industrial Relations, in cooperation with the Bureau of Labor Statistics.

TABLE 7.—Average wages and hours worked in the mineral industries, 1955–56 [1]

Industry	1955			1956		
	Average hourly rate	Average weekly earnings	Average hours worked per week	Average hourly rate	Average weekly earnings	Average hours worked per week
Metal mining	$2.03	$90.31	44.4	$2.25	$97.70	43.4
Mineral-fuel production	2.45	97.36	39.7	2.60	102.96	39.6
Nonmetallic mining and quarrying	2.32	95.82	41.3	2.49	105.24	42.4

[1] Data from Division of Labor Statistics and Research, California Department of Industrial Relations, in cooperation with the Bureau of Labor Statistics.

TABLE 8.—Fatal and nonfatal disabling work injuries, mineral industries, 1955–56 [1]

Industry	1955			1956			Disabling work injuries per 1,000 workers [2]	
	Fatal	Nonfatal	Total	Fatal	Nonfatal	Total	1955	1956
Metal mining	12	523	535	7	443	450	162	155
Mineral-fuel production	11	2,058	2,069	7	1,696	1,703	76	65
Nonmetallic mining and quarrying	9	457	466	5	447	452	71	59
Total	32	3,038	3,070	19	2,586	2,605	82	71

[1] California Department of Industrial Relations, Division of Labor Statistics and Research, California Work Injuries, 1956.
[2] A disabling work injury is defined as one that causes disability beyond the day of the accident.

the assistance afforded the mineral industries through the efforts of the Governor's Safety Conference, which has made the individual worker more safety conscious.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—No activity was reported at California antimony mines in 1956. The chief reasons for continued inactivity were low ore prices and excessive shipping distances to ore markets. Last reported production was in 1952. An undetermined quantity of recoverable antimony was contained in gold, lead, and lead-zinc ores shipped to lead smelters from mines in several counties.

Cadmium.—Zinc concentrate from ores of the Darwin and Shoshone mine groups in Inyo County contained an appreciable quantity of recoverable cadmium. The tonnage of cadmium recovered at zinc smelters outside the State was undetermined but was estimated to have been higher than in 1955 due to the increased output of zinc concentrate.

Chromite.—Aided to some extent by the Government chromite carlot program initiated in 1956, whereby carload lots of ore and concentrate were accepted by the Government at railheads, the total shipments of chromite ore and concentrate in California during 1956 exceeded those in the preceding year. Before this new regulation, the shippers of ore and concentrate paid the costs of carlot delivery to the Grants Pass (Oreg.) Purchase Depot. It was significant that consignments of direct-shipping ore containing less than 45 percent Cr_2O_3 decreased 12 percent and those with more than 45 percent Cr_2O_3 decreased 16 percent, while shipments of concentrate containing less than 45 percent and more than 45 percent Cr_2O_3 increased 84 and 13 precent, respectively, over the preceding year. In the transition to mining lower grade chromite ores (due to gradual depletion of high-grade deposits) fewer properties were worked in 1956 than in 1955.

The mining areas of the State, in the order of ore tonnage produced, were the Coast Range, Klamath Mountains, and the Sierra Nevada Range. The mining properties in the counties of the Coast Range yielded most of the milling-grade ore and had the highest output of chromite concentrate. The mines of the Klamath Mountains produced the greatest percentage of high-grade shipping ore. The Government bought the entire California production of chromite ore and concentrate for stockpiling. Chromite used in the State for manufacturing chromium salts and refractories, except for a small tonnage received from an Oregon deposit, was imported. California's major producers of chromite ore and concentrate were: Castella Mining & Milling Co., from the Lambert mine in Butte County; and Southwest Oil Co., from the Butler Estate in Fresno County.

Copper.—California's minor copper production was 859 tons from all sources in 1956—a 40-percent increase over 1955 and a high since 1951. Inyo County produced 73 percent of the State total, most of which was a byproduct of the tungsten ores of the Bishop (Pine

TABLE 9.—Shipments of chromite ore and concentrate in 1956, by counties

County	Active mines and prospects	Rank in State (by value)	Milling ore treated [1] (gross long tons)	Material shipped (dry weight, long tons)					Value
				Total wet weight (long tons)	Under 45 percent Cr_2O_3		Over 45 percent Cr_2O_3		
					Ore	Concentrate	Ore	Concentrate	
Butte	1	3	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Del Norte	28	5	595	1,922	403	1,310	18	156	$210,159
Fresno	3	2	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Glenn	1	9	548	219			24	183	21,872
Humboldt	1	12		(2)		(2)			(2)
Monterey	1	16		(2)		(2)			(2)
Napa	2	10	172	122	10	41		68	14,308
Placer	5	11		109	12	96			11,295
San Benito	2	7	1,003	408		7		368	43,629
San Luis Obispo	9	1	20,830	9,079	261	607	5,260	2,372	718,677
Santa Barbara	2	6	(2)	(2)	(2)	(2)		(2)	(2)
Siskiyou	22	4	2,796	2,102	38	990	103	841	215,666
Stanislaus	1	13	(2)	(2)				(2)	(2)
Tehama	14	8	853	423	40	126		230	41,343
Trinity	3	14		36	24	12			3,487
Undistributed	2	15	19,046	9,760	409	611	2,960	5,083	911,520
Total	97		45,843	24,180	1,197	3,800	8,365	9,301	2,191,956

[1] Partly estimated.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

TABLE 10.—Mine production of gold, silver copper, lead, and zinc in 1956, by counties, in terms of recoverable metals

County	Mines producing [1]		Gold					
			Lode		Placer		Total	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador, Calaveras, and Del Norte [2]	8	5	155	$5,425	281	$9,835	436	$15,260
Butte		8			72	2,520	72	2,520
El Dorado [3]	5	1	2,695	94,325	(3)	(3)	[3] 2,695	[3] 94,325
Fresno, Stanislaus, and Yuba [2 3]		7			[3] 76,363	[3] 2,672,705	[3] 76,363	[3] 2,672,705
Humboldt, Imperial, and Mono [2 4]	4		[4] 68	[4] 2,380			[4] 68	[4] 2,380
Inyo	18		1,704	59,640	2	70	1,706	59,710
Kern [3]	10	1	4,453	155,855	(3)	(3)	[3] 4,453	[3] 155,855
Los Angeles, Madera, and Plumas [2]	3	5	82	2,870	474	16,590	556	19,460
Mariposa [3]	7	1	1,565	54,775	(3)	(3)	[3] 1,565	[3] 54,775
Merced		1			27	945	27	945
Nevada	7	7	22,568	789,880	294	10,290	22,862	800,170
Placer [4]	2	11	(4)	(4)	420	14,700	[4] 420	[4] 14,700
Riverside	4		3	105			3	105
Sacramento		7			[4] 49,641	1,737,435	49,641	1,737,435
San Bernardino	26		209	7,315			209	7,315
San Diego, Shasta, Trinity, and Tuolumne [2]	14	9	285	9,975	6,291	220,185	6,576	230,160
Sierra	5	6	10,547	369,145	107	3,745	10,654	372,890
Siskiyou	3	4	15,035	526,225	475	16,625	15,510	542,850
Total	116	73	59,369	2,077,915	134,447	4,705,645	193,816	6,783,560

See footnotes at end of table.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals—Continued

County	Silver					
	Lode		Placer		Total	
	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador, Calaveras, and Del Norte [2]	7,644	$6,918	26	$24	7,670	$6,942
Butte			6	5	6	5
El Dorado [3]	1,741	1,576	(3)	(3)	[3] 1,741	[3] 1,576
Fresno, Stanislaus, and Yuba [2 3]			[3] 4,184	[3] 3,788	[3] 4,184	[3] 3,788
Humboldt, Imperial, and Mono [2 4]	[4] 47	[4] 42			[4] 47	[4] 42
Inyo	853,133	772,128	1	1	853,134	772,129
Kern [3]	15,215	13,770	(3)	(3)	[3] 15,215	[3] 13,770
Los Angeles, Madera, and Plumas [2]	286	259	66	60	352	319
Mariposa [3]	377	341	(3)	(3)	[3] 377	[3] 341
Merced			3	3	3	3
Nevada	7,434	6,728	49	44	7,483	6,772
Placer [4]	(4)	(4)	40	36	[4] 40	[4] 36
Riverside	226	205			226	205
Sacramento			2,166	1,960	2,166	1,960
San Bernardino	3,671	3,323			3,671	3,323
San Diego, Shasta, Trinity, and Tuolumne [2]	1,571	1,422	705	637	2,276	2,059
Sierra	2,134	1,931	10	9	2,144	1,940
Siskiyou	37,340	33,795	64	58	37,404	33,853
Total	930,819	842,438	7,320	6,625	938,139	849,063

County	Copper		Lead		Zinc		Total
	Pounds	Value	Pounds	Value	Pounds	Value	
Amador, Calaveras, and Del Norte [2]	235,500	$100,088	6,700	$1,052			$123,342
Butte							2,525
El Dorado [3]	67,800	28,815	10,600	1,664	2,700	$370	[3] 126,750
Fresno, Stanislaus, and Yuba [2 3]							[3] 2,676,493
Humboldt, Imperial, and Mono [2 4]	2,300	978					[4] 3,400
Inyo	1,255,500	533,588	18,523,400	2,908,174	16,044,800	2,198,138	6,471,739
Kern [3]	300	127	500	79	900	123	[3] 169,954
Los Angeles, Madera, and Plumas [2]	26,600	11,305					31,084
Mariposa [3]	500	212					[3] 55,328
Merced							948
Nevada							806,942
Placer [4]							[4] 14,736
Riverside	2,700	1,148					1,458
Sacramento							1,739,395
San Bernardino	92,900	39,482	34,500	5,416	8,800	1,205	56,741
San Diego, Shasta, Trinity and Tuolumne [2]	33,900	14,407	16,300	2,559	40,800	5,590	254,775
Sierra							374,830
Siskiyou							576,703
Total	1,718,000	730,150	18,592,000	2,918,944	16,098,000	2,205,426	13,487,143

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Combined to avoid disclosing individual output.
[3] El Dorado, Kern, and Mariposa Counties placer gold and silver combined with Fresno, Stanislaus, and Yuba Counties to avoid disclosing individual company confidential data.
[4] Placer County lode gold and silver combined with Humboldt, Imperial, and Mono Counties to avoid disclosing individual company confidential data.

Creek) district and the lead-zinc ores of the Darwin (Coso) district. Amador County was next highest, producing slightly more than 10 percent, and was followed by San Bernardino, with about 5 percent. Copper production from straight copper ore—largely from the West Belt district of Amador, Calaveras, and Madera Counties—was nearly 31 percent of the State total, which came from 38 mines in 13 counties.

Several new mines were opened, and abandoned workings of others were reactivated in response to price stimulation. However, the relatively small copper output in California reflected a dearth of deposits that could supply enough ore to warrant the capital outlay for beneficiation plants necessary to treat the California low-grade, and usually complex, copper ores. Copper ore and concentrate produced in the State were shipped to Washington, Utah, and Texas smelters. Some copper was recovered in matte form from ore and concentrate treated at lead smelters in California and Utah and from residues obtained at Montana zinc plants. The major copper producers in California during 1956 were: Union Carbide Nuclear Co., Bishop (Pine Creek) district, (tungsten ore) and The Anaconda Co., Darwin (Coso) district (lead-zinc ore), both in Inyo County; and Fitzgerald, Smith & Associates, West Belt district, Amador County (copper ore).

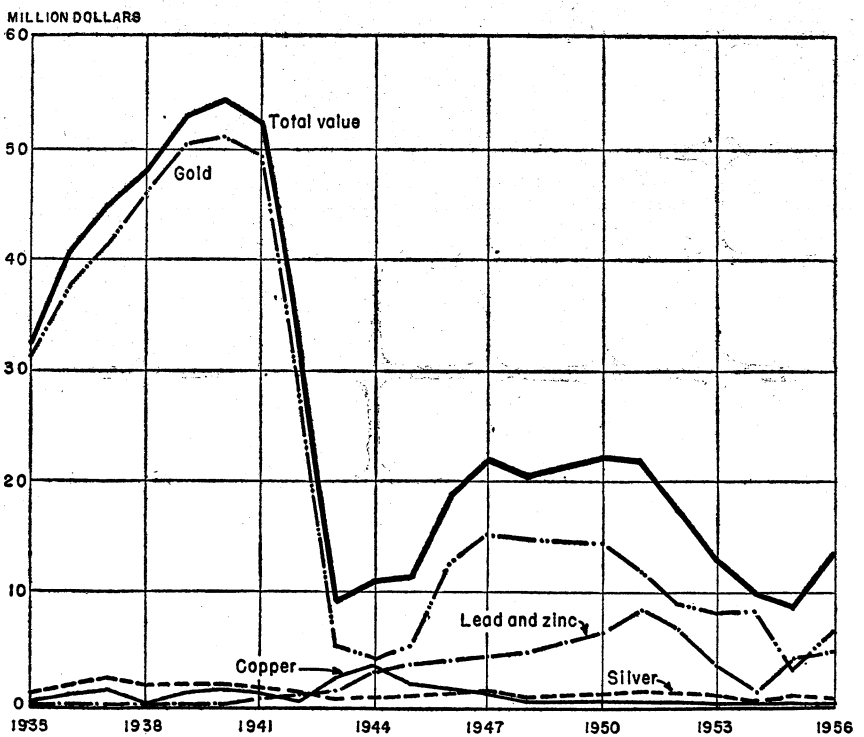

FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in California, 1935–56.

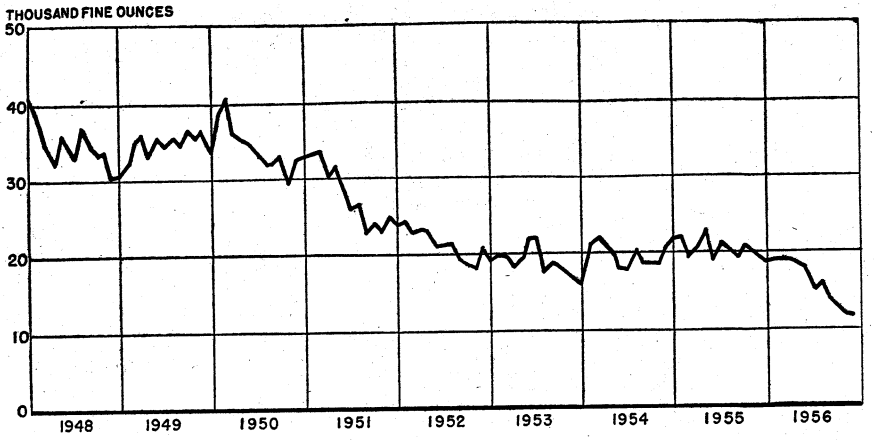

FIGURE 3.—Mine production of gold in California, 1948–56, by months, in terms of recoverable gold.

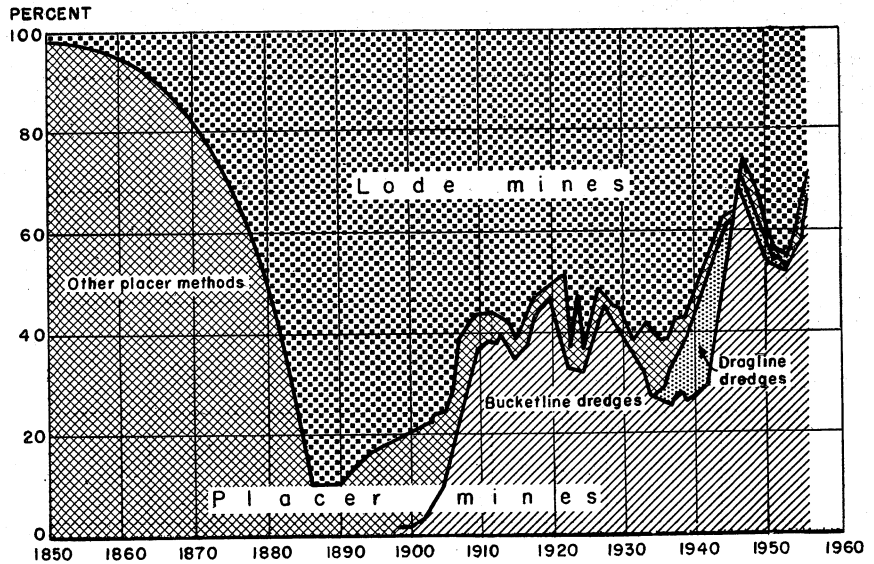

FIGURE 4.—Percentage of total California gold produced at lode and placer mines and by various methods of placer mining, 1850–1956.

TABLE 11.—Gold production at placer mines, 1947–51 (average), 1952–56, and total 1848–1956, by classes of mines and methods of recovery [1]

Class and method	Mines producing [2]	Washing plants (dredges)	Material treated (cubic yards)	Gold recovered		
				Fine ounces	Value	Average value per cubic yard
Surface placers:						
Gravel mechanically handled:						
Bucketline dredges:						
1947–51 (average)	18	31	85,005,140	230,842	$8,079,456	$0.095
1952	6	16	49,881,800	131,806	4,613,210	.092
1953	3	14	45,528,800	119,022	4,165,770	.091
1954	3	15	44,910,720	134,096	4,693,360	.105
1955	3	11	40,810,210	142,548	4,989,180	.122
1956	3	10	36,356,640	130,631	4,572,085	.126
Dragline dredges: [3]						
1947–51 (average)	25	22	3,287,700	16,083	562,891	.172
1952	7	7	1,447,700	6,655	232,925	.161
1953	8	7	302,600	935	32,725	.107
1954	9	9	179,400	1,466	51,310	.286
1955	7	7	131,710	589	20,615	.157
1956	7	7	328,010	871	30,485	.093
Suction dredges:						
1947–51 (average)	10	9	170,760	885	30,982	.196
1952	9	9	74,100	305	10,675	.144
1953	7	8	87,700	341	11,935	.136
1954	3	3	3,800	53	1,855	.488
1955	5	5	2,400	46	1,610	.670
1956	2	2	23,920	27	945	.040
Nonfloating washing plants: [3 4]						
1947–51 (average)	22	22	99,620	2,806	98,210	.624
1952	18	18	11,600	1,462	51,170	2.040
1953	24	24	40,800	1,143	40,005	.486
1954	24	24	8,820	2,298	80,430	.836
1955	18	18	80,140	1,865	65,275	.288
1956	18	22	2,520	1,624	56,840	1.583
Gravel hydraulically handled:						
1947–51 (average)	25	----------	•316,260	1,295	45,311	.167
1952	9	----------	53,100	409	14,315	.270
1953	16	----------	216,200	469	16,415	.076
1954	8	----------	43,600	235	8,225	.189
1955	7	----------	115,520	230	8,050	.070
1956	6	----------	9,090	101	3,535	.389
Small-scale hand methods: [5]						
1947–51 (average)	69	----------	256,762	4,761	166,642	.774
1952	48	----------	51,900	1,576	55,160	1.063
1953	53	----------	76,500	1,271	44,485	.583
1954	46	----------	119,800	1,802	63,070	.527
1955	28	----------	94,130	1,182	41,370	.439
1956	26	----------	19,281	1,029	36,015	.459
Underground placers:						
Drift:						
1947–51 (average)	11	----------	5,860	243	8,491	2.559
1952	11	----------	3,700	130	4,550	1.230
1953	12	----------	3,330	165	5,775	1.734
1954	17	----------	6,580	247	8,645	1.313
1955	14	----------	4,780	153	5,355	1.120
1956	11	----------	3,880	164	5,740	1.481
Grand total placers:						
1947–51 (average)	180	----------	89,142,102	256,914	8,991,983	1.002
1952	108	----------	51,523,900	142,343	4,982,005	.097
1953	123	----------	46,255,930	123,346	4,317,110	.093
1954	110	----------	45,272,720	140,197	4,906,895	.106
1955	82	----------	41,238,890	146,613	5,131,455	.122
1956	73	----------	36,802,790	134,447	4,705,645	.126
1848–1956	----------	----------	(6)	67,504,309	1,498,388,461	(6)

[1] For historical data by years, see Minerals Yearbook, Review of 1940, p. 219.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Includes commercial rock plants and tungsten mines that produced byproduct gold from gravels; byproduct gold is included with gold recovered, but material treated and average value per cubic yard refer only to straight gold dredging.
[4] Includes all placer operations using power excavator and washing plants, both on dry land; when washing plant is movable outfit is termed "dry-land dredge."
[5] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
[6] Complete data not available.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc 1947–51 (average), 1952–56, and total 1848–1956, in terms of recoverable metals [1]

Year	Mines producing [2]		Material sold or treated (short tons) [3]	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	222	180	542,373	404,394	$14,153,783	1,064,646	$963,542
1952	141	108	424,783	258,176	9,036,160	1,099,658	995,246
1953	150	123	390,583	234,591	8,210,685	1,036,372	937,969
1954	131	110	231,517	237,886	8,326,010	309,575	280,181
1955	130	82	304,519	251,737	8,810,795	954,181	863,582
1956	116	73	281,102	193,816	6,783,560	938,139	849,063
1848–1956			[4]	105,079,394	2,379,882,442	117,861,242	95,884,693

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	1,021	$437,980	11,861	$3,706,372	7,020	$2,030,865	$21,292,542
1952	800	387,200	11,199	3,606,078	9,419	3,127,108	17,151,792
1953	382	219,268	8,664	2,269,968	5,358	1,232,340	12,870,230
1954	362	213,580	2,671	731,854	1,415	305,640	9,857,265
1955	613	457,298	8,265	2,462,970	6,836	1,681,656	14,276,301
1956	859	730,150	9,296	2,918,944	8,049	2,205,426	13,487,143
1848–1956	633,944	205,491,260	259,053	51,164,691	146,386	34,564,890	2,766,987,976

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; tungsten ore; and ore, old tailings, slag, flue dust, and pyritic ore residue shipped to smelters during calendar year indicated.

[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

[3] Does not include gravel washed.

[4] Figure not available.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	18,704	75,821	59	740	594
February	18,776	77,611	55	748	647
March	18,933	83,478	102	739	791
April	18,931	99,894	101	826	703
May	18,689	83,312	70	930	637
June	18,232	89,340	73	1,004	630
July	15,260	76,539	95	789	588
August	16,025	80,276	69	819	749
September	13,835	65,584	45	769	703
October	12,707	70,580	61	734	706
November	11,982	64,386	59	578	673
December	11,742	71,318	70	620	628
Total	193,816	938,139	859	9,296	8,049

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation:					
Ore	[1] 24,705	4,333	----------	----------	----------
Total	24,705	4,333	----------	----------	----------
Cyanidation:					
Ore	26,181	45,210	----------	----------	----------
Total	26,181	45,210	----------	----------	----------
Total recoverable in bullion	50,886	49,543	----------	----------	----------
Concentration, and smelting of concentrates:					
Ore [2 4]	7,484	713,182	1,379,400	13,877,400	14,857,400
Total	7,484	713,182	1,379,400	13,877,400	14,857,400
Direct smelting:					
Ore [3 4]	999	168,094	338,600	4,714,600	1,240,600
Total	999	168,094	338,600	4,714,600	1,240,600
Placer	134,447	7,320	----------	----------	----------
Grand total	193,816	938,139	1,718,000	18,592,000	16,098,000

[1] Includes gold recovered as "natural gold."
[2] Includes tungsten-ore concentrate.
[3] Includes flue dust.
[4] Combined to avoid disclosing individual company confidential data.

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	78	90,190	57,062	59,102	3,400	10,800	3,600
Dry gold-silver	2	737	318	5,764	----------	----------	----------
Dry silver	3	168	----------	335	2,100	----------	----------
Total	83	91,095	57,380	65,201	5,500	10,800	3,600
Copper	38	14,866	292	10,758	529,500	7,500	----------
Lead	9	5,271	113	94,120	14,800	2,655,700	216,900
Lead-zinc	13	169,583	1,445	676,781	406,400	15,898,800	15,830,300
Zinc	2	76	2	983	100	2,900	6,400
Total	62	189,796	1,852	782,642	950,800	18,564,900	16,053,600
Other "lode" material:							
Tungsten ore and flue dust [2]	3	[3] 211	137	82,976	761,700	16,300	40,800
Total	3	[3] 211	137	82,976	761,700	16,300	40,800
Total "lode" material	116	281,102	59,369	930,819	1,718,000	18,592,000	16,098,000
Gravel (placer operations)	73	[4]	134,447	7,320	----------	----------	----------
Total, all sources	189	----------	193,816	938,139	1,718,000	18,592,000	16,098,000

[1] Detail will not necessarily add to total, because some mines produce more than one class of material.
[2] Combined to avoid disclosing individual company confidential data.
[3] Tungsten ore tonnage not included.
[4] 36,802,790 cubic yards. Does not include material washed at commercial gravel plants to produce 1,510 ounces of byproduct gold and 159 ounces of byproduct silver included in placer totals.

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For material treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Amador, Calaveras and Los Angeles [2]	10,000	32	8	581	104	7,297	181,700	6,700	
El Dorado	7,129	24	2	379	2,671	1,739	67,800	10,600	2,700
Inyo	159,053	9	2	32,068	1,209	694,366	1,103,700	13,859,600	14,853,800
Kern	1,383	1,789	2,565	25	2,419	8,038	300	500	900
Madera, Placer, and San Diego [2]	548	13	2	79	80	247	25,100		
Mariposa	435	1,476	355	7	75	11			
Mono	5	3							
Nevada	23,928	22,404	7,334	35	164	100			
Riverside	15	3	1						
San Bernardino	114			10	75	1,153	800		
Shasta, Trinity, and Tuolumne [2]	116	227	29	3	11	2			
Sierra	21,665	9,871	1,905	117	676	229			
Siskiyou	36,638	15,035	37,340						
Total: 1956	261,029	50,886	49,543	33,304	7,484	713,182	1,379,400	13,877,400	14,857,400
1955	293,309	94,708	83,150	30,010	9,376	663,466	1,160,900	13,327,700	13,213,900
BY CLASSES OF MATERIAL TREATED									
Dry gold: Crude ore	90,044	50,886	49,543	350	6,009	9,329	300	10,800	3,600
Dry gold-silver: Crude ore	70			7	73	1,152			
Copper: Crude ore and tungsten ore [2 3]	11,882			2,090	325	89,820	1,027,000	7,000	
Lead: Crude ore	5			1		33		100	
Lead-zinc: Crude ore	159,028			30,856	1,077	612,848	352,100	13,859,500	14,853,800
Total 1956	261,029	50,886	49,543	33,304	7,484	713,182	1,379,400	13,877,400	14,857,400
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]									
Dry gold				320	5,954	9,299	300	10,800	3,600
Dry gold-silver				7	73	1,152			
Copper				[4] 2,086	[4] 325	[4] 89,820	[4] 1,022,000	7,000	
Lead				14,890	512	509,429	230,600	10,798,100	1,514,800
Lead-zinc				3,708	507	51,272	17,100	2,434,300	441,100
Zinc				12,259	58	52,180	104,400	627,200	12,897,900
Cement copper				4			5,000		
Pyrite				30	55	30			
Total 1956				33,304	7,484	713,182	1,379,400	13,877,400	14,857,400

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Calaveras, Del Norte, and Humboldt [2]	399	21	344	56,100		
Imperial, Mono, and Plumas [2]	55	56	79	1,500		
Inyo	16,618	486	158,765	151,800	4,663,800	1,191,000
Kern	667	245	4,612			
Mariposa	25	14	11	500		
Riverside	143		225	2,700		
San Bernardino	1,778	134	2,518	92,100	34,500	8,800
Shasta, Trinity, and Tuolumne [2]	388	43	1,540	33,900	16,300	40,800
Total: 1956	20,073	999	168,094	338,600	4,714,600	1,240,600
1955	11,210	1,040	199,840	65,100	3,202,300	458,100
BY CLASSES OF MATERIAL						
Dry gold: Crude ore	146	167	230	3,100		
Dry gold-silver: Crude ore	667	245	4,612			
Dry silver: Crude ore	168		335	2,100		
Copper: Crude ore and flue dust [2]	3,167	102	3,625	264,000	12,700	40,200
Lead: Crude ore and flue dust [2]	5,294	115	94,376	15,000	2,659,700	217,500
Lead-zinc: Crude ore	10,555	368	63,933	54,300	2,039,300	976,500
Zinc: Crude ore	76	2	983	100	2,900	6,400
Total 1956	20,073	999	168,094	338,600	4,714,600	1,240,600

[1] Excludes concentrate treated only by amalgamation and/or cyanidation.
[2] Combined to avoid disclosing individual company confidential data.
[3] Tungsten ore tonnage not included with material treated.
[4] Includes concentrate and contained recoverable metal from tungsten ore.

TABLE 17.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	320	5,954	9,299	397	10,921	4,623
Dry gold-silver	7	73	1,152	4	22	
Copper	[1] 2,086	[1] 325	[1] 89,825	[1] 1,046,140	12,801	125,850
Lead	14,890	512	509,429	271,585	10,985,269	1,917,541
Lead-zinc	3,708	507	51,272	20,084	2,476,416	558,292
Zinc	12,259	58	52,180	106,693	660,174	13,201,895
Cement copper	4			5,191	15	
Pyrite	30	55	30	1	5	45
Total: 1956	33,304	7,484	713,187	1,450,095	14,145,623	15,808,246
1955	30,010	9,376	663,466	1,214,039	13,589,628	13,950,697
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold: Crude ore	146	167	230	3,433	17	60
Dry gold-silver: Crude ore	667	245	4,612			
Dry silver: Crude ore	168		335	2,200		
Copper: Crude ore and flue dust [2]	3,167	102	3,633	272,932	13,121	50,872
Lead: Crude ore and flue dust [2]	5,294	115	94,376	18,060	2,722,408	275,225
Lead-zinc: Crude ore	10,555	368	63,933	70,006	2,068,677	1,235,948
Zinc: Crude ore	76	2	983	192	2,971	8,061
Total: 1956	20,073	999	168,102	366,823	4,807,194	1,570,166
1955	11,210	1,040	199,910	71,406	3,368,492	582,374

[1] Includes concentrate and contained metal from tungsten ore.
[2] Combined to avoid disclosing individual company confidential data.

TABLE 18.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals [1]

County and district	Mines producing [2]		Lode material (short, tons)	Gold (fine ounces)			Silver (lode and placer [3] fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Amador County:											
East Belt [4]		1			26	26	4				$914
West Belt [5]	1	1	(6)	(6)	12	[7] 12	[7] 1	(6)	(6)		[7] 421
Butte County:											
		(6)			3	3					105
Butte Creek		1			13	13	1				456
Forbestown		3			27	27	3				947
Oroville		3			21	21	1				736
Yankee Hill											
Calaveras County:											
East Belt [4]	2	(6)	(6)	(6)	9	[7] 9	[7] 1				[7] 316
Mother Lode [9]	(6)	1	cleanup	8	(6)	[10] 8	[10] 2				[10] 282
West Belt [5]	3	1	633	4	(6)	4	[10] 308	51, 300			[10] 22, 221
El Dorado County: East Belt [4]	1	(6)	5, 590	2, 651	(6)	[10] 2, 651	[10] 945		10, 300	2, 700	[10] 95, 627
Inyo County:											
Deep Springs	1		50	2		2	59	4, 700			2, 121
Fish Springs	1		20	5		5	218		4, 700		1, 110
Independence (Russ)	1		20	3		3	61	1, 500	300		844
Modoc	2	(6)	(6)	(6)	2	[7] 2	[7] 1	(6)	(6)	(6)	[7] 71
Kern County:											
Clear Creek	1		29	30		30	12				1, 061
Kern River		(6)			47	47	10				1, 655
Randsburg	4	1	616	582	(6)	[10] 582	[10] 147				[10] 20, 503
Madera County: Chowchilla River		1			20	20	8				707
Mariposa County:											
East Belt [4]	2	(6)	(6)	(6)	2	[7] 2	(7)				[7] 70
Mother Lode	4	1	386	1, 467	(6)	[10] 1, 467	[10] 347				[10] 51, 659
Merced County: Merced River (Snelling)		1			27	27	3				948
Mono County: Cooney Lake	1		5	3		3					105
Nevada County:											
Chicago Park		(6)			4	4					140
French Corral		3			64	64	7				2, 246
Grass Valley-Nevada City	3	1	(6)	(6)	8	[7] 8	(7)				[7] 280
Washington-North Columbia	2	2	210	84	(6)	84	(10)				[10] 2, 940
Placer County:											
American River (Folsom) [11]		(6)			10	10	2				352
Auburn	1	(6)	(6)		19	19	[7] 3				[7] 668
Colfax		(6)			18	18	1				631
Dutch Flat	(6)	(6)	(6)	(6)	35	[7] 35	[7] 2				[7] 1, 227
Rocklin		2			22	22	1				771
West Belt [5]		(6)			1	1					35
Plumas County:											
Granite Basin		(6)			13	13	1				456
La Porte		(6)			15	15	2				527

Sacramento County: American River (Folsom)[11]		7			49,641	49,641	2,166				1,739,395
San Bernardino County:											
Dale	3		97	44		44	148	2,200			2,609
Spangler	1		1				8		100		23
Whipple Mountains	6		356	38		38	41	13,800			7,232
Shasta County:											
French Gulch	1	(6)	(6)	(6)	10	[7] 10	[7] 4				[7] 353
Redding	1	1	6	2	(6)	[10] 2	(10)				[10] 70
Sierra County:											
Gibsonville		(6)			3	3					105
Poverty Hill		1			5	5	1				176
Trinity County:											
Cinnibar		1			1	1					35
Trinity River	1	6	(6)	(6)	6,103	[7] 6,103	[7] 688	(6)			[7] 214,227
Tuolumne County: East Belt[4]	3		23	102		102	4				3,574
Yuba County:											
Bear River		(6)			27	27	4				949
Dobbins		(6)			14	14					490
Smartville		(6)			1	1					35
Strawberry		(6)			6	6	1				211
Undistributed[12]	70	34	273,060	54,344	78,218	132,562	932,923	1,644,500	18,576,600	16,095,300	11,304,507
Total	116	73	281,102	59,369	134,447	193,816	938,139	1,718,000	18,592,000	16,098,000	13,487,143

[1] Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts are listed in footnote 12 and their output grouped as "Undistributed."

[2] Excludes itinerant prospectors, "snipers", "high-graders," and others who gave no evidence of legal right to property.

[3] Source of total silver as follows: 930,819 ounces from lode mines and 7,320 ounces from placer mines.

[4] East Belt district lies in Amador, Calaveras, El Dorado, Mariposa, and Tuolumne Counties.

[5] West Belt district lies in Amador, Calaveras, and Placer Counties.

[6] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[7] Exclusive of lode output, which is included with "Undistributed."

[8] From property not classed as a mine.

[9] Mother Lode district lies in Calaveras and Mariposa Counties.

[10] Exclusive of placer output, which is included with "Undistributed."

[11] American River (Folsom) district lies in Placer and Sacramento Counties.

[12] Includes the following districts: Cosumnes River and Mother Lode, Amador County; French Hill, Del Norte County; Mother Lode and West Belt, El Dorado County; San Joaquin (Friant), Fresno County; Horse Mountain, Humboldt County; Cargo Muchacho, Imperial County; Bishop, Darwin (Coso), Furnace Creek (Greenwater), Lee, Le Moigne, Resting Springs (Tecopa), Sherman South Park and Ubehebe, Inyo County; Greenhorn, Mohave and Sageland, Kern County; Neenach and San Gabriel, Los Angeles County; Fresno River (Dennis) and West Belt (Daulton), Madera County; West Belt, Mariposa County; Masonic, Mono County; Graniteville-Bowman and You Bet (Little York), Nevada County; Dairy Farm, Foresthill, Iowa Hill, Last Chance, Lincoln and Ralston Divide, Placer County; Greenville, Quincy and Red Rock, Plumas County: Bendigo, Corona and Dale, Riverside County; Barstow, Clark Mountain, Fry Mountains, Ivanpah, Kingston, Morongo, Needles, Newberry, Ord Mountain, Signal, Solo and Turtle Mountain, San Bernardino County; Julian and Pine Valley, San Diego County; Cow Creek (Ingot), Flat Creek (Kennett) and Shasta, Shasta County; Alleghany, Downieville, Gold Lake, Pike (Indian Hill) and Poker Flat (Port Wine), Sierra County; Klamath River, Salmon River, Scott River and Shasta River, Siskiyou County; Stanislaus River, Stanislaus County; Hayfork and New River, Trinity County; Mother Lode, Tuolumne County, Comptonville, Challenge (Brownsville) and Yuba River, Yuba County; and "Undistributed" for various counties.

Gold.—The 1956 gold output dropped sharply—to the lowest point since 1945. This was due largely to the narrowing margin between operating costs at the gold mines and the fixed gold price, and, more specifically, to the closing of the Empire Star group of mines in Nevada County during the year. The property was shut down during a labor strike over wages and did not reopen. Over 100 lode mines in 23 counties produced 280,000 tons of ore, which yielded nearly 60,000 ounces of gold. Eighty-six percent of this yield was recovered as bullion from amalgamation and cyanidation processes. Recoveries from smelting concentrates and ores were about 12 and 2 percent, respectively.

Placer mines contributed a large percentage of the total gold produced in the State. In 1956 placer production was 69 percent of the total yield compared with 58 percent in 1955. The quantity of placer gold recovered (from 10 percent fewer properties) was 8 percent lower than in 1955. Most of the production came from bucket-line dredging in the Trinity River (Weaverville) district, Trinity County; the American River (Folsom) district, Sacramento County; and the Yuba River district, Yuba County. Although the United States Mint at San Francisco had suspended making coinage in March 1955, it continued to be a principal depository of gold and silver bullion produced in California during 1956. The American Smelting and Refining Co. gold and silver refinery at Selby also received noteworthy shipments of bullion. The following leading gold producers supplied most of the State's total output: Natomas Co., Sacramento County (dredging); Yuba Consolidated Gold Fields, Yuba County (dredging); Empire Star Mines Co., Ltd., Nevada County (gold ore); and Siskon Corp., Siskiyou County (gold ore).

Iron Ore.—California iron-ore production in 1956, from two counties, was a direct reflection of the increased demand by western industry for steel products. The mine output at the Eagle Mountain mine of the Kaiser Steel Corp., Riverside County, was up over 40 percent compared with 1955. In addition to supplying the needs of the company Fontana steel plant, approximately 150,000 tons of ore was shipped for export—an increase of more than 100 percent over the preceding year. Although the average grade of mine-run ore was lower, the tonnage beneficiated and shipped to furnaces increased nearly 50 percent above 1955.

The iron-ore output in San Bernardino County was limited to two producers. One operator worked only during the last 2 months of the year and shipped iron ore to the Fontana blast furnaces. The other operated in December only and produced a low-grade ore that was used in a San Bernardino County plant as an additive to portland cement. The average grade of the ore shipped in the State in 1956 was 53.3 percent compared with 54.5 in 1955.

Iron and Steel.—Pig-iron production in California in 1956 was more than 1.4 million tons and was the product of 3 blast furnaces operated by Kaiser Steel Corp. at Fontana (San Bernardino County). The annual capacity of these furnaces was reported at 1,314,000 tons, indicating that yield was nearly 100 percent of capacity in 1956 and 17 percent greater than in 1955. Approximately 85 percent of the pig-iron output was used at the Fontana plant to make steel; the remainder was sold to Pacific coast foundries and other steel producers

and exported. The pig iron used in steelmaking by the Pittsburg and Torrance plants of Columbia-Geneva Steel Division, United States Steel Corp., was received from the company Geneva (Utah) blast furnaces.

TABLE 19.—Iron ore and other metallic materials consumed and pig iron produced, 1947–51 (average) and 1952–56, in net tons

Year	Iron and manganiferous iron ores		Sinter [1]	Miscellaneous	Total	Pig iron produced
	Domestic	Foreign				
1947–51 (average)	507,434	1,818	388,886	92,630	990,768	563,701
1952	952,606		612,356	172,227	1,737,189	977,121
1953	987,471		805,938	150,504	1,943,913	1,095,118
1954	752,766		650,609	134,768	1,538,143	860,162
1955	1,008,256		800,929	134,358	1,943,543	1,122,091
1956	1,256,344		1,094,319	110,857	2,461,520	1,409,105

[1] Excludes recycled materials.

The production of steel ingots and steel for castings in 1956 exceeded 3.1 million tons, 8 percent above the 1955 figure, and represented 96 percent of the capacity for all California steel plants. The active steel plants operating open-hearth furnaces during the year were: Kaiser Steel Corp., at Fontana in San Bernardino County (9 furnaces); Columbia-Geneva Steel Division, United States Steel Corp., at Pittsburg in Contra Costa County (5 furnaces) and at Torrance in Los Angeles County (4 furnaces); Bethlehem Pacific Coast Steel Corp., at South San Francisco in San Mateo County (5 furnaces); and Pacific States Steel Corp., at Niles, and Judson Steel Corp., at Emeryville, in Alameda County (3 furnaces each). Three steel companies, all in Los Angeles County, produced steel during 1956, using electric furnaces. They were: Bethlehem Pacific Coast Steel Corp. (3 furnaces) and Southwest Steel Rolling Mills (1 furnace) at Los Angeles; and National Supply Co., at Torrance (3 furnaces). The 36 furnaces at 9 plants had an annual rated capacity of 3,280,000 tons of steel ingots and castings.

Lead.—The quantity of lead produced in 1956 was 12 percent above 1955. The high yield was attributed principally to an average 5-percent metal-price increase for the year. Inyo County produced a very high percentage of California's entire output, and within the county the Darwin group of mines in the Darwin (Coso) district and the Shoshone group in the Resting Springs district produced most of the county total. Other production in Inyo County was from the Modoc, Lee, Ubehebe, and Fish Springs districts. The lead-zinc ores yielded the greatest quantity of lead, followed by the ores of lead, gold, copper, and zinc. The Anaconda Co. was the leading lead producer, followed by Foreman & Foreman, Modoc district; Norris & Bracken, Lee district; and Lippincott Lead Mines, Ubehebe district (all in Inyo County).

Because the second largest use for lead has been in tetraethyl lead for gasoline antiknock compounds, it was interesting to note that one new California plant began producing these compounds in 1956, and plans were announced for constructing another. American Smelting and Refining Co. operated California's only major smelter treating

primary nonferrous material at Selby (Contra Costa County). At Ontario (San Bernardino County) Lippincott Lead Co. smelted lead scrap in conjunction with lead ore from its Lippincott (Lead King) mine in Inyo County. The lead bullion was utilized locally in storage batteries.

Manganese.—For the fourth year the quantity of metallurgical-type manganese ore produced in California declined. Contrary to previous years, important tonnages of low-grade manganese ore were concentrated at Riverside County mills. One of these concentrators custom-milled ores from Imperial County. A high percentage of the ore and concentrate came from open-pit and underground mines in the Little Maria Mountains, Riverside County. Except for one operator in Lake County who shipped to the low-grade depot at Butte, Mont., all shipments were to Government stockpiles on the carlot program. Manganese concentrates comprised 60 percent of all shipments during the year. No low-grade ore or concentrates were shipped in 1956. California Limestone Products, in the Ironwood district of Riverside County, was California's leading shipper of manganese ore and concentrate. Aspen Mining Co., in the same district, operated California's only mill that concentrated low-grade manganese ores and was an important producer of manganese concentrate and ore from its Black Jack mine. Wm. L. Ash (Mt. Hough mine, Plumas County), Walter S. Thing (Black Point and Tadpole mines, Imperial County), and S & C Mining Co. (South Thomas mine, Mendocino County) mined and shipped appreciable tonnages of manganese ore. Activity under DMEA projects was limited to one contract executed in San Bernardino County and one contract termination in Plumas County.

TABLE 20.—Mercury produced in 1956, by counties

County	Producing mines	Ore treated (short tons)	Mercury recovered	
			76-pound flasks	Value [1]
Fresno	3	324	26	$6,758
Lake	9	25,778	2,482	645,121
Monterey	2	10	2	520
San Benito	12	30,029	2,914	757,407
San Luis Obispo	6	1,550	117	30,411
San Mateo	1	6,766	532	138,277
Santa Clara	3	6,676	1,905	495,148
Trinity	3	62	10	2,599
Undistributed [2]	32	14,918	1,029	267,458
Total	71	86,113	[3] 9,017	2,343,699

[1] Value calculated at average price at New York—$259.92 per flask.
[2] Includes Del Norte, Kings, Marin, Merced, Napa, San Bernardino, Santa Barbara, Sonoma, and Stanislaus Counties to avoid disclosing individual company confidential data.
[3] Includes mercury from dump and placer material treated.

Mercury.—The production of mercury in 1956 continued the decline begun the preceding year, in spite of an increase of 31 operators and 22 producing operations. Only 13 producers in 6 counties reported a yield for the year of 100 or more flasks. Over 50 percent of California's mercury operations yielded less than 10 flasks each for the entire year. Despite these circumstances, in 1956 California produced

TABLE 21.—Mercury produced, 1947–51 (average) and 1952–56, by methods of recovery

Year	Furnaced [1]		Retorted		Unclassified [2]	Total		Operating mines
	Ore (short tons)	76-pound flasks	Ore (short tons)	76-pound flasks	76-pound flasks	76-pound flasks	Value [3]	
1947–51 (average)	62,785	7,641	603	254	300	8,195	$772,562	19
1952	82,431	6,992	1,239	202	47	7,241	1,441,683	24
1953	95,325	8,874	1,556	343	73	9,290	1,793,249	28
1954	110,445	10,525	10,100	724	13	11,262	2,977,560	35
1955	122,937	8,671	5,982	1,077	127	9,875	2,867,206	49
1956	76,801	6,991	9,312	1,971	55	9,017	2,343,699	71

[1] Includes ore and mercury from dumps not separable.
[2] Includes mercury recovered from miscellaneous dump material, placer, and cleanup operations.
[3] Value calculated at average price at New York.

37 percent of the domestic mercury. Three counties (Lake, San Benito, and Santa Clara) furnished over 80 percent of the State's entire production. The major mercury producers in 1956 were: New Idria Mining & Chemical Co., Idria district, San Benito County; and California Quicksilver Mines, Inc., Sulfur Springs district, and Bradley Mining Co., Mayacmas district, both in Lake County. Activity under DMEA projects continued high during the year. Out of 10 contracts for exploration and development of mercury deposits in effect, only 2 (1 each in Lake and Napa Counties) were terminated.

Molybdenum.—California's entire output of molybdenum concentrates was produced by an operator in the Pine Creek area, Inyo County. Molybdenite and powellite concentrates were recovered as byproducts in the treatment of tungsten ores. The concentrates were sold for export.

Platinum.—The quantity of platinum recovered as a byproduct from gold dredging in Sacramento and Yuba Counties was only slightly over half that in the preceding year. Most of the 1956 production came from the Yuba River district (Yuba County).

Rare-Earth Metals.—California's output of rare-earth minerals in 1956 originated in the Molybdenum Corp. of America open-pit mine in northeastern San Bernardino County. The deposit adjoins U. S. Highway 91 in the Mountain Pass area. The mined ore contained about 10 percent of rare earths and 25 percent of barite. Bastnaesite—a fluocarbonate of the cerium subgroup of the rare-earth metals—was recovered by flotation as a concentrate containing about 60 percent rare-earth oxides. Part of the concentrates received further treatment by acid leaching and roasting to produce a concentrate containing above 90 percent of rare-earth oxides. Shipments of both grades of concentrates were made to consumers, part going to the Pennsylvania plant of the company for further treatment and basic research on extraction of the rare-earth elements. Production exceeded shipments, and stocks at year's end were appreciable. The barite tailings from the flotation process have been impounded, awaiting a possible future market.

Silver.—The quantity of silver produced in 1956 dropped less than 2 percent below that in 1955, largely because of the increased activity in lead- and zinc-ore production, from which silver was a byproduct metal. Inyo County was the source of 91 percent of the State total,

most of which came from the lead-zinc ores of mines in the Darwin (Coso) and Resting Springs districts and the tungsten ore of the Bishop district. Less than 1 percent was produced by placer mines as the coproduct of gold. Output was supplied by 148 lode mines and 64 placer mines in 29 counties. The major silver producers, both in Inyo County, were The Anaconda Co., Darwin (Coso) district (lead-zinc ore); and Union Carbide Nuclear Co., Bishop district (tungsten ore).

TABLE 22.—A. Tungsten concentrates produced in 1956, by counties in which ore was milled

County	Producing mines and prospects	Ore [1]			Concentrates produced [1] (pounds)	Contained WO_3 [1] (units)
		Mined (short tons)	To mills (short tons)	Milled [2] (short tons)		
Alpine	5	555	555			
Calaveras	1	20	20	20	225	7
El Dorado	2	(3)	(3)	(3)	(3)	(3)
Fresno	13	5,922	5,922	6,005	51,906	1,701
Inyo	54	274,285	276,933	[4] 278,533	[4] 4,276,811	[4] 152,106
Kern	45	5,862	4,913	4,189	53,413	1,695
Los Angeles				460	4,880	151
Madera	8	16,433	16,433	15,942	158,489	5,617
Mariposa	8	279	279	781	6,727	230
Mono	10	166,046	168,287	167,675	2,102,812	65,912
Nevada	1	(3)	(3)	(3)	(3)	(3)
Placer	1	(3)	(3)	(3)	(3)	(3)
Riverside	5	71	71	11	122	4
San Bernardino	21	49,229	49,229	49,759	516,505	16,450
San Diego	3	1,196	1,196	943	10,189	330
Tulare	34	28,101	28,091	28,060	232,368	7,319
Tuolumne	1	(3)	(3)	(3)	(3)	(3)
Undistributed [5]		12,607	12,607	12,028	112,480	4,303
Total	212	560,606	564,536	564,406	7,526,927	255,825

B.—Production and shipments of tungsten concentrates in 1956 credited to California counties in which ore was mined

County	Concentrates				
	Produced [1]		Shipped		
	Pounds	Units	Pounds	Contained WO_3 Units	Value [6]
Alpine	20,245	661	20,245	661	$36,990
Calaveras	225	7	225	7	432
Fresno	51,016	1,672	51,016	1,672	97,142
Inyo	4,259,858	151,573	3,500,174	124,283	7,556,340
Kern	59,618	1,888	59,618	1,888	114,342
Madera	161,731	5,733	161,731	5,733	321,347
Mariposa	3,342	110	3,342	110	6,870
Mono	2,110,454	66,142	1,894,948	60,049	3,614,814
Riverside	706	23	706	23	1,399
San Bernardino	512,262	16,320	517,508	16,496	977,837
San Diego	12,389	394	12,389	394	22,555
Tulare	232,721	7,330	232,721	7,330	433,746
Undistributed [6]	119,124	4,509	119,124	4,509	265,564
Total	7,543,691	256,362	6,573,747	223,155	13,449,378

[1] Partly estimated.
[2] Ore actually milled in county, including material from other counties and States.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[4] Includes material from Nevada mines.
[5] Based on GSA values.
[6] Includes El Dorado, Nevada, Placer, and Tuolumne Counties.

Tungsten.—Production of tungsten concentrate in California in 1956 decreased 3 percent compared with the record high of 1955. Shipments declined 16 percent, yet the State supplied over 25 percent of the domestic output during 1956, second only to Nevada. There were 85 fewer producing mines, which reflected closing of many marginal mining operations. The purchase of tungsten concentrates by Government under the original purchase program was virtually complete by June, and available funds were exhausted in September 1956. New legislation made additional funds available in October but at a reduced unit price to major producers, who had greatly curtailed operations by the end of the year. Three counties yielded over 90 percent of the State production, and 3 mines produced 83 percent of the recovered tungsten concentrate. They were: The Pine Creek mine, Inyo County; the Black Rock mine, Mono County; and the Atolia mine, San Bernardino County. There was no new activity in tungsten exploration under the DMEA program. Three contracts in effect during 1955 continued active throughout 1956.

Uranium.—Uranium activity continued to be high in 1956. Ten mining companies shipped ore to concentrators in Arizona, Colorado, and Utah during the year. Operations in the Coso Range (Inyo County) and the Greenhorn Mountains (Kern County) yielded the most consistent production. A development company in Kern County operated a pilot plant intermittently near Mojave in an attempt to produce a concentrate, from ores of several deposits in the county, acceptable to Atomic Energy Commission (AEC). Available production figures for the first half of 1956 showed uranium-ore shipments by one operator each in Imperial, Inyo, Kern and San Bernardino Counties. A total of 514 tons of uranium ore, containing 1,371 pounds of U_3O_8, with an f. o. b. mine value at $2,156, was shipped to out-of-State processing plants during this period, representing a 60-percent-plus decrease in value below shipments in the last part of 1955.

Zinc.—Continued operation of the Darwin and Shoshone groups of mines in Inyo County by the Anaconda Co., aided by a high average price for zinc, lead to a production of zinc from California-mined material that was 18 percent above 1955, making 1956 the peak year since 1952. Contributing in part to this increase was the Government stockpile purchases of zinc. Additional important quantities of zinc recovered from the lead-zinc ores mined in the Lee and Modoc districts were credited to Inyo County. Flue dust from abandoned smelters of the Cow Creek district (Shasta County) treated at smelters supplied most of the remaining zinc production although several tons of the metal was recovered at smelter-fuming plants from gold and silver ores mined in the Kingston and Nipton districts (San Bernardino County), and from gold ore produced in the East Belt district (El Dorado County). Important zinc producers in 1956, other than The Anaconda Co., were: Louis Warnken, Jr., Darwin (Coso) district; Norris & Bracken, Lee district; and Foreman & Foreman, Modoc district.

Other Metals.—The lead and zinc concentrates produced from ores of the Darwin (Coso) district (Inyo County) contained an undetermined quantity of selenium, which was recovered at smelters outside the State.

In 1956 several occurrences of the minerals of cobalt, nickel, titanium, zirconium, and hafnium were reported in the State, but no production was recorded. Near Bagby in the Mother Lode district (Mariposa County), the presence of cobalt and nickel was noted in a complex sulfide vein mined for gold and copper. In San Diego County near Julian, cobalt-nickel minerals were found during development work, and preparations were made for a diamond-drilling program to explore the deposit.

The occurrence of zirconium-hafnium minerals in an open pit near Mojave (Kern County) was reported, and the ore body was blocked out. No ore has been mined owing to the lack of processing facilities that could yield a competitive product in the present market. A placer operation for gold and silver near Rocklin, Placer County, reported the presence in the gravel of zirconium and titanium minerals in varying amounts, but no immediate recovery thereof was contemplated.

SECONDARY METALS

Iron and Steel Scrap.—The total tonnage of ferrous scrap consumed in California in 1956 was slightly higher than in 1955. Consumption by the 9 steel plants in the State took 84 percent of the total and was slightly above 1955. Although the California production of steel ingots and steel for castings in 1956 was 8 percent greater than in 1955, the scrap consumption by the steel industry in 1956 was only 3 percent greater than 1955. The ratio of scrap consumption to the production of steel ingots and steel for castings was 0.78 in 1955 and 0.74 in 1956. Scrap consumption by the iron and steel foundries was 15 percent of the total and 9 percent less than in 1955. Consumption of scrap by the three blast furnaces in the State was negligible. Miscellaneous consumption was 1 percent of the total and 27 percent below 1955. Stock of scrap held by consumers on December 31, 1956, were 8 percent higher than on December 31, 1955. Home scrap produced and purchased scrap received in the State during 1956 was 42 and 63 percent, respectively, of the total scrap consumed, compared with 40 and 65 percent during 1955.

TABLE 23.—Consumption of ferrous scrap and pig iron, 1947–51 (average) and 1952–56, in short tons

Year	Total scrap used	Pig iron used	Year	Total scrap used	Pig iron used
1947–51 (average)	2,133,772	828,664	1954	2,185,451	1,000,576
1952	2,470,169	1,288,561	1955	2,777,589	1,223,264
1953	2,574,840	1,233,898	1956	2,789,406	1,430,737

Nonferrous-Metal Scrap.—It is estimated that interstate shipments of nonferrous scrap from California in 1956 totaled 90,000 tons and that approximately 12,000 tons were received in the State, from most of the Western States and the Territory of Hawaii. The Federated Metals Division of American Smelting and Refining Co. operated large remelt plants in the Los Angeles and San Francisco areas, the source locations of most of California's nonferrous-scrap supply. The com-

TABLE 24.—Consumption of ferrous scrap and pig iron in 1955–56, by types of furnaces and miscellaneous uses, in short tons

Ferrous scrap and pig iron charged to—	1955	1956	Ferrous scrap and pig iron charged to—	1955	1956
Steel furnaces: [1]			Miscellaneous uses: Scrap [3]	55,735	40,476
Scrap	2,264,324	2,331,570			
Pig iron	1,026,216	1,242,812	Total scrap	2,777,589	2,789,406
			Total pig iron	1,223,264	1,430,737
Total	3,290,540	3,574,382			
			Grand total	4,000,853	4,220,143
Iron furnaces: [2]					
Scrap	457,530	417,360			
Pig iron	197,048	187,925			
Total	654,578	605,285			

[1] Includes open-hearth and electric furnaces.
[2] Includes cupola, air, and blast furnaces; also direct castings.
[3] Includes rerolling, copper precipitation, nonferrous, and chemical uses.

pany purchased scrap for reshipment to other division plants and for export.

Aluminum scrap was shipped to Los Angeles; copper scrap to Tacoma, Wash.; and magnesium scrap to Houston, Tex. The Selby smelter (Contra Costa County), handled all lead scrap, including special forms and battery plates. In 1956 the San Francisco remelt plant purchased about 20,000 tons of all nonferrous metals; an approximately equal tonnage was handled at the Los Angeles plant. Probably 90 percent of the scrap tonnages at both plants originated in California. The only other major plant, a brass-remelt operation, handling nonferrous scrap, was H. Kramer & Co. in El Segundo (Los Angeles County).

NONMETALS

Asbestos.—Although the quantity of asbestos mined in California in 1956 rose very slightly above 1955 the tonnage shipped dropped over 70 percent. The value of the shipments was less than half that in the previous year because of the relative quantities of amphibole and chrysotile asbestos shipped in each of the 2 years. An Inyo County operator mined amphibole material at an open pit near Lone Pine and imported Canadian short-fiber asbestos for milling. Near Monticello Dam (Napa County) one company produced chrysolite asbestos from open pit and milled the material for use as a cement additive.

A very small quantity of amphibole asbestos was mined near Iowa Hill (Placer County) and shipped to an east coast processor. In Shasta County near Redding a few tons of amphibole material was mined, but no shipment was made. One southern California processor received several hundred tons of short-fiber asbestos from Arizona producers and milled the material for resale to various consumers. Considerable interest was displayed in California asbestos deposits during the year; however, shipments from out-of-State producers and imports have effectively curtailed full development of this segment of the mining industry.

Barite.—Although the mine production of crude barite in 1956 was less than one-tenth that in the previous year, the quantity sold and used from stocks, previously mined, was appreciable. Major California production during the year was from an open pit in Tulare

County. This company shipped crude barite to its grinding plant in Kern County, where it was prepared for use in glass and well-drilling muds. A small tonnage of barite was mined in Inyo County and shipped to grinding plants in Los Angeles for use in well-drilling mud. A grinding plant in Stanislaus County was supplied with crude barite from the company properties in Nevada; it prepared the material for use in manufacturing barium chemicals, principally oxides and hydrates. One company operated grinding plants in Mariposa and Merced Counties and received crude barite from its pits in Mariposa and Nevada Counties, and the State of Nevada. Other grinding plants in Alameda, Fresno, and Los Angeles Counties ground crude barite received from out-of-state mines. The output of ground barite, produced for all uses, was only slightly below that in 1955. The demand in California has been steady for the past 2 years.

Boron Minerals.—The Nation's entire supply of boron minerals in 1956 was obtained from the bedded deposits of kernite and borax (tincal) near Boron, Kern County, and the brines of Searles Lake, San Bernardino County, except for a few tons of colemanite (natural calcium borate) mined near Death Valley Junction, Inyo County. The 1956 output was produced by three firms, namely: United States Borax & Chemical Corp. (formerly Pacific Coast Borax Co.), with refineries in Kern and Los Angeles Counties, and American Potash & Chemical Corp. and West End Chemical Division of Stauffer Chemical Co., in San Bernardino County.

Marketable compounds produced at the refineries included borax (decahydrate and pentahydrate), anhydrous sodium tetraborate, boric acid, sodium pentaborate, sodium-calcium borate, and various weed-killing and soap products. The demand for boron minerals was about the same as in 1955 and showed a quantity increase of only 2 percent. The 17-percent increase in value was attributed to higher wage and material costs in 1956.

Bromine.—The output of elemental bromine, produced from well brines in San Bernardino County, increased in 1956 owing to rising demand in the motor-fuel and fumigant industries. The liquid bromine was shipped to the Los Angeles area and used in producing ethylene dibromide (a constituent of high-octane motor fuel and soil fumigants), methyl bromide (a space fumigant), and dibromo chloropropane (a constituent of a soil fumigant). Ethylene dibromide was also produced as a byproduct in the processing of salt-works bitterns at a plant in Alameda County.

Calcium Chloride.—All of California's 1956 calcium chloride production was derived from the dry-lake brines of the Bristol Lake area near Amboy (San Bernardino County). California Salt Co. and National Chloride Co. of America produced liquid calcium chloride. Hill Bros. Chemical Co. prepared a flake product from the liquid chloride. The increased output of the liquid compound was credited to an increased demand resulting from expanded use in cement manufacturing. The calcium chloride is added to reduce the alkalinity of the lime used in the cement product, when required.

Cement.—Increased cement production in 1956 was due to the growing demands of the construction industry. Production, shipments, and value set new alltime records. Three California companies completed expansion programs during the year, which increased their

1956 output. One company in Kern County completed a new plant late in 1955 and was in full production during 1956. Two companies (one each in Santa Clara and Kern Counties) had expansion programs under way that will be completed early in 1957; and a third (in San Bernardino County) will have a new plant in operation by the end of the first quarter of 1957.

The impact of the Federal Highway Program on the cement industry has not yet been felt. The 1956 productions figures indicate that the slump in private dwelling construction has been offset by other construction requirements. The per unit value for cement increased in 1956, largely because of higher labor costs.

TABLE 25.—Finished portland cement produced, shipped, and in stock, and estimated consumption, 1947–51 (average) and 1952–56

Year	Active plants	Estimated capacity (thousand barrels)	Production (thousand barrels)	Shipments from mills			Estimated consumption (thousand barrels)	Stocks at mills Dec. 31 (thousand barrels)
				Thousand barrels	Value			
					Total	Average per barrel		
1947–51 (average)	11	30,393	25,360	25,170	$60,952,000	$2.42	21,702	1,078
1952	11	35,120	29,585	29,786	79,458,000	2.67	25,361	1,575
1953	11	35,220	32,145	32,002	90,873,000	2.84	27,733	1,708
1954	11	35,845	32,599	32,762	98,251,000	3.00	28,761	1,563
1955	11	37,173	35,450	35,084	103,804,000	2.96	31,643	1,929
1956	12	43,582	39,547	39,290	120,511,000	3.05	35,856	2,184

TABLE 26.—Production, shipments from mills, and stocks at mills of finished portland cement in 1956, by months, in thousand barrels

Month	Mill production	Mill shipments	Shipments to California [1]	Stocks at mills (end of month)
January	2,723	2,432	2,193	2,219
February	2,820	2,901	2,704	2,137
March	3,397	3,721	3,229	1,814
April	3,404	3,126	2,827	2,091
May	3,557	3,555	3,194	2,094
June	3,294	3,480	3,118	1,908
July	3,331	3,537	3,179	1,702
August	3,640	3,770	3,460	1,572
September	3,594	3,295	2,993	1,871
October	3,509	3,719	3,405	1,661
November	3,220	3,113	2,883	1,768
December	3,058	2,641	2,447	2,184

[1] Includes interstate and intrastate shipments.

Clays.—The total tonnage of clays produced in 1956 was 4 percent greater than in 1955; the value was 22 percent greater. About 80 percent of the total output was used directly by the producers, and the remainder was sold to various processors. The manufacture of heavy clay products (brick, drain tile, sewage pipe, and kindred products) consumed 52 percent of the total, cement 26 percent, and lightweight aggregate 16 percent; the remaining 6 percent was variously consumed. There was a minor output of ball-type clay in 1956. Similar clay was produced in 1955 and classified as kaolin. The production of

fire clay increased 50 percent and clay used for cement manufacture was 7 percent greater than in 1955. The output of kaolin declined 51 percent, bentonite 8 percent, fuller's earth 38 percent, and miscellaneous clay 3 percent from 1955.

The sources of the clays produced were: 48 percent of the clays used in heavy clay products from Los Angeles and Riverside Counties—the remainder from 19 other counties; 75 percent of the clays used in cement manufacture from Calaveras, San Mateo, and Riverside Counties—the remainder from Kern, San Benito, San Bernardino, Santa Clara, and Santa Cruz Counties; 85 percent of the clays bloated for lightweight aggregate from Solano and Ventura Counties—the remainder from Amador and Yuba Counties; 85 percent of the clays used in manufacturing refractories from Amador County—the remainder from Alameda, Orange, and Riverside Counties; 96 percent of the clays used in drilling mud from Kern County—the remainder from Ventura County; 95 percent of the clays used in floor-tile manufacture from San Bernardino County—the remainder from Riverside County; and 69 percent of the clays used in pottery and stoneware manufacture from Kern and Riverside Counties—the remainder from 5 other counties. The clays used for filter and filler purposes came from deposits in Kern, Inyo, Los Angeles, and Mono Counties.

The leading clay producers in 1956 were: Gladding, McBean & Co., Davidson Brick Co., and Pacific Clay Products Co. (for heavy clay products); Calaveras Cement Co., Ideal Cement Co., and Riverside Cement Co. (for cement); Basalt Rock Co., Gladding, McBean & Co., and Rocklite Products, Inc. (for lightweight aggregate); Elsinore Clay Co., Gladding, McBean & Co., and Western Refractories Co. (for refractories); Macco Corp., McKittrick Mud Co., and Mojave

TABLE 27.—Clays produced in 1955–56, by counties

County	1955		1956	
	Short tons	Value	Short tons	Value
Alameda	44,032	$29,144	(1)	(1)
Amador	180,173	606,943	235,830	$764,963
Calaveras	123,130	152,400	173,643	228,580
Contra Costa	74,145	101,145	75,621	116,100
Humboldt	284	71	----------	----------
Imperial	1,613	11,265	----------	----------
Inyo	15,125	85,818	9,894	57,499
Kern	124,136	533,936	130,986	309,754
Los Angeles	586,811	641,734	475,528	593,144
Mono	2,042	10,210	(1)	(1)
Orange	41,918	155,885	49,210	197,180
Riverside	385,456	785,503	461,275	1,164,210
San Benito	----------	----------	(1)	(1)
San Bernardino	102,935	362,399	46,541	218,803
San Diego	22,070	22,070	40,885	40,885
San Joaquin	8,132	13,556	35,331	44,164
Santa Barbara	(1)	(1)	9,982	9,982
Stanislaus	4,267	15,989	3,937	12,795
Tulare	6,210	6,210	7,600	9,500
Ventura	113,768	145,116	(1)	(1)
Undistributed [1]	1,024,148	1,347,987	1,225,332	2,369,958
Total	2,860,395	5,027,381	2,981,595	6,137,517

[1] Alameda (1956), Fresno, Marin, Mono (1956), Placer, Sacramento, San Benito (1956), San Luis Obispo, San Mateo, Santa Barbara (1955), Santa Clara, Santa Cruz, Solano, Sonoma (1956), Sutter, Ventura (1956), and Yuba Counties included with "Undistributed" to avoid disclosing individual company confidential data.

Corp. (for drilling mud); Alberhill Coal & Clay Co., Gladding, McBean & Co., and Southern California Minerals Co. (for floor tile); American Minerals Co., Joe Deleo, and W. A. Shoeppe (for pottery and stoneware); American Minerals Co., Huntley Industrial Minerals, and Sierra Talc & Clay Co. (for filler use); and Sierra Talc & Clay Co. (for filter and decolorizing uses).

Diatomite.—California's major output of diatomite in 1956 was from open pits in Santa Barbara and Los Angeles Counties. In most instances the material was processed in mills at the pit sites. A lesser but important tonnage was mined in Napa County. This material, while not a true diatomaceous earth, contains an amorphous diatomaceous silica. Nearly all the Napa County production was used in cement and as an additive to concrete, to reduce segregation and bleeding.

Although the industry lists several hundred uses for diatomite, most of the production was used as a filter aid and in the manufacturing of insulation material. Other important uses that consumed part of the State production included: Filler in paper products and rubber, lightweight aggregate, extender in paint, and desiccants. The higher 1956 production followed an increased demand by sugar and insulation industries as compared with that of 1955.

The major producers of prepared diatomite were: Johns-Manville Products Corp. and Airox Co., from deposits in Santa Barbara County; and Great Lakes Carbon Corp., which operated open pits in both Santa Barbara and Los Angeles Counties.

Feldspar.—California feldspar production in 1956 continued to come principally from the dune-sand deposits in Monterey County, with a smaller quantity from an open pit near Kramer Junction (San Bernardino County). The very marked indicated increase in tonnage over 1955 was due to a reclassification of the crude dune material from Monterey County, rather than to an actual production rise in feldspar products. An important quantity of the crude sand was ground and upgraded by flotation to produce a product that met the feldspar requirements of several glass and ceramic-product manufacturers.

Fluorspar.—California reported no output of fluorspar in 1956. One operator in San Bernardino County reported stripping preparatory to open-pit mining and progress in constructing a flotation mill. Full-scale operation was expected early in 1957. California's fluorspar requirements in 1956 were met by shipments from Nevada mines and by imports.

Gem Stones.—Throughout the State quantities of gem minerals were produced in varying amounts. Most of the production was as agate, jasper, jade, rhodonite, quartz, obsidian, garnet, and onyx. Amethyst, benitoite, opalite, tourmaline, and topaz were found in smaller quantities, yet brought greater dollar value. Amethyst was found in Inyo County, amethyst and opalite in San Bernardino County, benitoite in San Benito County, and tourmaline and topaz in San Diego County. A high percentage of the better quality quartz crystals was obtained in Inyo, San Bernardino, and San Diego Counties. Of particular interest was the few pounds of myrickite (cinnabar-bearing chalcedony) from Lake County and the poundage of bloodstone collected in the Panamint Mountains of Inyo County.

Gypsum.—The tonnage of crude gypsum produced in 1956 exceeded that in 1955 by 7 percent, and the value was 4 percent greater. Imperial County was the chief producer in California, leading in both quantity and value. Kern County was second, with 31 percent of the tonnage and 23 percent of the value. Minor production was reported from Kings, Merced, Riverside, San Luis Obispo, and Ventura Counties. Crude gypsum imported from Mexico and shipments from Nevada supplied about 20 percent of the gypsum consumed in the State.

The uses of the gypsum processed in California have been estimated as 64 percent for gypsum board and lath, 32 percent for uncalcined agricultural gypsum, 3 percent as a cement retarder (uncalcined), and 1 percent for all other uses.

The leading producer of gypsum in 1956 was the United States Gypsum Co., which operated open-pit mines at Plaster City (Imperial County) and Midland (Riverside County). H. M. Holloway, Inc., produced gypsite from the Lost Hills open pit in Kern County. The Kaiser Gypsum Co., with a wallboard and lath plant at Long Beach, Los Angeles County, and Antioch, Contra Costa County, imported crude gypsum from San Marcos Island in the Gulf of California. The Pabco Products, Inc., wallboard and lath plants, in Los Angeles and Alameda Counties, received gypsum from the company mine near Henderson, Nev. The McPhaill Gypsum Co., with an open pit at Avenal (Kings County), produced agricultural gypsum. Westvaco Mineral Products Division recovered byproduct gypsum at its sea-water magnesia plant in Alameda County.

Iodine.—Waste oil-well brines from the Los Angeles Basin were the source of California's (and the nation's) 1956 crude-iodine production. In addition to the crude product, Deep Water Chemical Co., Ltd., and Dow Chemical Co., produced iodide salts. The output of both the crude and the salts increased over 1955 owing primarily to a favorable combination of raw-material supply, lack of maintenance difficulties, and a generally good production experience at the Los Angeles plants of two companies.

Iron Oxide Pigments.—A small tonnage of natural iron oxide pigments was produced by an Alameda County manufacturer from limonite obtained in the Columbia River area (Oregon). This company also produced a moderate quantity of synthetic iron oxide pigment from mild-steel scrap, sulfuric acid, and caustic soda.

Lime.—California's 1956 lime production increased above that in 1955. Lime was consumed primarily by chemical and metallurgical plants and in refractories. Demand for hydrated quicklime remained on a par with that in 1955. Over half the quicklime output was utilized on plants producing magnesium compounds from sea water. Utilization of quicklime in the building trades showed the only important decline and was due to substitution of magnesia and cement plasters for lime plaster. As in 1955, only a token quantity of lime was consumed by agriculture.

Lithium.—American Potash & Chemical Corp. continued to produce lithium carbonate from the Searles Lake brines in San Bernardino County. Burkeite was obtained through evaporation and fractional crystalization of the brines and dilithium-sodium phosphate was separated by flotation and treated with sulfuric acid. Sodium car-

bonate was added, precipitating the lithium carbonate. Recovery of lithium at Searles Lake was begun in 1938, and production of the carbonate product has increased steadily since that date.

Magnesite and Magnesium Compounds.—A small tonnage of magnesite was mined at Red Mountain (Santa Clara County) in 1956. The raw material was utilized by an Alameda County producer of hydrous magnesium sulfate. Magnesite production continued the decline begun in 1955. Competition from magnesia produced from sea water has brought about this decline. The 1956 output was less than half that in 1955.

California continued to be an important domestic supplier of magnesium compounds in 1956. Although some magnesium compounds decreased in quantity, the tonnages of refractory magnesia, and caustic-calcined magnesia used in the cement, paper, and chemical industries increased appreciably. The total output for all magnesium compounds was 14 percent above 1955. Plants in Alameda, Monterey, San Diego, and San Mateo Counties used raw sea water, sea-water bitterns, and dolomite (from quarries in Monterey and San Benito Counties) as the basic raw materials to produce various magnesium compounds.

Mica.—Imperial County produced all of California's mica during 1956 from two open pits. Sericite schist from one pit was wet-ground at a nearby plant and the finished product shipped for use in paint. Mica schist produced at the other pit was processed by the producer and used in manufacturing roofing paper. Crude scrap mica from South Dakota, South Africa, and India was processed at a plant in Los Angeles County for use by the roofing industry and in paint. During the year new equipment was installed to meet an increased demand by manufacturers of shingles and roofing paper.

Perlite.—During 1956 crude perlite was mined from deposits in Inyo, Napa, and San Bernardino Counties. The crude material from Inyo County was shipped to a plant in Los Angeles. Perlite production at a Napa County deposit was expanded in a plant operated at the quarry site. Although expansion plants were operated in Contra Costa, Fresno, Marin, Napa, Riverside, San Bernardino, and San Diego Counties nearly 80 percent of all crude perlite processed in California was treated at plants in the Los Angeles area. Nevada mines were the source of a considerable quantity of the crude mineral expanded at these plants. Most of the expanded material was utilized in plaster aggregate, and the decline in production was due primarily to substitution of sheet rock and similar products for custom plastering at tract home projects. Near the end of the year one Los Angeles plant leased a structure to increase its plant and warehousing facilities.

Potassium Salts.—The production of potassium salts in California in 1956 continued to be confined principally to one plant in San Bernardino County. The output of the plant was primarily muriate of potash, with about 10-percent conversion to potassium sulfate. The muriate (being comparatively free of calcium and magnesium salts) was in demand for conversion to potassium hydroxide. The production of potassium chloride has been rather stable for several years. The Commercial grade has been utilized by the fertilizer industry and the Chemical-grade muriate has been consumed by the

chemical industry in manufacturing other potassium compounds. Because of the potassium content, some flue-dust accumulations at cement plants in Contra Costa and Santa Cruz Counties were utilized in plant-food preparations. The material has had rather limited agricultural use.

Pumice and Volcanic Cinder.—The total production of pumice and volcanic cinder declined about 20 percent from 1955. A 12-percent increase in the output of pumice (due primarily to greater demand for use as concrete aggregate) was more than offset by a 26-percent drop in the tonnage of volcanic cinder quarried during the year. The chief reason for the decline in volcanic cinder production was the marked drop in demand for its use in surfacing roads, highways, and airstrips by Federal, State, and county agencies. Eighteen open pits in 10 counties supplied the 1956 output of pumice—56 percent of which was used as concrete aggregate, 24 percent in abrasives, 8 percent in road ballast and fill, 6 percent as a carrier for insecticides, and the remaining 6 percent for such purposes as soil conditioner, soundproof plaster, and as a filler in paints and absorbents. Eighty-two percent of the volcanic cinder output was used for ballast and fill; most of it was produced by railroad companies in San Bernardino and Siskiyou Counties for their own use. Fourteen percent of the volcanic-cinder production was used as concrete aggregate, and the remaining 4 percent was consumed in manufacturing soil conditioners and acoustic plasters.

TABLE 28.—Pumice[1] sold or used in 1956, by counties

County	Crude		Prepared		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Fresno	69	$396	217	$1,545	286	$1,941
Imperial	3,674	5,670	14,152	43,680	17,826	49,350
Inyo	3,212	6,424	105,402	644,115	108,614	650,539
Madera	600	1,350	6,946	103,557	7,546	104,907
Mono	(2)	(2)	30,358	494,566	(2)	(2)
San Bernardino	229	401	(2)	(2)	(2)	(2)
Shasta	5,233	15,125	(2)	(2)	(2)	(2)
Siskiyou	347,853	697,806	12,427	46,271	360,280	744,077
Other counties[3]	14,620	29,240	89,364	243,663	139,804	782,995
Total	375,490	$756,412	258,866	$1,577,397	634,356	2,333,809

[1] Includes pumicite and volcanic cinder.
[2] Kern, Lake, Lassen, Modoc Counties and portions of Mono, San Bernardino, and Shasta Counties included with "Other counties" to avoid disclosing individual company confidential data.

Pyrite.—The Hornet mine in the Iron Mountain area (Shasta County), produced all of California's pyrite in 1956. The ore was shipped to two sulfuric acid plants in Contra Costa County, and some of the resulting cinder was utilized as an ingredient in manufacturing special quick-setting cements. Production was slightly below that in 1955; but shipments were higher, and mine stockpiles were reduced appreciably.

Salt.—Nearly 75 percent of California salt production in 1956 was supplied by recovery from sea water in the San Francisco Bay area by solar evaporation and the vacuum-pan methods. Producers in Monterey, Orange, and San Diego Counties also recovered important

quantities of salt in this manner. Operators in Kern and San Bernardino Counties produced salt from dry lake brines. California's only producer of rock salt (in San Bernardino County), mined halite deposits by open-pit methods. The total salt production was greater than in 1955, and the increase was utilized mainly by manufacturers of chlorine, food processors, and water-softening plants. The entire output of one southern California producer was used in the water-softening plant of a large city. In 1956 California salt producers shipped to five Western States, Alaska, Hawaii, and the Pacific Island possessions and exported salt to Canada, Mexico, several Caribbean countries, the Philippine Islands, and Japan.

Sand and Gravel.—California again led the Nation in sand and gravel production in 1956. The output of these materials was up throughout the State, which was due in large part to the uninterrupted production in 1956 in contrast to the curtailed production in 1955 caused by the Los Angeles County building-trade strike and major floods in northern California. The requirements at the Beardsley Project (a dam construction near Strawberry, Tuolumne County), and freeway additions in Alameda, Marin, and Los Angeles Counties were responsible for a high percentage of the greater output.

A noteworthy percentage of the greatly increased tonnage produced in San Bernardino County was shipped to and utilized in the Los Angeles area. Stepped-up activity in new home construction in Merced County accounted for the high tonnage of prepared sand and gravel produced in that area. The trend toward increased use of portable preparation plants made possible greater utilization of California's widespread sand and gravel deposits. The trend has resulted in savings in transportation costs in a highly competitive industry, despite changing product requirements and has allowed the small operator to compete successfully at many isolated projects.

TABLE 29.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	16,221,852	$13,739,220	21,833,079	$18,852,430	38,054,931	$32,591,650
1952	20,434,017	18,060,627	32,617,243	25,572,498	53,051,260	43,633,125
1953	22,129,931	21,232,885	36,299,597	31,991,318	58,429,528	53,224,203
1954	25,094,671	25,655,359	45,429,941	42,483,219	70,524,612	68,138,578
1955	25,506,919	26,856,865	39,371,729	39,963,495	64,878,648	66,820,360
1956	30,643,471	35,742,334	55,882,484	61,033,878	86,525,955	96,776,212

Slate.—The quantity and value of slate produced in California during the year were virtually the same as in 1955. One quarry near Kelsey (El Dorado Coutny) had no 1956 production but sold stocks of slate on hand for use as flagging. Another producer near Placerville in the same county quarried a substantial tonnage of slate, which was consumed as roofing granules and rock flour. The remaining California production came from a quarry near Mariposa (Mariposa County) and was utilized for flagging.

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TABLE 30.—Sand and gravel sold or used by producers 1955–56, by commercial and Government-and-contractor operations and by uses

	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Glass	(1)	(1)	(1)	692,998	$2,040,420	$2.94
Molding	43,018	$168,034	$3.91	(1)	(1)	(1)
Building	16,520,270	16,241,357	.98	16,912,937	19,088,591	1.13
Paving	5,749,733	5,512,871	.96	7,247,940	7,614,506	1.05
Blast	(1)	(1)	(1)	145,170	480,245	3.31
Engine	74,571	152,926	2.05	50,575	98,838	1.95
Filter	52,976	95,899	1.81	69,496	105,315	1.52
Other [1]	1,556,088	3,643,029	2.34	3,453,208	4,366,865	1.26
Total sand	23,996,656	25,814,116	1.07	28,572,324	33,794,780	1.18
Gravel:						
Building	15,148,728	17,521,842	1.15	17,030,375	21,337,879	1.25
Paving	11,182,713	12,862,144	1.15	18,633,827	22,543,075	1.21
Railroad ballast	1,239,699	1,021,534	.82	343,495	304,369	.89
Other	1,521,019	1,713,157	1.13	9,388,547	7,651,486	.81
Total gravel	29,092,159	33,118,677	1.13	45,396,244	51,836,809	1.14
Total sand and gravel	53,088,815	58,932,793	1.11	73,968,568	85,631,589	1.16
GOVERNMENT-AND-CONTRACTOR OPERATIONS [2]						
Sand:						
Building	104,378	113,579	1.09	810,971	951,811	1.17
Paving	1,405,885	929,170	.66	1,260,176	995,743	.79
Total sand	1,510,263	1,042,749	.69	2,071,147	1,947,554	.94
Gravel:						
Building	160,886	170,902	1.06	824,508	1,332,287	1.62
Paving	10,118,684	6,673,916	.66	9,661,732	7,864,782	.81
Total gravel	10,279,570	6,844,818	.67	10,486,240	9,197,069	.88
Total sand and gravel	11,789,833	7,887,567	.67	12,557,387	11,144,623	.89
ALL OPERATIONS						
Sand	25,506,919	26,856,865	1.05	30,643,471	35,742,334	1.17
Gravel	39,371,729	39,963,495	1.01	55,882,484	61,033,878	1.09
Grand total	64,878,648	66,820,360	1.02	86,525,955	96,776,212	1.12

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."
[2] Includes figures for State, counties, municipalities, and other Government agencies.

Sodium Compounds.—Although most of California's 1956 production of sodium compounds was derived from the dry lake brines of San Bernardino County, an important tonnage of soda ash and trona was recovered from dry-lake brines in Inyo County. A smaller quantity of salt cake was obtained from an underground deposit in Kern County. The overall increase in the output of these compounds (as compared with the preceding year) was due primarily to increased demand for salt cake for use in making kraft (paper) pulp. Production of natural sodium carbonate also increased during the year to meet the requirements of the glass and chemical industries. Unit prices were slightly higher because of higher labor costs.

Stone.—The stone industry enjoyed an appreciable increase in production in 1956 as a result of expanded activity in major construction projects. The 32-percent rise in quantity and 24-percent

TABLE 31.—Production of sand and gravel in 1956, by counties

County	Short tons	Value	County	Short tons	Value
Alameda	9,838,805	$11,339,907	Plumas	120,170	$109,243
Alpine	19,150	14,900	Riverside	1,301,577	1,774,864
Amador	199,942	621,160	Sacramento	3,400,325	3,940,478
Butte	694,127	757,489	San Benito	158,961	119,779
Calaveras	106,026	181,194	San Bernardino	4,436,478	4,462,583
Colusa	158,900	185,458	San Diego	3,231,171	5,375,035
Contra Costa	196,809	211,841	San Francisco	278,852	184,240
Del Norte	165,920	188,394	San Joaquin	2,223,007	2,321,680
El Dorado	187,612	194,234	San Luis Obispo	730,215	646,315
Fresno	997,527	1,170,024	San Mateo	187,366	134,539
Glenn	410,378	369,328	Santa Barbara	751,565	952,563
Humboldt	1,109,393	1,122,295	Santa Clara	1,499,194	1,216,835
Imperial	588,693	517,616	Santa Cruz	734,907	768,918
Inyo	164,791	148,830	Shasta	493,249	633,325
Kern	1,106,645	1,807,330	Siskiyou	407,384	519,503
Kings	17,094	17,420	Sierra	5,191	2,595
Lake	187,461	170,972	Solano	853,394	868,800
Lassen	447,182	463,439	Stanislaus	795,322	764,686
Los Angeles	28,904,482	30,807,859	Sutter	1,283,779	1,915,064
Mariposa	90,862	145,670	Tehama	184,921	235,088
Mendocino	536,273	353,948	Trinity	201,277	250,012
Merced	1,778,909	1,470,102	Tulare	559,922	716,186
Modoc	213,460	209,160	Ventura	2,874,826	3,367,855
Mono	196,320	169,770	Yolo	686,162	632,609
Monterey	667,299	2,062,709	Yuba	608,250	959,442
Napa	92,558	101,264	Other counties [1]	5,162,584	4,545,213
Nevada	75,507	87,367			
Orange	4,094,469	4,347,366	Total	86,525,955	96,776,212
Placer	109,312	121,716			

[1] Includes Madera, Marin, Sonoma, and Tuolumne Counties, combined to avoid disclosing individual company confidential data.

TABLE 32.—Stone sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Quantity	Value	Quantity	Value
Dimension stone:				
Rough construction and rubble—short tons	23,169	$342,697	40,468	$731,991
Rough architectural—cubic feet	70,252	131,163	[1] 45,015	[1] 303,800
Approximate equivalent in short tons	5,670		3,884	
Monuments and mausoleums—cubic feet	25,390	158,038	52,329	569,296
Approximate equivalent in short tons	2,083		4,510	
Flagging—cubic feet	10,008	19,271	6,794	13,751
Approximate equivalent in short tons	822		584	
Total dimension stone (quantities approximate in short tons)	31,744	651,169	49,446	1,618,838
Crushed and broken stone:				
Riprap—short tons	727,866	1,513,269	1,369,152	2,322,133
Metallurgical—do	61,501	223,682	52,240	171,561
Concrete and roadstone—do	11,047,258	12,426,429	11,829,859	15,466,048
Railroad ballast—do	168,823	177,225	144,771	167,318
Agricultural—do	576	4,653	1,720	8,336
Chemical—do	69,960	336,977	28,284	81,454
Miscellaneous [2]—do	[3] 12,600,593	[3] 21,830,980	[4] 19,107,898	[4] 26,272,964
Total crushed and broken stone—do	24,676,577	36,513,215	32,533,924	44,489,814
Grand total (quantities approximate in short tons)	24,708,321	37,164,384	32,583,370	46,108,652

[1] Includes 13,005 cubic feet valued at $64,400 of dressed architectural stone.
[2] Includes whiting substitute, filler, mineral food, poultry grit, stucco, roofing granules, filter beds, terrazzo, and miscellaneous uses.
[3] Includes 10,462,734 short tons of limestone used in cement valued at $15,514,339 and 514,818 tons of limestone used in lime valued at $917,095.
[4] Includes 11,583,084 short tons of limestone used in cement valued at $16,119,212 and 676,456 tons of limestone used in lime valued at $1,235,698.

increase in value, compared with 1955, was due primarily to greater demand for crushed and broken stone used in concrete and roadstone and was particularly noticeable in the outputs of crushed granite in Los Angeles County and crushed basalt in Marin County. The quantity of dimension stone (both rough and dressed) produced for construction and architectural uses also increased substantially. The output of marble for terrazzo and limestone, granite, and basalt for roofing granules showed little variation from 1955 figures despite a slight statewide decline in new home construction.

TABLE 33.—Production of stone [1] in 1956, by counties

County	Short tons	Value	County	Short tons	Value
Alameda	1,218,764	$784,940	San Benito	1,188,900	$1,858,118
Butte	83,211	73,961	San Bernardino	4,705,587	7,091,552
Contra Costa	2,375,230	3,211,808	San Diego	400,753	1,347,940
Del Norte	118,685	192,857	San Francisco	849,042	433,663
El Dorado	396,227	985,325	San Mateo	2,680,419	2,510,993
Fresno	143,953	364,355	Santa Clara	4,329,640	4,654,761
Humboldt	34,835	44,712	Santa Cruz	946,933	1,602,750
Imperial	47,285	50,965	Shasta	114,147	98,014
Kern	1,755,242	3,725,622	Siskiyou	109,880	109,880
Lassen	99,423	173,624	Solano	295,800	406,781
Los Angeles	2,336,968	3,725,604	Tehama	10,725	32,175
Marin	1,305,859	2,059,599	Trinity	8,282	13,632
Mariposa	14,129	22,665	Tulare	46,793	70,027
Mendocino	41,655	53,975	Tuolumne	779,810	1,474,883
Modoc	44,266	66,399	Ventura	25,662	217,877
Mono	6,000	5,000	Yolo	38,675	68,321
Plumas	6,126	6,279	Other counties [2]	4,275,788	5,993,173
Riverside	1,740,790	2,558,791			
Sacramento	7,886	17,631	Total	32,583,370	46,108,652

[1] Includes stone used in cement and lime.
[2] Includes Amador, Calaveras, Colusa, Inyo, Madera, Monterey, Napa, Orange, Placer, San Luis Obispo, Santa Barbara, and Sonoma, combined to avoid disclosing individual company confidential data.

TABLE 34.—Stone sold or used by producers, 1952–56, by kinds

Year	Granite		Basalt and related rocks (traprock)		Marble	
	Short tons	Value	Short tons	Value	Short tons	Value
1952	1,903,866	$1,979,756	1,996,836	$2,524,972	7,168	$137,664
1953	3,565,847	3,214,767	2,664,009	2,800,346	(1)	(1)
1954	3,012,041	3,480,586	2,129,545	2,786,035	(1)	(1)
1955	2,724,342	3,420,057	1,923,351	2,547,821	(1)	(1)
1956	3,899,350	5,155,292	1,966,581	2,339,318	(1)	(1)

Year	Limestone		Sandstone		Other Stone [2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1952	1,631,369	$4,033,203	1,029,084	$1,290,141	7,806,607	$7,731,349	14,374,930	$17,697,085
1953	1,993,217	4,940,034	2,093,219	2,835,693	4,188,796	4,903,511	14,505,088	18,694,351
1954	[3] 11,044,061	[3] 21,434,189	2,703,599	3,723,255	4,414,510	6,117,049	23,303,756	37,541,114
1955	[4] 12,472,285	[4] 21,075,656	2,937,537	4,886,507	4,650,806	5,234,343	24,708,321	37,164,384
1956	[5] 14,115,070	[5] 22,118,105	2,917,916	4,833,877	9,684,453	11,662,060	32,583,370	46,108,652

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes light colored volcanics, schist, serpentine, river boulders, and such other stone as cannot properly be classed in any main group, and marble (1953–56).
[3] Includes 9,567,191 tons of limestone valued at $17,229,547 used in cement and lime.
[4] Includes 10,977,552 tons of limestone valued at $16,431,434 used in cement and lime.
[5] Includes 12,259,540 tons of limestone valued at $17,354,910 used in cement and lime.

Sandstone production also remained virtually unchanged, although its utilization varied considerably, inasmuch as the gain in demand for sandstone as riprap was offset by lower requirements for use as ganister, concrete, and roadstone. Of special interest were the large tonnages of crushed miscellaneous stone used at the Monticello Dam in Napa County and in the Beardsley Project in Tuolumne County.

Strontium Minerals.—Production of celestite was reported from two counties. An important tonnage of the mineral from San Bernardino County was shipped to southern Nevada and used in concentrating certain manganese ores. A few tons produced in San Diego County was shipped to a chemical plant in Los Angeles and converted to strontium carbonate for reagent use.

Sulfur.—Sulfur-ore production in 1956 was limited to the Leviathan open pit of The Anaconda Co. in Alpine County. The output of this mine, although slightly less than in 1955, conformed to company requirements for sulfuric acid used at its copper-leaching plant in Lyon County, Nev. The average grade of the ore mined and shipped was about 30 percent sulfur.

During the year elemental sulfur was recovered as a byproduct from hydrogen sulfide gas obtained in petroleum refining. In Los Angeles County Hancock Chemical Co., Union Oil Co. of California, and Wilshire Oil Co. of California produced sulfur at their plants in Watson, Wilmington, and Norwalk, respectively. The Union Oil Co. also recovered elemental sulfur from hydrogen sulfide gas at its refineries in Contra Costa and San Luis Obispo Counties. Approximately 80 percent of the sulfur produced was utilized in manufacturing sulfuric acid. A base-metal smelter in Contra Costa County produced liquid sulfur dioxide and sulfuric acid as byproducts in roasting sulfide ores. Production was shipped to chemical companies in the bay area.

Talc, Soapstone, and Pyrophyllite.—The 1956 output of these minerals in California dropped nearly 8 percent below 1955. The decline was not general, based on use, in that the tonnages used in ceramics and for asphalt filler were appreciably above those in the preceding year. The most noticeable declines were in the use of talc and soapstone for filler in paint, paper, and rubber. The drop in the quantity used as a carrier in insecticides was due to substitution of such materials as diatomite and pumicite. Most of the State's 1956 talc production was mined at deposits in Inyo and San Bernardino Counties. All of the soapstone output was obtained from mines in El Dorado and Los Angeles Counties, and the entire 1956 yield of pyrophyllite came from producers in Mono, San Bernardino, and San Diego Counties. Several major producers operated grinding plants in counties other than those where the raw materials were produced. Some grinders of these materials processed the crude minerals obtained from company-owned deposits outside the State. Other processors of talc and soapstone purchased the California-produced crude minerals and received shipments from out-of-State producers as well. The tonnage of talc, soapstone, and pyrophyllite ground (or otherwise processed) by California plants in 1956 was nearly 14 percent below 1955.

Vermiculite.—No crude vermiculite was mined in California. One company in Orange County operated an exfoliation plant on the

crude mineral imported from Portuguese East Africa. The entire output of this plant was used in plaster aggregate. Another company operated exfoliation plants in Los Angeles and Sacramento Counties, using vermiculite mined at its Montana property. The output of these plants was utilized in thermal and acoustic insulation and in lightweight concrete (to prevent segregation). The total production of exfoliated mineral was slightly below that in the preceding year. The truckdrivers' strike during the latter part of 1956 was credited as a factor contributing to the decline.

Wollastonite.—Several hundred tons of wollastonite was quarried at three deposits near Blythe, Riverside County. Because of its distinctive weathered appearance, the entire output was sold to a Los Angeles supplier of ceramic materials and used as ornamental stone for rubble-type facing of building structures.

MINERAL FUELS

Carbon Dioxide (Natural Gas).—The Cal Dry Ice Corp. continued the operation of its well in the Hopland field, Mendocino County, as a source of "dry ice." In the latter part of the year water reported as containing a boron mineral or boron minerals seeped from the well and allegedly destroyed the nearby vegetation. It became necessary to correct this situation to continue the production of carbon dioxide. An estimate of the cost involved proved to be prohibitive, and the well was shut down in October.

Coal (Lignite).—Lignite was mined in 1956 near Ione (Amador County) primarily for its montan-wax content. Production increased 57 percent above 1955.

Natural Gas.—In 1956 slightly less natural gas was marketed than in 1955, both in terms of quantity and value. Wet-gas production accounted for 73 percent of the total. The California (State) Division of Oil and Gas listed 201 producing gasfields during the latter half of 1956. The Rio Vista field in Sacramento, Solano, and Contra Costa Counties remained much the largest gasfield in the State with a production for the year of 70,683,850 thousand cubic feet. The discovery of four new dry gasfields of minor importance was reported—one each in Colusa, Glenn, Sacramento and San Joaquin Counties. Two new wet gasfields were reported in Kern County.

Natural-Gas Liquids.—The quantity of natural gasoline and cycle products processed in 1956 decreased slightly below 1955. The LP-gases produced, however, increased 14 percent in quantity and 10 percent in value.

Peat.—Peat production, for use as a soil-improving agent, increased substantially in value over 1955. Most of the peat dug came from the delta of the San Joaquin River near Brentwood (Contra Costa County). Production was also reported from Jess Valley (Modoc County) and from Orange County.

Petroleum.—The quantity of crude oil produced in California was slightly lower in 1956 than in 1955, but the value was 4 percent higher. First- and second-half-year outputs were almost exactly equal. Although exploratory drilling continued to be active, it was below that in 1955. New well proposals decreased from 2,507 in 1955 to 2,467 in

1956. The California (State) Division of Oil and Gas listed 185 producing oilfields during the latter half of 1956. No major oilfield discoveries were reported during the year, but nine new minor fields were reported. Five were in Kern County, 2 in Orange County, and 1 each in San Benito and San Mateo Counties.

TABLE 35.—Natural gas, natural-gas liquids, and petroleum produced, in 1956,[1] by counties

County	Marketed natural gas		Natural-gas liquids				Petroleum	
			Natural gasoline and cycle products		LP-gases from plants			
	Million cubic feet	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand 42-gallon barrels	Value (thousand dollars)
Butte	5,677	1,419						
Colusa	882	221						
Contra Costa	1,162	291						
Fresno	34,243	7,396	64,692	6,243	61,289	3,187	35,980	104,449
Glenn	6,077	1,519						
Humboldt	2,230	558						
Kern	78,148	16,880	211,782	20,435	168,686	8,772	96,485	244,493
Kings	11,247	2,429	16,041	1,548	6,851	356	2,437	7,722
Los Angeles	95,409	20,608	272,705	26,314	57,556	2,993	92,024	243,036
Madera	3,190	798						
Monterey	4,169	901					11,733	18,890
Orange	26,989	5,830	111,852	10,793	18,132	943	37,051	95,147
Sacramento	49,511	12,378						
San Benito	124	31					100	(2)
San Bernardino	7	2					110	(2)
San Joaquin	15,588	3,897						
San Luis Obispo	1,697	367	10,344	998	4,964	258	2,423	7,256
San Mateo	3	1					17	57
Santa Barbara	18,757	4,052	45,144	4,356	16,040	834	29,006	77,882
Solano	35,467	8,867						
Sonoma	136	29					1	1
Sutter	1,055	264						
Tehama	1,437	359						
Tulare	6,449	1,612					54	116
Ventura	80,348	17,355	144,022	13,897	76,714	3,989	43,021	119,427
Yolo	2,474	618						
Undistributed	21,982	4,821	320	31			312	499
Total	504,458	113,503	876,902	84,615	410,232	21,332	350,754	918,975

[1] Production from petroleum and natural-gas fields that lie in more than 1 county prorated among the involved counties.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

REVIEW BY COUNTIES

Six counties produced minerals that represented over 75 percent of California's total mineral-production value; nearly 90 percent of this amount was accredited to mineral fuels. The counties (in the order of the value of their production) were: Los Angeles, Kern, Ventura, Fresno, Orange, and Santa Barbara. In 1956 Fresno replaced Orange County as California's fourth ranking producer of mineral commodities, primarily because of an increase and decrease, respectively, in the mineral-fuels output of the two counties. Los Angeles County again led the State in mineral-fuels production, and San Bernardino County ranked first in the output of nonmetals. Riverside County continued to be the top producer of metals, largely by virtue of its iron-ore output.

TABLE 36.—Value of mineral production in California, 1955–56, by counties

County	1955 [2]	1956	Minerals produced in 1956 in order of value [1]
Alameda	$16,311,467	$20,417,259	Sand and gravel, salt, magnesium compounds, stone, bromine, clays.
Alpine	(3)	(3)	Sulfur ore, tungsten, sand and gravel.
Amador	1,271,832	1,633,536	Clays, sand and gravel, coal (lignite), copper, stone, gold, silver, lead, gem stones.
Butte	2,286,168	2,559,164	Natural gas, sand and gravel, chromite, stone, gold, silver.
Calaveras	10,014,759	11,466,710	Cement, stone, clays, sand and gravel, copper, gold, tungsten, silver, gem stones.
Colusa	351,115	406,861	Natural gas, sand and gravel, stone, gem stones.
Contra Costa	3,884,231	5,174,878	Stone, sulfur (byproduct), natural gas, sand and gravel, peat, clays, potassium salts.
Del Norte	639,415	599,216	Chromite, stone, sand and gravel, mercury, copper, silver.
El Dorado	2,062,384	2,282,684	Lime, stone, sand and gravel, slate, gold, soapstone, copper, lead, silver, tungsten, zinc.
Fresno	112,347,442	123,483,407	Petroleum, natural gas liquids, natural gas, sand and gravel, chromite, stone, tungsten, clays, gold, mercury, pumice, silver, gem stones.
Glenn	706,479	1,910,200	Natural gas, sand and gravel, chromite.
Humboldt	[4] 1,102,215	1,734,711	Sand and gravel, natural gas, stone, chromite, copper, gem stones, silver.
Imperial	[4] 2,178,778	2,446,840	Gypsum, sand and gravel, stone, pumice and pumicite, manganese ore, mica (scrap), gold, gem stones, uranium, silver.
Inyo	[4] 17,162,980	17,239,485	Tungsten, lead, zinc, molybdenum, silver, sodium carbonate, pumice, pumicite and volcanic cinder, talc, copper, sand and gravel, stone, boron minerals, gold, clays, perlite, asbestos, uranium, barite, gem stones.
Kern	321,341,429	340,970,947	Petroleum, boron minerals, natural gas liquids, natural gas, cement, stone, sand and gravel, gypsum, clays, gold, tungsten, salt, sodium sulfate, pumice, silver, uranium, copper, gem stone, zinc.
Kings	13,781,021	12,257,020	Petroleum, natural gas, natural gas liquids, gypsum, mercury, sand and gravel.
Lake	[4] 747,620	[4] 829,667	Mercury, sand and gravel, pumice and volcanic cinder, gem stones.
Lassen	[5] 306,203	656,227	Sand and gravel, stone, volcanic cinder.
Los Angeles	318,687,274	334,277,226	Petroleum, sand and gravel, natural gas liquids, natural gas, stone, sulfur (byproduct), cement, diatomite, clays, iodine, soapstone, gold, silver.
Madera	1,801,511	1,618,691	Natural gas, sand and gravel, tungsten, pumicite, stone, copper, gold, silver.
Marin	1,388,526	2,339,295	Stone, sand and gravel, clays, mercury, gem stones.
Mariposa	185,108	234,594	Sand and gravel, gold, stone, tungsten, slate, silver, copper, gem stones.
Mendocino	447,625	436,245	Sand and gravel, stone, carbon dioxide, manganese ore, gem stones.
Merced	1,061,708	1,478,685	Sand and gravel, mercury, gypsum, gold, silver.
Modoc	249,743	429,459	Sand and gravel, pumice and volcanic cinder, peat, stone, gem stones.
Mono	4,424,537	4,334,564	Tungsten, pumice and volcanic cinder, sand and gravel, pyrophyllite, clays, stone, gem stones, gold, silver.
Monterey	23,641,021	28,302,774	Petroleum, lime, sand and gravel, magnesium compounds, feldspar, stone, natural gas, salt, chromite, mercury, gem stones.
Napa	1,269,276	1,647,973	Stone, diatomite, sand and gravel, perlite, mercury, chromite, asbestos, gem stones.
Nevada	2,018,522	1,454,234	Gold, barite, tungsten, sand and gravel, silver.
Orange	127,990,556	117,873,865	Petroleum, natural gas liquids, natural gas, sand and gravel, iodine, clays, salt, peat, stone.
Placer	533,799	563,314	Clays, sand and gravel, stone, gold, chromite, tungsten, asbestos, gem stones, silver.
Plumas	138,935	154,386	Sand and gravel, manganese ore, stone, gold, copper, silver.
Riverside	[4] 29,273,556	39,477,680	Iron ore, cement, stone, sand and gravel, clays, gypsum, manganese ore, tungsten, copper, gem stones, silver, gold.
Sacramento	19,507,504	18,136,327	Natural gas, sand and gravel, gold, clays, stone, platinum, silver.
San Benito	5,043,905	5,163,927	Cement, stone, mercury, petroleum, sand and gravel, chomite, natural gas, clays, gem stones.
San Bernardino	71,779,792	81,932,310	Cement, boron minerals, sodium carbonate, stone, potassium salts, sodium sulfate, sand and gravel, tungsten, salt, talc and pyrophyllite, calcium-magnesium chloride, petroleum, bromine, lime, clays, rare earths, pumicite and volcanic cinder, strontium minerals, iron ore, perlite, copper, manganese ore, gold, feldspar, lead, silver, natural gas, gem stones, mercury, zinc, uranium ore.

See footnotes at end of table.

TABLE 36.—Value of mineral production in California, 1955–56, by counties—Con.

County	1955 [2]	1956	Minerals produced in 1956 in order of value [1]
San Diego	$5,456,730	$7,281,856	Sand and gravel, stone, salt, magnesium compounds, clays, tungsten, pyrophyllite, gem stones, strontium minerals, gold.
San Francisco	39,938	617,903	Stone, sand and gravel.
San Joaquin	[4] 4,302,310	6,262,844	Natural gas, sand and gravel, clays.
San Luis Obispo	11,629,505	10,812,246	Petroleum, natural gas liquids, chromite, sand and gravel, natural gas, sulfur (byproudct), stone, gypsum, mercury, clays, manganese, gem stones.
San Mateo	9,949,667	9,873,577	Cement, stone, magnesium compounds, clays, mercury, sand and gravel, petroleum, natural gas, gem stones.
Santa Barbara	91,568,575	101,973,862	Petroleum, diatomite, natural gas liquids, natural gas, sand and gravel, stone, mercury, chromite, clays.
Santa Clara	21,403,152	24,782,941	Cement, stone, sand and gravel, mercury, clays, masonry, cement magnesite, gem stones.
Santa Cruz	8,052,923	7,631,707	Cement, stone, sand and gravel, clays, potassium salts.
Shasta	1,726,412	1,531,280	Pyrites, sand and gravel, stone, volcanic cinder, gold, zinc, copper, lead, silver.
Sierra	708,064	377,425	Gold, sand and gravel, silver.
Siskiyou	[4] 1,532,833	2,165,914	Pumice, pumicite and volcanic, gold, sand and gravel, chromite, stone, silver, gem stones.
Solano	9,951,939	11,112,903	Natural gas, clays, sand and gravel, stone.
Sonoma	[4] 2,422,613	3,595,124	Sand and gravel, stone, mercury, clays, natural gas, petroleum.
Stanislaus	[4] 475,614	782,414	Sand and gravel, clays, chromite, gold, mercury, silver.
Sutter	382,113	2,215,262	Sand and gravel, natural gas, clays.
Tehama	801,841	667,606	Natural gas, sand and gravel, chromite, stone.
Trinity	[4] 424,431	540,620	Sand and gravel, gold, manganese ore, stone, copper, chromite, mercury, silver.
Tulare	3,104,362	3,022,299	Natural gas, sand and gravel, tungsten, petroleum, stone, barite, clays, gem stones.
Tuolumne	1,179,017	4,150,232	Sand and gravel, stone, lime, tungsten, gold, silver.
Ventura	158,740,924	158,526,508	Petroleum, natural gas liquids, natural gas, sand and gravel, stone, clays, gypsum.
Yolo	1,323,480	1,318,930	Sand and gravel, natural gas, stone.
Yuba	3,367,067	3,651,441	Gold, sand and gravel, clays, platinum, silver.
Undistributed [5]	2,030,808	6,443,387	
Total	1,456,513,000	1,555,263,000	

[1] Excludes lithium.
[2] Includes revised county distribution of natural gas.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[4] Excludes value of manganese and low-grade manganese ores sold and blended at Government low-grade stockpiles for future beneficiation.
[5] Includes natural gas, petroleum, sulfur ore, gem stones, tungsten, sand and gravel, mercury, manganese ore, chromite, talc and value indicated by footnote. [3]

Alameda.—Sand and gravel contributed over $11 million to Alameda County economy; it was produced principally by the Henry J. Kaiser Co. and Pacific Cement & Aggregates, Inc., near Pleasanton and Niles, primarily for structural and paving use. The latter company also worked a pit near Fremont, as did Rhodes & Jamieson, Ltd. Other commercial producers were Bell's Sand & Gravel Co. at Irvington; California Rock & Gravel Co. at Livermore; Deetz Sand & Gravel Co. and A. C. Zaro Gravel Pit at Pleasanton; and Niles Sand & Gravel Co., Inc., at Niles.

American Salt Co. and Oliver Bros. Salt Co. at Mount Eden and Leslie Salt Co. and Morton Salt Co. at Newark had an overall increased production of salt from sea water at San Francisco Bay plants in 1956. The greater demand for salt was from food processors and chlorine and water-softener producers. Westvaco Mineral Products Division, Food Machinery & Chemical Corp., produced bromine and magnesium compounds from salt-works bitterns at Newark. Raw dolomite was used in the magnesia plant, and synthetic gypsum was

recovered as a byproduct. Philadelphia Quartz Co. of California at Berkeley used California magnesite and Nevada brucite in manufacturing hydrous magnesium sulfate (epsom salt).

Gallagher & Burk, Inc., crushed basalt at the Leona Quarry in Oakland for concrete aggregate and fill. Miscellaneous stone was produced for fill by Goddard Bros. near Hayward, Niles Quarry Co. at Niles, San Leandro Rock Co. at San Leandro, and the California Division of Highways. Sandstone was quarried and crushed by Independent Construction Co. in Oakland for use in road construction. Miscellaneous clay was produced at Niles by California Pottery Co. for building materials and refractory use and by Interlocking Roof Tile Co. and Kraftile Co. for building materials. Bell's Sand & Gravel Co. at Irvington was the major clay producer in the county, supplying a Santa Clara County brick plant.

Crude barite from Nevada deposits was ground for well-drilling mud, paint filler, and chemicals by Chemical & Pigment Co., in Oakland; Industrial Minerals & Chemical Co., in Berkeley; Westvaco Mineral Products Co., in Newark; and Yuba Milling Division, Metals Disintegrating Co., in Emeryville. Industrial Minerals & Chemical Co. operated its grinding plant on a custom basis and ground chromite, clays, feldspar, fullers earth, pinite, soapstone, and volcanic ash, all produced outside the county. Pabco Products, Inc., calcined company-produced Nevada gypsum at its Newark wallboard plant and operated an asphalt plant at Emeryville. Also at Emeryville, C. K. Williams Co. manufactured natural and synthetic iron oxide pigments from material produced outside the State, and Judson Steel Corp. operated open-hearth steel furnaces. Pacific State Steel Corp. operated 3 open-hearth steel furnaces at Niles, with an annual capacity of 216,000 tons.

Alpine.—Production of the only sulfur ore mined in California by The Anaconda Co., from its Leviathan mine near Markleville, continued high in 1956. Sulfur-ore shipments made up about one-fourth of California's total production of elemental and contained sulfur during the year. The ore was trucked to the company plant at Weed Heights near Yerington, Nev., where it was manufactured into sulfuric acid for leaching copper oxide ore.

A small tonnage of tungsten concentrate was shipped from four mines in the *Hope Valley* district near Woodfords, and about one-half of Alpine County's total output of tungsten concentrate was produced by C. B. Lovestedt from ores of the Alpine and Alturas mines. Clyde Morrison shipped tungsten ore from the Valpine mine to the newly activated mill of the Metallurgical Development Co. east of Gardnerville, Nev.

The California Division of Highways contracted for paving sand and gravel produced at various sites in the county.

Amador.—Fire-clay production, valued at $765,000 in 1956, continued to lead Amador County's mineral output. Gladding, McBean & Co., Ione Clay & Sand Corp., Pacific Clay Products, and Western Refractories Co., all in the Ione area, sold or used most of their output for refractories and heavy clay products. Owens-Illinois Glass Co. produced glass sand near Ione, in conjunction with Gladding, McBean & Co., which utilized clay separated at the same plant. Sierra Sand-Gravel Co. prepared gravel near Sutter Creek for paving. Gravel for

paving was also produced by crews of the Amador County Road Department.

The output of stone in the county was 56 percent higher in 1956 than in 1955, due primarily to the increased production of granite for roofing granules by Harley T. Kreth near Lancha Plana. American Lignite Co. mined lignite from open pits near Ione, principally for its montan-wax content, which was recovered at the Buena Vista plant.

Fitzgerald, Smith & Associates mined copper ore containing values in gold, silver, and lead from the Copper Hill lode mine in the *West Belt* district near Plymouth. The operators leased the Volo mill at Placerville in El Dorado County for treatment of the ore and shipped copper concentrate to a smelter at Tacoma, Wash. Gold was recovered at Selby, Contra Costa County, from gold ore mined at the Italian mine operated by the American International Mining & Milling Co. in the *Mother Lode* district near Drytown. Amador County's placer gold and silver output was principally from the dragline operations at the Lorentz group in the *Cosumnes River* district near Plymouth and the Garibaldi placer mine in the *East Belt* district near Volcano. Alvah G. Ekel hydraulicked 1,000 cubic yards of bench gravel at the Waddell Ranch (Blue Bucket) mine near Ione and shipped a small quantity of gold and silver in bullion to the United States Mint.

The Fresno Gem & Mineral Society collected 400 pounds of rhodonite for gem stone at the Lubanko mine near Fiddletown.

Butte.—Dry natural gas continued to be the most valuable mineral product of Butte County in 1956. Production was reported from the Wild Goose, Durham, Chico, and Perkin's Lake fields. The Wild Goose field supplied 86 percent of the total quantity produced.

Five firms produced sand and gravel—1 sand only and 3 gravel only. Of the nearly 600,000 tons of sand and gravel produced and shipped during the year over 50 percent was moved by truck, the remainder by rail. The Henry J. Kaiser Co. was far the leading shipper. The chief sources of Butte County's sand and gravel production were pits near Chico, Oroville, Gridley, Biggs, and Richvale.

Chromite ore was shipped for concentrating by the Castella Mining & Milling Co. from its Lambert mine in the *Magalia* district to the Castella mill in Shasta County. Most of the concentrate produced was under 45 percent Cr_2O_3 and made up about one-third of California's output of this grade.

The California Division of Highways contracted for the production in the county of crushed granite and paving gravel used as aggregate and road metal, as did the Butte County Highway Department for miscellaneous stone which had the same end use.

Six small placer-gold operations were active during 1956, one more than in 1955. Four of these were in the *Oroville* district and one each in the *Forbestown* and *Butte Creek* districts. The quantity of gold recovered was 20 percent less than in 1955.

Calaveras.—The cement output of the Calaveras Cement Co., with its five-kiln plant at Kentucky House, continued to have a higher value than any other mineral commodity produced in Calaveras County. Limestone and clays—raw materials for portland cement—were quarried in the *East Belt* district.

One firm in the county produced sand and gravel and two gravel only. Total shipments exceeded 100,000 tons, all moved by truck. The active pits were near Angels Camp, Sonora, and Mokelumne Hill. The Calaveras County Highway Engineer produced paving sand and gravel, and the California Division of Highways contracted for the production of paving sand in the county.

Minor tonnages of fire clay and miscellaneous clay were dug from a pit near Valley Springs.

At Calaveras County's placer- and lode-gold mines, minor quantities of gold and silver were recovered. Direct smelting ore that contained several thousand pounds of copper, a few ounces of gold, and considerable silver was shipped from the *West Belt* district. Union Copper Co., a subsidiary of Daybreak Uranium, Inc., began shipping copper ore from the old Calaveras mine at Copperopolis, and the Standard Mining Corp. shipped copper ore, containing gold and silver, from the New Penn mine near Campo Seco. The total value of the gold, silver, and copper at smelters was more than $30,000.

The Moore Creek Mining Co. shipped a minor quantity of tungsten concentrate recovered at its mine near Pioneer.

Colusa.—Natural gas was withdrawn from the Princeton field, Colusa County's only producing field in 1956.

The California Division of Highways and Colusa County Highway Department, and their contractors, produced 81 percent of the county's total sand and gravel output, nearly 130,000 tons of which was used for paving. Other producers of structural or paving sand and gravel were Baldwin Contracting Co., Inc., Cortina Rock Sand & Gravel, Paul Entremont, and Harms Bros., Inc., from various deposits in the county.

California Cut Stone & Granite Works quarried "Colusa Sandstone" near Sites, for use in building construction. Onyx for gem collectors was gathered at Sulphur Creek.

Contra Costa.—Blake Bros., at Point Richmond and Serra Bros., at Pacheco crushed sandstone obtained from their respective quarries, for use as riprap, concrete aggregate, and railroad ballast. The California Division of Highways contracted for the production of crushed sandstone in Contra Costa County; it was used as concrete aggregate and roadstone.

A. C. and A. M. Goerig crushed basalt from the Tunnel Rock quarry near Orinda for use as riprap, aggregate, and roadstone. The United States Naval Magazine, Port Chicago, contracted to produce a minor tonnage of crushed basalt used as riprap and of gravel used as aggregate. The Henry J. Kaiser Co. and the Pacific Cement and Aggregates, Inc., both produced miscellaneous stone from near Clayton for concrete aggregate and roadstone.

The Standard Oil Co. of California continued to recover hydrogen sulfide from crude oil at its Richmond plant, which was piped to the sulfuric acid plant at General Chemical Division, Allied Chemical & Dye Corp. at Richmond. The Tidewater Oil Co. also recovered hydrogen sulfide and delivered it to the Monsanto Chemical Co. sulfuric acid plant at Avon. The Union Oil Co. of California recovered molten sulfur from crude oil at its Rodeo refinery.

Although no petroleum was produced in the county four crude-oil refineries were active at Richmond, Oleum, Martinez, and Avon;

these were plants, respectively, of the Standard Oil Co. of California, the Union Oil Co. of California, the Shell Oil Co., and the Tidewater Oil Co. The crude petroleum refined in the county was of both domestic and foreign origin and reached the plants by rail, truck, pipeline, and tanker. The combined daily throughput capacity of the refineries was 342,300 barrels. There was a net combined decrease in daily capacity of 22,100 barrels in 1956 compared with 1955. No natural gasoline and cycling plants operated in Contra Costa County in 1956.

Natural gas was produced from a small portion of the Rio Vista field—the largest gasfield in the State. This field also lies in Solano and Sacramento Counties. Approximately 2 percent of the State's 1956 field production of natural gas was produced in Contra Costa County.

At Selby the American Smelting and Refining Co. continued to recover sulfur dioxide by smelting sulfide ores; about one-half was converted to liquid sulfur dioxide and one-half to sulfuric acid.

The major portion of the peat dug in the State came from the delta of the San Joaquin River near Brentwood. The Federal Bureau of Reclamation and the California Division of Highways contracted for the production in the county of sand used in concrete. Four firms produced sand and one, gravel only. More than 178,000 tons of sand and gravel were produced and shipped in 1956, by rail and truck. The principal operating pits were near Cowell and Antioch. A small tonnage of furnace sand was produced from the Antioch pit. Minor tonnages of miscellaneous clay were dug from pits near Port Costa and Richmond for use locally in brick plants.

The Kaiser Gypsum Co. imported crude gypsum from San Marcos Island, Lower California, Mexico, for calcining at its Antioch board and plaster plant.

The Selby smelter of the American Smelting and Refining Co., California's only najor smelter treating primary nonferrous material, operated largely on lead ore and concentrate of foreign origin, and refined gold and silver. Zinc fume recovered from both hot and cold slag was shipped out of California for recovering zinc and zinc oxide.

Del Norte.—The value of the 1956 chromite shipments was 35 percent of the total value of all minerals produced in Del Norte County. Harold T. Funk shipped 408 tons of ore and concentrate containing 44 to 49 percent Cr_2O_3, from the Old Doe mine in the Wimer (Low Divide) chromite area, and Holiday Mines shipped 105 tons of ore and concentrate containing 43 to 47 percent Cr_2O_3 from the Holiday mine in the Patrick Creek area. Major shipments of ore were also made by Tulare Mining Co. from the High Plateau mine in the High Plateau area and by J & W Mining Co. from the J & W (French Hill) mine in the French Hill area. W. B. Freeman operated the Havilah custom mill north of Gasquet; its daily capacity was about 20 tons of chromite ore.

Stone production increased from 76,000 tons in 1955 to 119,000 tons in 1956, owing to the greater demand for sandstone, basalt, and miscellaneous stone for riprap and roadstone. All of the crushed sandstone produced was used for roadstone by the California Division of Highways. Rowdy Creek Crusher Co. quarried and crushed basalt for use in surfacing and repairing private roads of the Simonson Logging Co. The production of basalt by the Del Norte County

Road Commission for paving was more than three times that in the preceding year. Peter Kiewit Sons' Co. produced 50,000 tons of miscellaneous stone from the Outer Rock quarry near Crescent City for use as jetty stone by the United States Army Corps of Engineers.

Anne Chapman and Simpson Redwood Co. removed gravel from a pit near Klamath, to be used as road base. The California Division of Highways and Del Norte County Road Commission and their contractors produced paving gravel in the Crescent City and Fort Dick areas. Marlin Tryon at Fort Dick prepared industrial sands and structural gravel.

A. Folkins & Howard Muloney recovered mercury from ores of the Webb mine in the *High Plateau* district near Gasquet. Copper ore containing silver was shipped to a smelter in the State of Washington from the Hiouchi open-pit mine operated by Hamilton Bros. in the French Hill area.

El Dorado.—Diamond Springs Lime Co. prepared quick and hydrated lime for building, chemical, and industrial use and hydrated lime for agriculture. The company operated 2 rotary kilns and 1 continuous hydrator at Diamond Springs.

The output of stone rose 38 percent during 1956 compared with 1955 owing to the demand for roadstone. Crews and contractors of the El Dorado County Road Department crushed granite, limestone, and miscellaneous stone at various sites in the county, used in constructing and maintaining roads. Limestone for flux, chemicals in sugar refining, and roadstone was quarried and crushed at the Cool Quarry of California Rock & Gravel Co. The output of limestone by El Dorado Limestone Co. included material for chemical uses by glass factories. T. C. Nutt and Sierra Placerite Corp. produced dimension and crushed miscellaneous stone near Placerville for rough construction and roofing granules.

Construction and maintenance crews and contractors of the California Division of Highways and the El Dorado County Road Department utilized 129,200 tons of sand and gravel, obtained for paving, from various deposits in the county. Cold Springs Sand & Gravel, the Estate of Erwin A. Goltz, Harms Bros., and J. T. White, operated sand and gravel pits in the Placerville and Meeks Bay areas.

Kelsey Slate Co. produced slate flagging at Kelsey and Pacific Minerals Co., Ltd., crushed and ground slate from its Chili Bar mine near Placerville for roofing granules and rock flour. Soapstone from the Latrobe area was mined and shipped by Frank Harris and Pacific Minerals Co., Ltd., to grinders in the San Francisco Bay area, principally for use in paint and insecticides.

Placer gold and silver output was limited to several small-scale operations, mainly in the *Mother Lode* district. Hazel Creek Mining Corp. operated the Hazel Creek mine and mill in the *East Belt* district near Pollock Pines and added a mill building and an 80-ton ball mill, increasing its flotation-mill capacity to 110 tons per 24 hours. Gold ore from the company underground mine was concentrated and shipped to a California smelter-fuming plant and yielded some lead and zinc, in addition to 2,651 ounces of gold and 945 ounces of silver. Fitzgerald, Smith & Associates worked the Noonday copper mine, in the *Mother Lode* district near Placerville, for 5 months and hauled 1,400 tons of copper ore to the company-operated Volo mill near

Placerville for treatment. Copper concentrate containing some gold and silver was shipped to a Washington smelter.

Sciaroni Bros. shipped tungsten ore from the Last Hope mine in the *East Belt* district to mills in Mariposa County and in Douglas County, Nev.

Fresno.—Petroleum, natural gasoline and cycle products, and liquified-petroleum and natural gases were the major mineral commodities produced in Fresno County in 1956. Their combined value was 12 percent higher than in 1955. The quantity of petroleum produced was slightly higher than in 1955. Twelve oilfields were producing in the latter half of 1956; the largest were the Guijarral Hills, Coalinga Extension East, the Fresno County portion of the Kettleman Hills North Dome, the Coalinga, and the Raisin City. The value of the natural-gas liquids decreased slightly below the 1955 value.

Four natural-gasoline plants were in operation during 1956—the General Petroleum Co. plant at Burrell, the Los Nietos Co. plant and the Standard Oil Co. of California, and the P. S. Magruder plants at Coalinga. The combined daily productive capacities of these plants was approximately 285,000 gallons—6 percent of the State total. The P. S. Magruder plant was much the largest in the county.

The quantity of natural gas from Fresno County fields utilized was 6 percent below that in 1955. Eleven fields produced wet gas in 1956, and the major fields, in their order of productivity were: The Guijarral Hills, the Coalinga Extension East, the Fresno County portion of the Kettleman Hills North Dome, and the Helm.

Nine firms quarried and shipped nearly 1 million tons of sand and gravel for aggregate; the larger part was moved by truck, the remainder by water and rail. A high percentage of material came from pits near Coalinga, Friant, Sanger and Avenal. The Federal Bureau of Reclamation, the California Division of Highways and the Fresno City Engineer contracted for the production in Fresno County of sand and gravel used as aggregate. The Fresno County Road Commission and the California Division of Highways also produced sand and gravel with their crews.

The Fresno County Commission of Public Works contracted in the county for the production of granite and miscellaneous stone which was used as road fill, and the Federal Forest Service contracted for miscellaneous stone used in road repair. A minor tonnage of miscellaneous clay was dug from a pit near Fresno and utilized at a local brick plant.

Three operators shipped chromite concentrate from the *Idria* district, nearly all of which contained over 45 percent Cr_2O_3.

In 1956, 13 producers shipped over 50,000 pounds of tungsten concentrate averaging 65.5 percent WO_3. A major source of this concentrate was the tungsten ore of the Jackpot open pit mine, near Tollhouse, operated by E. A. McMurtry and Alfred Benson. Other areas of tungsten-ore production were in the vicinity of Sanger, Piedra, and Dinkey Creek. Granite was obtained from the Clovis quarry by the Superior Academy Granite Co. for use as rough monumental stone.

The Albireo open-pit mine near Mercy Hot Springs, and the Archer underground mine, in the *Idria* district, produced a combined total of 25 flasks of mercury during 1956. Three aggregate plants recovered

gold and silver as a byproduct from ancient stream deposits near Friant.

A small quantity of pebble pumice was produced by the Fresno Pumi-Tile Co. from its South Dome property near Friant. Some chert and petrified wood were collected in Fresno County as gem stone.

Glenn.—During 1956 natural gas was withdrawn from the Afton, Beehive Bend, Ord Bend, and Willows fields. Substantially increased outputs of structural and paving sand and gravel were prepared by Orland Sand & Gravel Co. at Orland and of gravel for railroad ballast by the Southern Pacific Railroad Co., at Wyo, Calif. The California Division of Highways and Glenn County Road Department utilized 215,000 tons of sand and gravel for paving from various deposits worked under contract by William Dunlap, E. B. Estes, Frank Reager, Kingman Reynolds, and Harms Bros.

The Burrows chromite mine in the *Elk Creek* district southwest of Newville and a mill at Elk Creek, were operated by David Chalmers. He shipped chromite concentrate averaging more than 45 percent Cr_2O_3 to the Government (GSA) Grants Pass (Oreg.) Purchase Depot.

Humboldt.—Natural-gas production in 1956 was limited to the Eureka field.

The increased output of gravel during 1956 was due to the higher demand for paving gravel by city, county, and State road agencies, and for structural gravel by the United States Bureau of Public Roads and the United States Army Corps of Engineers. The principal producers were Eureka Sand & Gravel, on James Creek, near Arcata, and McWhorter & Dougherty, on the Eel River, near Fortuna.

Stone production rose from 21,500 tons in 1955 to 34,800 in 1956 owing to an increased output of sandstone required for road projects by the California Division of Highways. Miscellaneous stone for riprap and roads was quarried and crushed by Tom Hull at the Jacoby Creek quarry near Arcata, the McClure quarry near Blue Lake, and crews of the California Division of Highways.

Dan Haight operated the White Cedar chromite mine in the Klamath River area northwest of Martins Ferry and shipped ore averaging 47 percent Cr_2O_3 to the Grants Pass (Oreg.) Purchase Depot. Palos Verde Copper Co. shipped copper ore from its open-pit mine at Berry Summit on Horse Mountain near Arcata to a smelter in the State of Washington.

Roy's Rock Shop of Trinidad collected 200 pounds of jasper along the county's ocean beaches.

Imperial.—United States Gypsum Co. was again the leading producer of gypsum in California from open pits in the Fish Creek Mountains. The material was shipped to Plaster City for calcining at the company plaster and board plant.

The output of sand and gravel in Imperial County increased 22 percent over 1955 owing to the greater demand for structural sand and gravel by construction companies and city and county projects; it was produced principally by H. C. Gibson and Valley Transmit Cement Co., Inc., near Brawley and by Inland Materials Supply Co. and Nelson Gravel Pit near Holtville. Filter sand was prepared by Farmers Gravel Co. near Westmorland.

Stone production rose nearly 200 percent during 1956 owing to the increased output of basalt, sandstone, and granite used for riprap,

roadstone, and fill at various Government projects. The crews and contractors of the Imperial Irrigation District, produced basalt from the All-American No. 1 and Calipatra Igneous Rock quarries for riprap and quarried granite from other deposits for riprap and fill. Henry Abeyta crushed granite from a pit near Plaster City and used it in road construction. Sandstone for use as riprap in constructing a steam plant near Winterhaven, was produced by J. B. Stringfellow Co. from the nearby Pilot Knob quarry. Superlite Builders Supply Co. prepared pumice at its quarry near Calipatra for use as concrete aggregate.

Manganese ore from the Black Jet mine in the *Palo Verde* district and Pioneer mine in the *Paymaster* district, operated by Donald F. Lockwood and L. Mills Beam, respectively, was milled by Aspen Mining Co. near Blythe for shipment to a Government stockpile. Walter S. Thing operated the Black Point and Tadpole mines in the *Palo Verde* district near Blythe and was the county's leading producer of manganese ore.

Amateur collectors gathered garnet and kyanite ore specimens from the vicinity of the Bluebird mine near Ogilby. This open-pit mine (operated by R. K. Foster) yielded 263 tons of sericite schist, which was shipped to a mill at Sidewinder. John Humer, who operated the mill, ground the material for use in paint. Western Non-Metallics continued to produce and grind mica schist near Ogilby for use in making roofing materials.

Sand spikes were collected near Calexico and fossil oystershell near Plaster City for mineral specimens.

Gold and silver were recovered by an Arizona smelter from gold ore mined by J. M. Mueller at the La Colorado mine in the *Cargo Muchacho* district.

Inyo.—Although a wide variety of minerals was produced in Inyo County in 1956, tungsten again had the greatest production value. The Union Carbide Nuclear Co. Pine Creek mine near Bishop, continued to be the State's leading producer of tungsten ore. The company Morgan Creek flotation mill and digestion plant produced tungsten concentrate and synthetic scheelite from company and custom ore, and low-grade concentrate. Copper concentrate, containing silver and gold and molybdenum concentrate, were recovered as byproducts in the milling of the Pine Creek mine ore. Ore from the Brownstone mine, 23 miles northwest of Bishop, yielded nearly 186,000 pounds of tungsten concentrate averaging more than 70 percent WO_3. Other major producers included: Palmer & Decker (Adamson mine), Rom and Allison (Hanging Valley mine), S. H. Holder (Robbins mine), J. C. Esola (Shamrock mine), Lee Early, Harry David, and T. H. Stockes (Moonlight mine), Forest B. Ellis, Gene Stockman, C. V. Davis, and George Lasley (Rossi mine), and Ajax Tungsten Corp. (Tungstar mine), all in the *Bishop* district; R. G. Bradley and Richard D. Horn (Jumbo mine), in the *Union* district; R & S Mining Co. and Sooner Death Valley Mining Co., Ltd. (R & S mine) and Wm. L. Bennett (South Side mine) in the *Wildrose* district.

The Anaconda Co. was California's leading producer of zinc, lead, and silver, from lead and zinc concentrates recovered at the Darwin and Shoshone groups of mines in the *Darwin* (*Coso*) and *Resting Springs* districts, respectively. The company's lead-zinc ore also

yielded gold and copper which was recovered from the concentrates at Utah and Montana smelters. Substantial quantities of lead and zinc were recovered at a California smelter-fuming plant from ore mined at the Santa Rosa mine in the *Lee* district, and at the Defense mine in the *Modoc* district. Nearly 90 percent of the gold production credited to Inyo County was contained in the lead-zinc ores mined in the *Darwin* (*Coso*) district. The remaining gold output was recovered from tungsten ores of the *Bishop* district, lead-zinc ores of the *Lee* district and lead ores of the *Modoc* district.

Columbia-Southern Chemical Corp., a subsidiary of Pittsburg Plate Glass Co., recovered sodium carbonate from dry-lake brines of Owens Lake near Bartlett. Pumicite from the Van Loon Pumice pit, near Bishop, was quarried and used for concrete aggregate by Transmix Corp. In the Little Lake area over 105,000 tons of pumice and volcanic cinder was produced and used primarily for concrete aggregate and roofing granules. Of the 65,000 tons of talc produced in the county, 37,000 tons was mined by Louise Grantham & Associates at the Big Talc and Warm Springs No. 5 deposits near Shoshone. Other major talc producers in the county included the Eureka, Talc City, Frisco, and Rogers mines of Sierra Talc & Clay Co., the Death Valley mine of Multi Mines, Inc., and the Eclipse mine of Kennedy Minerals Co., Inc. Most of the crude shipments went to grinders in Inyo and Los Angeles Counties and were ultimately used in ceramics and paint. Huntley Industrial Minerals, Inc., ground California- and Nevada-produced talc and pyrophyllite at Laws, principally for use in paint and insecticides.

Sand and gravel for structural and paving purposes was produced by Bishop Engineering & Construction Co., I. L. Croft & Son, and projects of the California Division of Highways, the Death Valley National Monument, the Inyo County highway engineer, and the North and South Districts of the Los Angeles Aqueduct and their contractors.

West End Chemical Co. quarried limestone in the Argus Range and calcined it for carbon dioxide, which was utilized in producing sodium carbonate in its plant near Trona (San Bernardino County). The byproduct lime, although of excellent chemical grade, was stockpiled for possible future use or sale.

Material from the Inyo Quartzite quarry operated by Gladding, McBean & Co. near Lone Pine was used in manufacturing silica brick in Los Angeles County. United States Borax & Chemical Corp. and its predecessor companies mined colemanite (natural calcium borate) at the Corkscrew Canyon underground and East Coleman open-pit operations near Death Valley Junction and sodium-calcium borate at the Gerstley underground mine near Shoshone, all of which were treated at the company plant at Boron (Kern County).

The active clay deposits in Inyo County during 1956 were: The Calclay and Olancha pits in the Owens Lake area (fuller's earth); the Side Hill pit near Death Valley; and Ibex pit near Tecopa (bentonite). The total output, which was less than that in 1955, was used principally as a carrier for insecticides and filter aids and in pharmaceuticals.

International Minerals & Chemical Corp. produced perlite from its mine at Fish Springs and shipped the material to company and other expanding plants in Los Angeles County.

Asbestos (amphibole) shorts obtained from the Tin Mountain-Lawrence claim near Tin Mountain, were shipped by Huntley Industrial Minerals, Inc., to the Flintkote Co. at Hilo, Hawaii. Bloodstone, for gem stone, was collected in the Panamint Range, Death Valley.

Kern.—The quantity of petroleum produced increased slightly above that in 1955. Five minor oilfields were discovered during the year: The Blackford, the Gonyer Anticline, the Jerry Slough, the Semitropic and the Strandsouth. During 1956, 8 crude-oil refineries were active in Kern County or about one-fifth of the 39 operating in the State. All these were in the Bakersfield area. The largest were those of the Standard Oil Co. of California and the Bankline Oil Co. The combined daily throughput capacity of these refineries was 64,400 barrels—5 percent of the State total. The net increase in daily capacity during 1956 was 1,600 barrels.

The output of natural gasoline and cycle products decreased slightly and that of LP-gases increased. Twenty natural-gasoline and cycling plants were active in Kern County during the year. Seven were in Bakersfield, 4 in Taft, 3 each in Maricopa and McKittrick, and 1 each in Tupman, Elk Hills, and Shafter. The largest plants were those of the Western Gulf Oil Co. at Bakersfield, the Ohio Oil Co. at Bakersfield, and the Richfield Oil Corp. at Tupman. These were the only two cycling plants in the State. The combined daily productive capacity of all natural-gasoline and cycling plants was approximately 1,500,160 gallons (32 percent of the State total) and the largest of any county in the State.

The quantity of natural gas from county fields utilized was 25 percent below that in 1955. One new wet-gas field was discovered and designated as the Shale Point area, with an initial daily flow of 3,550 thousand cubic feet.

The United States Borax & Chemical Corp. continued to be the leading borax producer in the State and in the Nation from its underground operation near Boron. The company also produced important quantities of other sodium compounds from the same material.

Portland cement was produced by Monolith Portland Cement Co. and the California Portland Cement Co. at Monolith and near Mojave, respectively. The Monolith plant operated five kilns, obtained gypsum from Ventura County, and mined limestone and clay locally. A minor tonnage of sandstone was quarried for rough architectural use by N. W. Sweetser near Rosamond.

The Groover Mining & Milling Co. quarried miscellaneous stone near Cantil for use as roofing granules, and the California Division of Highways contracted for the quarrying in the county of miscellaneous stone used for concrete and roadstone.

Nine firms produced sand and gravel, 1 gravel only and 1 sand only for aggregate. Shipments exceeded 1 million tons of sand and gravel, all hauled by truck. The major producing pits were near Bakersfield, Inyokern, Maricopa and Ridgecrest. The Federal Bureau of Reclamation and the California Division of Highways both contracted for production in the county of sand and gravel used as aggregate. The latter agency also quarried sand and gravel with its own crews.

Six producers quarried over 400,000 short tons of crude gypsite, principally for agricultural use. The product of the Superior Gypsum

Co. pit, near Lost Hills, was used both as an agricultural aid and as a cement retarder. Major production was by H. M. Holloway, Inc., near Lost Hills.

Miscellaneous clay was dug from pits near Mojave, McKittrick, and Rosamond for use in cement and drilling muds.

Sixty-six producers shipped nearly 60,000 pounds of tungsten concentrate, which averaged 63.3 percent WO_3. The major sources of this production were the ores of the High Peak mine near Inyokern, the Hard Luck mine near Randsburg, and the Victory group of claims near Red Mountain. Rene Engel and Associates planned to construct a tungsten mill near Weldon, and to develop 17 claims.

One placer mine (a small dragline operation in the *Randsburg* district) produced gold and silver. The Burton mill, equipped for custom cyanidation and flotation of gold and silver ores, was subsequently leased to Golconda Metals Co. Gold-silver fluxing ore was shipped to an Arizona smelter from the Silver Queen mine in the *Mojave* district. Lode properties that produced gold and silver by amalgamation of gold ores included the Porter group of claims in the *Clear Creek* district; Standard group of claims, *Mojave* district; Butte Lode, Mountain Lion operation, and Yellow Astor mines, *Randsburg* district; and the Peon claim in the *Sageland* district. A large percentage of the gold and silver yield and all of the small copper, lead, and zinc output credited to the county was recovered by cyanidation and smelting of cleanup material from the Burton mill in the *Mojave* district, operated by Burton Bros., Inc. The S. T. & G. Development Co. took over the operation of the Darmond Mining & Smelting Co. plant, 1 mile south of Rosamond, on a long term basis. The plant was operated 30 days during 1956 on gold and silver ores from the Bertha Ann group in the *Darwin* district, Inyo County.

The Long Beach Salt Co. produced salt by solar evaporation of brines near Randsburg. Small quantities of rhodonite and jasper were collected in the county as gem stone.

Kings.—Petroleum and natural gas continued to be the major mineral products in Kings County in 1956. The quantity of petroleum produced decreased 9 percent below 1955. The Pyramid Hills and part of the Kettleman Hills fields were the only producing areas. One crude-oil refinery—that of the Caminol Co. at Hanford—operated during the year. The throughput daily capacity of this plant was 5,000 barrels. Four natural-gasoline plants at Avenal had a combined daily production capacity of approximately 458,000 gallons—10 percent of the State total. Three of these plants were operated by Standard Oil Co. of California and one by P. S. Magruder. The quantity of utilized natural gas from county fields was 11 percent greater than in 1955. No new oil- or gas-field discoveries were reported in the county during 1956.

Minor quantities of sand and gravel were quarried in Kings County by crews of the California Division of Highways and an additional tonnage contracted for. The McPhaill Gypsum Co. produced crude gypsum for agricultural use from its quarry near Avenal.

The Fredanna and Little King mercury mines near Parkfield were productive during the year.

Lake.—Shipments of mercury produced in 1956 amounted to $645,000, or 78 percent of the total value of all minerals produced in

Lake County. California Quicksilver Mines, Inc., the county's principal producer, operated the Abbot mercury mine in the *Sulphur* district near Willow Springs. The company completed 2,866 feet of new drifts, developed a new ore body, and diamond-drilled 4,546 feet. Bradley Mining Co. recovered 672 flasks of mercury by furnace and secondary retort at the Sulphur Bank deposit near Clearlake Oaks. Other operating mercury mines were the Baker mine near Lower Lake and the Big Chief and Big Injun Groups, the Chicago, Helen, Joyce Prospect, Mirabel, and Wall Street mines near Middletown in the *East Mayacmas* district.

The Government-and-contractor sand and gravel output for roadstone used by the California Division of Highways and the Lake County Road Department decreased 33 percent in 1956 compared with 1955. The principal commercial producers of structural and paving sand and gravel were F. M. Frazell and Lange Bros., who operated pits near Kelseyville. Cache Creek Gravel Co. produced sand and gravel used for channel diversion and road construction between Cache Creek and the Wilson Valley Dam site.

V. V. Coleman prepared pumice and volcanic cinder from the Coleman quarry near Clear Lake Highlands, for use in fill, plaster, and soil conditioning.

About 260 long dry tons of manganese ore averaging 42 percent Mn and 2 percent Fe was shipped to a low-grade Government (GSA) depot from the Toy Young mine in Potter Valley, 30 miles northeast of Ukiah.

Members of the San Francisco Gem & Mineral Society gathered miscellaneous gem stones in the county, including 25 pounds of cinnabar, 200 pounds of obsidian, and 67 pounds of jasper.

Lassen.—The sand and gravel operations of Grayson Concrete & Materials near Janesville, Harms Bros. and George E. Miller in the Susanville area, and Lester L. Rice & Sons near Adin contributed considerably to the increased value of the county 1956 mineral production over 1955. The California Division of Highways, the United States Army Corps of Engineers, and the Modoc County Road Department also utilized structural and paving material produced in the county.

The higher output of basalt and miscellaneous stone and the increased use of granite for curbing and flagging explained the higher value of stone production in 1956 compared with 1955. The portable crusher operation of Lester L. Rice & Sons in the Susanville area yielded basalt for paving material. Susanville Marble & Granite Works, at Susanville, quarried gray granite for curbings; granite for riprap and roadstone was crushed at various localities in the county, by crews and contractors of the Lassen County Highway Department. The United States Forest Service utilized crushed miscellaneous stone in the Lassen National Forest for road repair. Mt. Lassen Cinder Co. quarried volcanic cinder near Susanville for concrete aggregate.

Los Angeles.—The quantity of petroleum from 44 producing fields increased slightly over 1955. During 1956, 18 crude-oil refineries were active in Los Angeles County, or slightly less than half of the 39 operating in the State. Six were in Long Beach, 4 in Wilmington, 2 in Torrance, and 1 each in El Segundo, Norwalk, Sante Fe Springs,

Paramount, Watson, and Newhall. The three largest were the Richfield Oil Corp. refinery at Watson, the General Petroleum Corp. refinery at Torrance, and the Standard Oil of California refinery at El Segundo. The combined daily throughput capacity of the county refineries was 790,400 barrels or 64 percent of the State total. The net increase in daily capacity during the year was 79,400 barrels.

The production of natural-gas liquids and cycle products was lower and that of LP-gases slightly higher in 1956 than in 1955. Twenty-six natural-gasoline plants were active in Los Angeles County in 1956, or about one-third of the 78 plants active in the State. Five of these were at Santa Fe Springs, 4 at Signal Hill, 3 each at Compton and Long Beach, 2 each at Inglewood and Newhall, and 1 each at Wilmington, Torrance, Castaic, Playa Del Rey, Seal Beach, Brea, and Los Angeles. The two largest plants were the Lomita Gasoline Co. of Long Beach and the General Petroleum Corporation at Wilmington. The daily productive capacity of Los Angeles County plants was approximately 1,097,300 gallons, or 23 percent of the State total. The quantity of utilized natural gas from county fields decreased 10 percent below the figure for 1955; 38 fields reported production.

Thirty-two firms produced and shipped over 26 million tons of sand and gravel, most of which was transported by truck. Major pits were near Littlerock in the northeast part of the county and near Irwindale, Arcadia, El Monte, and Azuza in the eastern portion. A relatively small tonnage of blast, engine, and filter sands was produced. Nearly 1 million tons of crushed granite was produced by 6 operators.

Over 800,000 tons of crushed miscellaneous stone was produced by 2 operators and over 23,000 tons of dimension miscellaneous stone was produced by 7 operators. The California Division of Highways, the Burbank City Engineer, the Glendale County Engineer, the Los Angeles Public Road Department, and the Los Angeles Water Power Department and their contractors, produced sand and gravel used as aggregate. The City of Burbank contracted for the quarrying in the county of granite used as riprap. The City of Los Angeles, Harbor Department, contracted for granite used as fill. The cities of Los Angeles and Long Beach contracted for miscellaneous stone used for concrete aggregate and road stone.

The Union Oil Co. of California and the Wilshire Oil Co. of California produced molten sulfur from crude oil at their refineries at Wilmington and Watson, respectively. The Hancock Chemical Co. purchased hydrogen sulfide and recovered molten sulfur in its sulfur plant at Watson. The Standard Oil Co. of California (with a refinery at El Segundo), and the Shell Oil Co. (with a refinery at Wilmington), recovered hydrogen sulfide from crude oil.

The Great Lakes Carbon Corp. prepared diatomite at its Walteria mill from crude obtained at the nearby company pit.

Portland cement was produced by the Blue Diamond Corp. in its Los Angeles plant, using purchased "clinker" as raw material.

Iodine was recovered at Dominguez by the Deepwater Chemical Co. from waste oil-well brines in the Dominguez oilfield.

Over 31,000 tons of miscellaneous clay was produced from pits near Reseda, Sunland, and Los Angeles, for local use in manufacturing of heavy clay products. Nearly 444,000 tons of miscellaneous clays,

mostly for brick manufacture at county plants, was dug from 11 other producing pits in the county.

A modest tonnage of soapstone was obtained from the Katz property near Acton.

Two placer mines in the *San Gabriel* district and one lode-gold mine in the *Neenach* district were in operation during 1959 and produced several hundred ounces of gold and silver.

The Kaiser Gypsum Co., Inc., imported gypsum, and Pabco Products, Inc., received gypsum from its Henderson (Nev.) property, for calcining at their board plants in Long Beach and Los Angeles, respectively.

A small tonnage of feldspar mined in San Bernardino County was custom-ground by the Kennedy Minerals Co. for a southern California brick manufacturer. The Sunshine Mica Co. ground mica of foreign and out-of-State origin at its Los Nietos plant for use in paint and as a roofing material. Although there was only 1 relatively small soapstone producer in Los Angeles County, 7 of the State's 15 talc-and soapstone-grinding plants were in the county.

Madera.—Natural-gas production in 1956 at the Chowchilla, Gill Ranch, and Moffat Ranch fields increased 19 percent compared with 1955.

The major producer of structural and paving sand and gravel was C. W. Stewart & C. E. Nuss, who operated their fixed plant at Herndon. Other producers of aggregate for building and paving were the San Joaquin Valley Pipe Co. at Chowchilla and Thompson Materials & Construction Co., Inc., and Valley Feed & Fuel Co. near Madera. Paving sand and gravel production was contracted for in the county by the Federal Bureau of Reclamation, the California Division of Highways, and the Madera County Road Commission.

In the Friant area California Industrial Minerals Co., Elmer Erickson, and Ol'Rebel Minerals, Inc., quarried pumicite from tuff layers for pesticide filler, concrete aggregate, and abrasives. Raymond Granite Quarries prepared monumental and rough building stone quarried near Raymond.

The principal tungsten producer in the county—the New Idria Mining & Chemical Co.—operated the Strawberry mine in the *Jackass* district; it yielded 143,300 pounds of concentrate averaging 71.3 percent WO_3. Other producers included United States Tungsten Co., Victory Ridge No. 2 mine, and Donald Trainer, San Joaquin mine, in the North Fork area; and Fagan Bros., Coarse Gold dump and Hazzett (Tin Bucket) mine near Coarse Gold and Oakhurst, respectively.

Gold and coproduct silver were recovered from the Chowchilla River bed at Werly Ranch by the suction dredge of the Sunshine Dredging Co. Delta Mining Co. and Multi Metals, Inc., operated the Jesse Belle mine and a 50-ton flotation mill in the *West Belt* (*Daulton*) district, on copper ore, during the early and latter part of 1956 respectively, and shipped copper concentrate containing gold and silver to out-of-State smelters.

Marin.—The value of stone production—double that of 1955—was the principal item in Marin County's mineral output. Marin Rock & Asphalt Co., Inc., produced crushed basalt at Novato for road use. Contractors produced about 70,000 tons of crushed miscellaneous

stone, which was used for fill by the California Division of Highways. Sandstone, crushed for riprap and road construction, was quarried near San Rafael by Basalt Rock Co., Inc., at the McNear Quarry, and by Hutchinson Co. at the Greenbrae quarry.

Paving gravel was prepared by Niles Sand & Gravel Co. at its Black Point plant and by Basalt Rock Co., Inc., near San Rafael. The California Division of Highways used paving sand produced locally by contractors. L. P. McNear Brick Co. utilized weathered shale produced from the open-pit deposit of The McNear Co. near San Rafael, for manufacturing of common brick.

The McNear Co. expended shale from the same deposit for use in lightweight aggregate. Perolite Products Co., Sausalito, expanded crude perlite produced in Nevada, for plaster and agricultural use.

Turner & McFarland retorted mercury from ore mined at the Gambonini property near Marshall. Floyd Edwards & Bros. operated in the same area on mercury ore from the Edwards mine until May, when Panco Mining Corp. subleased the mine and began installing equipment.

Members of the San Francisco Gem & Mineral Society gathered 100 pounds of petrified whalebone at Bolinas.

Mariposa.—The output of sand and gravel increased 17 percent in quantity compared with 1955, owing principally to the demand for paving sand. Mariposa Sand and Gravel Co. produced building and paving sand and gravel at the Mormon Bar plant and recovered some byproduct gold and silver in the process. Other production in the county was by Baun Construction Co., Inc., and Wm. J. Sayre, Sr., near Mariposa and crews of the California Division of Highways and from Yosemite National Park.

About 14,000 tons of granite was quarried and crushed for riprap and road repair by crews and contractors of the Yosemite National Park. Formation Logging Service Co. produced and dressed building stone from the Specimen Hill quarry at Bagby. Lee I. Rowland of Mariposa produced slate from the Aqua Fria Slate quarry, which was used for flooring and facing.

Incline Mining Co. (operating the Blue Dipper, Blue Spot, and Garnet Queen mines near El Portal) was Mariposa County's principal tungsten producer. The company also custom-milled ores from other mines in the county and from deposits in adjacent counties.

Several gold mines were active in the county during 1956, yielding modest quantities of gold and silver. Chris Mills operated the Red Banks mine near Coulterville and was the leading producer of gold and silver recovered by amalgamation of ore. Other operators who recovered gold and silver by amalgamation included, Clyde T. Foster (Sweetwater mine) in the *East Belt* district, and E. B. Cook Co. (Permit mine) and Formation Logging Service Co. (Specimen Hill mine), in the *Mother Lode* district. Copper and silver were recovered from gold ore mined and shipped by Mines Contracting, Inc., from the Spanish gold mine to a California smelter.

Members of the San Francisco Gem & Mineral Society collected 100 pounds of mariposite and ankerite near the Tuolumne County border south of Jacksonville.

Mendocino.—The value of the sand and gravel output comprised 81 percent of Mendocino County's mineral production. C. A. Haun &

Sons produced sand and gravel (from a pit 1½ miles east of Willits) which was used in building construction and paving. Other major producers were E. T. Baxman at Fort Bragg and Ukiah Gravel & Cement Co., Inc., at Ukiah. Contractors for the California Division of Highways produced 191,000 tons of sand and gravel used for road maintenance. About 18,000 cubic yards of granite was quarried, crushed and screened for road repair by the construction and maintenance crews of the Federal Bureau of Indian Affairs. The Mendocino County Highway Department and the California Division of Highways used 17,000 tons of crushed sandstone for their various road projects.

Cal Dri Ice Corp. produced natural carbon dioxide gas for manufacturing dry ice at Hopland. Operations were discontinued in October owing to the reported destruction of vegetable life by seepage from the well into the surrounding area.

Manganese ore was shipped by S & C Mining Co. from the South Thomas mine near Ukiah to a Government stockpile.

The Covelo Jade mines yielded 4,000 pounds of jade during 1956, and Carl Jansen and Clifford C. Zarley collected about 2,000 pounds of jasper near Covelo.

Merced.—The continued high demand for sand and gravel in building and paving resulted in a dollar value for this commodity above that of all other minerals produced in Merced County. The output of gravel increased 90 percent compared with 1955 and was 74 percent of the total sand and gravel produced in the county. River Rock, Inc., operating the Snelling fixed plant and the Atwater portable plant, was the principal producer of sand and gravel in Merced County, including gravel used for railroad ballast. The company recovered also some gold and the coproduct silver at the Snelling operation. Other producers with fixed plants were Le Grand Sand & Gravel at Le Grand, Los Banos Gravel Co. at Los Banos, Turlock Rock Co. at Ballico, and Valley Aggregates, Inc., at Cressey. Portable operations were conducted by Frederickson & Kasler at Le Grand and Roy Richardson at Los Banos.

Agricultural Minerals & Fertilizer Co. produced Agricultural-grade gypsum from the Ortigalita Creek gypsite deposit near Los Banos.

The Baroid Sales Division, National Lead Co. in its mill at Merced processed bentonite and ground barite, received from its own mines in California and Nevada, for use in well drilling mud.

Burgen & Olsen recovered mercury from ore mined in an extension of the old Stayton mine near the San Benito County border east of Hollister.

Modoc.—Structural and paving sand and gravel were supplied principally by Moyer Gravel Co. from pits at Alturas. Great Northern Railway Co. produced gravel for railroad ballast at Mammoth. Paving sand and gravel was prepared at various sites by Baldwin Contracting Co., Inc., Harms Bros., California Division of Highways, Alturas City Engineer, and the county road commission. Contractors for the California Division of Highways produced crushed basalt for roadstone on State Highway 139. Great Northern Railway Co. quarried volcanic cinder from the Ainshea Butte quarry near Mammoth, used for fill. The Tulelake plant of United States Pumice

Supply Co., Inc., at Newell, cut and trimmed pumice, quarried by the company in Siskiyou County, for use as scouring blocks.

Modoc Peat Moss Co. recovered hypnum peat moss from a bog in Jess Valley near Likely and shipped the material in bulk by truck and rail for use as a soil-conditioning agent.

Clifford C. Zarley gathered 3,000 pounds of obsidian gem material from the Davis Creek area in the northwest section of Modoc County.

Mono.—The value of concentrate recovered from tungsten ore mined in 1956 exceeded that of any other mineral produced in the county. Wah Chang Mining Corp. Black Rock mine was the second ranking producer in California. This company also operated a flotation-chemical plant in the *Chidago* district near Benton for treating company ore and concentrate. Nevada Consolidated Uranium, Inc., Nevada Minerals, and Vandee Tungsten, operated the Tungsten Queen mine in the *West Walker River* district near Coleville and were the other major producers of tungsten ore in the county.

Gold was recovered by amalgamating ore mined by George H. Totland at the Bright Star mine in the Cooney Lake area. Masonic Mine Association shipped gold ore, containing silver, from the Sarita group of claims in the *Masonic* district near Bridgeport, to a California smelter.

Andrew Boyd and Cowan & McGraw prepared pumice taken from quarries in the Benton and Bishop areas for acoustic plaster and concrete aggregate. The Lee Vining mill of United States Pumice Supply Co., Inc., trimmed and cut pumice from the Frank Sam mine for scouring blocks.

About 160,000 tons of paving gravel was prepared and used in Mono County as compared with 41,000 tons in 1955. Rice Bros., Inc., contractors for the California Division of Highways, the Mono County Road Department, and the United States Forest Service were active producers of sand and gravel in various sections of the county.

Huntley Industrial Minerals, Inc., mined over 14,000 tons of pyrophyllite at its Pacific Pyrophyllite mine in the *White Mountain* district and ground the material at Laws (Inyo County) for use principally in insecticides and paint. The company also produced kaolin-type clay at its Little Antelope deposit near Mammoth, and prepared it for use in paint and stucco in Inyo County.

About 6,000 tons of basalt was crushed and used for fill by crews of the California Division of Highways.

A. Hugh Dial collected 500 pounds of geode gem material at Hot Creek, east of Casa Diablo.

Monterey.—Petroleum in 1956 continued to have the highest value of all minerals originating in Monterey County. Production was limited to the San Ardo field and increased 7 percent in quantity over 1955, while natural-gas production in the county decreased 49 percent.

The Kaiser Aluminum & Chemical Corp. produced quick and hydrated lime for building, agricultural, refractory and chemical uses. Dolomite was quarried and calcined by the company at Natividad. Magnesia was produced from sea water and calcined dolomote in the Kaiser plant at Moss Landing.

Six firms produced sand and 2 gravel, with a total output of nearly 500,000 tons. The major active pits were near Pacific Grove, Seaside, Marina, and Castroville. About 200,000 tons of glass sand was

produced from the Pacific Grove, Seaside, and Marina pits by the Owens-Illinois Glass Co., the Del Monte Properties Co. and the Monterey Sand Co. Blast, engine, and filter sands were produced from the Pacific Grove and Seaside pits in addition to the output of aggregate sand. The California Division of Highways and the Monterey County Highway Department produced sand and gravel with their own crews. The former agency also contracted for the production, in the county, of these materials, which were used as concrete aggregate.

A minor tonnage of miscellaneous dimension stone was quarried in the Carmel Valley by Porter-Margvard for use in rough construction.

The Del Monte Properties Co. produced silspar, a silica-feldspar mixture, and ground feldspar at its plant near Del Monte.

The Monterey Bay Salt Works produced salt by solar evaporation of sea water near Moss Landing.

The Old Murray No. 1, near San Simeon, and the Patriquin group of mines near Parkfield in the southern part of the county, accounted for the modest output of mercury during the year.

A few pounds of jade and limestone were collected in the county for gem stone use.

Napa.—The value of stone production in the county exceeded that for any other mineral, and the quantity produced in 1956 was 49 percent above that in 1955. Basalt Rock Co., Inc., contractors for the California Division of Highways, and the Napa County Engineer, quarried and crushed basalt and miscellaneous stone near Napa for riprap, road construction, and fill. Frederickson Bros. operated a portable crusher near Monticello and prepared sandstone for concrete aggregate and roadstone. About 156,000 tons of sandstone was crushed and used for fill by the County Engineer and the Federal Bureau of Reclamation. Basalt Rock Co., Inc., prepared diatomite from its Pozzolan pit near Napa by drying, burning, and grinding it for use in pozzolanic cement. This company also bloated shale from Solano County at its Napa Junction plant for light aggregate.

Sand and gravel for building and paving was produced at the Benson gravel plant near Pope Valley and at various localities by R. A. Farick Co., Basalt Rock Co., Inc., and crews of the Napa County Engineer.

Perlite Aggregates, Inc., quarried and expanded perlite at St. Helena for use in plaster.

W. T. Kritikos and Vincent Yracabel et al., recovered mercury from ore at the Oat Hill mine dump in the *East Mayacmas* district, near Aetna Springs. Other producing mercury properties were the James Creek, Mad Money, Pope Creek, Toyon, and Vian mines, in the *Pope Valley* as well as the *East Mayacmas* districts.

Chromite ore and concentrate were shipped from the Grub Stake No. 1 claim in the *Pope Valley* district by Clyde Davis and from the White Angel group in the *Knoxville* district by David Chalmers to the Government (GSA) Grants Pass (Oreg.) Purchase Depot.

Changes and improvements during the year at the Phoenix mine of the Tabor Mining Co. near Monticello, limited its output of chrysotile asbestos to less than its contemplated annual output. The company produced a special grade of shorts used as a cement additive.

The Manhattan deposit leased by Cole's Mineral Co., in the *Knoxville* district, yielded several tons of onyx gem stone during 1956. Members of the San Francisco Gem & Mineral Society collected 67 pounds of jasper in the Putah Creek area.

Nevada.—Placer gold and silver production in Nevada County was primarily from small-scale operations of prospectors and itinerant miners. Empire Star Mines Co., Ltd., operated the Empire-North Star group of mines in the *Nevada City-Grass Valley* district and recovered gold and silver from company gold ore and concentrate from neighboring mines treated by amalgamation and cyanidation. Company operations were closed by a labor strike in July and remained shut down the remainder of the year. Other producers of gold and silver in the same district included Jack Sutherland (Little Fort Knox mine) and Willow Valley Mines, Inc. (St. Louis Tunnel mine).

The Baroid Division, National Lead Co., shipped crude barite from the Spanish mine near Washington to company plants in California and Texas.

Idaho-Maryland Mines, which discontinued gold mining in December 1955, worked its Brunswick mine in the *Grass Valley* district, concentrated the tungsten ore in the new company 100-ton gravity mill, and shipped the concentrate to the Toulon mill, Pershing County, for roasting and magnetic separation.

Paving gravel composed 74 percent of the total quantity of sand and gravel produced in the county. Major producers were Hansen Bros. on the Bear River, near Grass Valley, and crews of the Nevada County Highway Dept. at various locations in the county.

Orange.—Petroleum, LP-gases, and natural gas again in 1956 was the most valuable mineral product of Orange County. The quantity of petroleum produced was 11 percent less than the 1955 figures, and was from 16 producing fields. The Esperanza field was a discovery during the year. During 1956, 1 crude-oil refinery was active in Orange County—the Socal Oil & Refining Co. plant at Huntington Beach with a daily throughput capacity of 2,350 barrels.

Production of natural-gas liquids increased slightly, and the quantity of natural gas, withdrawn from 14 fields, decreased 32 percent. Nine natural-gasoline plants were active, with a daily combined production capacity of 517,994 gallons or 11 percent of the State total. Three of these were in Brea and two each in La Habra, Placentia, and Huntington Beach. The largest plants were those of the Signal Oil Co. at La Habra and the Standard Oil Co. of California at Huntington Beach.

Six firms produced sand and gravel, 7 sand only, and 1 gravel only, with a total output of nearly 4 million tons, nearly all of which was moved by truck. The pits that supplied the greatest yield were near Anaheim, Orange, Yorba Linda, Corona del Mar, San Juan Capistrano, El Toro, and Garden Grove. The pits at Corona del Mar and El Toro also produced minor tonnages of molding sand. The California Division of Highways and the Santa Ana City Engineer contracted for the production in Orange County of sand and gravel used as aggregate.

Small tonnages of iodine and iodine compounds were produced at Seal Beach by the Dow Chemical Co. from waste oil-well brines of the Seal Beach oil field.

Fire clay was dug from pits near Corona by Gladding, McBean & Co., and minor tonnages of miscellaneous clay were dug from pits at Huntington Beach and Tustin by La Bolsa Tile Co. and Pacific Clay Products, respectively. Near El Toro, I. P. Arnold produced a kaolin-silica sand mixture for use in refractory furnace lining and W. A. Schoeppe produced kaolin.

The Western Salt Co. produced salt by solar evaporation of sea water near Corona del Mar.

Placer.—The production of clays by Gladding, McBean & Co. and Lincoln Clay Products Co., Inc., in the Lincoln area, led Placer County's mineral output, in terms of value. The clays produced were sold or used principally for the manufacture of heavy clay products.

Gravel prepared for paving purposes comprised 79 percent of the total sand and gravel produced at various localities in the county, principally by Marshall & Miles Gravel Co. near Colfax, operations of the California Division of Highways, and the Placer County Road Department and their contractors at various locations.

Union Granite Co. quarried building and monumental granite and crushed stone for poultry grit and nursery fines at Rocklin.

Small-scale placer operations at various mines and prospects in the county yielded 304 ounces of gold and 27 ounces of silver. Additional gold and silver production came from the Gleason and Occidental drift mines in the *Iowa Hill* district, the Murdock (Lee) draft mine in the *Rocklin* district, the Rawhide mine dump in the *Dutch Flat* district, and the Bowman (Midnight Hill group of claims), in the *Foresthill* district.

Cliff Hills and Russell Powell shipped a few tons of chromite ore averaging 44 percent Cr_2O_3, from the Mountain View mine in the *Michigan Bluff* district near Michigan Bluff to the Government (GSA) Grants Pass, Oreg., Purchase Depot. Shipments were also made from the Foresthill area by Joseph Delmue (Daisy Bell mine), J. J. & Elsie B. Stephenson (The Eisenhower mine), Blake Teague (Pit Forty Seven), and Frank Turner, Paul Beatty and Cliff Hills (Two Cedar mine).

The Buckeye Mining Co. made a small shipment of tungsten concentrate from the Buckeye mine in the *Michigan Bluff* district.

Zimdars & Delmue handsorted and shipped 2 tons of ½- by 10-inch tremolite asbestos from the Noon-Day asbestos mine near Iowa Hill. The mine was sold at the close of the year to L. L. Anderson of Foresthill.

About 200 pounds of agate for gem stone was collected near Folsom by W. J. McPherson.

Plumas.—The sand and gravel output in Plumas County in 1956 was confined to Government-and-contractor operations of the United States Bureau of Public Roads, the California Division of Highways, and Plumas County Road Department. Paving gravel composed 82 percent of the total sand and gravel produced.

About 6,000 tons of miscellaneous stone used for riprap was quarried near Tobin by the Western Pacific Railroad Co.

William L. Ash shipped 361 long tons of manganese ore averaging 45.6 percent Mn from the Mt. Hough mine, in the Quincy area, to a Government stockpile.

Leroy Kerr produced a few ounces of gold and the coproduct silver from bench gravel at the Wartime 41 group of claims near Quincy. Perry L. Jones shipped copper ore containing some silver from the Climax lode mine in the *Red Rock* district to a smelter.

Riverside.—Kaiser Steel Corp. mined and shipped magnetite-hematite ore and concentrate from the Eagle Mountain mine and beneficiation plant to the company blast furnaces at Fontana. The shipments, including ore for export, increased 38 percent in 1956 compared with 1955.

Riverside Cement Co. produced general use and moderate-heat portland cement at its Crestmore plant. Of the raw materials used, gypsum and iron ore were purchased, and limestone, shale, and quartzite were obtained from company owned deposits in Riverside and San Bernardino Counties.

The increased demand for granite and miscellaneous stone accounted for the rise in the total quantity of stone produced in 1956 compared with 1955. The high production of crushed granite was from the Stringfellow quarry near Riverside, used for riprap by the United States Army Corps of Engineers. Other producers of granite included Guy F. Atkinson Co. at Ormand, Haven Granite Co. at West Riverside, and the National Quarries' Popcorn operation at Perris. The latter property was sold to the Riverside Builders Corp. as a location for housing development. Contractors for the California Division of Highways crushed 81,000 tons of granite, which was produced in the county for road building. Riverside Cement Co. quarried and crushed limestone at Crestmore for use as asphalt and fertilizer filler, as well as for cement.

Miscellaneous dimension stone was produced near Midland by California Limestone Product Co., J. W. Hannah, Jr., Jontz Stone Co., and L. Johnson and was used in both rough and dressed form for building construction. Over 500,000 tons of crushed miscellaneous stone was used by the California Division of Highways in the county for concrete aggregate and roadstone. Minnesota Mining & Manufacturing Co. crushed miscellaneous stone at Corona for use as roofing granules. California Limestone Products, J. W. Hannah, Jr., and Lawrence Johnson sold wollastonite float obtained from the Midland area, for use as ornamental building stone.

Glass sand was prepared by Owens-Illinois Glass Co. at its Corona plant. Other major producers that contributed to a high sand and gravel output for paving and building were Baun Construction Co., Inc., Massey Rock & Sand Co., and Valley Rock & Sand Corp. in the Indio and San Jacinto areas. W. E. Kier Construction Co. operated a sand and gravel pit and a portable concrete mix plant near the Palo Verde Diversion Dam.

The quantity of clays dug by Riverside Cement Co. from its Crestmore pits, for use in cement, made the company Riverside County's leading clay producer in 1956. Pacific Clay Products ranked second, as a result of its fire-clay output at Corona and Elsinore, followed by Gladding, McBean & Co. with deposits in the same areas. Pacific Clay Products used fire clay mined by contractors for heavy clay products.

United States Gypsum Co. quarried gypsum in the Little Maria Mountains near Midland, which was used in manufacturing plaster-

board. More-Lite Co. at Crestmore expanded crude perlite from the Klondike quarry in San Bernardino County, for plaster aggregate.

California Limestone Products, which operated the Blue Chief, Glory Hole, Langdon, and South Arlington mines in the *Ironwood* (*McCoy*) district northwest of Blythe, was California's principal shipper of manganese ore and concentrate to Government stockpiles. The ore and concentrate shipped from the Langdon mine alone had a value over $300,000. Aspen Mining Co. relinquished operating control of its mill (at Inca Siding near Blythe) to the Blythe Manganese Co. in May 1956. Both companies milled manganese ore from deposits operated by California Limestone Products and Roberts & Stewart in the Blythe area of Riverside County, and from deposits in Imperial County.

The New World tungsten mine in the Banning area operated by Wilbur Stark and the Orchid No. 2 mine operated by Grover Burgoyne in the *Chuckawalla* district near Desert Center yielded a modest quantity of tungsten concentrate. Other producers included John H. Tibbetts (Milky Way mine), also in the Banning area, H. T. Lucas Mining Co. (Pigeon Creek mine) in the Santa Rosa area, and Charles Reno (Red Ocher No. 2 mine) in the Maria area.

Except for the gold ore amalgamated at the Gold Standard mine in the Dale district by Berton Schwab, ores from the Wichita & Yellow Dirt mines in the *Bendigo* district, the Collins property in the *Corona* district, and the Rusty Gold mine in the *Dale* district were shipped to an Arizona smelter for treatment.

Herb Brown and the Desert Gem & Mineral Society collected fire agate in the Blythe and Coon Hollow areas, respectively. Harold Shugart and the San Gorgonio Mineral & Gem Society gathered chalcedony and geode for gem materials in the Wiley Well area.

Sacramento.—Natural gas continued to be Sacramento County's most valuable mineral product in 1956, although the quantity produced decreased 17 percent below the 1955 figure. It was withdrawn at the Freeport, the River Island, and part of the Thornton and Rio Vista fields. It was estimated that 61 percent of the production of the Rio Vista field, which also lies in Solano and Contra Costa Counties, was in Sacramento County. A new producing area known as the West Thornton field was discovered during the year.

Seven firms produced sand and gravel (3 gravel only and 1 sand only), with a total production of more than 3 million tons, almost all of which was moved by truck. The pits of major activity were along the American River near Sacramento and Fair Oaks. Contractors for the United States Bureau of Public Roads, the Federal Bureau of Reclamation, the California State Highway Commission, and Sacramento County produced sand and gravel used as aggregate in concrete.

Sacramento County, the second-ranking gold-producing county in California, had recoveries from two active placer operations during 1956. The Natomas Co., using a fleet of bucketline dredges, was much the largest single operator. In addition, 10 active sand and gravel operations recovered gold and silver as byproducts. The quantity of gold recovered from all operations was 37 percent and silver 30 percent of the total placer recoveries in the State. All production was from the *American River* (*Folsom*) district, where platinum was also recovered at the Natomas Co. dredging operation.

A small tonnage of fire clay was dug from various prospects in the vicinity of Michigan Bar by R. J. Robideaux, for use in the manufacture of stoneware, pottery, and heavy clay products. Miscellaneous clay was dug from pits near Michigan Bar and Sacramento by Cannon & Co. and Sacramento Brick Co., respectively.

The California Division of Highways contracted for the production, in the county, of crushed sandstone, basalt, and granite used in concrete aggregate and roadstone. The United States Army Corps of Engineers contracted in the county for the quarrying of miscellaneous stone for riprap.

San Benito.—The Ideal Cement Co. operated a four-kiln portland-cement plant near San Juan Bautista. Limestone and clay for the operation were obtained from local quarries. Crushed dolomite was produced by the Westvaco Mineral Products Co. from a quarry near Hollister for use in manufacturing fiberglass, and at its magnesia plant in Alameda County.

Sixteen mercury mines produced nearly 3,000 flasks of metal during the year—about one-third of the total for the State—most of which was produced in the *Idria* district by the New Idria Mining & Chemical Co.

The California Division of Highways and the County of San Benito contracted in San Benito County for the production of gravel used as aggregate. The latter agency also prepared paving gravel with its own crews.

A few hundred tons of chromite ore was produced and shipped from three small mines in the *Idria* district.

Petroleum production was small but greater than in 1955. Although production was limited to the Vallecitos and the Ciervo areas, there was a new discovery in the Flint Hills area during the year. Natural-gas production remained small but was about five times larger than in 1955, with the output limited to the Hollister and Vallecitos areas.

Benitoite and jadeite were collected near Idria as gem stones.

San Bernardino.—Three portland-cement plants were operated during the year, namely: The California Portland Cement Co., with a 9-kiln plant at Colton and quarries in the vicinity; the Riverside Portland Cement Co., with a 10-kiln plant at Oro Grande and a limestone quarry at Klondike; and the Southwestern Portland Cement Co., with a 9-kiln plant at Victorville and a limestone quarry at Black Mountain.

Crushed limestone was produced in the Victorville area and used for metallurgical flux and in whiting manufacture (filler). Quartzite was also produced in the same area and used in the manufacture of cement and refractories. W. C. Higdon quarried a minor tonnage of dimension quartzite near Twentynine Palms and the Lucerne Valley Engineering Co. quarried rough dimension granite near Lucerne Valley. Miscellaneous stone was quarried by three firms and used in making roofing granules, for rough construction, and as railroad ballast. The Federal Bureau of Reclamation and the National Park Service contracted in the county for the production of granite used as riprap, and the California Division of Highways contracted for crushed granite used as concrete aggregate and roadstone.

The American Potash & Chemical Corp. produced borax, soda ash, salt cake, potassium chloride and sulfate, lithium carbonate, phosphoric acid and bromine; and West End Chemical Co. produced borax, soda ash, and salt cake from brines at Searles Lake. The first named firm provided California's only production of lithium and potassium compounds. Dale Chemical Industries produced soda ash from dry-lake brines near Twentynine Palms.

Sixteen firms produced sand and gravel, with shipments totaling over 4 million tons. The largest pits were in the southwest corner of the county near Redlands, Colton, Monte Vista and Upland. The Federal Bureau of Reclamation, the National Park Service, the California Division of Highways, and the San Bernardino County Highway Department employed their own crews to prepare sand and gravel for highway construction and maintenance. The California Division of Highways also contracted in the county for the production of sand and gravel.

During 1956, 27 producers shipped over 500,000 pounds of tungsten concentrate that averaged better than 60 percent WO_3. This was 8 percent of California's yield for 1956, and the Atolia mine of the Surcease Mining Co. in the *Atolia* district supplied most of the output. Other important producing areas were in the vicinity of Adelanto and Barstow.

The Metropolitan Water District of Southern California and the Pacific Salt & Chemical Co. produced salt by the solar evaporation of brines near Rice and Trona, respectively, most of which was used for water-softening purposes. The California Salt Co. mined rock salt in an open pit near Amboy and produced liquid calcium chloride from well brines in the same area. The National Chloride Co. of America also produced calcium chloride from dry-lake brines near Amboy.

The output of talc was reported by 9 firms from 18 properties in the northeast part of the county near Baker and Tecopa, and pyrophyllite production was limited to 1 mine near Oro Grande. A high percentage of the output of these minerals, which were ground outside the county, was utilized as carriers for insecticides and as fillers for paints.

A small tonnage of ball-type clay was dug from 2 pits near Hart, 15 miles southeast of Ivanpah. Bentonite, for pharmaceutical use, came from pits near Daggett, Newberry, Vidal, and Yermo, and nearly 17,000 tons of miscellaneous clay was dug from pits near Hart, Highgrove, and Chino, and used in heavy clay products.

The California Portland Cement Co. produced quick and hydrated lime at its plant near Colton, and the West End Chemical Co. hydrated lime at its plant near Trona. The only 1956 production of rare-earth minerals in the State was of bastnaesite by the Molybdenum Corp. of America from its Mountain Pass mine near Nipton. The 1956 production of concentrate, although minor, was almost double that of 1955.

The Iron Age Mining Co. operated the Iron Age open pit mine in the *Dale* district and shipped to the Kaiser Steel Corp. at Fontana. The Mineral Materials Co. worked the Cave Canyon property in the *Cave Mountain* district and shipped iron ore to southern California cement producers.

Petroleum production was small, although over twice the 1955 figure. Two fields, the Chino-Soquel and the Mahala, supplied all

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of the county's production. Natural-gas production from the Chino-Mahala and Soquel areas was quite small, only about one-fourth of the 1955 production.

The California Perlite Corp. produced crude perlite from its quarry near Ludlow, sold mostly to builders in the Los Angeles area, who do their own expanding.

A single shipment of manganese ore (pyrolusite) was made from the Owl's Head mine, in the Owl Springs area.

The sources of the county's gold and silver output were, primarily: The Telegraph mine operated by Death Valley Panamint Mining Co., *Solo* district (gold-silver ore); the New Trail mine operated by Jumbo Cycles Sales, Inc., *Ivanpah* district (copper ore); and the Alexander mine operated by Al Anderson, *Dale* district (gold ore). The New Trail mine, previously mentioned, and the Horn group, operated by Glove Uranium, Inc., in the *Turtle Mountain* district, yielded most of the copper output from direct smelting ore. A high percentage of the lead and zinc output credited to the county was recovered from lead and lead-zinc ores mined in the *Kingston*, *Barstow*, and *Ord Mountain* districts and shipped to a smelter-fuming plant. Lippincott Lead Co. operated a smelter at Ontario on lead scrap and lead ore from its Lippincott (Lead King) mine in Inyo County. The entire smelter output was utilized in the manufacture of batteries. The Bear Creek Mining Co., subsidiary of Kennecott Copper Corp., did exploration for copper in the *Halloran Springs* district east of Baker.

Gene DeZan mined celestite (strontium sulfate) at the Jasper Jean mine 8 miles northwest of Ludlow and sold the output to a Nevada concentrator of manganese ore for use as a reagent. A small quantity of pumicite was produced by Williams Bros. Pumice Products, from its mine near Hinkley, and used as concrete admixture, and a large tonnage of volcanic cinder was mined near Ludlow by the Atchison, Topeka & Santa Fe Railroad for use as railroad ballast.

Eleven gem dealers reported the collection of specimens of rhodonite, agate, jasper, quartz, petrified wood, jadeite, opalite, amethyst, and chalcedony in the county.

A small tonnage of crude feldspar was produced by Gladding, McBean & Co. from its Beck mine, near Kramer Junction, and ground in Los Angeles County for use in the production of acid brick and fire brick. The United States Forest Service contracted, in the county, for the production of miscellaneous stone used as concrete aggregate and road stone.

San Diego.—The value of sand and gravel output was 74 percent of the total value of minerals produced in San Diego County and was 18 percent higher in 1956 than in 1955. Caudell & Johnson, with gravel plants near San Diego and Poway, continued to be the county's principal producer. Crystal Silica Co.'s plant at Talica Siding near Oceanside was the source of glass, molding, blast, and filter sand, in addition to sand for the building trades. Maurice N. Gross acquired a sand-preparation plant at Lakeside from Charles Arnell and continued its steady output of building sand.

The higher production of sandstone, basalt, and granite explained the greater quantity of stone produced in 1956 compared with 1955. Nelson & Sloan crushed basalt at its quarry and crusher operations

near Otay for concrete aggregate and roadstone. Granite for building and monuments was quarried by Clemens Granite Co. at Suncrest, by National Quarries at Vista, and by Escondido Quarries and Valley Granite Co. at Escondido. Broken and crushed granite was shipped for riprap, roadstone, and railroad ballast by V. R. Dennis Construction Co. from the Canyon Rock Co. quarry, by M. H. Golden Construction Co. and Kenneth H. Golden Co., Inc., at the Mission Gorge Plant, near San Diego, and by Einer Brothers, Inc., near Escondido. Arnt Carlson quarried 1,000 tons of irregular shaped quartzite from the Red Rose Variegated Quarry at La Cresta, for building construction.

At Chula Vista Western Salt Co. produced salt from sea-water ponds by solar evaporation, and Westvaco Chemical Division, Food Machinery & Chemical Corp., recovered magnesium chloride from sea-water bitterns. All of San Diego County's miscellaneous clay was produced near San Diego by Hazard Block Co., Sorrento Brick & Clay Prod., Inc., and Union Brick Co. and utilized for heavy clay products.

Shipments of tungsten concentrate from ore mined in the county was higher in 1956 than in 1955, although only 3 mines were active, compared with 8 mines that produced in 1955. The three operators were Dale Neubert (Black Diamond mine) in the *Campo* district, Virgil Deaver (Palomar Mtn. mine) in the Escondido area, and P-K Mining & Milling Co. (Pay-Off mine) in the San Ysidro area.

Excel Mineral Co. mined celestite from Pan-Chemical Co.'s Fish Creek Mountain mine, about 9½ miles south of Ocotillo for use as a chemical reagent.

A small quantity of gold was recovered by amalgamation from ore mined from the Ella Group by Robert S. Manning and from cleanup operations at the Rose Quartz mine and mill by J. S. Mahood.

Pyrophyllite, for use in insecticides and paint, was mined in the Rancho Santa Fe area by Harborlite Corp., Howard G. Golem, and Pioneer Pyrophyllite Producers.

Harborlite Corp. of Escondido, expanded perlite from San Bernardino County and Arizona for aggregate and filter aids.

L. B. Spaulding gathered 1,500 carats of spessartite garnet from a new deposit in the *Ramona* district. Other gem stones collected in the same area were tourmaline, topaz, and smokey quartz.

San Francisco.—Miscellaneous stone produced by Charles L. Harney, Inc., at the 7th Street Quarry was used mainly by the California Division of Highways as subbase material for roads. Stone removed from the Sunset Reservoir of the San Francisco Water Department was hauled and used as fill for Stanley Drive near Lake Merced.

The use of locally produced sand and gravel in the City and County of San Francisco increased during the year owing to paving and building projects of the Department of Public Works and the reservoir projects of the San Francisco Water Department. Material removed from the site of the underground exhibit hall in Civic Center was hauled and used for fill at Hunters Point.

Commercial Minerals Co. operated a grinding plant in San Francisco and ground talc and soapstone received from producers in El Dorado and San Bernardino Counties.

San Joaquin.—During 1956 natural gas was withdrawn from the Galt, Lodi, McDonald Island, Roberts Island, Tracy, Vernalis, and part of the Thornton gasfields. The major part of the Thornton gasfield is in Sacramento County. Production of sand and gravel increased 11 percent in quantity as compared with 1955, owing primarily to the high output of paving gravel by R. A. Fraish Co. at Linden, Pacific Cement & Aggregates, Inc. at Tracy, and Rice Bros., Inc. at Clements. The Federal Bureau of Reclamation, the California Division of Highways, and the County of San Joaquin and their contractors prepared sand and gravel for paving at various localities in the county.

Stockton Brick & Tile Co. and Stockton Building Materials Co. worked deposits of miscellaneous clay near Stockton for their own use.

San Luis Obispo.—The quantity of petroleum produced decreased 14 percent below that of 1955. During 1956 one crude-oil refinery was active in the county, the Union Oil Co. of California plant near Arroyo Grande. The daily throughput capacity of this plant was 21,500 barrels, including a capacity increase of 2,500 barrels in 1956. The San Luis Obispo portion of the Russell Ranch field was the source of most of the crude petroleum.

The natural gas utilized from 6 producing fields decreased 13 percent.

Eleven producers shipped over 5,000 long tons of chromite concentrate averaging less than 45 percent Cr_2O_3 and better than 2,000 long tons containing more than 45 percent. Most of the chromite ore was mined in the Santa Lucia Range north of San Luis Obispo. A new chromite mill, with a daily capacity of 25 long tons, was put into operation by the Castro Mining Co., the county's major producer, on the Morro Bay-Atascadero road.

Three firms produced sand and gravel, 1 firm gravel only, and 1 firm sand only, with a total output of over 70,000 tons in 1956. The active pits were near Oceano, Cambria, and Atascadero. Minor quantities of glass and molding sands were produced from the Cambria and Oceano pits, respectively. The California Division of Highways and the County of San Luis Obispo employed their own crews to quarry sand and gravel. The former agency also contracted in the county for the production of these materials.

Eaton and Smith produced crushed limestone at their Lime Mountain property for use in sugar refining. The Great Lakes Carbon Corp. produced a minor tonnage of miscellaneous stone, used as rubble, from the Abelaida quarry near Paso Robles, and the California Division of Highways contracted in the county for the stone and used it in concrete aggregate and as roadstone.

The Union Oil Co. of California recovered molton sulfur from crude oil at its petroleum refinery at Arroyo Grande.

A small tonnage of miscellaneous clay was dug from a pit near San Luis Obispo by Faulstich Bros., to be used in manufacturing common brick.

The Superior Gypsum Co. quarried gypsum near Simler for agricultural use.

Seven mercury mines produced over 100 flasks of the metal in 1956, most of which was from ores of the La Libertad mine in the *Paso Robles* district.

One small shipment of manganese ore was made in 1956, from the Johe Ranch mine, 6 miles southeast of San Luis Obispo, to a Government stockpile.

A dealer in rock specimens collected a small quantity of agate near Nipomo.

San Mateo.—The Ideal Cement Co. produced portland cement at its 4-kiln Redwood City plant and dredged oystershell and clay from San Francisco bay for raw material. Pioneer Shell Co. and South Bay Dredging Co. also dredged oystershell, part of which was used in mineral food and poultry grit. The Pacific Cement & Aggregates Co. operating the Brisbane quarry and the Lowrie Paving Co. operating the San Andreas quarry near Millbrae produced crushed sandstone principally for use as concrete aggregate and roadstone. McCammon-Wunderlich produced miscellaneous stone from the Whipple Road quarry near San Mateo and the California Division of Highways contracted for its production, used as fill.

The Challenge and the Farm Hill No. 2 mercury mines near Redwood City produced over 500 flasks of metal, almost all of which was the product of the Challenge Mining Co., which operated a furnace near San Francisco Bay.

Two firms produced sand from pits near South San Francisco and Rockaway Beach. The California Division of Highways and the City of South San Francisco contracted in the county for the production of sand and gravel. The latter agency used its own crews to prepare paving sand.

Petroleum production, although small, increased more than fourfold over 1955 and was limited to the La Honda and Oil Creek fields. The La Honda field was a discovery. Natural-gas production, also minor, from these two fields was 50 percent higher than the 1955 output.

A small quantity of jasper collected on beaches in the county was sold to dealers.

Santa Barbara.—The yield of crude petroleum from the 16 fields that produced decreased slightly in 1956 compared with the previous year. Two crude-oil refineries operated in the county during the year—that of the Union Oil Co. of California at Orcutt and of the Douglas Oil Co. of California at Santa Maria. Their combined daily throughput capacity was 6,700 barrels.

The production of natural gasoline and cycle products decreased slightly while the output of LP-gases increased. Six natural-gasoline plants were active during the year. Two each were at Orcutt and Santa Maria, 1 at Santa Barbara and 1 at Goleta. Their combined daily production capacity was approximately 106,400 barrels. The largest of these plants was that of the Union Oil Co. of California at Santa Maria.

The natural-gas output from 17 producing fields dropped 17 percent. The Cuyama South field was the largest gas producer in the county.

Four firms prepared and sold diatomite during the year. The Johns-Manville Products Corp., with quarries at Lompoc, was much the largest producer in the State. The company received an award, under the National Safety Competition conducted by the Federal Bureau of Mines, for an outstanding safety record at the Lompoc operation during 1956.

Three firms produced sand and gravel and one gravel only and shipped more than 400,000 tons from pits near Solvang, Santa Maria, and Lompoc. The Federal Bureau of Reclamation and the City of Lompoc produced sand and gravel with their own crews, and the California Division of Highways and the County of Santa Barbara contracted in the county for the production of these materials.

Miscellaneous stone was produced from the Santa Maria quarry 10 miles west of Sisquoc by G. Antolini & Sons and used for rough construction.

Modest tonnages of chromite ore and concentrate were shipped to a Government stockpile from the Corrales and Davis mines near Santa Ynez and Los Olivos, respectively.

Miscellaneous clay was dug from the San Marcos pit near Santa Barbara by McNall Building Materials for use in heavy clay products. Over 200 flasks of mercury were produced in 1956 from the Gibraltar group of claims in the *Santa Barbara* district and the Red Rock mine near Los Olivos in the *Santa Ynez* district. The Gibralter group produced most of the metal.

Santa Clara.—The Permanente Cement Co., with a 6-kiln plant at Permanente, was the largest portland-cement producer in the State in 1956. The company also produced masonry cement. Limestone and part of the clay requirements were obtained locally. Crushed limestone for concrete aggregate and roadstone was produced by Bahr and Ledoyen, Inc., in the Los Altos Hills. Oystershell was dredged in San Francisco Bay by the South Bay Dredging Co. for use in mineral food and poultry grit. The Santa Clara County quarry, southwest of San Jose, was the source of a substantial tonnage of crushed limestone used for road fill. Six firms produced miscellaneous stone from the Lone Hill and Neary quarries near Los Altos and from the Stevens Creek quarry near Cupertino, used as fill and for concrete aggregate and roadstone. The Naval Air Station, Moffett Field, contracted in the county for the production of miscellaneous stone used in surfacing taxiways and airstrips.

Twelve firms in the county produced and shipped nearly 1.5 million tons of sand and gravel from pits near San Jose, Gilroy, Los Altos, Los Gatos, and Campbell. The California Division of Highways and the City of San Jose contracted in the county for the production of sand and gravel used as aggregate.

Twenty-one mercury operations were active in the county during the year, yielding over 1,900 flasks of the metal, more than half of which was recovered from reworked dump material at Almaden. The Palo Alto Mining Corp. operated the Guadalupe, the Deep Purple, and Poison Oak mines, in the *Almaden* district, and the Hillsdale mine, south of San Jose.

James McPeters produced a minor tonnage of magnesite from his mine near Livermore, which was utilized by a manufacturer of magnesium compounds in Alameda County.

Several thousand tons of miscellaneous clay was dug from pits near San Jose by producers of heavy clay products.

A small quantity of jasper was collected near Morgan Hill for gem stone.

Santa Cruz.—The Pacific Cement & Aggregates, Inc., successor to the Santa Cruz Portland Cement Co., produced portland cement in

its Davenport plant (equipped with 3 Lepol and 4 rotary kilns) and used limestone quarried locally and shale obtained near Chittenden. Near Santa Cruz the Pacific Limestone Products Co. produced limestone for rubble and for use in poultry grit.

The Santa Cruz County Road Commission contracted in the county for the production of crushed granite used as fill. Six firms produced and prepared more than 700,000 tons of sand and gravel from pits near Santa Cruz, Felton, and Soquel. The California Division of Highways contracted for the production of sand and gravel, and the County of Santa Cruz used its own crews to produce gravel.

A minor tonnage of flue dust, containing potassium sulfate, from the Davenport cement plant, was marketed as a fertilizer material.

Shasta.—The Mountain Copper Co., Ltd., continued to be California's only producer of pyrite at its Hornet-Brick Flat open pit and Hornet-Richmond underground mine in the *Flat Creek* district. The pyrite was shipped to two sulfuric acid plants in the San Francisco Bay area.

Nine firms produced and shipped nearly 500,000 tons of sand and gravel from pits near Redding, Cassel, and Burney. The California Division of Highways, the Lassen Volcanic National Park, and the County of Shasta used their own crews to quarry gravel, and the Federal Bureau of Reclamation contracted for production of this material. The Shasta County Engineer contracted for a minor tonnage of basalt used as riprap, and miscellaneous stone used as concrete aggregate and roadstone. Volcanic cinder was quarried and processed for use as roadstone by three producers near Glenburn.

Roy S. Olson operated a placer mine by dragline in the *Igo* district. Two small lode-gold mines were active in the *Shasta* district and one each in the *French Gulch* and *Redding* districts. Modest quantities of gold and silver were recovered at each of the five operations. Flue dust shipped to a smelter-fuming plant from the old Afterthought (*Cow Creek* district) and the *Balaklala* (*Flat Creek* district) copper smelters, yielded considerable silver and several thousand pounds of copper, lead, and zinc.

The Phelps-Dodge Corp. signed an agreement with Shasta Copper & Uranium, Inc. calling for a minimum expenditure per year for a 5-year period on 250 mining claims in the *West Shasta* mining district 15 miles north of Redding. Shasta Copper & Uranium, Inc., completed one DMEA surface-drilling project in the *French Gulch* district, and a second DMEA drilling project was under way in the *Flat Creek* district.

The Castella Mining & Milling Co. milled chromite ore from the Lambert mine, in Butte County, at its Castella mill and trucked the concentrate to the Government (GSA) Grants Pass (Oreg.) Purchase Depot.

Sierra.—Gold and some silver were recovered from ore mined at the Original 16 to 1 mine in the *Alleghany* district by amalgamation and by smelting sulfide concentrate shipped to Selby, Contra Costa County. Best Mines Co., Inc., operated the Brush Creek underground mine and a 100-ton flotation mill 1½ miles in the *Downieville* district south of Goodyear Bar. Free gold and silver were recovered by amalgamation, and the concentrate was cyanided at the Empire Star mill in Nevada County. Six widely scattered placer operations,

principally small-scale hand methods, were active during the year and produced a modest quantity of gold and silver.

Sand and gravel production at various localities in the county, was limited to 5,200 tons of paving gravel prepared and used for road maintenance by crews of the California Division of Highways, as compared with 38,000 tons in 1955.

Siskiyou.—John Madsen, Thompson Pumice Co., and United States Pumice Supply Co., Inc., removed pumice and volcanic cinder from deposits in the Glass Mountain area for use as griddle blocks and concrete aggregate. Shastalite Cinder Block Co. quarried 2,250 tons of volcanic cinder for its own use in the Cinder Cone area, and McCloud River Lumber Co. removed pumicite from the Porcupine Ballast deposit, near Hambone for use as ballast in its logging railroad spurs and truck roads. Southern Pacific Co. quarried 329,000 tons of volcanic cinder from a deposit at Kegg for use as railroad ballast.

The output of sand and gravel was higher in 1956, in relation to 1955 figures, owing to the demand for paving gravel by the United States Bureau of Public Roads and the California Division of Highways. Portable plants were operated by Peter Kiewit Sons' Co. at Fort Jones and by Clements Construction Co. at Fort Jones and Tulelake. E. E. Schoonmaker operated a portable plant at Yreka and Mt. Shasta Gravel Co. continued to produce building sand and gravel at the fixed plant near Mt. Shasta.

The Siskon mine, operated by Siskon Corp., in the *Klamath River* district near Happy Camp, yielded 15,020 ounces of gold and 37,336 ounces of silver from gold ore treated. The company added a larger ball mill, and increased its cyanide plant capacity to 150 tons per day. The dragline dredge operation of the Scott River Dredging Co. at the Hayden deposit (in the Scott River area near Callahan) was the principal source of placer gold and silver.

Ashland Mining Co. Fairview mine, in the *Hamburg* district northwest of Hamburg, shipped chromite ore to its mill at Ashland, Oreg., and recovered 588 tons of concentrate containing over 45 percent Cr_2O_3. The company also custom-milled ore for several chromite producers in the county and shipped concentrate to the Government (GSA) Grants Pass (Oreg.) Purchase Depot. Other major producers of chromite included J. A. Richter (Gazelle Mtn. mine) in the Callahan area, and Virgil A. Grey (Dry Gulch Group) in the Cecilville area, J. H. Watkins and F. L. Merrill (Lady Grey and Seiad mines) in the McGuffy Creek area southwest of Scott Bar, and Ruth Robertson, who shipped 102 tons of ore and 6 tons of concentrate containing more than 45 percent Cr_2O_3 from the Cyclone Gap mine, in the Indian Creek area.

Stone production rose from 62,000 tons in 1955 to 110,000 tons during 1956, owing primarily to the higher output of sandstone and miscellaneous stone for concrete aggregate and roadstone. Crews of the Siskiyou County Engineer crushed basalt obtained in the immediate vicinity of the road repair projects. About 80,000 tons of miscellaneous stone was produced near Yreka by William Tregembo for use on the Yreka-Oberlin road. Construction and maintenance crews of the California Division of Highways also crushed miscellaneous stone and sandstone obtained locally for road projects. Roy's Rock Shop

collected 100 pounds of californite at Happy Camp; 25 pounds of nephrite was gathered at Indian Creek by Louis A. Sauers.

Solano.—Natural-gas production from eight producing fields decreased slightly below 1955 figures. A large percentage of the production came from the Solano County portion of the Rio Vista field, which also extended into Sacramento and Contra Costa Counties and was about 38 percent of the total field output.

Miscellaneous clay was dug from a pit near Vallejo by Basalt Rock Co., Inc., and bloated in Napa County for use as lightweight aggregate.

Five firms quarried over 400,000 tons of sand and gravel from pits near Rio Vista and Winters. The United States Bureau of Public Roads, the Federal Bureau of Reclamation, the California Division of Highways, the Solano County Road Department, and United States Army Corps of Engineers contracted for sand and gravel produced at various localities in the county.

A substantial tonnage of crushed limestone from a quarry near Rio Vista (used for road fill) and of crushed sandstone from the northwest corner of the county (used as concrete aggregate and roadstone) was produced for the Federal Bureau of Reclamation by contractors. Two rock-crushing plants near Thomassen and Benicia, produced minor tonnages of crushed basalt, used as concrete aggregate, and the Benicia Arsenal contracted the production of this material for the same use. A minor tonnage of miscellaneous stone was also quarried from the Solano Red Rock quarry near Benicia for use as concrete aggregate and roadstone, and the United States Army Corps of Engineers contracted for its production for the same end use.

Sonoma.—The Healdsburg fixed preparation plant of Basalt Rock Co., Inc., continued to be the source of major quantities of sand and gravel in the county. Construction Supply Co. prepared 96,000 tons of structural and paving sand and structural gravel at its Mirabel plant. Other producers included Cloverdale Ready Mix, Empire Rock Co., Inc., at Santa Rosa and Hein Bros. at West Windsor.

The combined production of basalt and miscellaneous stone increased from 235,000 tons in 1955 to 1,525,000 tons in 1956. Broken and crushed basalt for riprap, road fill, and railroad ballast, was produced by Basalt Rock Co., Inc., and Parish Bros., Inc., at Petaluma, and by Joe Ortega near Cotati. An important tonnage of miscellaneous dimension stone for building construction, rubble, and flagging was produced at Paul Cabrol's Valley of the Moon Quarry and J. B. Wingate & Son's Trinity Quarry at Glen Ellen and at Cliff Reed's Sonoma Stone Quarry and Santa Helena Stone Co.'s quarry, at Kenwood. Miscellaneous stone for riprap and road construction was quarried and crushed by Ben Gerrick Co., Thomas A. Graham at Occidental, and Charles Talbert, near Cotati. Joe Malugani sold crushed shale produced from a hillside occurrence at Mark West.

During the year Buckman Mines and Sonoma Quicksilver Mines, Inc., were the only shippers of mercury from the Buckman group of mines in the *West Mayacmas* district and the Mt. Jackson-Great Eastern mine in the *Guerneville* district, respectively. Both companies reported extensive long-range exploration and development.

Modest quantities of natural gas and crude petroleum were withdrawn from wells in the Petaluma area.

Stanislaus.—Sand and gravel production increased 57 percent in 1956 in relation to 1955 owing to the requirements for paving gravel by the California Division of Highways, County of Stanislaus, and the City of Modesto. The commercial demand for structural sand and gravel and paving gravel in the county was supplied by 7 fixed plants and 2 portable operations. The leading producer was Standard Rock Co., with a plant (fixed) at Oakdale and a new plant (fixed) 3 miles downstream from Knights Ferry.

A small quantity of byproduct gold and silver was recovered at the Oakdale plant. Others included American Sand & Gravel Co., Inc. (fixed plant), near Empire; Graystone Tile Sand Pit and fixed plant at Modesto; the Hughson Gravel Plant (fixed plant); M. J. Ruddy & Son (portable plants) at Oakdale and Waterford; and Chas. D. Warner & Son, Inc. (fixed plants) at Hickman and Empire.

Clayton & Lester Raggio produced and sold clay from the Knights Ferry clay pit for use in architectural tile.

Barium Products, Ltd., produced barium chemicals at Modesto, from crude barite obtained at its Nevada mines, used in the manufacture of glass.

Del Puerto Mining Co. shipped chromite concentrate averaging 46 percent Cr_2O_3 from its Del Puerto mine in the *Red Mountain* district 24 miles west of Patterson.

Josef Odermatt retorted mercury from ores of the Adobe open-pit and underground mine, also in the *Red Mountain* district.

Sutter.—Natural-gas production decreased slightly from 1955 at the Marysville Butte field, the only producing gasfield in the county.

Six firms quarried about 100,000 tons of sand and gravel at pits near Sheridan, Live Oak, and Wheatland. The California Division of Public Roads, and the United States Army Corps of Engineers contracted for the production of paving sand and gravel, and Sutter County quarried gravel with its own crews, used in road construction and repair.

A minor tonnage of miscellaneous clay was dug from a pit near Nicolaus by Gladding, McBean & Co. for use in heavy clay products at its Placer County plant.

Tehama.—Natural-gas production in 1956 was limited to the Corning and Corning South gasfields.

Red Bluff Sand & Gravel Co. produced 87,000 tons of structural and paving sand and gravel in its fixed plant at Red Bluff. Allen & Reddy Sand & Gravel operated three portable plants near Red Bluff, and Globe Builders Supply, Inc., operated a fixed plant at Richfield, north of Corning, and prepared structural gravel. Government-and-contractor operations in the county by the California Division of Highways, Lassen Volcanic National Park, Tehama County, and United States Army Corps of Engineers produced paving sand, and building and paving gravel, from various locations in the county.

Crews of Lassen Volcanic National Park used dimension basalt, produced locally, for rubble, and the Federal Bureau of Reclamation contracted for miscellaneous stone used for riprap and produced from occurrences along the Sacramento River.

Beegum Mining Co. operated various chromite deposits in the *Beegum-Tedoc* district south of Platina, milled the ore, and shipped concentrate to the Government (GSA) Grants Pass (Oreg.) Purchase Depot. L. B. Duffin and Utah Chrome Co. also shipped chromite ore from the same area. Dave Brundage and Richland Mining Co. shipped chromite ore from the Grau and Kleinsorge leases in the *Elder Creek* district southwest of Red Bluff.

Trinity.—Sand and gravel was produced along the Trinity River by Arbuckle & Garrison at Lewiston, Trinity Sand & Gravel Co. near Douglas City, and at various projects of the California Division of Highways. Although modest quantities of structural, paving, and filter sands were prepared from pits near Douglas City, the demand was mostly for paving gravel.

About 5,300 tons of crushed miscellaneous stone and 3,000 tons of crushed sandstone, produced at various localities in Trinity County, was used by the California Division of Highways for road projects.

The principal production of placer gold and silver was from the bucketline dredge operation of Fairview Placers near Lewiston. C. M. Bennett worked the Bennett mine, in the *Trinity River* district near Big Bar, by hydraulic method and recovered 43 ounces of gold and 5 ounces of silver. The yield of lode gold and silver were mainly from the Layman mine, in the *Hayfork* district and from the Beat Tooth mine in the New River area near Denny. Copper ore containing silver was mined at the Rainbow mine by Hoover Drilling Co., in the *Trinity River* district near Trinity Center and shipped to a smelter.

Manganese ores with an average analysis of 45 percent Mn were shipped from the Ruth area to Government stockpiles by Walter Wells and Pat Jordan (Barry Creek mine), R. W. Matthews and Ray Pearson (Pearson mine), and K. P. F. & F. Mining Co. (Trout Creek mine).

Lee Chapman (Cedar mine) in the Crow Creek area, Starr Bee Mines (Redskin mine) in the Oak Ridge area, and Liston Ehorn (Shamrock mine) in the Dubakella Mountain area near Wildwood shipped chromite ore to the Grants Pass, Oreg. depot.

Philip Munko retorted 12 tons of cinnabar ore and recovered 4 flasks of mercury at the Altoona mine in the Trinity River area near Castella Creek. The mine was also operated by Austin & Smith. Other mercury producers in the same area were A. Y. Cripps (Lilly mine), and the Integral Mining Co. (Integral mine).

Tulare.—The quantity of petroleum produced during the year was small and decreased 16 percent below 1955. The Deer Creek field was the only producing oilfield in the county. Natural-gas production about equaled the 1955 output; all of it came from the Tulare County portion of the Trico gasfield, which also lies in Kings and Kern Counties. The quantity credited to this county was estimated at 77 percent of the field's total production.

Five firms quarried over 500,000 tons of sand and gravel from pits near Porterville and Lemon Cove. The Federal Bureau of Reclamation and the California Division of Highways both contracted in the

county for the production of paving sand and gravel. The latter agency also used its own crews to produce and prepare paving sand used in highway construction.

Over 200,000 pounds of tungsten concentrate, containing an average of 63 percent WO_3, was recovered from the ores of 44 active mines in 1956. The leading producers were; Claud Rouch Sr. and Jr., with mines in the Cottonwood Creek area near Orosi, National Tungsten Co., with mines in the Deer Creek and Kern River areas, and Tulare County Tungsten Co. with a mine in the Kawean River area near Lindsay.

The Federal Bureau of Reclamation contracted in the county for miscellaneous stone used as riprap, and the California Division of Highways contracted for the stone, which was used as concrete aggregate and for roadstone.

A minor tonnage of miscellaneous clay was dug from a pit near Exeter by S. P. Brick & Tile Co. and used in the manufacture of common brick.

The Macco Corp. quarried a small tonnage of crude barite from the Barite King group of claims in the Chimney Peak area and ground the material at its Rosamond plant in Kern County.

A dealer in gem stones collected a small quantity of rock crystal in the Sequoia National Forest.

Tuolumne.—Gravel used for fill and structural purposes (produced by Tri-Dam Constructors at Strawberry) increased the output of sand and gravel in 1956 compared with 1955. Other sand and gravel producers in Tuolumne County included A. P. Jones, Beerman & Jones, M. J. Ruddy & Son, and Stewart & Prothero operations in the Sonora and Chinese Camp areas.

The increased production of sandstone and miscellaneous stone for concrete aggregate and roadstone explained the rise in total stone production in 1956 compared with 1955. Sonora Marble Aggregates Co. produced limestone for rough construction, fill and poultry grit, and marble for terrazzo from its own quarries near Sonora. Geo E. France, Inc., contractor, produced crushed limestone from the quarries of United States Lime Prod. Corp. near Columbia and Sonora, and used by the latter in lime manufacture, and for chemicals used in glass, for filler, and in mineral food. Government-and-contractor operations of the South San Joaquin and Oakdale Irrigation Districts, and the Tuolumne County Road Commission produced and utilized 654,000 tons of miscellaneous stone and 3,500 tons of crushed sandstone for concrete aggregate and road material.

United States Lime Products Corp. at Sonora, which became a wholly-owned subsidiary of the Flintkote Co. in September, produced quick and hydrated lime for building, chemical, and industrial use and hydrated lime for agriculture.

High Sierra Scheelite Co. operated the High Sierra tungsten mine in the *Dorothy Lake* district near Pine Crest and was the only shipper of tungsten ore and concentrate in the county.

Gold and silver were recovered by amalgamation in the *East Belt* (*Big Oak Flat*) and *Mother Lode* (*Columbia*) districts, from the Grand

Turk mine, operated by William J. Rule, and the Eureka (Grizzly-Eureka) mine, operated by Charles F. Harper, respectively.

Ventura.—Petroleum continued to be much the most valuable mineral product of Ventura County. The 1956 output, from 27 producing fields, decreased slightly below 1955. Three of four crude-oil refineries active were at Oxnard and the other at Ventura. The largest of these was that of the Seaside Oil Co. at Ventura. The combined daily throughput capacity was 8,500 barrels.

The yield of natural gasoline and cycle products decreased slightly, while the output of LP-gases increased compared with 1955. Nine natural-gasoline plants were active, with a daily combined production capacity of approximately 771,400 gallons—16 percent of the State total. Seven of these were in Ventura and two in Fillmore. Much the largest operation was that of the Shell Oil Co. at Ventura.

Natural gas was produced at 24 fields in the county, and the output utilized decreased slightly below the 1955 figure.

Four firms produced over 1.5 million tons of sand and gravel from quarries near Santa Paula, Ventura, Saticoy, El Rio, and Montalvo. The California Division of Highways contracted in the county to produce over 1 million tons of paving gravel used in highway construction and repair. Limestone (shells) from the Tapo Alta deposit near Santa Susana was crushed by the Western Lime Products Co. and used in manufacturing whiting and agricultural products and in mineral food and poultry grit. Miscellaneous clay was dug from pits near Frazier Park and bloated for use as lightweight aggregate. Clays from Ventura were used as drilling muds. The Monolith Portland Cement Co. quarried gypsum near Cuyama for use as a cement retarder at its Kern County plant.

Yolo.—Structural and paving sand and gravel were produced by Pacific Cement & Aggregates, Inc. at Yolo and by Schwarzgruber & Sons, A. Teichert & Son, Inc., and Mrs. Lucy L. Woods, near Woodland. The Federal Bureau of Reclamation at Monticello Dam, the California Division of Highways, the United States Army Corps of Engineers, Yolo County, and crews of the Sutter County Road Commission and their contractors produced sand and gravel for building and paving use at various localities in the county.

The United States Army Corps of Engineers also used 36,000 tons of miscellaneous stone, obtained from local occurrences, for riprap. Contractors for Travis Air Force Base and the Federal Bureau of Reclamation produced 2,650 tons of crushed sandstone used for road construction and as fill material.

Natural gas was withdrawn at the Dunnigan Hills, Pleasant Creek, Sycamore Slough and part of the Winters gasfields; a portion of the Winters gasfield is in Solano County.

Yuba.—Yuba Consolidated Gold Fields, California's principal gold producer, operated a fleet of electrically controlled bucketline dredges and worked gravels in the Yuba River Basin near Hammonton. The company also recovered silver, in combination with the gold and platinum. The balance of Yuba County's gold and silver output was obtained by small-scale operations in the *Bear River, Camptonville,*

Challenge, and *Dobbins* districts and as a byproduct at the Hallwood Gravel Plant of Baldwin Contracting Co., Inc.

Sand and gravel output increased 41 percent in 1956 compared with 1955 owing to an increased demand for structural and paving gravel. Major tonnages of these materials were produced by Baldwin Contracting Co., Inc., Lester Rice & Son, and Yuba River Sand Co., from deposits along the Yuba River. Additional tonnages of structural sand and structural and paving gravel were prepared by contractors for the Sutter County Road Commission, the United States Army Corps of Engineers, and the County of Yuba.

Miscellaneous clay was dug at the Wheatland pit by Gladding, McBean & Co. for heavy clay products manufactured at its Placer County plant.

The Mineral Industry of Colorado

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker[1]

IN 1956 Colorado produced minerals valued at $329 million, including $12 million for uranium, compared with $286 million, excluding uranium, in 1955. Larger output of petroleum from the Rangely field and the still growing Denver-Julesburg basin and a production increase of natural-gas liquids from new plants, plus a higher unit value for molybdenum that offset a production drop plus an inclusion of a value for uranium production, were the factors primarily responsible for the $43 million increase in 1956.

Important increases in value were also reported for the base metals, whose production was stimulated by higher prices; for vanadium, whose production was closely allied to an increasing uranium output; for sand and gravel, which was in greater demand by the construction industry; and for stone, which was affected by a higher unit evaluation of captive limestone.

For one-third of the commodities produced in the State, lower values were reported for the year, but the combined decrease was less than $2 million. Tungsten production was reduced 24 percent because lower grade material was treated by the major producer and because the Government purchase program lapsed. Silver output declined, in spite of generally higher base-metal production, because production of silver-bearing copper ore at a major operation was smaller. A small decrease in the demand for coking coal within the State caused a 2-percent drop in coal production.

Activity in the uranium industry continued on an increasing scale, and some production and reserve data were released by the Atomic Energy Commission (AEC). Colorado's share of the domestic uranium industry included 6.8 percent of the reserves, 18 percent of the mine production (FY 1956), and 25 percent of the milling capacity.

Interest in oil-shale deposits increased during the year. The Federal Bureau of Mines plant at Rifle was closed in June; however, experimental work was carried on by at least three private concerns.

Considerable interest was also shown in some of the less common metals—beryl, columbium and tantalum, and the rare-earth metals—although production remained relatively small.

Antimony, arsenic, bismuth, cadmium, and selenium were recovered from Colorado ores; but, because the quantities were small and not accounted for in early metallurgical processing, no quantitative data are available.

New Plants and Construction.—Several new plants and facilities were completed during 1956. A $2.5 million plant at Florence was completed for the production of wallboard, sheathing, and lath from gypsum mined in Fremont County. At Rico a flotation plant to treat tailings for pyrite was constructed. Of importance to natural-gas producers in western counties was completion of the Pacific Northwest

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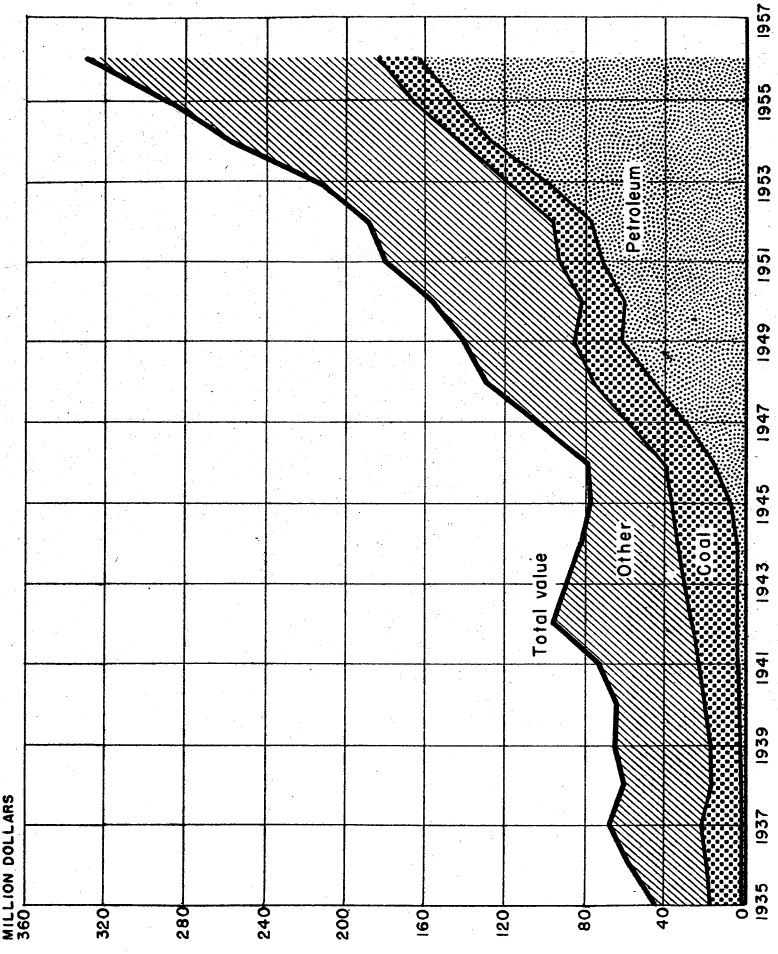

FIGURE 1.—Value of petroleum, coal and total value of all minerals produced in Colorado, 1935–56 (excludes uranium 1941–55).

TABLE 1.—Mineral production in Colorado, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate—gross weight	46	$22,950	179	$93,748
Clays	464,231	1,117,901	522,573	1,215,305
Coal	3,567,930	20,100,174	3,502,163	19,831,818
Columbium-tantalum concentrate—pounds	4,325	7,254	52	32
Copper (recoverable content of ores, etc.)	4,323	3,224,958	4,228	3,593,800
Feldspar—long tons	46,114	313,716	47,014	327,276
Gem stones	[2]	48,000	[2]	30,000
Gold (recoverable content of ores, etc.)—troy ounces	88,577	3,100,195	97,668	3,418,380
Gypsum	76,649	329,321	88,026	352,761
Iron ore (usable)—long tons, gross weight	3,666	[3]	[3]	[3]
Lead (recoverable content of ores, etc.)	15,805	4,709,890	19,856	6,234,784
Mica:				
Sheet—pounds			8	126
Scrap	699	12,596	517	7,596
Natural gas—million cubic feet	49,152	4,866,000	54,205	5,312,000
Petroleum (crude)—thousand 42-gallon barrels	52,653	144,800,000	58,516	162,674,000
Pumice	70,530	162,605	50,015	109,206
Rare-earth metals concentrates—pounds	[3]	[3]	32,145	23,152
Salt (common)	3,688	17,400	[3]	[3]
Sand and gravel	12,911,783	8,914,429	15,152,000	11,081,625
Silver (recoverable content of ores, etc.)—troy ounces	2,772,073	2,508,866	2,284,701	2,067,770
Stone	2,149,019	3,508,053	2,250,168	5,216,641
Tungsten concentrate—60-percent WO_3 basis	1,152	4,079,341	873	3,010,074
Uranium ore	[4]	[4]	495,450	12,000,000
Vanadium (recoverable content of ores, etc.)—pounds	4,595,359	[3]	5,582,484	[3]
Zinc (recoverable content of ores, etc.)	35,350	8,696,100	40,246	11,027,404
Value of items that cannot be disclosed: Carbon dioxide, cement, fluorspar, molybdenum, natural-gas liquids, perlite, pyrite, tin (1955), and values indicated by footnote 3		[5] 76,969,285		83,595,653
Total Colorado [6] [5]		[7] 286,219,000		329,450,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration purchase depots is excluded.
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[4] Excludes uranium; uranium figure for 1955 not released by Atomic Energy Commission.
[5] Revised figure.
[6] The total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.
[7] Excludes uranium as indicated in footnote reference 4.

TABLE 2.—Average unit value of selected mineral commodities in Colorado, 1955–56 [1]

Commodity	1955	1956	Commodity	1955	1956
Beryl—short ton	$498.913	$523.732	Natural gas—thousand cubic feet	$0.099	$0.098
Clays—do	2.408	2.326	Petroleum [4]—42-gallon barrel	2.750	2.780
Coal—do	5.634	5.663	Pumice—short ton	2.305	2.183
Columbium-tantalum—pound	1.677	.615	Sand and gravel—do	.690	.731
Copper [2]—do	.373	.425	Silver [5]—troy ounce	+.905	+.905
Feldspar—long ton	6.803	6.961	Stone—short ton	1.632	2.318
Gold [3]—troy ounce	35.000	35.000	Tungsten—short ton unit	58.997	57.472
Gypsum—short ton	4.296	4.007	Zinc [2]—pound	.123	.137
Lead [2]—pound	.149	.157			
Mica:					
Sheet—do		15.750			
Scrap—short ton	18.020	14.692			

[1] Based on average value f. o. b. mines or mills reported by the producers, except as otherwise noted.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Value at wells.
[5] Treasury buying price for newly mined silver July 1, 1946 to date—$0.9050505.

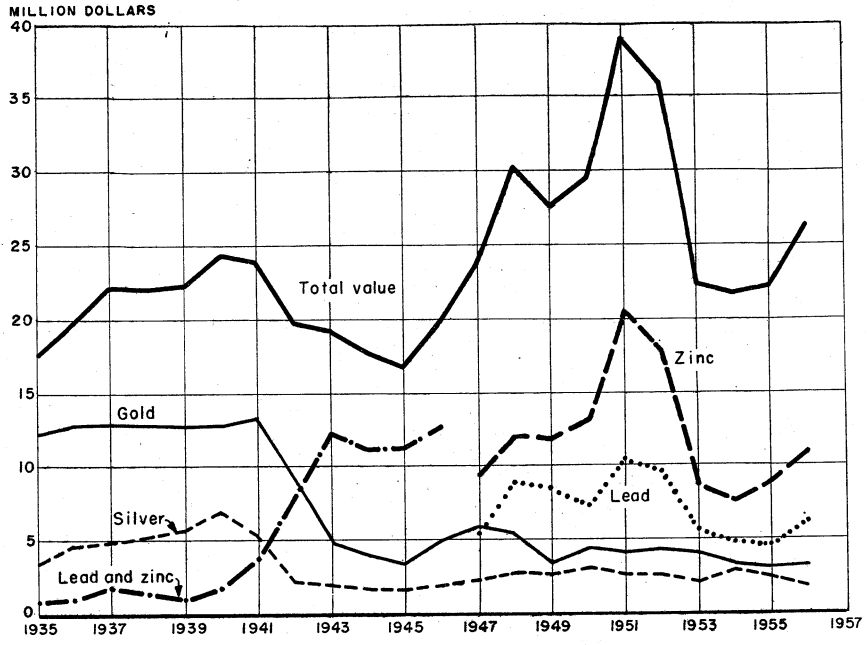

FIGURE 2.—Value of mine production of gold, silver, lead and zinc and total value of gold, silver, copper, lead, and zinc in Colorado, 1935–56. The value of copper has been less than $2,000,000 annually, except for 1937–40 and in 1954.

pipeline, which will provide a market outlet for natural-gas reserves. A new brick plant in Denver was also erected and was of interest because of the high degree of automation involved. At the year end, a new uranium mill at Rifle and a shale-oil pilot plant at Grand Valley were under construction.

Employment and Earnings.—Employment in Colorado mineral industries accounted for 3.5 percent of all nonagricultural employment during 1956 and increased 7 percent over the preceding year (total nonagricultural employment rose 5 percent over 1955). Gross average weekly earnings for all mineral industries rose from $90.72 in 1955 to $97.70 in the current year. Detailed data on employment and earnings are presented below and were supplied by the Bureau of Labor Statistics:

Industry	Average employment		Average hourly earnings, 1956	Average weekly hours, 1956	Average weekly earnings, 1956
	1955	1956			
Total nonagricultural	433,200	456,700			
Total mining	14,900	16,000	$2.36	41.4	$97.70
Metal mining	5,700	6,400	2.26	43.7	98.76
Coal mining	2,600	2,500	2.76	34.1	94.12
Petroleum and natural gas	5,900	6,300	2.38	42.2	100.44
Other mining and quarrying	700	800			

Average employment includes all full- and part-time workers below the administrative level. Average earnings are gross earnings and include overtime pay, night differential, and special incentive pay

TABLE 3.—Defense Minerals Exploration Administration contracts executed in 1956

County and contractor	Property	Commodity	Contract		
			Date 1956	Total amount	Government participation percent
Boulder					
Elmer Hetzer et al	Pennsylvania mine	Tungsten	Feb. 21	$16,100	75
Jimtown Uranium Co	Victory, Lulu, and Gold Leaf Lode claims.	Uranium	Apr. 18	16,000	75
Fremont					
Josey & Roper et al	Big Bear et al. claims	do	Mar. 29	39,586	75
Gunnison					
G. R. Bennett et al	High and Mighty group.	Lead-zinc	Oct. 23	24,030	50
Gunnison and Saguache					
Vulcan Silver-Lead Corp	Indian Creek group	Uranium	Aug. 3	160,369	75
Jefferson					
Grapevine Mines, Inc	Grapevine mine	do	Oct. 30	16,600	75
Mesa					
American Leduc Uranium Corp.	Outlaw Mesa mine	do	July 23	23,944	75
Lee E. Cox & T. R. Gillenwaters	Okan mine	do	Aug. 22	19,960	75
Hamilton et al. and Simpson Mining Co.[1]	Beaver Mesa group	do	Aug. 1	291,510	75
Mineral					
Gormax Mining Co	Gormax mine	Lead-zinc	Mar. 22	56,720	50
Outlet Mining Co. and Sublet Mining Co.	Outlet mines	do	Feb. 23	108,506	50
Montrose					
Union Mines, Inc	Ruth K group	Uranium	Aug. 21	60,800	75
Saguache					
Gibralter Minerals Co	Big Indian claims	do	Aug. 16	55,580	75
San Juan					
Jesse A. Bingel	Dora mine	Tungsten-lead-copper.	Aug. 22	28,010	62
Walby & Clifford	Tin Cup and Gypsy claims.	Tungsten	Feb. 6	13,000	75
San Miguel					
Crown Uranium Co	Lost Brothers mine	Uranium	Aug. 31	15,800	75
Total				946,515	70

[1] Property in Mesa County, Colorado, and Grand County, Utah; value of contract has been split 50-50

before deductions and taxes; such earnings are not wage rates or take-home pay.

In contract construction work, some employees are commonly engaged in mining construction materials. These men are not included in the above totals, as the industry itself does not make the distinction in its employment records.

Defense Minerals Exploration Administration (DMEA) Program.—Government participation in the search for strategic minerals continued during 1956. Sixteen DMEA contracts were executed during the year, for a total of $946,515, of which the Government contributed

70 percent. As indicated by total contract amounts, exploration carried out under the DMEA program in Colorado has grown significantly in recent years—$511,084 in 1955 and $374,036 in 1954. Contracts executed during 1956 covered exploration for copper, lead, tungsten, uranium, and zinc.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Asphalt and Related Bitumens.—Construction of a refining plant to produce gasoline and metallurgical coke from gilsonite was begun in April by the American Gilsonite Co. at Fruita, Mesa County. The gilsonite will be supplied from mines at Bonanza, Utah, and transported to the refinery by pipeline. The American Gilsonite Co. is a subsidiary of the Barber Oil Corp. and Standard Oil Co. of California.

Carbon Dioxide.—Natural carbon dioxide gas was produced from wells in the McCallum-North field, Jackson County; the Nina View field, Las Animas County; and the McElmo field, Montezuma County. The gas was chilled and compressed to the liquid or solid state. As a liquid the material was used to cool some high-speed machining tools and to extinguish fires. In the more familiar solid form—dry ice—carbon dioxide was used as a refrigerant.

Coal.—Colorado coal production for 1956 was 3.5 million tons—2 percent less than the output for the previous year.

Coal delivered to coke ovens within the State amounted to 1.20 million tons, compared with 1.26 million in 1955. Most of this coal was mined in Las Animas County and shipped to Pueblo.

Out-of-State shipments, which represent one-seventh of Colorado's output, rose 6 percent over 1955 in response to increased demand for

TABLE 4.—Production of coal, 1955–56, by counties

(Exclusive of mines producing less than 1,000 tons annually)

	1955		1956	
	Short tons	Average value per ton [1]	Short tons	Average value per ton [1]
Boulder	24,406	$6.42	5,419	$6.59
Delta	52,288	5.68	58,066	5.63
El Paso	73,384	4.73	47,172	4.77
Fremont	216,119	3.86	240,522	3.73
Garfield	33,750	5.12	24,096	6.03
Gunnison	326,173	5.24	302,968	5.51
Huerfano	63,903	5.82	61,892	5.83
Jackson	1,329	3.99	2,051	3.97
La Plata	54,728	3.98	51,447	4.21
Las Animas	1,317,403	7.11	1,232,916	7.11
Mesa	48,363	5.18	70,360	5.36
Moffat	100,554	5.38	96,460	5.60
Montezuma	1,108	3.98		
Montrose	3,220	5.44	2,707	6.54
Pitkin	91,909	7.65	153,979	7.19
Rio Blanco	20,046	5.86	18,630	5.53
Routt	525,039	4.40	489,938	4.37
Weld	614,208	4.36	643,540	4.50
Total	3,567,930	5.63	3,502,163	5.66

[1] Value received or charged for coal f. o. b. mine, including selling cost. Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.

coking coal from Utah coke ovens (Colorado coal delivered to Utah ovens in 1956 amounted to 287,000 tons compared with 224,000 in 1955). Five-sixths of the coal shipped from Colorado was from mines in Pitkin, Gunnison, and Routt Counties, and such shipments were all, one-half, and one-quarter, respectively, of the markets of these counties. Markets outside of Colorado were also important to mines in Moffat and Delta Counties, being two-fifths and one-third of the demand for coal from these two counties.

Coal-fired thermal-electric plants in the State usually consume 400 to 500 thousand tons of coal a year. At year end, two new plants were under construction—at Cameo, Mesa County, and at Nucla, Montrose County. Evidence of the importance of these 2 plants to local coal markets was shown by a contract for the Nucla plant executed in September, in which the Edna Coal Co. agreed to supply the plant with approximately 90,000 tons of coal a year through 1972. The value of the contract, covering 1.4 million tons of coal, was reported to be $6 million.

May 1956 marked the closing of one of Colorado's well-known operations—the Morley mine in Las Animas County, owned and operated by the Colorado Fuel & Iron Corp. The mine was opened in 1906 and had its record production of 491,000 tons in 1928. During its 50-year history the Morley mine yielded 11 million tons of coal, most of which was consumed by the Santa Fe Railway and coking ovens at Pueblo. Coal reserves have been depleted.

Because of limited reserves and a gassy condition that would require extensive changes in the ventilation system to permit mechanical equipment, the Morley mine was never mechanized, and closing of the mine terminated the last large-scale use of mule haulage in the Rocky Mountains. Although animal haulage continued to be employed in some smaller Colorado mines, mules had been displaced by locomotives in all operations as large as the Morley.

Natural Gas and Natural-Gas Liquids.—Marketed production of natural gas rose 10 percent over 1955, and output of natural-gas liquids increased almost threefold over the previous year. The large increase in production of LP-gases and natural gasoline resulted from a full year of operation for plants newly installed during 1955 (see Colorado chapter of 1955 Minerals Yearbook, volume III).

Major areas of natural-gas production were in Rio Blanco and Moffat Counties of northwestern Colorado, La Plata County in the southwest, and Logan County and surrounding areas of the Denver-Julesburg basin in the northeast. Plants to produce natural-gas liquids were operated in Logan, Morgan, Rio Blanco, and Moffat Counties.

Twenty new gas-discovery wells were reported during the year; half of them were in western counties, where drilling activity increased markedly. Successful development wells drilled in natural-gas fields totaled 87, compared with 61 in 1955. Over half of the successful development wells were drilled in La Plata County, where activity was focused on the Bondad-Ignacio field.

Drilling for natural gas in the western counties was stimulated by construction of the Pacific Northwest pipeline, completed during 1956.

Petroleum.—In 1956 Colorado produced 58.5 million barrels of crude petroleum—11 percent more than in the previous year. Main sources of the increase in production were oilfields in Rio Blanco, Washington, Jackson, and Weld Counties. The Weber pool of the Rangely field in Rio Blanco County alone accounted for over half of the increased production, yielding 28.3 million barrels in 1956 compared with 23.9 million in 1955.

Drilling activity in the Denver-Julesburg basin declined markedly during the year, causing an overall drop in drilling totals for the State. In Logan, Morgan, and Washington Counties, the 3 most active counties in both 1955 and 1956, total drilling dropped from 993 holes to 660 holes. Of 26 oil discoveries in the State, all but 1 were in the Denver-Julesburg basin.

The Adena field, largest in the Denver-Julesburg basin and second largest in the State, was placed under unit operation in October, and the Pure Oil Co. was designated as field operator. In addition, Rangely-field operators continued to discuss the problems and differences involved in unit operation of the field. It was estimated that secondary recovery methods, if applied, would increase the ultimate reserves of the 2 fields over 50 percent.

TABLE 5.—Production of crude petroleum, 1955–56, by counties, in barrels [1]

County	1955	1956	Principal fields in 1956 in order of production
Adams	1,079,000	1,067,000	Badger Creek, Beacon, Middlemist.
Archuleta	179,000	152,000	Price Gramps, Chromo.
Bent	4,000	5,000	Bent's Fort.
Boulder	2,000	3,000	Boulder, Highland.
Elbert	(2)		
Fremont	31,000	30,000	Florence-Canon City.
Jackson	278,000	725,000	McCallum-N, Battleship, Canadian River.
Jefferson	8,000	3,000	Soda Lakes.
La Plata	9,000	10,000	Red Mesa, Barker Dome.
Larimer	130,000	181,000	Fort Collins, Wellington, Clark Lake.
Logan	9,021,000	7,975,000	Cliff, Graylin-NW, Yenter.
Moffat	950,000	1,281,000	Powder Wash, Thornburg, Hiawatha.
Montezuma	7,000	6,000	Dove Creek.
Morgan	7,428,000	7,376,000	Adena, Sand River, Orchard.
Rio Blanco	26,174,000	30,618,000	Rangely, Wilson Creek, Douglas Creek-N.
Routt	42,000	65,000	Tow Creek.
Washington	5,784,000	7,192,000	Little Beaver, Plum Bush Creek, Bobcat.
Weld	1,527,000	1,827,000	Black Hollow, Jackpot, Battle Canyon.
Total	52,653,000	58,516,000	

[1] Distribution by county effected by use of Colorado Oil and Gas Commission data adjusted to Bureau of Mines total.
[2] Less than 500 barrels.

Shale Oil.—In July operations ceased at the Federal Bureau of Mines Oil-Shale Experiment Station at Rifle. Maintenance crews only remained active to keep the plant in standby condition. Funds for maintenance were supplied by the Department of the Navy.

During the year Union Oil Co. of California continued to prepare and construct facilities to mine and retort 300 tons a day of oil shale on a pilot-plant basis. The plant site was 12 miles north of Grand Valley in Garfield County. Production of shale oil from test runs was expected early in 1957.

Concurrently, the Denver Research Institute, under a contract with the Oil Shale Corp., began designing a 24-ton-per-day oil-shale pilot plant to be erected in Denver. The design was based on the

TABLE 6.—Wildcat and development completions, in 1956, by counties

[Oil and Gas Journal]

County	Oil	Gas	Dry	Total	Footage	County	Oil	Gas	Dry	Total	Footage
Wildcat completions						*Wildcat completions*—Con.					
Adams	2		36	38	238,300	Saguache			1	1	3,800
Arapahoe			2	2	11,400	Washington	7		165	172	819,800
Baca			7	7	38,900	Weld	2	3	51	56	375,700
Bent		1	6	7	35,900	Yuma			34	34	131,100
Boulder			6	6	12,300						
Cheyenne			1	1	4,800	Total wildcat	26	20	629	675	3,368,100
Crowley			1	1	7,600						
Delta		1	4	5	8,200	*Development completions*					
Dolores			1	1	8,200						
Eagle			1	1	8,300						
Elbert			3	3	18,900	Adams	11	1	13	25	136,700
El Paso			5	5	21,400	Archuleta		1		1	5,500
Garfield		1	1	2	11,600	Baca		1	1	2	9,500
Huerfano			2	2	11,200	Bent	1	1		2	11,000
Jackson		1	5	6	28,900	Garfield		2	1	3	9,700
Jefferson			1	1	9,800	Jackson	11	1	5	17	60,000
Kiowa		1	1	2	11,100	Kiowa		1		1	5,000
Kit Carson			9	9	31,100	Kit Carson			1	1	5,800
La Plata		1	16	17	63,000	La Plata		48	9	57	296,200
Las Animas			3	3	11,100	Larimer	3		4	7	39,600
Larimer	1		6	7	36,000	Logan	36	8	54	98	513,900
Lincoln			16	16	72,900	Mesa		1		1	3,000
Logan	6	2	86	94	499,900	Moffat	12	8	2	22	19,400
Mesa		3	11	14	44,200	Montezuma	2	1	3	6	9,200
Moffat		2	8	10	45,500	Morgan	36	3	40	79	453,100
Montezuma			13	13	40,400	Rio Blanco	2	5	3	10	39,600
Montrose			5	5	7,700	Routt	3		5	8	22,000
Morgan	7	1	66	74	433,800	Washington	69	2	72	143	805,400
Park			6	6	26,300	Weld	39	3	22	64	419,000
Phillips			3	3	12,100						
Prowers			3	3	16,600	Total development	225	87	235	547	2,863,600
Pueblo			8	8	24,500						
Rio Blanco	1	1	14	16	104,200	Total all drilling	251	107	864	1,222	6,231,700
Routt		1	6	7	18,300						
Sedgwick		1	16	17	63,300						

Swedish "Aspeco" process, in which heated ceramic balls are brought into mobile contact with the raw shale to effect heating, thermal decomposition of the contained organic material, and separation of oil and gaseous products.

Sinclair Research Laboratories, Inc., continued experimental work at Haystack Mountain on underground in-place decomposition of oil shale by heat.

METALS

Beryllium.—Output of beryllium concentrate (beryl) in Colorado in 1956 increased fourfold over that in 1955; it was recovered from pegmatite by hand sorting. The beryl was sold to Beryl Ores Co. of Arvada, International Minerals & Chemical Corp., Parkdale, and the Custer (S. Dak.) Government Purchase Depot. In some instances other associated minerals—feldspar, mica, and columbite-tantalite—were recovered as byproducts or coproducts of the beryl. Fremont, Larimer, and Park were the principal beryl-producing counties. Smaller quantities of beryl came from Boulder, Clear Creek, Gunnison, Jefferson, and Lake Counties. The Boomer Lode in Park County, operated by G. H. Sager, was by far the outstanding producer in the State.

Cadmium, Indium, and Thallium.—The Globe smelter of the American Smelting and Refining Co. in Denver recovered cadmium,

indium, and thallium from flue dust, dross, and other byproduct material shipped to it from other company smelters in 1956.

Columbium-Tantalum.—The recorded output of columbium-tantalum concentrate (columbite-tantalite) was small in 1956 compared with 1955. It was recovered by four operators in as many counties as a byproduct of beryl from pegmatite.

Copper.—Copper output in Colorado in 1956 declined 2 percent compared with 1955. However, owing to the rise in price of copper, the value of the production increased 11 percent. Ores classed as copper, copper-lead, and copper-lead-zinc yielded 87 percent, and ores classed as lead, lead-zinc, and zinc 11 percent of the copper output. The remaining 2 percent came from ores of gold and silver (mostly smelter fluxing ores) and from fluorspar ore, mill cleanings, and tungsten ore.

The Treasury Tunnel-Black Bear-Smuggler Union group of mines in the Upper San Miguel district of San Miguel County, operated by

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1858–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	243	27	1,439,276	134,518	$4,708,144	2,948,742	$2,668,735
1952	171	20	1,548,815	124,594	4,360,790	2,813,643	2,546,489
1953	118	19	1,204,517	119,218	4,172,630	2,200,317	1,991,398
1954	123	19	973,177	96,146	3,365,110	3,417,072	3,092,623
1955	120	14	908,416	88,577	3,100,195	2,772,073	2,508,866
1956	124	18	1,156,019	97,668	3,418,380	2,284,701	2,067,770
1858–1956	----------	----------	[3]	40,256,738	902,862,794	758,658,194	593,120,944

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	2,641	$1,141,676	25,607	$8,131,867	46,620	$13,300,108	$29,950,530
1952	3,606	1,745,304	30,066	9,681,252	53,203	17,663,396	35,997,231
1953	2,941	1,688,134	21,754	5,699,548	37,809	8,696,070	22,247,780
1954	4,523	2,668,570	17,823	4,883,502	35,150	7,592,400	21,602,205
1955	4,323	3,224,958	15,805	4,709,890	35,350	8,696,100	22,240,009
1956	4,228	3,593,800	19,856	6,234,784	40,246	11,027,404	26,342,138
1858–1956	283,536	84,914,513	2,695,221	310,780,175	1,774,058	323,436,296	2,215,114,722

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore, old slag, or tailings shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	7,968	149,167	255	1,289	3,179
February	7,417	146,460	243	1,062	2,951
March	8,447	181,972	307	1,720	3,493
April	7,577	150,014	293	1,445	2,970
May	7,829	157,104	287	1,442	3,181
June	7,100	152,982	296	1,569	3,564
July	5,597	152,209	319	1,601	3,065
August	9,577	232,827	413	2,001	3,730
September	9,141	208,685	422	1,900	3,286
October	9,247	239,916	468	2,040	3,800
November	8,963	260,664	479	1,931	3,631
December	8,805	252,701	446	1,856	3,446
Total	97,668	2,284,701	4,228	19,856	40,246

TABLE 9.—Gold and silver produced at placer mines, 1947–51 (average) and 1952–56, in fine ounces, in terms of recoverable metals

Year	Small-scale hand methods [1]		Gravel mechanically handled				Total	
			Nonfloating washing plants [2]		Bucketline and dragline dredges			
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
1947–51 (average)	120	28	723	114	14,551	2,877	15,394	3,019
1952	28	7	(3)	(3)	[3] 2,152	[3] 338	2,180	345
1953	37	11	1,046	159	546	75	1,629	245
1954	79	16	1,112	163	364	47	1,555	226
1955	61	11	1,125	181	610	82	1,796	274
1956	41	6	1,227	189	[4] 648	[4] 88	1,916	283

[1] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
[2] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[3] Production by nonfloating washing plants included with that by bucketline dredges to avoid disclosing individual company confidential data.
[4] Includes 8 fine ounces of gold and 3 fine ounces of silver—byproduct of tungsten ore.

the Idarado Mining Co., was the principal copper producer in the State in 1956. Copper output by this company, recovered from copper, lead, and zinc concentrates produced from the ore, was substantially increased above 1955. This increase virtually balanced a drop in copper production from the Eagle mine operated by The New Jersey Zinc Co., which was the second-ranking copper producer in the State in 1956. The decline in copper output from this mine resulted from a reduction in the quantity of copper ore mined and shipped directly to the smelter and a drop in the copper content of the lead-zinc ore mined and concentrated.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals

County	Mines producing [1]		Lode material sold or treated (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
Adams		4		1,311	$45,885	184	$167
Boulder	4	2	161	87	3,045	5,266	4,766
Chaffee	6		271	18	630	1,972	1,785
Clear Creek	18	1	21,303	5,091	178,185	76,401	69,147
Custer	3		169	4	140	720	652
Dolores	2		32,970	179	6,265	97,181	87,954
Douglas		1		3	105		
Eagle	2		265,682	2,053	71,855	581,901	526,650
Fremont	2		32	1	35	13	12
Gilpin	8	3	9,266	243	8,505	7,448	6,741
Gunnison	7		73,440	94	3,290	399,355	361,436
Hinsdale	2		37	9	315	1,859	1,682
Jackson	3		7			94	85
Jefferson		4		488	17,080	81	73
Lake	13	1	48,930	3,556	124,460	156,628	141,756
La Plata	2		38	1	35	2,580	2,335
Larimer	1		3			2	2
Mineral	◂2		29,432	802	28,070	111,731	101,122
Moffat	2		479	2	70	198	179
Montezuma	1		15	34	1,190	70	63
Ouray	3		33,981	2,647	92,645	56,475	51,113
Park	5	1	286	70	2,450	895	810
Pitkin	1		395			497	450
Saguache	5		401	4	140	2,958	2,677
San Juan	8		19,780	841	29,435	37,283	33,743
San Miguel	3		483,150	27,150	950,250	694,655	628,698
Summit	10	1	14,032	436	15,260	41,602	37,652
Teller	11		121,759	52,544	1,839,040	6,652	6,020
Total: 1956	124	18	1,156,019	97,668	3,418,380	2,284,701	2,067,770
1955	120	14	908,416	88,577	3,100,195	2,772,073	2,508,866

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Adams							$46,052
Boulder	8,000	$3,400	85,300	$13,392			24,603
Chaffee	2,800	1,190	37,300	5,856	11,600	$1,589	11,050
Clear Creek	109,000	46,325	1,151,100	180,722			474,379
Custer	10,800	4,590	12,500	1,963			7,345
Dolores	12,400	5,270	3,715,900	583,396	3,336,600	457,114	1,139,999
Douglas							105
Eagle	1,395,100	592,917	7,258,200	1,139,537	39,532,100	5,415,898	7,746,857
Fremont	700	297					344
Gilpin	3,600	1,530	173,700	27,271	47,900	6,562	50,609
Gunnison	976,500	415,013	2,763,800	433,917	6,395,500	876,183	2,089,839
Hinsdale	400	170	4,000	628			2,795
Jackson	600	255					340
Jefferson							17,153
Lake	208,400	88,570	3,319,000	521,083	4,255,000	582,935	1,458,804
La Plata	1,800	765					3,135
Larimer	100	42					44
Mineral	47,200	20,060	2,531,100	397,383	1,853,400	253,916	800,551
Moffat	34,800	14,790					15,039
Montezuma	200	85					1,338
Ouray	251,000	106,675	1,054,700	165,588	1,175,900	161,098	577,119
Park	6,500	2,763	9,600	1,507	19,700	2,699	10,229
Pitkin			71,900	11,288			11,738
Saguache	8,000	3,400	111,000	17,427	14,100	1,932	25,576
San Juan	85,600	36,380	1,665,800	261,531	1,287,400	176,374	537,463
San Miguel	5,262,600	2,236,605	14,399,000	2,260,643	20,335,800	2,786,005	8,862,201
Summit	29,900	12,708	1,348,100	211,652	2,227,000	305,099	582,371
Teller							1,845,060
Total: 1956	8,456,000	3,593,800	39,712,000	6,234,784	80,492,000	11,027,404	26,342,138
1955	8,646,000	3,224,958	31,610,000	4,709,890	70,700,000	8,696,100	22,240,009

[1] Operation at slag dumps and old mill or miscellaneous cleanups not counted as a producing mine.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	26	124,145	52,839	7,153	1,000	2,800	2,400
Dry gold-silver	9	5,632	363	6,910	110,700	101,900	----------
Dry silver	16	8,091	94	28,349	1,900	464,000	----------
Total	48	137,868	53,296	42,412	113,600	568,700	2,400
Copper	11	21,788	1,415	344,315	1,152,500	157,100	----------
Copper-lead	2	11	1	267	1,100	4,200	----------
Copper-lead-zinc	3	554,821	27,151	1,089,555	6,235,400	17,033,200	26,622,200
Lead	40	29,768	5,260	102,507	127,600	2,345,500	----------
Lead-zinc	30	410,963	8,489	699.955	817,600	19,487.400	53,866,100
Zinc	1	15	9	20	100	100	1,300
Total	81	1,017,366	42,325	2,236,619	8,334,300	39,027,500	80,489,600
Other "lode" material:							
Cleanings [2]	2	23	11	87	----------	4,700	----------
Fluorspar ore	1	----------	23	3,350	7,800	79,900	----------
Mill cleanings [3]	5	14	71	373	100	2,500	----------
Old slag (lead)	1	748	6	1,572	----------	28,700	----------
Tungsten ore	1	----------	20	5	200	----------	----------
Total	10	785	131	5,387	8,100	115,800	----------
Total "lode" material	124	1,156,019	95,752	2,284,418	8,456,000	39.712,000	80,492,000
Gravel (placer operations)	17	----------	1,916	283	----------	----------	----------
Total, all sources	141	1,156,019	97,668	2,284.701	8,456,000	39,712,000	80,492,000

[1] Detail will not necessarily add to totals, because some mines produce more than 1 class of material.
[2] Gold, 4 tons; lead, 19 tons.
[3] Gold, less than 1 ton; gold-silver, 3 tons; lead, 11 tons.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation [1]	6,206	2,316	----------	----------	----------
Cyanidation [1]	52,412	6,513	----------	----------	----------
Total recoverable in bullion	58,618	8,829	----------	----------	----------
Concentration, and smelting of concentrates:					
Ore	35,100	1,869,244	7,172,200	38,272,700	80,492,000
Fluorspar ore	23	3,350	7,800	79,900	----------
Tungsten ore	20	5	200	----------	----------
Total	35,143	1,872,599	7,180,200	38,352,600	80,492,000
Direct-smelting:					
Ore	1,903	400,958	1,275,700	1,323,500	----------
Cleanings	11	87	----------	4,700	----------
Mill cleanings	71	373	100	2,500	----------
Old slag	6	1,572	----------	28,700	----------
Total	1,991	402,990	1,275,800	1,359,400	----------
Placer	1,916	283	----------	----------	----------
Grand total	97,668	2,284,701	8,456,000	39,712,000	80.492,000

[1] Ore only; no old tailings, etc., processed by this method in 1956.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For ore treated at mills

	Ore treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Boulder	150			421	44	4,383	8,000	83,600	
Chaffee	91			26		61		9,100	11,600
Clear Creek	20,759	75	22	2,022	4,931	62,285	107,900	990,900	
Dolores	32,970	96	23	5,709	83	97,158	12,400	3,715,900	3,336,600
Eagle	240,398			52,169	622	236,696	188,000	7,028,100	39,532,100
Gilpin	9,266	3	1	374	231	7,445	3,600	173,700	47,900
Gunnison	73,344			11,604	87	397,687	975,900	2,741,800	6,395,500
Lake	42,257	1,327	861	7,565	1,906	136,093	208,400	2,805,100	4,255,000
Mineral	28,643			3,805	783	104,895	47,200	2,341,900	1,853,400
Ouray	33,979			2,782	2,647	55,903	251,000	1,054,700	1,175,900
Park	182	16	2	27	23	282	700	5,400	19,700
Saguache	100	1		36	1	323	300	22,800	14,100
San Juan	19,763			3,081	841	36,914	85,400	1,652,600	1,287,400
San Miguel	483,119	4,680	1,397	39,670	22,400	693,049	5,261,500	14,397,000	20,335,800
Summit	13,905	8	10	4,587	412	39,286	29,900	1,330,000	2,227,000
Teller	121,759	52,412	6,513	23	132	139			
Total: 1956	1,120,685	58,618	8,829	133,901	35,143	1,872,599	7,180,200	38,352,600	80,492,000
1955	830,137	55,661	10,563	112,774	22,626	1,368,191	4,638,200	29,994,000	70,677,200
BY CLASSES OF ORE TREATED									
Dry gold	124,120	52,534	6,545	90	236	399	600	2,600	2,400
Dry gold-silver	892	59	17	43	56	1,632	200	5,200	
Dry silver	2,450			44	19	4,110		16,000	
Copper-lead-zinc	554,821	4,680	1,397	51,071	22,471	1,088,158	6,235,400	17,033,200	26,622,200
Fluorspar				411	23	3,350	7,800	79,900	
Lead	27,424			2,686	5,165	75,840	118,300	1,728,200	
Lead-zinc	410,963	1,341	870	79,551	7,148	699,085	817,600	19,487,400	53,866,100
Tungsten				4	20	5	200		
Zinc	15	4		1	5	20	100	100	1,300
Total: 1956	1,120,685	58,618	8,829	133,901	35,143	1,872,599	7,180,200	38,352,600	80,492,000
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS [1]									
Dry gold				66	179	229	300	100	
Dry gold-silver				4	4	51		100	
Dry silver				11	2	1,025		900	
Copper				[2] 9,708	[2] 8,614	[2] 175,402	4,410,600	560,700	162,700
Copper-lead				8,850	8,285	533,969	1,304,800	6,083,300	200
Copper-zinc				8	2	57	1,200	600	5,300
Iron [3]				1,682	70	2,700	4,000	23,300	
Lead				[4] 26,175	[4] 16,725	[4] 1,048,140	[4] 850,200	[4] 31,020,700	22,200
Zinc				87,397	1,262	111,026	609,100	662,900	80,301,600
Total: 1956				133,901	35,143	1,872,599	7,180,200	38,352,600	80,492,000

See footnotes at end of table.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc, in 1956 by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Boulder	11		878		1,700	
Chaffee	180	18	1,911	2,800	28,200	
Clear Creek	544	54	14,090	1,100	160,200	
Custer	169	4	720	10,800	12,500	
Eagle	25,284	1,431	345,205	1,207,100	230,100	
Fremont	32	1	13	700		
Gunnison	96	7	1,668	600	22,000	
Hinsdale	37	9	1,859	400	4,000	
Jackson	7		94	600		
Lake	6,673	306	19,672		513,900	
La Plata	38	1	2,580	1,800		
Larimer	3		2	100		
Mineral	789	19	6,836		189,200	
Moffat	479	2	198	34,800		
Montezuma	15	34	70	200		
Ouray	2		572			
Park	104	25	610	5,800	4,200	
Pitkin	395		497		71,900	
Saguache	301	2	2,635	7,700	88,200	
San Juan	17		369	200	13,200	
San Miguel	31	70	209	1,100	2,000	
Summit	127	8	2,302		18,100	
Total: 1956	35,334	1,991	402,990	1,275,800	1,359,400	
1955	78,279	8,494	1,393,045	4,007,800	1,616,000	22,800
BY CLASSES OF MATERIAL						
Dry gold:						
Crude ore	25	69	209	400	200	
Cleanings	4	5	25		200	
Mill cleanings	(5)	25	5			
Dry gold-silver:						
Crude ore	4,740	248	5,261	110,500	96,700	
Mill cleanings	3	2	51		200	
Dry silver: Crude ore	5,641	75	24,239	1,900	448,000	
Copper: Crude ore	21,788	1,415	344,315	1,152,500	157,100	
Copper-lead: Crude ore	11	1	267	1,100	4,200	
Lead:						
Crude ore	2,344	95	26,667	9,300	617,300	
Cleanings	19	6	62		4,500	
Mill cleanings	11	44	317	100	2,300	
Old slag	748	6	1,572		28,700	
Total 1956	35,334	1,991	402,990	1,275,800	1,359,400	

[1] Excludes concentrates treated only by amalgamation and/or cyanidation.
[2] Includes concentrate and contained recoverable metal from tungsten ore.
[3] From copper-lead-zinc and lead-zinc ores.
[4] Includes concentrate and contained recoverable metal from fluorspar ore.
[5] Less than 1 ton.

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Material shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	66	179	229	389	215	----------
Dry gold-silver	4	4	51	79	175	----------
Dry silver	11	2	1,025	7	944	318
Copper	9,708	8,614	175,402	4,547,038	934,567	1,207,379
Copper-lead	8,850	8,285	533,969	1,536,976	6,336,786	1,095,860
Copper-zinc	8	2	57	1,368	658	5,464
Iron [1]	1,682	70	2,700	5,506	24,777	41,475
Lead	26,175	16,725	1,048,140	1,006,804	32,021,543	1,261,263
Zinc	87,397	1,855	161,138	760,102	901,266	90,596,306
Total: 1956	133,901	35,736	1,922,711	7,858,269	40,220,931	94,208,065
1955	112,774	22,997	1,394,751	5,120,206	31,612,211	81,497,720
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold:						
Crude ore	25	69	209	503	316	855
Cleanings	4	5	25	45	282	----------
Mill cleanings	(2)	25	5	----------	----------	----------
Dry gold-silver:						
Crude ore	4,740	248	5,261	112,782	146,715	----------
Mill cleanings	3	2	51	71	264	----------
Dry silver: Crude ore	5,641	75	24,239	2,388	467,053	16,002
Copper: Crude ore	21,788	1,415	344,315	1,195,252	248,701	----------
Copper-lead: Crude ore	11	1	267	1,293	4,343	----------
Lead:						
Crude ore	2,344	95	26,667	11,326	643,023	14,593
Cleanings	19	6	62	----------	4,734	----------
Mill cleanings	11	44	317	220	2,512	----------
Old slag	748	6	1,572	----------	29,920	----------
Total: 1956	35,334	1,991	402,990	1,323,880	1,547,863	31,450
1955	78,279	8,494	1,393,095	4,122,090	1,873,064	49,097

[1] From copper-lead-zinc and lead-zinc ores.
[2] Less than 1 ton.

Gold.—Colorado's 1956 gold production increased 10 percent above 1955. Two counties—Teller and San Miguel—contributed most of the State gold output—54 and 28 percent, respectively.

Eleven mines in the Cripple Creek district producing straight gold ore accounted for the Teller County production. All of this ore was treated at the 1,000-ton-per-day Carlton custom mill of the Golden Cycle Corp. This company also operated the Ajax group of mines which was the leading gold producer in Colorado in 1954 and 1955. In 1956, despite an increased output, compared with 1955, these mines ranked second to the Treasury Tunnel-Black Bear-Smuggler Union group of mines operated by Idarado Mining Co. The latter group accounted for most of the gold output from San Miguel County which ranked second to Teller County in 1956.

Other leading gold-producing mines in 1956, in order of output, were Cresson (operated by Cresson Consolidated Gold Mining and Milling Co.) and Vindicator (operated by United Gold Mines Co.), both in the Cripple Creek district of Teller County, and Bald Eagle (operated by Bald Eagle Mining Co.) in the Idaho Springs district of Clear

Creek County. The Eagle mine in the Red Cliff (Battle Mountain) district of Eagle County—the 4th largest gold producer in the State in 1955—dropped to 10th place in 1956. This decline resulted from a reduction in the quantity of copper ore mined, from which the gold was recovered as a coproduct, and a lower gold content in the copper ore mined, compared with 1955.

Fifty-five percent of the total gold output was recovered from ores of gold and silver, 43 percent from ores of copper, lead, and zinc, and the remaining 2 percent mostly from placer mining. Fifty-four percent of the gold was recovered by cyanidation of ore, 36 percent by the smelting of concentrate produced from ore, and the remainder by amalgamation, direct smelting of ore and cleanup material, and placer mining.

Iron Ore.—During 1956 C. K. Williams Co. shipped bog iron (limonite) from the Iron Springs placer mine at Ophir, San Miguel County, to buyers outside of the State for use in the manufacture of paint. Output dropped by one-third, compared with 1955, because of a lower demand for this material. Iron ore for the Colorado Fuel & Iron Corp. plant at Pueblo was obtained from company mines in Utah and Wyoming.

Lead.—Colorado lead output rose from 15,805 tons in 1955 to 19,856 tons in 1956, a 26-percent increase. Most of this advance resulted from the stimulus incident to the rise in the price of lead from the yearly average weighted price of 14.9 cents in 1955 to 15.7 cents in 1956. The bulk (63 percent) of the State lead output was recovered as a byproduct or coproduct of complex ores of copper, lead, and zinc from 3 mines. Of these, the leading lead producer was by far the Treasury Tunnel-Black Bear-Smuggler Union group of mines, operated by Idarado Mining Co. It was followed by The New Jersey Zinc Co. Eagle mine and the Rico Argentine Mining Co. Rico-Argentine mine. Other leading lead-producing mines were Keystone Unit, Resurrection, and Emperius.

Molybdenum.—The Climax Molybdenum Co. mine on Fremont Pass 13 miles north of Leadville in Lake County again produced the entire output of molybdenum from Colorado in 1956. In its annual report to the stockholders, the company reported that production in 1956 fell below the production in 1954 and 1955, despite a record tonnage of ore (9,930,000 tons) mined and milled. The decline in molybdenum output resulted from the necessity of mining and drawing lower grade ore. The quantity of ore mined during 1956 represented the greatest annual production in the history of the mine and the greatest ever achieved from an underground mine in North America.

Rare-Earth Metals.—There was considerable activity in rare-earth mining in Colorado during 1956. Production and sales of gadolinite, samarskite, and yttrium-bearing fluorite were reported in Jefferson and Park Counties. The largest producer was Edwin Over and associates at the Boomer mine in Park County, where gadolinite and yttrium-bearing fluorite were recovered. Beal & Associates was the second-ranking shipper and produced yttrium-bearing fluorite from a property in Jefferson County. Yttrium-bearing fluorite was also reported in Jefferson County by M. F. Kurtz and other producers, whereas a small quantity of samarskite was produced by Elements, Inc., also in Jefferson County.

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals

County and district	Mines producing [1]		Lode material sold or treated (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
Adams County		4			1,311	1,311		184	184				$46,052
Boulder County:													
Central (Jamestown)	1			23		23	3,350		3,350	7,800	79,900		19,696
Gold Hill		1			35	35		2	2				1,227
Grand Island	1	1	5		8	8	828	3	831		1,000		1,189
Ward	2		156	21		21	1,083		1,083	200	4,400		2,491
Chaffee County:													
Chalk Creek	2		53	3		3	133		133		4,900	2,800	1,379
Monarch	4		218	15		15	1,839		1,839	2,800	32,400	8,800	9,671
Clear Creek County:													
Argentine and Griffith [2]	4		8,303	248		248	15,659		15,659	15,600	165,000		55,387
Cascade and Ute Creek	1		100	13		13	4		4				459
Empire	1		202	13		13	212		212	500	11,700		2,697
Idaho Springs	6	1	9,152	4,568	31	4,599	40,627	4	40,631	88,000	629,800		334,016
Montana	4		2,992	126		126	17,727		17,727	2,800	232,100		58,084
Trail Creek or Freeland (Lamartine)	2		554	92		92	2,168		2,168	2,100	112,500		23,736
Custer County: Hardscrabble	3		169	4		4	720		720	10,800	12,500		7,345
Dolores County: Pioneer	2		32,970	179		179	97,181		97,181	12,400	3,715,900	3,336,600	1,139,999
Douglas County:													
Newlin Gulch		1			3	3							105
Eagle County:													
Burns-McCoy and Red Cliff (Battle Mountain) [2]	2		265,682	2,053		2,053	581,901		581,901	1,395,100	7,258,200	39,532,100	7,746,857
Fremont County: Cotopaxi	2		32	1		1	13		13	700			344
Gilpin County:													
Northern	1	1	40	11	2	13	8		8				462
Southern	7	2	9,226	223	7	230	7,438	2	7,440	3,600	173,700	47,900	50,147
Gunnison County:													
Elk Mountain and Tomichi [2]	6		73,402	93		93	398,177		398,177	975,900	2,748,300	6,395,500	2,086,049
Rock Creek	1		38	1		1	1,178		1,178	600	15,500		3,790
Hinsdale County:													
Galena	1		6	1		1	69		69	300	3,300		742
Lake	1		31	8		8	1,790		1,790	100	700		2,053
Jackson County: Pearl	3		7				94		94	600			340
Jefferson County		4			488	488		81	81				17,153
Lake County:													
California	12	1	48,929	3,537	17	3,554	156,620	2	156,622	208,400	3,319,000	4,255,000	1,458,729
Granite	1		1	2		2	6		6				75
La Plata County: California	2		38	1		1	2,580		2,580	1,800			3,135
Larimer County: Manhattan	1		3				2		2	100			44
Mineral County: Creede	2		29,432	802		802	111,731		111,731	47,200	2,531,100	1,853,400	800,551
Moffat County: Douglas Mountain (Sunbeam)	2		479	2		2	198		198	34,800			15,039

Montezuma County:													
California	1		15	34		34	70		70	200			1,338
Ouray County:													
Red Mountain	1		2				572		572				518
Sneffels	2		33,979	2,647		2,647	55,903		55,903	251,000	1,054,700	1,175,900	576,601
Park County:													
Alma Placers-Fairplay		1			6	6		1	1				211
Buckskin	2		172	30		30	462		462	1,400	6,200	18,400	5,557
Consolidated Montgomery	1		20	32		32	63		63	300	100	1,300	1,499
Freshwater	1		65				101		101	4,800	400		2,194
Mosquito Creek	1		29	2		2	268		268		2,900		768
Pitkin County: Roaring Fork	1		395				497		497		71,900		11,738
Saguache County: Kerber Creek (Bonanza)	5		401	4		4	2,958		2,958	8,000	111,000	14,100	25,576
San Juan County:													
Animas	4		15,978	757		757	28,945		28,945	66,200	1,489,700	1,127,700	469,205
Eureka	4		3,802	84		84	8,338		8,338	19,400	176,100	159,700	68,258
San Miguel County:													
Iron Springs			9	12		12	119		119	100	1,300		775
Lower and Upper San Miguel [2]	3		483,141	27,138		27,138	694,536		694,536	5,262,500	14,397,700	20,335,800	8,861,426
Summit County:													
Breckenridge	2	1	8,501	358	8	366	20,913	4	20,917	27,500	1,151,200	1,659,800	451,559
Montezuma	6		5,012	9		9	19,259		19,259	2,100	181,200	537,800	120,765
Ten Mile Consolidated	2		518	61		61	1,257		1,257	300	15,400	29,400	9,847
Wilkinson			1				169		169		300		200
Teller County: Cripple Creek	11		121,759	52,544		52,544	6,652		6,652				1,845,060
Total Colorado	124	18	1,156,019	95,752	1,916	97,668	2,284,418	283	2,284,701	8,456,000	39,712,000	80,492,000	26,342,138

[1] Operations at slag dumps and old mill or miscellaneous cleanups not counted as a producing mine.
[2] Combined to avoid disclosing individual company confidential data.

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All mine production was sold to Beryl Ores Co. of Arvada and to Rare Earth Chemical Co. of Mead.

Silver.—Ninety-eight percent of the total silver output in Colorado in 1956 was recovered as a byproduct of ores of copper, lead, and zinc. Three mines—Treasury Tunnel-Black Bear-Smuggler Union group, Eagle, and Keystone Unit—supplied 73 percent of the State silver production. The 18-percent decline in silver output in 1956 (compared with 1955) resulted mainly from a reduction in the quantity of copper ore mined from the Eagle mine (from which silver is recovered as a byproduct) and a lower silver content of the copper ore mined.

Tin.—The Climax Molybdenum Co. recovered 24.37 short tons of tin concentrate containing 39.6 percent or 8.62 long tons of metallic tin as a byproduct from the treatment of molybdenum ore. This concentrate was not sold by the close of the year; therefore, it was not recorded as mineral production in Colorado in 1956 but will be shown in the year when it is marketed.

Tungsten.—Production of tungsten concentrate (60-percent WO_3 equivalent) in Colorado in 1956 decreased 24 percent compared with 1955. Most of this decline resulted from a drop in the output of tungsten concentrate from the Climax Molybdenum Co. mine in Lake County—the major tungsten producer in the State—where tungsten was recovered as a byproduct of the treatment of molybdenum ore. According to the company, tungsten output declined in 1956 compared with 1955, despite the fact that a higher tonnage of ore was fed to the tungsten plant, because of a lower tungsten content in the ore, which varies considerably in molybdenum, tungsten, and tin content from place to place in the mine.

Part of the decline in tungsten output in the State in 1956 resulted from an overall drop in production from the 63 individual mines in Boulder County and 1 in Gilpin County. This drop was due to the uncertainty of the extension of the Government domestic purchase program for tungsten during the interim between May 1956, when the purchase quota was filled, until July, when Public Law 733 was enacted extending the program. Lowering of the price from $63 per unit to $55 on the new program reduced the incentive to produce, and exhaustion of Government Purchase Program funds for tungsten concentrate early in December closed most of the operations.

In Boulder County, Cold Spring Tungsten, Inc., second-ranking producer of tungsten in the State, continued to operate the Hetzer mill on custom ore and on ore from its mine. The Tungsten Refining, Inc., and Wah Chang Corp. custom mills were active throughout the

TABLE 16.—Shipments of tungsten concentrate (60-percent WO_3), 1947–51 (average), 1952–56, and total, 1900–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	206	$437,156	1955	1,152	$4,079,341
1952	625	2,354,664	1956	873	3,010,074
1953	817	2,902,490			
1954	927	3,420,563	1900–56	29,982	[1] 41,068,378

[1] Value estimated for some years.

year on ore produced by individual small tungsten-ore producers in Boulder County.

Two DMEA contracts for tungsten-exploration projects and one for a tungsten-lead-copper project, totaling $57,110 and financed jointly by Government and private capital, were awarded in the State in 1956.

Uranium.—Production of uranium ore from Colorado mines from July 1, 1955, to June 30, 1956, amounted to 394,000 tons at an average grade of 0.30 percent contained U_3O_8. State tonnage for the period represented 18 percent of the domestic total. Production data are based on information supplied to the Federal Bureau of Mines by the AEC.

Ore reserve for the State, as of November 1, totaled 4.1 million tons at an average grade of 0.33 percent contained U_3O_8[2] and represented 6.8 percent of the domestic uranium-ore reserve. The reserve given included measured, indicated, and inferred ore; the last class composed approximately two-fifths of the State total.

A major portion of the ore reserve was concentrated in Mesa, Montrose, and San Miguel Counties, which also supplied 95 percent of the production in the July–June fiscal year. These 3 counties, plus Dolores and Montezuma, contained approximately 70 percent of the total reserve. Other counties containing significant reserves were Moffat, Rio Blanco, Saguache, Grand, Jefferson, Fremont, and Boulder.

TABLE 17.—Mine production of uranium ore during the fiscal year 1956[1]

County	July–December, 1955			January–June, 1956		
	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)
Boulder	3	189	1,477	3	(2)	(2)
Clear Creek	1	(2)	(2)	1	(2)	(2)
Custer	1	(2)	(2)			
Dolores				1	(2)	(2)
El Paso	1	(2)	(2)			
Fremont	3	(2)	(2)	2	(2)	(2)
Garfield	4	(2)	(2)	2	(2)	(2)
Gilpin	2	(2)	(2)			
Huerfano	2	(2)	(2)	1	(2)	(2)
Jefferson	8	1,004	7,321	8	4,900	41,713
La Plata				1	(2)	(2)
Larimer	1	(2)	(2)	2	(2)	(2)
Mesa	51	36,441	252,519	75	38,242	251,311
Moffat	5	(2)	(2)	9	(2)	(2)
Montezuma	1	(2)	(2)	1	(2)	(2)
Montrose	116	94,497	576,847	138	121,534	710,607
Pueblo	1	(2)	(2)			
Rio Blanco	11	494	3,777	8	(2)	(2)
Saguache	5	(2)	(2)	1	(2)	(2)
San Juan	1	(2)	(2)	1	(2)	(2)
San Miguel	69	34,840	205,440	81	43,483	241,496
Undistributed		6,520	25,095		11,602	57,180
Total	286	173,985	1,072,476	335	219,761	1,302,307

[1] Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[2] AEC, Statistics on Domestic Uranium Production and Reserves: Press Release 178 (Grand Junction, Colo., office), Dec. 13, 1956, 3 pp.

The capacity of uranium-milling operations was also released in December [3] and was given as follows:

Location, county:	Rated capacity, tons per day	Operator
Durango, La Plata	430	Vanadium Corp. of America.
Grand Junction, Mesa	350	Climax Uranium Corp.
Naturita, Montrose	350	Vanadium Corp. of America.
Rifle, Garfield	280	Union Carbide Nuclear Co.
Uravan, Montrose	850	Do.
Total	2,260	

The milling capacity for Colorado represented one-quarter of the national total.

During the year contracts for four additional mills in Colorado were negotiated with the AEC. They were:

Location, county:	Rated capacity, tons per day	Operator
Bedrock, Montrose	200	Atomic Fuels Extraction Co.
Gunnison, Gunnison	200	Gunnison Mining Co.
Maybell, Moffat	300	Trace Elements Corp.
Rifle, Garfield	1,000	Union Carbide Nuclear Co.
Total	1,700	

By the year end construction work had begun on the new mill at Rifle, to replace the smaller operating plant at the same location; it was designed to operate in conjunction with upgrading plants at other locations to give in effect a daily capacity of 1,000 tons of raw ore.

Private exploration and development drilling for uranium within the State increased slightly to 1.1 million feet. A more pronounced change was shown in the footage driven in underground workings (shafts, adits, drifts, raises, etc.), which totaled 84,000 feet compared with 68,000 in 1955.

Ten DMEA contracts were executed for uranium exploration in Colorado for a total amount of $700,140. Growth of DMEA activities in uranium exploration is indicated by comparison with previous years: In 1955, 14 contracts totaling $308,154; in 1954, 6 contracts totaling $232,773.

Vanadium.—Mine production of vanadium, in terms of recoverable metal, for Colorado was 5.6 million pounds compared with 4.6 million in the previous year. Vanadium was mined in conjunction with uranium from mines in Montrose, Mesa, and San Miguel Counties and was processed at mills in Colorado. All five operating mills in the State recovered vanadium. These mills also processed ore from other States (primarily Utah and Arizona), which represented approximately one-third of the vanadium-bearing ore supplied to the plants.

Zinc.—Zinc output in Colorado in 1956 increased 14 percent in quantity and 27 percent in value of production, compared with 1955. Part of this increased output resulted from the stimulus of an advance in price; the annual weighted average price for zinc was 13.7 cents a pound in 1956, compared with 12.3 cents in 1955. Substantially increased output of zinc was reported for 2 of the 3 leading zinc producers in the State—Treasury Tunnel-Black Bear-Smuggler

[3] Work cited in footnote 2.

Union and Keystone Unit. Output from the leading producer in the State (Eagle mine) dropped in 1956 because of a lower zinc content in the ore mined. Together these 3 mines yielded 82 percent of the total State zinc output. Other major zinc-producing mines were Resurrection, Rico-Argentine, Emperius, Wellington, and Camp Bird, in that order.

NONMETALS

Cement.—In terms of value, cement was the fourth ranking commodity produced by the mineral industries of Colorado in 1956. Shipments of portland and masonry cements, the highest in the history of the State, were 1 percent above 1955. Value, on the other hand, was 5 percent higher due to a rise in the average price. The three cement plants at Portland (wet and dry process) and Boettcher (dry process) operated at optimum capacity throughout 1956, producing types I, II, III, oil-well, waterproof, and masonry cements, the bulk of which was shipped by truck. To supply its need for raw materials, the Ideal Cement Co. (operator of all plants) mined limestone, clays, gypsum, sandstone, and sand. Other raw materials were purchased locally or brought in from other States. The cement plants consumed 93.4 million kilowatt-hours of electrical energy in 1956 and 9 kilns were in operation during the year. Shipments were reported into California, Kansas, Nebraska, New Mexico, Oklahoma, Utah, and Wyoming, as well as local purchases in Colorado.

Clays.—Coupled with the demand for brick and other structural-clay products by the construction industry of the State, output of clays rose to 523,000 tons valued at $1.2 million in 1956, a 13-percent increase in tonnage and a 9-percent rise in value. Mining in 1956 was conducted at 40 underground and open-pit mines, compared with 41 in 1955. During 1956 all types of clay except bentonite gained in mine output, but the largest percentage increase was in the fire-clay group. Clays were mined in 10 counties, and the larger producing counties were Jefferson, Boulder, Douglas, and Pueblo. Fire-clay production reached 304,000 tons in 1956 compared with 262,000 tons in 1955, and production of miscellaneous clay rose from 202,000 tons in 1955 to 218,000 in 1956. No bentonite was produced in 1956 owing to cessation of mining in Bent County by Clay Productions, Inc. The use of fire clay in manufacturing building brick and other structural-clay commodities represented the bulk of the total produced, followed by the consumption of fire clay in manufacturing firebrick and block, fire-clay mortar, clay crucibles, art pottery, floor and wall tile, terra cotta, and refractories for foundries and steelworks. Building brick and heavy clay products consumed all but a small quantity of total miscellaneous-clay output; the exception was the miscellaneous clay used for art pottery.

Mining in 1956 was carried on by 27 companies or individuals that either sold their entire output or used it in manufacturing clay products. Of the 523,000 tons of clays produced in Colorado in 1956, 201,000 tons was sold by producers and 322,000 tons used. The leading mine operators of fire-clay deposits were: Golden Brick Co., George W. Parfet Estate, Inc., and H. M. Rubey Clay Co., in Jefferson County; Pueblo Clay Products Co., in Pueblo County; and S. A.

TABLE 18.—Production of clays, 1955–56, by counties

County	1955		1956	
	Short tons	Value	Short tons	Value
Bent	207	$931		
Boulder	101,624	177,842	97,751	$171,065
Delta	831	1,454	801	1,402
Douglas	58,794	159,362	77,243	206,563
El Paso	17,891	63,982	11,892	44,178
Fremont	18,807	61,060	6,282	21,358
Huerfano	7,969	41,337	9,501	49,880
Jefferson	168,419	382,077	236,605	501,091
Las Animas	7,082	15,934	7,543	16,972
Mesa	4,500	7,875	1,764	2,664
Pueblo	78,107	205,547	73,191	200,132
Total	464,231	1,117,901	522,573	1,215,305

Whisenhunt, in Douglas County. The major producers of miscellaneous clay in the State were Colorado Brick Co., in Boulder County; Robinson Brick & Tile Co. and Lakewood Brick & Tile Co., in Jefferson County; and Summit Pressed Brick & Tile Co., in Pueblo County.

The average value for fire clay, f. o. b. mine, in 1956 reported to the Federal Bureau of Mines was $2.69 per ton and $1.82 per ton for miscellaneous clay.

The market and manufacturing center for brick and other clay products was concentrated largely in the Denver metropolitan area. One of the larger brick manufacturers in this region was the Robinson Brick & Tile Co., which, according to its 1956 annual report, sold over $3 million worth of clay products. During its 76th year of continuous operation the company completed installing automatic equipment valued at $1 million, which will reduce raw clay to minute particles, mix clays to formula, and finally deliver the clay in the form of tiles ready for drying and burning. The rated capacity of the new installation was 36 tons per hour.

Robinson also reported the addition of 1 open-pit and 1 underground mine during the year, making a total of 14 mines supplying clays for the plant, as well as the expansion of its sales dealerships to include 22 Western States, Alaska, Hawaii, and western Canada.

Feldspar.—The demand for ground feldspar used in glass and pottery manufacture remained strong in 1956, and output of crude potash and soda feldspar rose to 47,000 tons, a 2-percent increase over 1955. Prices for crude material reported by mine operators rose from $6.80 per short ton in 1955 to $6.96 per short ton in 1956, indicating an upward price trend to stimulate larger mine production.

Chaffee County continued to be the largest producing region, and the M & S mine of M & S, Inc., was the only active mining operation reported in the county. Jefferson County ranked second in terms of output, with 17 mines, followed by Fremont, with 13 operators. In all, there were 42 individuals or companies for which mine production was reported, and approximately 30 individual deposits worked during the year. All mines were worked by open-pit methods. The crude feldspar was trucked to a grinding plant at Salida and another at Denver.

Fluorspar.—Output of Acid-grade fluorspar concentrate in Colorado continued to decline in 1956 and dropped 5 percent below 1955. This

decrease was due to the availability to consumers of large quantities of imported fluorspar at a price which, according to western operators, was below that needed for profitable operation of their mines. Ozark-Mahoning Co. and General Chemical Division, Allied Chemical & Dye Corp., were the only producers of any consequence. Two tons of Metallurgical-grade fluorspar was reported in Boulder County and 30 tons in Park County. This output resulted from a limited demand created by operation of industrial furnaces in the Denver area. Of the finished fluorspar, 44 percent was used in manufacturing hydrofluoric acid, 55 percent went to the Government stockpile, and 1 percent was consumed in cement manufacturing and metallurgical uses.

TABLE 19.—Shipments of fluorspar, 1947–51 (average), 1952–56, and total 1905–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	24,265	$803,961	1954	59,197	$3,197,252
1952	29,185	1,505,968	1955–56	(1)	(1)
1953	53,276	2,872,360	1905–56	839,725	24,563,857

[1] Figure withheld to avoid disclosing individual company confidential data.

Mine production was reported by Ozark-Mahoning Co. at its Emmett and Afterthought mines in Boulder County and the Northgate mines in Jackson County. General Chemical Division only operated its Burlington mine in Boulder County. Crude ore was treated at the Valmont mill of General Chemical and the Jamestown and Northgate mills of Ozark-Mahoning Co.

Gem Stones.—The value of gem stones collected in Colorado during 1956 reached $30,000 and included agate, onyx, beryl, garnet, amazonite, topaz, quartz, alabaster, satin spar, amethyst, moss opal, jasper, pyromorphite, rhodonite, and turquois. Production was reported in 18 of the 63 counties in the State, with the largest value of material collected reported in Saguache County. Turquois from the Villa Grove turquois lode was the most important stone, followed by agate and amethyst. Mineral County ranked second in terms of value, followed by Fremont, Chaffee, and Teller.

Gypsum.—Production of gypsum in 1956 reached 88,000 tons—the highest in Colorado history—and resulted principally from the demand for crude ore by the gypsum-wallboard plant of Pabco Building Materials Division, Fibreboard Paper Products Corp., at Florence. The strong demand for gypsum in manufacturing cement and gypsum products continued in 1956, and mine output was again concentrated in Fremont and Larimer Counties. Mine production was reported by Ideal Cement Co. in Fremont County, and Ernest W. Munroe supplied gypsum to the Ideal cement plant in Larimer County. Production of crude gypsum also was reported by United States Gypsum Co. in Larimer County, U. S. Soil Conditioning Co. in Fremont County, and Atlas Mining & Manufacturing Co. in Delta County.

On June 7, 1956, the $2.5 million plant of Pabco Building Materials Division was dedicated, and production of wallboard, sheathing, and lath began a few days later. The plant is on a 47-acre site 4 miles

east of Florence. A feature of the plant is the 10-deck drier, which hardens the finished wallboard.

Mica.—Mine output of scrap mica continued the downward trend reported in 1954 and 1955 by dropping to 517 tons in 1956, a 26-percent decline over 1955 and 58 percent less than in 1954. The decrease was not due to lessened demand for good-quality ground mica but rather to the relatively low price and competition of substitute materials, which precluded a higher price for mine production. Fremont County remained the largest producing area, with output reported by eight mine operators. Park, Larimer, and Jefferson, in that order, were the next most important producing counties.

For the first time in a number of years sales of sheet mica were reported in Colorado. J. R. Rose, operating the Big Moose mine in Clear Creek County, and L. E. Coosh, working the Lil Kat Lode in Larimer, shipped hand-cobbed mica to the Custer, S. Dak., depot of the General Services Administration.

Perlite.—The steady demand for expanded perlite for use as aggregate, replacing sand, in gypsum plaster, for grouting oil wells, loose-fill insulation, and as a filler resulted in a 4-percent increase in mine production. The Rosita mine of the Great Lakes Carbon Corp. continued to be the only source of crude perlite, and the bulk of the mine shipments were to company expanding plants in other States. Persolite Products, Inc., was the only plant operated in Colorado, and the expanded material produced was used in plaster and concrete aggregate.

Pumice.—Production of volcanic scoria in Colorado during 1956 continued to decline by dropping to 50,000 tons, a 29-percent decline over 1955. The Mesita Hill mine of Colorado Aggregate Co., Inc., Costilla County, and the McCoy mine of McCoy Aggregate Co., Routt County, continued to be the only active mining operations in the State. Of the 50,000 tons produced during the year, 44,000 tons was used in concrete aggregate and 6,000 tons as railroad ballast.

Pyrites.—Record production of sulfuric acid during 1956 was reported; in addition, the output of pyrite used to make acid also reached a new high. The largest producer was the Rico Argentine Mining Co. at Rico, Dolores County. During the year a flotation plant to upgrade tailings was constructed. This plant, working on the lower grade portions of the tailings, produced a pyrite concentrate ranging from 45 to 50 percent sulfur. According to reports, the acid plant was producing 200 tons of pure sulfuric acid per day. Preparations were also made to mine the pyrite underground, and several million tons was reported blocked out. The only other shipper of pyrite concentrate was the Climax Molybdenum Co. in Lake County. Output resulted from treatment of pyrite-bearing concentrate at the company byproduct plant at Climax; the material was shipped to the Denver plant of Allied Chemical & Dye Corp., where it was processed to produce sulfuric acid.

Salt.—The Union Carbide Nuclear Co. in Montrose County continued to be the only producer of salt in Colorado in 1956. Production came from a brine well operated by the company and was used in processing uranium ores.

Sand and Gravel.—The demand for sand and gravel for highway construction and building needs reached a new high in 1956 by rising to 15.1 million tons—an increase of 17 percent over 1955 and 12 percent above the previous record of 1954. Of the 1956 production total, 9.8 million tons was classified as Government-and-contractor production and 5.3 million tons as commercial output. This compares with 8.2 million tons and 4.7 million tons in 1955.

Government-and-contractor production was reported in 54 counties and commercial output in 17 counties; sand and gravel was tabulated for 55 out of the 63 counties in the State. Adams County, with a recorded production of 2.4 million tons, was the leading producer, followed by Arapahoe, Jefferson, Pueblo, El Paso, Lincoln, Weld, and Boulder Counties, all of which produced 500,000 tons or more.

Two-thirds of the total material sold or used in 1956 was produced by private contractors and used on Federal, State, and county highway and municipal projects. Of the 9.8 million tons of Government-and-contractor production, 80 percent was washed, screened, or otherwise prepared, and of the 5.3 million tons of commercial material, 95 percent was processed. Pit-run or prepared material was transported predominantly by truck, as only 1 percent of the total production was shipped by railroad. The leading commercial producers included Cooley Gravel Co., Western Paving Construction Co., Broderick & Gibbons, Rio Grande Co., Fountain Sand & Gravel Co., Brannan Sand & Gravel Co., Hall Sand & Gravel, Inc., and Colorado Materials Co. These 8 operators supplied 65 percent of the commercial output and 23 percent of the total State production. The major contractors engaged in Government roadwork, and who produced 50 percent of the total Government-and-contractor production and 33 percent of the State output, were Pioneer Construction Co., Northwestern Engineering Co., Peter Kiewit Sons' Co., Schmidt Construction, Inc., C. L. Hubner Co., Blanchard Construction Co., and Herren & Strong.

Stone.—Production of all types of stone quarried in Colorado during 1956 rose to 2.25 million tons—a 5-percent advance over 1955. Increased production was reported for crushed limestone, which represented 91 percent of the total. Gains in output were also reported for dimension sandstone, granite, and crushed marble. Decreases were noted in the quarrying of dimension marble and crushed sandstone and miscellaneous stone.

The bulk of the total stone tonnage in 1956 was used in manufacturing cement. The next largest use was as a flux, followed by use as concrete aggregate, as a refractory, as riprap, and in sugar refining. Sandstone was the principal dimension stone produced; flagging and rough and dressed building stone were the more important uses. The leading producers of limestone were Ideal Cement Co., Fremont and Larimer Counties; Colorado Fuel & Iron Corp., Chaffee and Fremont Counties; and Frank H. Norberg Co., Fremont, Garfield, and Larimer Counties.

Vermiculite.—Exfoliated vermiculite was produced at Denver by the Western Mineral Products Co. from ore produced in Montana. The finished product was used as loose-fill insulation, lightweight plaster, and concrete aggregate.

REVIEW BY COUNTIES

Adams.—Petroleum was produced from 15 fields, 3 of which—Badger Creek, Beacon, and Middlemist—composed seven-eighths of the total county production. The Second Creek field (sec. 8, T. 3 S., R. 6 SW.) was discovered during the year, and a confirmation well was reported being drilled at year end. Drilling activity was considerably less than in 1955, as was true of the whole Denver-Julesburg basin.

Output of sand and gravel in 1956 increased 12 percent over 1955, and the county continued to rank as the largest producer in the State. Productive operations were reported by 9 operators—6 classified as commercial and 3 as Government-and-contractor producers. Western Paving Construction Co. led in production, followed by Cooley Gravel Co. and Brannan Sand & Gravel Co. These firms supplied 82 percent of the 1,382,000 tons of commercial output. Highway contracts let by the State highway department and activities of highway-department crews resulted in the production of 976,000 tons of paving gravel. Of the 2,358,000 tons of sand and gravel produced in Adams County, all was washed, crushed, or otherwise prepared.

TABLE 20.—Value of mineral production in Colorado, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Adams	$5,179,207	$4,865,652	Petroleum, sand and gravel, gold, silver.
Alamosa	56,526	89,000	Sand and gravel.
Arapahoe	714,582	1,468,750	Do.
Archuleta	550,442	422,500	Petroleum.
Baca	33,166	27,000	Sand and gravel.
Bent	28,574	101,700	Sand and gravel, petroleum.
Boulder	3,193,451	4,350,411	Stone, fluorspar, tungsten, sand and gravel, clays, coal, lead, petroleum, silver, copper, gold, feldspar, beryl, mica.
Chaffee	988,339	977,425	Stone, feldspar, sand and gravel, lead, silver, zinc, copper, gem stones, gold.
Cheyenne		67,000	Sand and gravel.
Clear Creek	109,980	481,836	Lead, gold, silver, copper, stone, sand and gravel, feldspar, gem stones, mica, beryl.
Conejos	21,474	121,000	Sand and gravel.
Costilla	87,005	85,791	Pumice, sand and gravel.
Crowley	849		
Custer	727,863	778,043	Perlite, copper, stone, lead, sand and gravel, silver, gold, gem stones.
Delta	592,364	617,211	Coal, sand and gravel, clays, gypsum.
Denver	111,611	382,500	Sand and gravel.
Dolores	[1] 1,507,772	1,580,607	Lead, zinc, pyrite, silver, gold, copper.
Douglas	243,489	384,078	Clays, sand and gravel, stone, feldspar, gem stones, gold.
Eagle	9,651,425	7,752,034	Zinc, lead, copper, silver, gold, stone.
Elbert	24,744	85,020	Sand and gravel, gem stones.
El Paso	1,073,474	1,172,090	Sand and gravel, coal, stone, clays, mica.
Fremont	11,524,720	12,712,561	Cement, stone, coal, gypsum, petroleum, feldspar, clays, sand and gravel, beryl, mica, gem stones, copper, gold, silver.
Garfield	297,477	173,522	Coal, stone.
Gilpin	81,453	52,378	Lead, gold, silver, zinc, sand and gravel, copper, tungsten.
Grand	94,063	82,000	Sand and gravel.
Gunnison	2,512,057	3,818,583	Coal, zinc, lead, copper, silver, stone, feldspar, sand and gravel, gold, beryl, columbium-tantalum.
Hinsdale	14,720	16,795	Sand and gravel, silver, lead, gold, copper.
Huerfano	413,535	573,821	Coal, sand and gravel, clays.
Jackson	2,642,267	3,688,470	Petroleum, fluorspar, sand and gravel, coal, copper, silver.
Jefferson	1,131,279	1,613,655	Sand and gravel, clays, feldspar, gold, rare earth minerals, petroleum, mica, beryl, gem stones, silver, columbium-tantalum.
Kiowa	59,252	17,000	Sand and gravel.
Kit Carson	11,830	72,000	Do.

See footnotes at end of table.

TABLE 20.—Value of mineral production in Colorado, 1955–56, by counties—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Lake	$52,323,801	$54,122,510	Molybdenum, tungsten, zinc, lead, silver, gold, copper, pyrite, stone, beryl.
La Plata	534,080	347,117	Coal, stone, sand and gravel, petroleum, silver, copper, gold.
Larimer	5,468,570	5,582,042	Cement, stone, petroleum, sand and gravel, gypsum, beryl, feldspar, mica, copper, columbium-tantalum, silver.
Las Animas	9,415,036	8,940,827	Coal, stone, sand and gravel, clays, gem stones.
Lincoln	68,087	368,000	Sand and gravel.
Logan	24,926,473	22,378,500	Petroleum, sand and gravel.
Mesa	669,793	650,140	Coal, sand and gravel, clays, stone, gem stones.
Mineral	722,940	805,501	Lead, zinc, silver, gold, copper, gem stones, sand and gravel.
Moffat	3,241,996	4,148,915	Petroleum, coal, sand and gravel, copper, silver, gold.
Montezuma	245,231	44,363	Petroleum, stone, sand and gravel, gold, copper, silver.
Montrose	115,106	84,780	Sand and gravel, salt, coal, gem stones.
Morgan	20,361,957	20,651,300	Petroleum, sand and gravel.
Otero	38,248	----------	
Ouray	658,218	577,119	Lead, zinc, copper, gold, silver.
Park	97,081	99,402	Beryl, rare-earth minerals, feldspar, copper, zinc, gold, lead, mica, fluorspar, silver, gem stones, columbium-tantalum.
Phillips	----------	8,000	Sand and gravel.
Pitkin	703,517	1,141,846	Coal, sand and gravel, lead, silver.
Prowers	55,255	87,000	Sand and gravel.
Pueblo	949,396	1,004,732	Sand and gravel, clays, stone.
Rio Blanco	72,135,825	85,224,537	Petroleum, coal, sand and gravel.
Rio Grande	994	235,150	Sand and gravel, gem stones.
Routt	[2] 2,721,929	2,461,122	Coal, petroleum, sand and gravel, pumice and pumicite.
Saguache	91,580	72,576	Sand and gravel, gem stones, lead, copper, silver, zinc, gold.
San Juan	281,751	597,763	Lead, zinc, sand and gravel, copper, silver, gold, gem stones.
San Miguel	5,425,082	8,889,026	Zinc, lead, copper, gold, silver, sand and gravel, iron ore, gem stones.
Sedgwick	1,636	29,060	Sand and gravel, gem stones.
Summit	328,911	[3] 583,871	Zinc, lead, silver, gold, copper, sand and gravel.
Teller	1,667,599	1,904,372	Gold, sand and gravel, stone, silver, feldspar, gem stones, mica.
Washington	16,032,243	20,197,000	Petroleum, sand and gravel.
Weld	7,279,865	8,321,641	Petroleum, coal, sand and gravel.
Yuma	162,212	164,500	Sand and gravel.
Undistributed	17,105,632	[3] 32,870,006	
Total [4]	[1] [5] 286,219,000	329,450,000	

[1] Revised figure.
[2] Excludes value of manganese ore sold and blended at Government low-grade stockpiles for future beneficiation.
[3] Includes value of carbon dioxide, gem stones, natural gas, natural-gas liquids, uranium, vanadium, sand and gravel, and stone production that cannot be assigned to specific counties.
[4] Total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.
[5] Excludes uranium; uranium figure for 1955 not released by Atomic Energy Commission.

Opening of the new Inland Sand & Gravel Co. plant at Adams City north of Denver was a highlight of the industry in 1956. This processing facility—the newest in the area—is a modern, flexible operation capable of producing a wide range of sizes and adjustable to wide variations in graduation of the deposit. The plant was designed to handle an input of 300 tons per hour and by the end of 1956 was averaging 200 tons per hour of finished products, the difference being largely an excess of 8- and 16-mesh waste material. Five salable products were being made: Sand; ⅜-inch chips; and ¼- to ⅝-inch, ¼- to ¾-inch, and ¾- to 1½-inch gravel. Also notable was the first large hydraulic dredge in this area. The river-bed deposit is at the junction of Clear Creek and the Platte River 5 miles north of Denver, and the plant was the only one operating on the Platte River north of

Denver—most of them are farther west on Clear Creek. The deposit averages 30 feet in depth and is well graded, with about 45 percent under ¼ inch in size and very little over 2 inches. The overburden is light and consists largely of sand.

All gold and silver output in Adams County in 1956, virtually equal to 1955, was recovered as a byproduct at some of the sand and gravel washing and screening plants. Kerkling & Slensker recovered gold and silver from sluice boxes at the stationary plants of Brannan Sand & Gravel Co. gravel pits 8 and 10 and F. S. Rizzuto gravel pit. The Cooley Gravel Co. recovered gold and silver in sluice boxes on the floating washing plant (fed by dragline) at the North Plant pit.

Alamosa.—Sand and gravel production in Alamosa County during 1956 rose to 343,000 tons compared with 180,000 in 1955, owing largely to increased highway-construction activities. Contracts let to Graham Construction Co., Pioneer Construction Co., and Siegrist Construction Co. through the State highway department provided the stimulus for this output.

One refinery was operated at Alamosa by the Oriental Refining Co. Crude oil supplied to the refinery was derived from the Chromo and Price-Gramps fields in Archuleta County and the Florence-Canon City field in Fremont County.

Arapahoe.—As a result of increased highway construction in Arapahoe County during 1956, output of sand and gravel rose to 1.4 million tons valued at $1.5 million—a gain of 87 percent in tonnage and a twofold increase in value. Total production comprised 958,500 tons of commercial structural sand and gravel plus a small quantity of filter sand and 471,000 tons of Government-and-contractor paving gravel. The major commercial operators were Cooley Gravel Co., Hall Sand & Gravel, Inc., and Herbertson Sand & Gravel Co. Peter Kiewit Sons' Co. and C. L. Hubner were the contractors for the State and county highway departments. Construction and maintenance crews of the Colorado Department of Highways and the county highway department produced 124,000 tons of paving gravel.

Baca.—Natural gas was produced from the Greenwood field. One development well was completed by Cities Service Co. in the South Greenwood field, although no production was reported for the field. Some sand and gravel was also produced.

Bent.—C. L. Hubner Co., Schmidt Construction, Inc., and Leon K. Suhm, as contractors for the Colorado Department of Highways, produced 211,000 tons of paving gravel valued at $88,000. Because of the shutdown of the mine of Clay Productions, Inc., no bentonite was reported in Bent County during 1956.

Petroleum was produced from the Bent's Fort field. During 1956 2 successful development wells were completed in the field; 1 was an oil producer by Stansbury Oil Co., and the second was a gas well by El Paso Natural Gas Co. Additionally, a gas discovery was reported by D. D. Harrington. The new field was named Lubers field and produced 10 million cubic feet of gas per day on initial testing.

Boulder.—Boulder County was a source of 14 mineral commodities in 1956; of these, stone, fluorspar, and tungsten led in terms of value.

Sales of nonmetals composed 76 percent of the total value of mineral output in Boulder County during 1956 compared with 59 percent in 1955. This gain was due principally to an increase in the value of

stone. For the first time in the history of the county, the value of stone outranked fluorspar—long the leading mineral commodity. Production of all types of stone rose from 21,000 tons valued at $320,000 in 1955 to 94,000 tons valued at $1,693,000 in 1956. This increase resulted largely from the accelerated building program under way at the University of Colorado at Boulder. The university, operating its Ingersoll and Hall quarries, produced 73,000 tons of rough construction dimension sandstone valued at $1.5 million. Boulder County continued to be the leading source of commercial dimension sandstone in Colorado. The major producers were Dewey H. Summers, The Jacobson-Lyons Stone Co., Inc., and Loukonen Bros.

The Emmett and Afterthought mines of Ozark-Mahoning Co. were the largest producers of crude fluorspar in Colorado during 1956, followed closely by the Burlington mine of Allied Chemical & Dye Corp. Both companies continued to operate mills—Ozark at Jamestown and Allied at Boulder—but output fell slightly below 1955. Underground operations at the Burlington mine utilized 28 miners, who worked an average of 238 days whereas 7 men worked a like period in surface operations. The mill at Boulder employed 14 men for 273 days. Employment at the Emmett mine reached 11 men (9 underground and 2 surface), and the workyear averaged 318 days. On the other hand, 4 men were engaged in mining at the Afterthought mine for 278 days. The Wano mill at Jamestown operated 330 days and employed 13 men.

Sand and gravel production reached 505,000 tons in 1956—a slight increase over 1955. The bulk of the output was classified as commercial and was reported by Boulder Gravel Products, Inc., and Golden Transfer Co. The Colorado Department of Highways (through the activities of W. Hodgman & Sons, Inc., and Lowdermilk Bros.) produced 181,000 tons of paving gravel.

The Colorado Brick Co. continued to operate its Rocky Flats and Valmont open-pit miscellaneous-clay mines during 1956. The company also operates a brick plant at Valmont.

Mining operations by the SMN Mining Co. at the Little Bonnie pegmatite resulted in the production of 76 long tons of feldspar and 4 short tons of scrap mica.

The value of the tungsten produced was 23 percent of the total for minerals produced in the county in 1956, compared with 34 percent in 1955. Sixty-three individual operations and possibly more produced tungsten ore. Three tungsten mills for upgrading the ore to a marketable product were operated in the county. Cold Spring Tungsten, Inc., treated custom ore at the Hetzer mill, in addition to ore from its mine. The Tungsten Refining, Inc., and Wah Chang Corp. mills operated exclusively on custom ore from Boulder County.

The total value of metals other than tungsten produced in the county in 1956, including lead, silver, copper, gold, and beryl (in order of value of output), was only one-third of that in 1955. Eighty percent of this value in 1956 was derived from lead, silver, copper, and gold recovered from lead concentrate produced as a byproduct of the treatment of fluorspar ore at the Jamestown operation (Afterthought, Argo, Blue Jay, Brown Spar, Emmett, and Escanaba mines) of the Ozark-Mahoning Co. Small quantities of gold, silver,

and copper were also recovered as byproducts of tungsten ore mined by Gold & Tungsten Consolidated from the Golden Queen mine. Limited amounts of gold, silver, and lead were recovered from the Comstock mine by Durable Construction Co. and from White Raven mine by Don P. Sandidage. Boulder Gravel Products, Inc., recovered a little gold and silver by placer-mining methods incidental to washing and preparing sand and gravel from the George Sawhill Ranch pit and by E. J. & R. M. Ford as a byproduct of tungsten concentrate recovered from the Cougar Gulch placer. Beryl was produced and sold to Beryl Ores Co. of Arvada from the Little Bonnie mine by Specht, Morris & Novick.

During the first half of the year, shipments of uranium ore were made from the Central M D, Lulu B Lode, and Mountain Goat mines operated by the Golden Age Uranium Co., Jimtown Uranium Co., and Frontier Mining Corp., respectively. In addition, Mountain States Uranium, Inc., carried out tunnel work on the Mamie and Buffalo No. 1 claims.

Petroleum was produced in the Boulder and Highland fields.

In May the county's only operating coal mine—the Black Diamond No. 2—was closed by the Black Diamond Fuel Co. During its 25-year history the mine produced 802,000 tons.

Chaffee.—The value of nonmetals continued to be all but a small portion of the total for mineral production in Chaffee County in 1956. Increased values for feldspar and sand and gravel were offset by decreases for stone and gem stones; accordingly, the total for the county declined slightly. Sand and gravel valued at $67,500 was reported by the State and county highway departments, and M & S, Inc., produced all the feldspar reported.

Of the 384,000 tons of stone reported in 1956, all but a small quantity was crushed limestone mined at the Monarch Quarry of Colorado Fuel & Iron Corp. A strike in July at the Pueblo Steel Plant and conversion of the company railroad from narrow to standard gage stopped quarrying operations for 3 months. The Colorado Granite Co. produced 100 tons of dressed monumental stone for local consumption. Agate, onyx, beryl, and garnet valued at $975 were recovered from various outcrops and surface diggings throughout the county.

The Reynolds Mining Corp. Poncha Springs fluorspar mine and mill remained idle during 1956, with only necessary maintenance by company personnel. The property was on a standby basis to permit resumption of operations at any time. The Brown Canyon fluorspar properties of General Chemical Division, Allied Chemical & Dye Corp., also were idle in 1956, with only a small amount of development carried on. The U. S. Fluorspar Co. properties managed by Peter L. Bancroft of Denver were under development, and the company retained a Salida mining firm to complete re-evaluation preliminary to resumption of mining operations.

Six mines that produced the gold, silver, copper, lead, and zinc reported for the county in 1956 supplied 1 percent of the total value of mineral production. Each of these mines produced less than 100 tons of ore during the year. No beryl or tungsten was produced.

Clear Creek.—Mining activity increased in the county throughout 1956. The total value of gold, silver, copper, and lead, which ad-

vanced from $80,000 in 1955 to $474,000 in 1956, made up 98 percent of the total value of mineral production in the county during the year. Eighteen lode mines and one placer mine produced these metals. In addition, exploration, development, or rehabilitation work was conducted at 30 other nonproducing mines in Clear Creek County.

The Grizzly Gulch, Bald Eagle, Red Elephant group, Crazy Girl, and Senator mines were the principal gold, silver, copper, and lead producers in the county. The Grizzly Gulch mine was operated by the Greater Minerals Corp. from the beginning of the year until August 20, when the British Western American Uranium Corp. took over the mine. Most of the ore was treated in the company 100-ton-per-day flotation mill at Georgetown. All mine buildings and equipment destroyed by fire in the fall of the year were rebuilt and new machinery and ore bins installed by the close of the year. The Bald Eagle mine, operated by the Bald Eagle Mining Co.—a joint venture between Jackpot Oil Co. of Denver and Hafen Leavitt of Idaho Springs— was working out of Two Brothers Tunnel in Virginia Canyon. The mine was completely mechanized and electrified during the year. The ore mined was milled at the Front Range mill at Idaho Springs and the concentrate (in addition to some crude ore) was shipped to the Arkansas Valley plant of the American Smelting and Refining Co. at Leadville.

Universal Oil & Uranium Corp. made several shipments of lead ore from the Red Elephant mine during 1956. Charles E. Fetterhoff and Robert M. Shatto shipped 199 tons of lead ore containing 6 fine ounces of gold, 8,439 ounces of silver, and 73,491 pounds of lead, and 3 tons of lead concentrate containing 72 fine ounces of silver and 847 pounds of lead to the Arkansas Valley plant from the Senator mine. The Crazy Girl Mining Co. (Howard Coffindaffer) operated the Crazy Girl mine throughout the year.

Lone Star Mining & Development Corp. shipped uranium ore from the Lone Star No. 1 claim during the first half of the year. Universal Oil & Uranium Corp. did some drifting on the Red Elephant group of claims.

The preparation of sand and gravel and stone for highway construction and the mining of pegmatites produced nonmetal commodities valued at $7,400 in 1956. Construction and maintenance crews of the Colorado Department of Highways were responsible for all sand and gravel produced; and the Federal Bureau of Public Roads quarried some dimension granite, which was used as rubble in a reclamation project. Joe Grover continued to operate the Grover Dike, producing potash feldspar. Feldspar production was also reported by Carl Ballast from the Paradise Mountain mine, and hand-cobbed mica was shipped to the Custer (S. Dak.) GSA Depot by J. R. Rose. Gem stones collected in the county during 1956 consisted of amazonite picked up by Ben Nott in the Buffalo Creek area.

Costilla.—Volcanic scoria continued to provide the major portion of the value of mineral production in Costilla County in 1956. However, output fell from 36,000 tons in 1955 to 18,000 in 1956. The Colorado Aggregate Co., Inc., continued to be the only producer, operating its open-pit mine for 292 days and employing 2 men. The crushing plant was operative for 292 days, and 3 men were employed. Graham Construction Co., as contractor for the Colorado Department

of Highways, and construction crews of the State highway department produced 79,000 tons of paving gravel.

Custer.—The value of perlite, stone, sand and gravel, and gem stones produced was 99 percent of the total for mineral output in Custer County in 1956. Crude perlite produced by the Great Lakes Carbon Corp. at its Rosita mine was the most important mineral, followed by construction materials—stone and sand and gravel—quarried by contractors for the State highway department and the Federal Bureau of Public Roads. Two hundred pounds of agatized wood was collected in the Westcliffe area.

The Defender mine—the major producer of lead and the only producer of zinc in Custer County in 1955—was inactive in 1956. The gold, silver, copper, and lead output came from Big Annie (C. P. Parsons), Navajo (J. K. Banks), and Passiflora (Passiflora Mining Co.) mines, all in the Hardscrabble district of Custer County.

Delta.—Coal was produced from 7 operations employing 50 men. Approximately one-third of the county coal production was sold outside of Colorado.

Sand and gravel output in 1956 totaled 376,000 tons, the bulk of which was produced by the Delta County Highway Department. The Delta Sand & Gravel Co. reported the production of structural and paving sand and paving gravel. Miscellaneous clay continued to be mined by the Delta Brick & Tile Co. for use at its brick plant, and 300 tons of agricultural gypsum was produced at the Doty mine by the Atlas Mining & Manufacturing Co. of Delta.

Minerals Engineering was reported to have made a natural-gas discovery in the Happy Hollow area.

Denver.—Denver County continued to be the principal marketing area for most of the mines in adjacent counties—particularly for nonmetals. Denver was the focal point for the manufacture of brick and other structural-clay products in the State, and plants were operated by Denver Fire Clay Co., Denver Brick & Pipe Co., Denver Terra Cotta Co., Overland Pressed Brick Co., Robinson Brick & Tile Co., and Western Tile Manufacturing Co. In addition to brick and other similar commodities produced by these manufacturing facilities, the Denver Fire Clay Co. and Denver Brick & Pipe Co. manufactured refractory-grade products. All companies either mined their own raw clay or purchased it from local mine operators. Certain special clays were purchased from out-of-State sources.

A number of processing plants for other nonmetallic minerals also were active during the year and continued to play an important part in the industrial growth of Colorado. Consolidated Feldspar Department, International Minerals & Chemical Corp., operated its Denver feldspar-grinding plant on crude material from mines in adjacent counties and from Wyoming and South Dakota. Western Mineral Products Co. produced exfoliated vermiculite at its Denver plant from crude vermiculite from Montana, and General Chemical Division, Allied Chemical & Dye Corp., operated its sulfuric-acid plant on pyrite concentrate obtained from Lake County.

Late in 1956 the Denver Research Institute began constructing its "Aspeco" oil-shale pilot plant. Another addition to the development of Colorado resources was the Kerr-McGee Oil Industries, Inc., metallurgical and research laboratory; the laboratory will direct work

on uranium-processing research. Also, the Globe byproducts smelter of American Smelting and Refining Co. recovered cadmium, indium, and thallium from flue dust, dross, and other material shipped to it from various company smelters.

Dolores.—The Rico-Argentine mine operated by the Rico Argentine Mining Co. was again the principal producer of gold, silver, copper, lead, and zinc in Dolores County in 1956 and ranked third, fifth, and sixth in output of lead, zinc, and silver, respectively, in the State. Lead-zinc ore mined was treated in the company mill at Rico; the products (lead and zinc concentrates) were shipped to the United States Smelting Refining and Mining Co. lead smelter at Midvale, Utah, and to The Anaconda Co. zinc smelter at Black Eagle, Mont.

J. Ben Williford carried out underground exploration and development on the Rainy Day and Pack Rat claims during the year. One shipment of uranium ore was made from the Rainy Day claim.

Production of pyrite used in manufacturing sulfuric acid continued to be the most important nonmetal activity of the mineral industry of Dolores County during 1956. Rico Argentine Mining Co. was the only company reporting output of pyrite. The company sulfuric-acid plant at Rico operated throughout the year as well as the tailings upgrading plant below the Rico-Argentine mill.

Douglas.—The total value of mineral output in Douglas County rose to $384,000 in 1956 compared with $243,000 in 1955. This increase was due to a rise in the value of sand and gravel and clays sold during the year. Of the 77,000 tons of clays sold or used in 1956, 70,000 tons was fire clay mined by T. L. Helmer (Helmer mine), S. A. Whisenhunt (Stevens mine), and Robinson Brick & Tile Co. (Hogback mine). The remaining 7,000 tons was miscellaneous clay quarried by Robinson Brick & Tile Co. at its Diamond and Ute mines. Sand and gravel output in 1956 rose to 312,000 tons compared with 130,000 tons in 1955. Commercial production amounted to 19,000 tons of structural sand and gravel, and the remainder was paving gravel produced by construction crews of the State and county highway departments and Bushman Construction Co. and Northwestern Engineering Co. as contractors for the Colorado Department of Highways.

Crushed limestone was the only stone quarried during the year, and shipments by John T. Fox and Helmer Bros. were used as a flux. Development at the Three Musketeers mine by Martin & Nolan and the Lone Pine mine by Carl Quinn resulted in shipment of 109 tons of mixed and 101 tons of potash feldspar to the Denver plant of International Minerals & Chemical Corp.

The value of gem or ornamental stones collected during 1956 was $270 and consisted of topaz and smoky quartz picked up by the Colorado Mineral Society and Ben Nott around Devil's Head.

Eagle.—A decline in the value of output of gold, silver, and copper was responsible for most of the drop in the total value of mineral production in Eagle County from $9.7 million in 1955 to $7.8 million in 1956. The combined value of lead and zinc output increased 6 percent in 1956, compared with 1955. No production of sand and gravel was reported. A small quantity of stone was quarried and sold in the county.

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The Eagle mine, operated continuously throughout the year by The New Jersey Zinc Co., was the leading producer of zinc in the State and was second to the Treasury Tunnel-Black Bear-Smuggler Union group of mines in San Miguel County in output of silver, copper, and lead. The value of its output of lead and zinc increased, but the value of output of gold, silver, and copper fell considerably below 1955. The decline resulted from a reduction in the quantity of copper ore carrying gold, silver, and lead mined and shipped directly to the smelter by the company. One other reason for the decline was that this ore had a lower metal content than in prior years. The lead-zinc ore from the mine was milled at the company 1,200-ton-per-day underground mill, and the lead and zinc concentrates produced were shipped to smelters.

The Copper King mine was operated by McFarland & Hullinger from August 1 to the end of the year. The direct-smelting gold-silver ore containing lead and copper was shipped to the American Smelting and Refining Co. smelter at Garfield, Utah.

El Paso.—The continued decline in the value of coal production in El Paso County during 1956 increased the relative contribution of the nonmetals to the total value of all mineral output.

Decreased sales were noted not only for coal but also clays and stone. However, a 92-percent gain in the quantity of sand and gravel sold or used more than offset these declines, and the total value of mineral production for the county rose to $1.2 million in 1956—a 9-percent gain.

Of the 994,000 tons of sand and gravel produced in 1956, 521,000 tons was Government-and-contractor production. As in past years, contractors for the State highway department produced and prepared the bulk of this material. During 1956 Bushman Construction Co. and Domenic Leone Construction Co. were the contractors. Production was also reported by the county highway department and the city of Colorado Springs. Construction of the Air Force Academy north of Colorado Springs further stimulated productive activity. Jack Adams & Haake Construction Co., Inc., and Nowers Construction Co. were the contractors for the Air Force Academy Construction Agency.

Crushed granite, limestone, and miscellaneous stone, used largely as concrete aggregate, were quarried during 1956. The Castle Concrete Co. quarried decomposed granite and crushed limestone. Limestone also was mined by the Certified Sand & Gravel Co. and Colorado Materials Co. (Lennox-Breed quarry). Construction activities at the Air Force Academy resulted in the production of 18,000 tons of crushed miscellaneous stone by Jack Adams & Haake Construction Co., Inc., Colorado Constructors, Inc., Mountain States Construction Co., Nowers Construction Co., and T. F. Scholes. Clay production in 1956 came from the National Clay Products Co., Robinson Brick & Tile Co. (Apache No. 7 mine), and Standard Fire Brick Co. (Husted mine). Alvin Sexton shipped a small quantity of scrap mica to the Pueblo grinding plant of International Minerals & Chemical Corp.

Two coal mines operated during the year—the Pikeview mine of the Pikes Peak Fuel Division of the Golden Cycle Corp. and the Franceville strip mine of the Franceville Coal Co.

Fremont.—Fremont County was a source of 14 mineral commodities during 1956 including 8 nonmetals, 2 fuels, and 4 metals. Of the 14, cement, stone, and coal were most important in terms of value.

The production and shipments of types I, II, and III, waterproof, and masonry cements from the Portland plant of Ideal Cement Co. continued to dominate the mineral industry of Fremont County. Shipments were 5 percent greater than in 1955; 18 men were employed at the quarry and 165 at the crusher and cement plant. Two 400-foot and five 120- to 125-foot rotary kilns were operated during the year, and the finished product was shipped to Kansas, Nebraska, New Mexico, Oklahoma, Utah, and Wyoming, in addition to local markets.

The total value of stone produced in 1956 rose to $1,619,000, a 24-percent increase over 1955. Crushed limestone continued to be the most important type of stone; production reached 1,053,000 tons, valued at $1,554,000, 80,400 tons and $474,000 greater than in 1955. Ideal Cement Co. was the largest individual quarry operator, and all output was used in manufacturing cement, except for a small quantity employed as rock dust in coal mines. Production was reported also by the Colorado Fuel & Iron Corp. for use as a refractory limestone; Colorado Limestone Co., fluxing limestone; Frank H. Norberg Co., limestone for sugar refining; and V. D. Coleman & Co., Aspen Ridge, dimension granite for monuments. Colonna Co. of Colorado, Inc., producers of 13 colors of terrazzo chips, reported shipments of flooring materials to markets in many States and began to ship roofing chips to Florida during 1956. Crushed sandstone for refractory use was reported by Ray B. Sturbaum, Standard Fire Brick Co., and Laclede-Christy Co. The Colorado State Penitentiary at Canon City reported 600 tons of crushed granite.

The production of crude gypsum increased 43 percent owing to completion of construction and operation of the Florence plant of Fibreboard Paper Products Co.—the only gypsum wallboard plant in the State. Crude gypsum was used in manufacturing cement at the Portland plant of Ideal Cement Co. and sold as a soil conditioner by the U. S. Soil Conditioning Co. The latter company reported employing 12 men at its quarry and mill and shipped sacked soil-conditioning materials to markets in Texas, New Mexico, Colorado, Arizona, and other States. Expansion of the operation is contemplated for 1957, with plans including production of poultry grits. The Coaldale quarry owned by Ideal Cement Co. and operated by Nat Senatore was sold to Fibreboard Paper Products Co., with the provision that Fibreboard would continue to provide Ideal Cement Co. with the gypsum required for its cement plant.

Output of clays dropped 67 percent, owing to lack of any productive activity by the Rocky Mountain Fire Clay Co., John B. Silengo, and Lovisone & Colarelli. Laclede-Christy Co. carried on the only active mining at its Flint mine.

No private contractors produced sand and gravel in 1956; all output was mined by construction and maintenance crews of the State and county highway departments and the city of Canon City.

Mining of pegmatites and recovery of feldspar and mica continued to play minor roles in the mineral industry of Fremont County. The Mica Lode, owned by International Minerals & Chemical Corp. and leased to a number of operators, was the largest feldspar producer.

Shipments were reported also by Kenneth R. Cox from the Devil's Hole, Cox and Isabell from the Ridge View, and Arko & Kalbach, K. J. Smith, and others from scattered prospects. Scrap mica sold to the Pueblo grinding plant of International Minerals & Chemical Corp. was reported by Arko & Kalbach, K. R. Cox, A. Ellis, F. & W. Hamilton, A. Lockhart, R. L. Owens, and Schward & Bouchard.

Gem-stone production in 1956 rose to $1,220 and consisted of alabaster, agatized wood, coprolite, and satin spar from deposits near Howard and Garden Park.

Output of coal from 21 mines increased 11 percent over the preceding year. The mines (20 underground and 1 strip) employed 125 men.

The county source of petroleum was the Florence-Canon City field, discovered in 1862; crude oil from the field was shipped to the refinery at Alamosa.

Two mines operated by the Carson Mining & Development Co. and by William Ogden & William Harvey, Jr., supplied the small quantities of gold, silver, and copper reported for the county in 1956.

Beryl from 12 mines in the county, was sold to the Beryl Ores Co., Arvada, and the International Minerals & Chemical Corp., Parkdale. Elmer Lockhart, who operated the Mica Lode, was the leading beryl producer in the county. Other major producers included Arko & Kalbach (partnership), Kenneth Cox, R. L. Owens, and Ken J. Smith.

Uranium exploration was conducted at the Snooper-Dickson claims by Juniper Oil & Mining Co. and on the Sunshine claim by the J. M. Huber Corp. Two small shipments were made during the first 6 months of the year by the Ben River Mining Co. from its Claim No. 2 and by Parkdale Uranium Co. from its Misery Mine No. 7.

Garfield.—Garfield County was a source of coal, natural gas, stone, and uranium ore. Additionally the county was the center of shale-oil activity and an important processing point for uranium-vanadium ore.

Natural gas was produced from the Garmesa and Twin Buttes fields. Renewed interest was shown in the Garmesa field area. The Garmesa field was discovered in 1925 and was known to produce a gas with a high carbon dioxide content. During 1956, Standard Uranium Corp., drilling 2.5 miles northwest of the established field, was credited with discovery of a gas with a higher heating value. Three additional development wells were completed by year end—2 successful, 1 dry.

A slight increase in the output of limestone by Frank H. Norberg Co. was reported in 1956. Major uses for the crushed limestone were as flux, and in sugar refining, concrete aggregates, and the production of lime.

Uranium ore was shipped during the first 6 months of the year from the End of Trail No. 2 and Mark No. 2 claims by W. L. Weaver and Black Hope Uranium Co., respectively. Exploration drilling for uranium was carried out by Mid-Continent Uranium Corp. on its U–V group of claims.

At Rifle, Union Carbide Nuclear Co. operated its 280-ton-per-day uranium-vanadium processing plant. During the year the company began to construct a larger plant to replace existing facilities. The

new plant was to operate in conjunction with upgrading plants at Slick Rock, San Miguel County, and Green River, Emery County, Utah.

In midyear the Federal Bureau of Mines oil-shale test plant at Rifle was closed. Bureau personnel maintained the plant on a standby basis with funds supplied by the Department of the Navy. Union Oil Co. of California continued to construct its pilot-plant oil-shale retort on Parachute Creek, 12 miles north of Grand Valley. Initial testing was expected to begin early in 1957. Additionally, at Haystack Mountain, Sinclair Research Laboratories, Inc., continued experiments in underground in-place retorting of oil shale.

Gilpin.—Eight lode mines producing gold, silver, copper, lead, and zinc, 3 placer gold mines, and 1 tungsten mine were active in the county in 1956, compared with 6, 1, and 4, respectively, in 1955. The United Mining & Leasing Corp. explored the Two Sisters mine and mined ore from the Carroll mine from January 1 to June 1, 1956. The ore was treated in the company 50-ton-per-day concentration mill near the mine at Central City. The Cherokee Uranium Mining Corp. had a substantial production of gold, silver, copper, and lead from ore mined from the Cherokee-Widow Woman mine (incidental to exploration during 1956) and milled at the Goldridge mill owned by the company.

Other mines in the county from which ores of gold, silver, lead, and zinc were produced included Dulajene (dump), Federal, Justice, Patch, and We Got Em. Placer gold containing a total of 9 fine ounces of gold and 2 ounces of silver was recovered from the Anna Mae, Gregory Gulch and Clear Creek, and Fool's Luck placer mines. The Glendale mine, operated by William Quiner, was the one tungsten producer in Gilpin County in 1956.

Gunnison.—Coal produced from 9 mines employing 228 men furnished 44 percent of the total value of minerals attributed to Gunnison County in 1956. Approximately half of the coal was sold in out-of-State markets, primarily for Utah coke ovens.

Production of metals (although individually less important than coal) formed, in the aggregate, 55 percent of the total value of minerals.

The Keystone mine of the American Smelting and Refining Co. supplied most of the metal output in Gunnison County. It ranked third in silver and zinc and fourth in lead output in the State. The ore was treated in the company 200-ton-per-day flotation mill, and lead and zinc concentrates produced were shipped to company smelters at Leadville, Colo., and Amarillo, Tex.

With 2 exceptions, all other metal producers reported outputs of less than 100 tons of ore during the year. The Atlas Uranium Corp. mined 300 tons of silver ore from the Hawkeye mine between October 1 and November 30, 1956. The ore, treated in the company 50-ton-per-day mill, yielded 11 tons of concentrate, containing 2 fine ounces of gold, 1,011 ounces of silver, 922 pounds of lead, and 318 pounds of zinc, which was shipped to the Arkansas Valley plant of the American Smelting and Refining Co. Ed G. Van Der Linden produced small quantities of beryl and columbium-tantalum from the Lucky Hill Mineral No. 2 mine and sold it to Beryl Ores Co. of Arvada.

Nonmetals produced in Gunnison County in 1956 consisted of 2,000 tons of potash feldspar by the C S & H Mining Co. at its Last

Chance mine, 5,000 of paving gravel by the county highway department, and a small quantity of dimension and crushed marble by the Basic Chemical Corp. and Colo-Texas Stone Co. The county highway department also reported using 10,800 tons of crushed limestone in connection with highway construction and maintenance.

Hinsdale.—The Hinsdale County Highway Department quarried the 28,000 tons of sand and gravel produced in 1956.

Small tonnages of ore carrying gold, silver, copper, lead, and zinc were shipped to the Arkansas Valley plant of the American Smelting and Refining Co. from the Czar group by John R. Wagner and from the Pelican group by Frank M. Mendenhall & J. R. Pray and by Interstate Mining Co.

Huerfano.—Coal was produced from 9 mines employing 64 men. The Morning Glory mine (operated by the Morning Glory Coal Co.), the Calumet (operated by the Decarbon Coal Co.), and the Gordon (operated by the Skinner Coal Co.) furnished approximately three-quarters of the county coal output.

The Chamblin mine of Standard Fire Brick Co. continued to be the only active clay mine in the county; production reached 9,500 tons in 1956 compared with 8,000 tons in 1955. The mine was operated for 217 days, and 8 men were employed. The raw clay was used in manufacturing heavy clay products, firebrick, and fire-clay mortar. Sand and gravel production was recorded at 321,000 tons; output resulted from highway contracts let by the State highway department. Domenic Leone Construction Co. and Pioneer Construction Co. were the private contractors engaged in this work.

During the first 6 months of the year the Security Exploration Corp. of Colorado shipped a small quantity of uranium ore from the Anal No. 1 mine.

Jackson.—Production of crude petroleum more than doubled over the previous year, as output from the Battleship field and North McCallum field (also a source of natural carbon dioxide) increased substantially. Cabeen Exploration Co. was credited with discovering the Canadian River field. The new field produced gas from the Muddy, Dakota, and Lakota sandstones; the latter unit also produced oil. Some difficulty was encountered at the initial well site when gas broke through to the surface from below the cased zone. The blow-out was brought under control later.

Coal was produced from the Marr strip mine.

Although fluorspar production at the Northgate mines (Whale pit and Two Hundred Level mine) of Ozark-Mahoning Co. lagged during the summer owing to expiration of the Government stockpile and price-support program, total production in 1956 was only slightly lower than 1955. During the third quarter of 1956 the stockpiling program was re-established and full-scale mining resumed. An average of 19 men was employed for 259 days during 1956 in underground and open-pit mining and 28 men for 326 days at the company mill near Cowdrey.

The Ozark-Mahoning Co., one of the leading producers of Acid-grade fluorspar in the United States, acquired the Northgate property of the Colorado Fluorspar Corp. in April 1951. This deposit in the Copper Ridge mining district ranks as one of the largest west of the Mississippi River. In 1956 open-pit operations were carried on from

May to October. Wagon drills broke the ore and waste. The ore was loaded into 10-ton trucks and hauled 3 miles to the mill; waste was loaded into 5-yard dumpsters by a 1-yard shovel and hauled a short distance to waste dumps; and an ore-to-waste ratio of 1:3 was maintained. Some 4,800 of the total 13,000 feet of vein system has been developed underground. Conventional and modified systems of shrinkage stoping were used. The latter method employed drawpoints and a longhole method of breaking. Four battery locomotives were used to haul the ore to the mill hopper and the development waste to the dumps.

The production of Acid-grade concentrate results from use of a flotation process to treat the complex ore. The principal mineral, fluorite, is associated with calcium carbonate, iron oxide, manganese, ilmenite, and iron sulfide. The grinding circuit consisted of a rod mill, ball mills, and spiral and centrifugal-type classifiers. Concentrate-handling facilities were comprised of filters, rotary drier, and dry-concentrate storage bin, as well as a filter-cake storage building. Concentrate was hauled 3 miles to either the Kings Canon or the Northgate railroad siding on the Union Pacific Railroad. The mill operated 24 hours per day at a daily rate of 120 tons.

All sand and gravel output in 1956 was classified as Government-and-contractor production and resulted from a highway contract let by the Colorado Department of Highways; Northwestern Engineering Co. was the contractor.

Jefferson.—The value of nonmetal output in Jefferson County during 1956 reached $1.6 million (98 percent of the total value of all mineral production, exclusive of uranium). Jefferson County remained the State's outstanding producer of clay, as well as one of the principal sources of sand and gravel. Mine production of raw clay reached 237,000 tons in 1956, a 41-percent gain over 1955. Building construction—both residential and industrial—was responsible for the gain.

In 1956, 19 opencut and underground mines were active; the largest was the Golden Brick Co. fire-clay pit near Golden. George W. Parfet Estate, Inc., Rockwell and Apex fire-clay mines was the second-ranking producer, followed by Robinson Brick & Tile Co., Lariat fire-clay mine, and the Chieftain, Navajo, Stranger, and Vermillion miscellaneous-clay mines. H. M. Rubey Clay Co. (Rubey mine) remained a major producer of fire clay. Production was also reported by Lakewood Brick & Tile Co., miscellaneous clay (Lindsay pit); Fred S. Caldwell, miscellaneous clay (Caldwell Clays); Denver Fire Clay Co., fire clay; John L. Harvey, miscellaneous clay; Viola Doughty, fire clay; Denver Brick & Pipe Co., fire clay (Johnson and Strainland mines); Christopher Bennetts, fire clay (Lindsay pit); Denver Terra Cotta Co. fire clay (Plastic Siding); and Coors Porcelain Co., fire clay.

Because of a higher average price, crude-feldspar output rose to 11,000 long tons in 1956 compared with 995 long tons in 1955. The Madonna Lode, the largest producing mine, was operated by L. M. Hollingsworth, R. H. Vahsholtz, and V. O. Eagle. R. V. McGuire and Olett Mining Co. worked the Lone Lode, the second-ranking producing property, followed by Dale Dunkle, Miller Lode; Vern Blomquist, Clark No. 1 mine; D. W. Powell, Powell and Friend Bros.

mine; C. A. Bevans, Circle S mine; L. M. Hollingsworth, Delbert No. 1; Albert Miller, Riley mine; and Elements, Inc., Elements mine.

Sand and gravel was another important source of income to the mineral industries of the county during 1956. The total output rose to 987,000 tons, a 50-percent increase over 1955. Of this total, only 230,000 tons was Government-and-contractor output quarried by C. L. Hubner Co., Peter Kiewit Sons' Co., and Schmidt Construction, Inc., as contractors for the Colorado Department of Highways. In comparison, 757,000 tons was commercial production and consisted of structural sand and gravel and paving sand and gravel. The largest producer in 1956 was the Rio Grande Co., followed by Western Paving Construction Co., Suburban Reddi-Mix Sand & Gravel Co., and H. N. Lee Sand & Gravel Co.

Rare-earth-mineral production was reported by Elements, Inc., which sold a small quantity of samarskite to the Beryl Ores Co. of Arvada. Sales of yttrium-bearing fluorite to Rare Earth Chemical Co. were reported by Beal & Associates, N. F. Kurtz, and several smaller producers. The crude material was processed by the Denver plant of Rare Earth Chemical Co., and heavy rare-earth oxides were recovered and sold.

In all, 27 tons of scrap mica was produced as a byproduct of pegmatite mining during 1956. Ben Waltz, operating the Biggers mine, was the leading individual producer. All crude material was sold to the Beryl Ores Co., Arvada, for grinding. Ornamental stone was also reported by Baders Minerals from the Crystal Peak area, where 250 pounds of amazonite valued at $500 was collected.

During the first half of the year 6 operators shipped uranium ore from 8 properties. The Ralston Creek mine, operated by Denver Golden Uranium & Oil Co., was the most productive, followed by the company Aubrey Ludwig mine. J. L. Mann property (operated by Uranium Enterprises, Inc.), the Leyden mine (operated by Moreno Uranium Corp.), and the Section 32 mine (operated by Foot Hills Mining Co.) also contributed an important share of county uranium output.

Gold and silver were recovered as byproducts at four sand-and-gravel washing and screening plants. W. B. Kerkling was by far the largest gold and silver producer of the four.

Considerably less beryl was produced than in 1955. Production was reported from eight individual operations; Elements, Inc., at the Little Abner mine, and Leo Sabin, at the Sabin mine, were the leading producers. All of the beryl was sold to the Beryl Ores Co., Arvada.

Additionally, petroleum was produced from the Soda Lakes field, discovered in 1955.

Kiowa.—Stanolind Oil and Gas Co. was credited with discovering the Colt gasfield (sec. 7, T. 20 S., R. 52 W.) which produced from the Morrow sandstone. In the Southwest Eads field, one gas well producing from the Morrow sandstone was tested for oil at the Marmaton horizon by Continental Oil Co., with reported success.

Lake.—The entire output of molybdenum from Colorado (which was below that in 1955) came from the Climax Molybdenum Co. Climax mine in Lake County. Molybdenum was again the dominant metal mined in the county, as it has been since 1929, when the value

of molybdenum produced first exceeded the combined value of gold, silver, copper, lead, and zinc. Except for 4 years, 1920–23, the mine has been a steady producer since the first concentrate was shipped in 1918.

In its annual report to the stockholders, the Climax Molybdenum Co. reported that the production of molybdenum during the past 5 years was:

Year	*Pounds of molybdenum contained in concentrate*
1952	23, 874, 408
1953	37, 306, 341
1954	42, 544, 795
1955	43, 043, 138
1956	37, 489, 000

The average daily production of ore mined and treated in the mill totaled 32,000 tons during 1956. This rate had been increased to 34,000 tons by year end. Despite this record tonnage, the necessity of drawing lower grade ores from the mine caused actual production of molybdenum to fall below the production of 1954 and 1955.

The company reported that sales of molybdenum contained in all forms during the year was 37,132,383 pounds valued at $50,693,847. For the first year since 1949 all sales were to industrial consumers. From 1950 through 1955 a sizable portion of the Climax production was sold to the Federal Government.

In addition, tungsten and tin were recovered by Climax as by-products of the molybdenum ore. The tin recovered was not sold and was not recorded as production in 1956. According to the company, the present byproduct facilities are limited, and plans were being completed in 1956 to expand and allow maximum treatment and recovery from the entire tonnage mined.

The total value of gold, silver, copper, lead, and zinc produced in Lake County in 1956 was $1.5 million, compared with $1.1 million in 1955, a 32-percent increase. Most of this increase reflected the output from the new operation at the Irene, Hellena & Julia Fisk shafts—a joint venture on an equal basis between American Smelting and Refining Co. (ASARCO) and Resurrection Mining Co. (100-percent owned by Newmont Mining Corp.). The joint operation, managed by Resurrection Mining Co., mined known ore bodies and conducted exploration and development work on individual company neighboring properties in the Sunday-Ibex-Iowa Gulch area. Ore production from development headings and stopes in ore bodies tributary to ASARCO's Irene shaft was begun in July 1956; this was followed by ore production from Resurrection's Iowa Gulch through the Hellena & Julia Fisk shafts. According to the Newmont Mining Corp. annual report for 1956, 36,873 tons of ore, containing 4.0 percent lead, 7.45 percent zinc, and 4.83 ounces of silver per ton, was mined during the year by the joint venture. The scheduled production rate (12,000 tons of ore per month) was not reached by the close of the year.

New buildings at the Irene included a modern fireproof changehouse, warehouse, headframe house, ore-truckloading enclosure, and hoist-compressor house. A modern 400-horsepower hoist and three 200-horsepower compressors were installed. The No. 2 unit of the Resurrection mill was rehabilitated and by the close of the year was operat-

ing at its capacity of 425 to 450 tons of ore a day on a 7-day-week basis.

On May 17 the Resurrection No. 2 surface plant burned, ending—at least temporarily—the Robert L. Jones lease operations that had employed 8 to 12 men since July 1953. Ellis Webster and associates continued work on their sublease at the Ibex. Other activities in the area by leasers included diamond drilling on the Ollie Reed by George Peschel and associates and operations at the Hayden shaft by the Cadwell Mining Co. Lead and silver were recovered by the American Smelting and Refining Co. by resmelting lead slag from its dump at the Arkansas Valley smelter at Leadville. It also purchased ores and concentrates of gold, silver, copper, and lead from various Colorado districts and concentrates, residues from zinc smelters, and other material from outside the State.

Nonmetals continued to supply only a small portion of the total mineral output for the county; pyrites and stone were the only commodities produced in this group. Climax Molybdenum Co. remained the only producer of pyrites; output resulted from the recovery of pyrite concentrate—a byproduct of the treatment of molybdenum ore. All output was used in manufacturing sulfuric acid at the Denver plant of Allied Chemical & Dye Corp. The production of sandstone (quartzite) at the Pineview Placer of Standard Fire Brick Co. remained relatively the same during both 1955 and 1956 (4,600 and 4,900 tons, respectively). All crude material was shipped to the company plant at Pueblo for manufacturing refractory brick.

La Plata.—The major activity in La Plata County during 1956 was development drilling in the Bondad-Ignacio natural-gas field. Drilling in this area brought in the bulk of the 48 successful gas-development wells completed. The Pacific Northwest Pipe Line Co., Pubco Petroleum Co., and United States Smelting Refining and Mining Co. were most active in the field. Wildcatting activity increased substantially over previous years, and one new gas discovery was reported.

Natural-gas production was reported from the Bondad-Ignacio, Barker Dome, Blanco, and Red Mesa fields. Barker Dome and Red Mesa fields also furnished the county output of petroleum.

Twelve coal mines employing 40 men were responsible for the county coal output during 1956.

Stone (principally miscellaneous stone) was the most important nonmetal in La Plata County. Crushed limestone was also produced; all output was reported by the Burnett Construction Co. and was used as concrete road metal. The Burnett Construction Co. also reported the production of sand and gravel, and additional output was indicated by the Hunt Construction Co. as contractor for the Colorado Department of Highways.

Small shipments of ore from the Copper Age mine operated by Radium King Mines, Inc., and the Muldoon mine operated by Herman Dalla & Herman Todeschi made the entire gold, silver, and copper output in the county in 1956.

A small quantity of uranium ore was shipped from the Blackhawk mine by the Barnett Mining Co. At Durango the Vanadium Corp. of America operated its 430-ton-per-day uranium-vanadium mill to capacity. The mill derives much of its feed from the company-owned Monument No. 2 mine in Apache County, Ariz. During 1956

a scrubber unit was added to treat dust and gases from the roaster, and a new slime-treating unit was near completion.

Larimer.—Production of types I, II, and III, oil-well, waterproof-portland, and masonry cements continued to be the principal mineral-industry activity in the county during 1956. The Ideal Cement Co. operated its Boettcher dry-process plant for 365 days, employing 123 men. Two rotary kilns were operated 337 and 343 days during 1956; and the clinker, after grinding and sacking, was shipped to California, Nebraska, New Mexico, and Wyoming, in addition to local distribution points.

In terms of value, stone was the second most important product of the mineral industry of Larimer County. During 1956 limestone was once again the dominant type of stone produced. Ideal Cement Co. was the major quarry operator; and, except for a small quantity used as filler for asphalt, the bulk of the output from the Boettcher quarry was used in manufacturing cement. Frank H. Norberg Co. also was active and reported production at its Rex quarry; all output was used in sugar refining. In 1956 Larimer County producers reported output of 8,400 tons of dimension sandstone, which consisted of rough architectural, rough construction, rubble, dressed stone, and flagging. Rocky Mountain Quarry Co. produced 290 tons of rough monumental granite.

Of the 493,000 tons of sand and gravel produced in 1956, the greater proportion resulted from highway contracts let by the Colorado Department of Highways and construction activities of the county highway department. Private contractors engaged in this work were Herren & Strong, Carl V. Hill, C. L. Hubner Co., Lawrence Construction Co., Northwestern Engineering Co., and Pendleton Garner Construction Co. Commercial production consisted of structural and paving sand and gravel reported by Loveland Ready-Mix Concrete, Inc., and Sterling Sand & Gravel Co.

The steady demand for gypsum in manufacturing cement was reflected in increased mine output by E. W. Munroe at his Goodwin quarry. In contrast, output at the Loveland quarry of United States Gypsum Co. declined 15 percent below 1955. The gypsum quarried at the Loveland quarry is used in manufacturing plaster products in company plants outside of Colorado; a portion is returned to Colorado in finished product form. The local (Colorado) market for plaster products produced at out-of-State plants was affected by operation of the new plaster-products plant at Florence, Fremont County.

Pegmatites—feldspar and mica (hand-cobbed and scrap)—were valued at $6,900 in 1956. Feldspar, shipped to the Denver grinding plant of International Minerals & Chemical Corp., was reported by B & M Mines, Inc., Lucas Mining Co., and J. W. Strait. L. E. Coosh shipped a small quantity of hand-cobbed mica to the Custer (S. Dak.) GSA Purchase Depot; B & M Mines, Inc., Mattox & Sabin, and H. A. Snider sold scrap mica to the Beryl Ores Co. of Arvada.

Petroleum (the county's third-ranking mineral in value) was produced from the Fort Collins, Wellington, Clark Lake, Loveland, and Berthoud fields. Production rose 40 percent over that of the preceding year to a total of 181,000 barrels. Increased output was derived from the Fort Collins and Loveland fields, where new pro-

ductive horizons were discovered during 1955. During 1956 oil was also produced from the Dakota formation of the Loveland field.

E. G. Talkington & Clide Thompson made one small shipment of silver ore (carrying some copper) to the Garfield smelter from an open-pit operation at the T & T mine in Larimer County in 1956.

Beryl output in the county was valued at $18,000 in 1956, compared with $3,000 in 1955. Production in 1956 was reported from 15 individual operations and was sold to Beryl Ores Co., Arvada, and to the GSA Government Depot. The outstanding beryl producer in the county was Phil-Mar Oil Co. on the Phil-Mar group of claims. H. A. Snider, who operated the Emerald Gem mine, was also a substantial beryl producer in the county in 1956.

In the first half of 1956 some uranium ore was shipped from the Eureka mine by New Mar Uranium Co. and from the Robinson Lease by the Uranium Queen Exploration Co.

Las Animas.—The mining of coking coal for use in the Pueblo blast furnaces continued to be the most important mining activity in Las Animas County during the year. During 1956, 12 mines were active and 1,172 men were employed. The 3 dominant operations of the Colorado Fuel & Iron Corp. (the Allen, Frederick, and Morley mines) were reduced to 2, with closing of the Morley mine in May (see commodity section).

Stone and sand and gravel provided the bulk of the income from nonmetals to the mineral industries of Las Animas County during 1956; all production was prompted by construction and maintenance of roads by the State and county highway departments.

The Scott-Ruiz Coal Co. continued to be the only clay producer and the 7,500 tons reported was classified as fire clay used in manufacturing firebrick and block.

Rose agate valued at $100 was collected in and around Kim.

The Nina View field was a source of natural carbon dioxide.

Logan.—Logan County continued to be an important source of crude petroleum in the State, as well as a producer of natural gas, natural-gas liquids, and sand and gravel.

Total crude-oil output (derived from 61 fields) was less than in 1955, as was total drilling activity, which declined from 331 holes to 192. Six new oil and two new gas discoveries were reported out of a total of 94 wildcat wells drilled. The new oilfields were the Amber, Beall Creek, Goat Hill, Loula, Prairie View, and Prewitt. The two gasfields were the Columbine and Knoll, both of which were shut in at year end.

Most of the county's 61 oilfields also yielded natural gas. Additionally, natural-gas liquids were produced from 3 plants at Sterling—2 operated by Ginther, Warren & Ginther and 1 operated by the Kansas-Nebraska Natural Gas Co.

Sand and gravel production in Logan County in 1956 was 335,000 tons valued at $208,000. Of this amount, 288,000 tons was produced by construction crews of the Colorado Department of Highways, Domenic Leone Construction Co. as contractor, and the county highway department. The Sterling Ready Mix Co. quarried 47,000 tons of structural sand and gravel, which was used in preparing ready-mix concrete.

Mesa.—The principal mining activity in Mesa County was the mining and milling of uranium ore. Coal mining (followed by excavation of sand and gravel) also formed an important part of mineral-industry activities. Natural gas, clays, stone, and gem stones also were reported.

During the first 6 months of the year, 75 individual properties produced uranium ore in Mesa County. Ore was shipped to 5 different mills and 1 buying station; however, the mills at Grand Junction and Rifle received the major share of the material.

Climax Uranium Co., one of the major operators in the county, reported completion of a shaft and an incline on its properties on Outlaw Mesa and the start of an adit on Beaver Mesa to enter ore discovered by drilling in 1955.

At Grand Junction the mill operated by Climax was modified further during the year. In September, a continuous solvent-extraction circuit was completed and was reported to be operating satisfactorily.

Production of coal (7 mines, 57 men) increased substantially over the 1955 output and totaled 70,360 tons. At Cameo a new coal-fired thermal-electric plant was near completion. The plant was to be supplied with coal from local sources.

Demand for sand and gravel for building and highway construction provided work at seven operations in Mesa County in 1956. Sand and gravel was produced by construction and maintenance crews of the county highway department, Lowdermilk Bros. as contractor for the Colorado Department of Highways, Hinman Bros. Construction Co. as contractor for the Federal Bureau of Public Roads, and by a contractor for the city of Grand Junction. Commercial structural and paving sand and gravel were reported by the Whitewater Sand & Gravel Co., at Whitewater and Grand Junction, and the United Sand & Gravel Co., Inc.

Dimension sandstone produced by Hinman Bros. Construction Co. for the Federal Bureau of Public Roads was used as rubble on a highway project. The Grand Junction Brick Co. continued to mine miscellaneous clay for use at its Grand Junction brick plant, but output in 1956 was considerably below 1955. Two hundred pounds of dinosaur bones was collected in the Glade Park region.

Sources of natural gas within the county were the Asbury Creek and Bar X fields. Three gas discoveries were reported for the year: One was a new productive zone in the Bar X field; the second was an unnamed discovery 2 miles west of the Highland Canal field; and the third was the Divide Creek field in the eastern part of the county.

Near Fruita, west of Grand Junction, the American Gilsonite Co. began to construct a refining plant to produce gasoline and metallurgical coke for gilsonite mined at Bonanza, Utah, and transported to the refinery by a 70-mile pipeline. The plant was to have an initial daily capacity to treat 500 tons of raw gilsonite producing 250 tons of metallurgical coke and 60,000 gallons of gasoline. When in full production, a daily plant capacity of 1,000 tons would be achieved, according to reports.

Mineral.—The Emperius Mining Co. Emperius mine furnished most of the gold, silver, copper, lead, and zinc output in the county in 1956 and was one of the major silver, lead, and zinc producers in the State.

The output of lead and zinc in 1956 was greater but of silver was less. A new mill and power plant, replacements for those destroyed by fire in August 1955, were placed in operation in June 1956.

The Outlet Mining Co. had a substantial output of silver and lead from the Outlet Tunnel in 1956. The Outlet Mining Co. and Sublet Mining Co. were granted a DMEA lead-zinc exploration project for $108,506 on the Outlet Tunnel mines during 1956. Gormax Mining Co. (Gordon & Maxine Smith) made one small shipment of lead ore from the Phoenix mine and conducted work under a $56,720 DMEA contract for lead-zinc at the Gormax mine.

Moffat.—Production of mineral fuels—petroleum, coal, natural gas, and natural-gas liquids—continued to be the major activity of the mineral industries of Moffat County in 1956.

Crude petroleum came from 12 fields. Greater output for the year resulted from increased production from the Hiawatha field and more importantly the Thornburg field (in which oil was discovered during 1955). It was in the latter field that the largest single concentration of development drilling was carried out. Ten development oil wells were completed by Continental Oil Co.—nine of them successful.

A new gas field (the North Craig) was reported by United States Smelting Refining and Mining Co. The field is 10 miles northeast of the Craig field.

Coal production came from the Red Wing mine operated by the Colowyo Coal Co., which shipped almost half of its output to out-of-State markets. The firm employed 38 miners during 1956.

Uranium ore was mined from 9 properties during the first 6 months of the year. The major operator during the period was Trace Elements Corp. Shipments were also reported by Counts & Henderson from the Cleta group and Seelco Mining Co. from the Sugar Loaf mine.

An AEC contract for a mill at Maybell was renegotiated during 1956. The mill, of 300-ton-per-day capacity, was to be built and operated by Trace Elements Corp.

Sand and gravel production in Moffat County in 1956 was predominantly the commercial output of Craig Sand & Gravel Co. Sand and gravel was also reported by the county highway department crews and used in constructing and maintaining county roads.

Cold Springs Minerals was active at the Red Jacket Nos. 1 and 2 mines from May 15 to July 15, 1956. One small shipment of copper ore was made from these mines to the American Smelting and Refining Co. smelter at Garfield. The Western Exploration Co. shipped a substantial quantity of copper ore, containing some gold and silver, from the Bromide No. 1 dump to the smelter in 1956.

Montezuma.—The value of minerals attributed to Montezuma County dropped from $245,000 in 1955 to $44,000 in 1956 owing to the decreased output of sand and gravel used in highway-construction projects. During 1956 sand and gravel was produced by the State highway department (Hunt Construction Co., contractor). A. S. Horner, contractor for the Federal Bureau of Public Roads, produced some crushed miscellaneous stone.

Petroleum and natural gas were derived from the Dove Creek field, and natural carbon dioxide gas was produced from the McElmo field.

No coal production was reported for the year.

Uranium ore was shipped during the first half of the year from the Roberta Jean mine by the Owen & Ringwold Mining Co.

Exploration and development work was conducted at the Gold Dollar mine by the First National Oil & Mineral Co. from July to November in 1956, and one shipment of gold ore carrying some silver and copper was made to the Leadville smelter.

Montrose.—Uranium mining and milling formed the principal activities of Montrose County mineral industries in 1956. Production of sand and gravel, salt, coal, and gem stones also was reported.

Uranium ore was produced from 138 properties and shipped primarily to the Uravan and Naturita mills; ore was also shipped out of the county to mills at Grand Junction, Rifle, and Durango.

Expansion of the Union Carbide Nuclear Co. mill at Uravan was completed and at year end the daily plant capacity was 850 tons. The Vanadium Corp. of America operated its 350-ton-per-day mill at Naturita throughout the year. Additionally, a contract was negotiated between the AEC and Atomic Fuels Extraction Co. for constructing and operating a 200-ton-a-day uranium mill at Bedrock.

Some of the more important mines (in terms of production for the first 6 months of the year) were as follows:

Mine:	*Operator*	*Location*
AEC Mining Lease No. 10	La Salle Mining Co	Club Mesa.
AEC Mining Lease No. 37	Shattuck Denn Mining Corp.	Do.
AEC Mining Lease No. 39	Golden Cycle Corp	Atkinson Mesa.
AEC Mining Lease No. 47	Worcester Mines	Do.
Hummer	Union Carbide Nuclear Co.	Monogram Mesa.
Mineral Joe No. 1	Climax Uranium Co	Do.
Mineral Joe No. 2	----do	Do.
Opera Box	Union Carbide Nuclear Co.	Do.
Oversight	----do	Do.
Republican	Vanadium Corp. of America	Long Park.

These properties produced 54,800 tons of ore during the 6-month period, or 45 percent of the county total.

Salt in brine recovered from a well operated by Union Carbide Nuclear Co., sand and gravel produced by Harrison & Atchison Co. as contractor for the State highway department, and jasper and dinosaur bones collected by Ray Cook and San Miguel Woodcraft & Gem Shop from the Long Park and Naturita Canyon areas constituted all nonmetal production in Montrose County in 1956.

At Nucla a coal-fired thermal-electric plant was being constructed. Coal for the plant was to be supplied from a new mine in the area by the Edna Coal Co., according to a contract signed during the year.

Morgan.—Petroleum continued to be the most important mineral produced in Morgan County. Associated with the production of crude petroleum, which came from 30 fields, was the output of natural gas (produced from most of the oilfields) and natural-gas liquids (produced from 2 plants at Fort Morgan operated by Continental Oil Co. and Pure Oil Co.).

In October the Adena field—leading producer in the county and second in the State—was placed under unit operation with Pure Oil Co. designated as operator. Unit operation permitted the use of secondary recovery methods, which will increase significantly total recoverable reserves of the field.

Drilling activity dropped from the preceding year—153 completed holes compared with 253 in 1955. The 74 wildcat holes drilled resulted in 7 oil discoveries and 1 gas discovery. One of the more important discoveries was the Orchard field (T. 4 N., R. 60 W.) which produced from both the "D" and "J" sand members of the Dakota formation.

Sand and gravel production in 1956 rose to 223,000 tons as a result of increased highway construction in the county. Commercial output was recorded for the Builders Aggregate Co. and Green Bros. Contractors, whereas Blanchard Construction Co., as contractor for the Colorado Department of Highways, and construction crews of the county highway department were responsible for Government-and-contractor production.

Ouray.—The King Lease, Inc., at the Camp Bird mine near Ouray—the principal producer of metals in the county since the mine was reopened by Joseph King in 1926—was active in 1956. It was the seventh-ranking silver and eighth-ranking gold, lead, and zinc producer in the State. A total of 33,871 tons of lead-zinc ore mined and milled in 1956 contained 2,954 fine ounces of gold, 72,552 fine ounces of silver, 158 tons of copper, 582 tons of lead, and 777 tons of zinc. On December 1, 1956, the King Lease, Inc., discontinued operation of the Camp Bird mine and relinquished its lease to the owners, Camp Bird, Ltd., which reported that it will operate the mine.

After 12 years of continuous operation the Red Mountain mill of the Idarado Mining Co. was closed on December 1, 1956, and placed on a standby basis. This 900-ton-per-day mill at the portal of the Treasury tunnel near Red Mountain Pass in Ouray County was operated on ore mined from company properties in San Miguel County. With closing of this mill all ores were diverted and moved via the Mill Level tunnel to the company-owned Pandora mill near Telluride.

Park.—Park County was a source of 12 mineral commodities; beryl and the rare-earth metals were the most valuable.

Beryl production, reported from five operations in Park County, was valued at $68,000. G. H. Sager, by far the leading beryl producer in the county and in the State, reported an output of 251,821 pounds of beryl, averaging over 10 percent BeO, from the Boomer Lode 7 miles west of Lake George. This beryl was sold to the Custer (S. Dak.) GSA depot. The four other beryl producers in the county sold their product to the Beryl Ores Co., Arvada.

For the first time in the history of the county the mining of rare-earth minerals was recorded. The Teller pegmatite mine in the Lake George area was the scene of mining activity, and sales of yttrium-bearing fluorite and gadolinite were reported by Edwin Over to the Rare Earth Chemical Co. of Denver. Collection of moss opal, amazonstone, and topaz in the Hartsel and Pine area was reported by L. L. Oliver and the Colorado Mineral Society.

Largely due to increased costs of mining and transportation, the production of crude feldspar in Park County dropped from 14,849 tons in 1955 to 601 tons in 1956. The only producing mines were the Blue Spruce and Knox, operated by Capra & Logan and M. E. Johnson. Crude fluorspar used for metallurgical purposes was reported by Eugene Kleinknecht from the Bear Cat and Morning Star

1 and 2 mines. Scrap mica was also produced by H. Douglas and Carl Quist and shipped to the Beryl Ores Co. at Arvada for grinding.

The Buckskin Joe Mines, Ltd., conducted exploration and development work at the Phillips mine from June through December 1956 and shipped 167 tons of lead-zinc ore from the mine to the Resurrection mill for concentration. The ore contained 37 fine ounces of gold, 276 ounces of silver, less than 1 ton of copper, 3 tons of lead, and 13 tons of zinc. In addition to this, 119 tons of ore was mined from 4 other mines in the county. Except for 15 tons which was milled, all of this ore was shipped directly to the smelters to recover gold, silver, copper, lead, and zinc.

Pitkin.—Coal mining was the major mining activity in Pitkin County in 1956. Two mines were operated by the Thompson Creek Coal & Coke Corp. and a third, the newly opened Dutch Creek mine, was operated by the Mid-Continent Coal & Coke Co. The 3 mines employed 90 men; all coal mined was shipped out of the State, largely to Utah coke ovens.

Silver and lead were recovered from ore mined by John F. Lewis from the Smuggler mine and shipped directly to the American Smelting and Refining Co. smelter at Leadville, and the United States Smelting Refining and Mining Co. smelter at Midvale, Utah.

Pueblo.—The value of mineral production in Pueblo County rose to $1 million, a 6-percent increase over 1955. Clays, sand and gravel, and stone were the only raw mineral commodities mined during the year. Total production of all clays mined in 1956 decreased slightly but not enough to have any economic significance. Pueblo Clay Products Co. (producer of fire clay) was the principal operator, but the company reported the sale of its mine and plant to General Refractories Co. of Lehi, Utah, during 1956. General Refractories Co. will continue to produce raw clay for local consumption, as well as for shipment to its Lehi (Utah) refractory works. Productive activity was also reported by the Colorado Fire Clay Co., Standard Fire Brick Co., and Summit Pressed Brick Co.; the Freeman Fire Brick Co. was idle. Except for 25,000 tons of miscellaneous clay, all mine output was fire clay used in manufacturing heavy clay products, firebrick and block, and fire-clay mortar.

Sand and gravel production was relatively static in 1956, with 114,500 tons classified as Government-and-contractor production and 871,000 tons as commercial output. The principal commercial operators were Broderick & Gibbons, Inc., Fountain Sand & Gravel Co., and Certified Concrete Co. Crushed limestone used as concrete road metal was quarried by Certified Sand & Gravel Co.

Rio Blanco.—Petroleum production continued to furnish all but a small fraction of the value assigned to minerals produced in Rio Blanco County. Natural gas and natural-gas liquids, coal, uranium, and sand and gravel were also produced.

The Rangely field, producing from 4 horizons, showed an increased output of 4 million barrels (17 percent) over 1955 and was an important factor in increased petroleum production for the State. Total production for the year from Rangely was 28.1 million barrels. Oil also was derived from the Wilson Creek and North Douglas Creek fields—the latter a new discovery. One refinery and one natural-gas

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liquid plant were operated at Rangely by Wesco Refining Co. and The California Co., respectively.

Coal production came from 3 mines—the Rienau, White River, and Blue Streak; these mines employed 12 men.

Uranium ore was shipped during the first half of the year from 8 properties, but the total amount was not large; McAlester Fuel Co. operated 5 of these properties.

Routt.—Three stripping operations and 4 underground mines furnished Routt County's coal production—490,000 tons. Employment at the 7 operations averaged 248 men.

The only source of petroleum during the current year was the Tow Creek field; no production was reported from the Oak Creek field.

Nonmetal production in Routt County in 1956 was composed of pumice (volcanic ash) and sand and gravel. McCoy Aggregate Co. continued to ship a significant quantity of scoria to Denver concrete-block manufacturers. The mine is 6 miles northwest of McCoy. Sand and gravel was produced as a result of highway contracts let by the Federal Forest Service to E. J. Rippy & Sons and the Colorado Department of Highways to Colorado Constructors, Inc.

Saguache.—All uranium-ore shipments during the first half of the year came from the Los Ochos mine operated by the Gunnison Mining Co. The company obtained an AEC contract in 1956 to construct and operate a 200-ton-per-day uranium mill. The mill is to be at Gunnison, Gunnison County, and will process ore from the Los Ochos mine and the surrounding area.

Saguache County continued to be the leading producer of turquois in the State, but the value of output was almost half of that in 1955. The Villa Grove turquois lode (8 miles west of Villa Grove) produced 300 pounds of crude material. The Pioneer Construction Co., as contractor for the Colorado Department of Highways, quarried 34,000 tons of paving gravel for use in road construction.

The Rawley mine operated by the Costello Lease continued to be the largest metal producer in the county. Lead ore from the mine was shipped to the American Smelting and Refining Co. Arkansas Valley plant for direct smelting, and lead-zinc ore was shipped to the Resurrection Mining Co. mill for concentration. Silver and copper were recovered, in addition to lead and zinc. Smaller quantities of these metals were recovered from ore mined by Jupiter Mining Co. from the Cora group, by Johnston Mining Co. from the Little Jenny mine, by Queen City Mines, Inc., from the Queen City mine, and by Warwick Mines Trust from the Marine Lode mine.

San Juan.—The $537,000 total value of gold, silver, copper, lead, and zinc produced in San Juan County in 1956 was double that in 1955 and four times that in 1954. As in 1955, the bulk of the output of these metals came from 5 of the 8 active mines in the county. These mines (operators in parentheses) were: Osceola (Tech-Ser Mining Co.), Lark (D. W. Ruhter), Pride (Barney Blackmore & Associates), Lead Carbonate (Lead Carbonate Mines, Inc.), and Mogul (Grant Gifford).

In the first half of the year, uranium ore was produced by the Dunning Graysill mine operated by the Vanadium Corp. of America. Ore was shipped to the company plant at Durango.

San Miguel.—Most gold, silver, copper, lead, and zinc produced in the county originated in the Treasury Tunnel-Black Bear-Smuggler Union group of mines of the Idarado Mining Co. The Newmont Mining Corp., which owns 74.2 percent of the Idarado Mining Co., stated in its annual report that during the year 481,700 tons of ore, averaging 0.067 ounce of gold and 1.66 ounces of silver per ton, 1.71 percent lead, 0.64 percent copper, and 2.79 percent zinc, was milled in the company Red Mountain and Pandora mills from the Idarado Mining Co. mines, compared with 274,550 tons in 1955. During the year both Telluride Mines, Inc., and Tomboy Gold Mines, Inc., were absorbed by the parent Idarado Mining Co., creating the largest consolidation of mining properties in the history of the district and totaling over 5,000 acres of contiguous patented claims.

Expansion of the Pandora mill near Telluride was completed in early January; this mill (with the Red Mountain mill in Ouray County) treated all of the ore from the Treasury Tunnel-Black Bear-Smuggler Union group of mines. According to the company, to obtain lower operating costs and greater efficiency, on December 1 the Red Mountain mill was closed, and all ores from the company mines was diverted to the new, larger, and completely rehabilitated Pandora mill for treatment.

Smaller quantities of gold, silver, copper, lead, and zinc were recovered from ore mined by T-Bar Mining Co., Utaco Uranium, Inc., and L. Mills Beam and from cleanup material from the Butterfly and Alta-St. Louis millsites by Albert McClusky.

The entire output of iron ore in Colorado in 1956 was produced from the Iron Springs placer deposit in San Miguel County by C. K. Williams Co. Production in 1956 was one-third less than in 1955. The ore was classed as bog iron (limonite) and used in manufacturing paint.

Uranium ore was shipped from 81 properties in the first half of the year to mills in Colorado and Utah. Some of the more productive were the AEC Mining Leases No. 4, No. 29, and No. 46 (Dulaney Mining Co., Ortmayer Mining Co., and Gayno Mining Co., respectively) and the Raven (F. V. Binder); these four produced almost half of the ore shipped during the period.

Production of sand and gravel and a minor amount of gem stones also was reported.

Summit.—As in 1955, the Wellington mine (2½ miles east of Breckenridge) was again the principal base- and precious-metal producer in the county. W. L. Davenport, who has operated this mine continuously since 1947, retired from active management in May 1956 and sold his interest to his two partners, Harold Horn and Marvin Burger, who operated the mine for the rest of the year. W. L. Davenport became associated with Dr. F. F. Gross in reopening and operating the Minnie mine one-half mile east of the Wellington mine on Mineral Hill. From July through December 604 tons of lead-zinc ore was mined and shipped for treatment.

Burke Martin Mines operated the Burke group of claims near Montezuma throughout the year; 52 tons of ore containing 1,740 fine ounces of silver and 2 tons of lead was shipped to the Arkansas Valley plant, and 4,535 tons of lead-zinc ore was milled to yield 124 tons of lead concentrate and 532 tons of zinc concentrate. The lead

concentrate was shipped to the Arkansas Valley plant and the zinc concentrate to the American Smelting and Refining Co. smelter at Amarillo, Tex. The metal content of the lead and zinc concentrates was 17,649 fine ounces of silver, 1 ton of copper, 71 tons of lead, and 302 tons of zinc.

Seven other lode mines (in addition to the Wellington, Minnie, and Burke) produced small quantities of gold, silver, copper, lead, and zinc in the county in 1956. One placer mine (Marie No. 1, Marie, Eve No. 1, Eve claims) was operated by Alex Bordoni. The deposit was worked by using a dragline to deliver the gold-bearing gravel to a washing plant to recover the gold.

C. L. Getman made a small shipment of manganese ore (35 percent or more manganese) from the Dillon mine to the GSA, Butte, Mont., Purchase Depot under its "low-grade" program. The ore will be recorded as production in the year when treated and a useful product is shipped from the depot.

Teller.—Production of gold in the Cripple Creek district increased from 47,171 fine ounces in 1955 to 52,544 ounces in 1956. The Golden Cycle Corp. continued to operate its 1,000-ton-per-day Carlton custom flotation-cyanidation mill near Cripple Creek and to mine and mill ore from its Ajax group of mines. The entire output of gold ore and mine-dump material from the district in 1956, which came from 11 active mines (including the company Ajax mine), was treated at the Carlton mill. According to the company annual report for 1956, the ore tonnage treated at the Carlton mill was 121,844 tons, with an average gross value of $15.09 per ton in 1956, compared with 100,548 tons valued at $18.31 per ton in 1955.

The Ajax mine (the leading gold producer in the district) ranked second in gold output (next to Treasury Tunnel-Black Bear-Smuggler Union group) in the State in 1956. The Golden Cycle Corp. reported that its production from the Ajax mine was 24,890 tons of ore with an average gross value of $37.18 per ton in 1956 compared with 25,364 tons valued at $42.86 per ton in 1955.

The Cresson mine (operated by the Cresson Consolidated Gold Mining and Milling Co.) followed the Ajax mine in gold output. In its annual report for 1956, the company reported that production from the Cresson mine was 42,501 tons of ore with an average gross value of $12.54 per ton in 1956, compared with 33,717 tons valued at $13.94 per ton in 1955.

Other major gold producers in the district in 1956 included the Grace Greenwood mine and dump operated by LeClair Consolidated Mines Co., El Paso dump by Thomas A. Copeland & James A. Knight, Free Coinage mine by Deadwood Leasing Co., and Vindicator group by United Gold Mines Co. Smaller quantities of gold were produced at the Elkton dump, Empire Lee Mining Co. property, Jeff Davis No. 2 dump, Old Gold mine, and Raaler Lode dump.

Sand and gravel, stone, feldspar, mica, and gem stones—comprising the nonmetals group—were valued at $59,000 in 1956. In terms of value, sand and gravel produced by construction and maintenance crews of the State highway department and Harrison & Atchison Co. as its contractor ranked first, followed by dimension granite quarried by the Pikes Peak Granite Co. E. S. Robinson shipped 950 tons of potash feldspar from the Black Cloud, Little Eagle, Little Annie, and

Snowflake mines near Divide, and E. M. Erickson and F. B. Young sold 18 tons of scrap mica.

Washington.—Petroleum plus a small quantity of sand and gravel was produced in 1956.

Petroleum production gained significantly in 1956, the total output being 7.2 million barrels compared with 5.8 million in 1955. The county was also the most active in drilling, with 172 wildcat and 143 development wells completed; of these, 7 wildcat and 71 development wells were successful.

Weld.—The county was a source of petroleum, coal, and sand and gravel, and the output of all three commodities was greater than in 1955. No production of stone was reported.

Petroleum output came from 23 fields, of which the Black Hollow, Jackpot, Battle Canyon, Pierce, West Buckingham, and May were the most important. The May field was a 1956 discovery.

Seven coal mines were active, and average employment was 301 men. The Eagle and Washington mines, operated by the Imperial Coal Co. and the Clayton Coal Co., respectively, were the most productive. In April the Shamrock mine was closed by the Shamrock Coal Co. The mine was opened in 1905 and had had a total production of 2.2 million tons.

Sand and gravel production in Weld County during 1956 reached 519,000 tons, compared with 308,000 tons in 1955. Increased activity by the Colorado Department of Highways through private contractors was responsible for the gain. The private contractors who quarried sand and gravel in conjunction with road projects were Blanchard Construction Co., Colorado Constructors, Inc., Herren & Strong, L. J. Hesser, Carl V. Hill, and Siegrist Construction Co. Output was also reported by construction crews of the county highway department and John Braddy as contractor for the Greeley city engineer.

The Mineral Industry of Connecticut

By Robert D. Thomson[1] and Mary E. Otte[2]

THE VALUE of mineral production in Connecticut was a record $11.9 million, a 14-percent increase over the $10.4 million for 1955. Tonnages and values of all mineral commodities increased over 1955, except for feldspar, mica, and columbium-tantalum. Stone ranked first in value, followed by sand and gravel, lime, and clays, in order of decreasing importance. As in 1955, companies were actively engaged in producing mineral commodities from all 8 counties. Hartford County led, with $4.1 million for mineral production. The mineral industry in New Haven County totaled $4 million, and Litchfield County production was over $1 million.

In addition to mineral producers, there was an active mineral processing and fabricating industry. Twelve iron and steel plants produced such items as steel wire, forgings, castings, hot and cold strip steel, and spring steel. Northeastern Steel Company operated 3 open-hearth and 2 electric furnaces at Bridgeport—a total annual steel capacity of 303,200 net tons. Twenty-four nonferrous-metal rolling mills were in production in 1956. These companies consumed aluminum, antimony, copper, lead, nickel, tin, and zinc for producing nonferrous plates, sheets, rolls, strips, wire and wire products, and tubing. Ten of the 24

TABLE 1.—Mineral production in Connecticut, 1955–56 [1]

Minerals	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate—gross weight	5	$3,185	(2)	(2)
Clays	324,832	314,577	337,984	$390,295
Lime	34,917	503,253	39,748	609,202
Mica, scrap, and flake	2	84		
Mica sheet—pounds	2,083	12,904	310	2,064
Peat	(2)	(2)	22,315	152,450
Sand and gravel	4,345,068	4,079,661	4,368,727	4,100,666
Stone	[3] 3,641,992	[3] 5,451,550	[3] 4,427,987	[3] 6,589,727
Value of items that cannot be disclosed: Columbium-tantalum (1955), feldspar, stone (crushed granite (1955) and dimension limestone), and values indicated by footnote 2		123,084		123,409
Total Connecticut [4]		10,428,000		11,876,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Excludes certain stones, value for which is included with items that cannot be disclosed.
[4] The total has been adjusted to eliminate duplicating the value of stone.

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companies produced brass products. Aluminum smelters were at Balsford, Bridgeport, Hamden, and New Haven; 2 of the 5 plants also had zinc-smelting facilities, and 1 plant was also designated as a smelter of magnesium. Two other plants—at East Berlin and at Waterbury—smelted zinc.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Clays.—Output of clays increased 4 percent in tonnage and 24 percent in value over 1955. As in 1955, 8 companies were active during the year—6 in Hartford County and 1 each in Middlesex and New Haven Counties. The eight operations were captive; the miscellaneous clay was used in adjacent plants for producing heavy clay products. In addition, North Haven Brick Co., New Haven County, sold a part of its clay to other brick plants and to a lightweight-aggregate producer.

Feldspar.—Production of crude feldspar decreased slightly in tonnage compared with 1955, but the average value per long ton increased from $7.34 to $9.41. Two companies, Eureka Feldspar Mining & Milling Co., Inc., and the Worth Spar Co., produced feldspar from open-pit mines for processing at local company plants. The ground feldspar was sold to the pottery and soap industries. The Toll Gate Mining Co. sold crude feldspar to a consumer grinder for use in making soap.

Lime.—Sales of lime produced in Connecticut were 14 percent greater in volume and 21 percent in value than in 1955. The volume of sales as mason's lime was less; sales for agricultural use and for manufacturing magnesium metal and insecticides were greater. Both quick and hydrated lime was shipped to consumers in Connecticut, Massachusetts, New York, and Rhode Island. In addition, hydrated lime was shipped to New Hampshire.

Mica.—Sales of sheet mica decreased 85 percent in quantity and 84 percent in value, compared with 1955. No sales were reported for scrap mica produced from mines in Connecticut. All of the sheet mica was produced in Middlesex County and sold to the Government Spruce Pine (N. C.) GSA Materials Service Depot, as hand-cobbed mica.

Sand and Gravel.—The sand and gravel industry showed less than 1 percent increase in tonnage and value for material sold or used, compared with 1955. Larger quantities of sand for molding, paving, grinding and polishing, filter, and other uses and gravel as building material and railroad ballast were used than in 1955. Sand as building material and gravel as paving material and other uses decreased. Blast sand was the only use category for which sand was reported in 1955 and not in 1956; engine sand was reported in 1956 and not in 1955. Overall, the 30-percent increase in commercial sand as paving material and 4-percent in gravel as a building material offset the 36-percent decrease in Government-and-contractor sand and gravel production. Of the total commercial production of sand and gravel, 85 percent was washed or screened. Ninety-one percent of the com-

mercial output was transported by truck, 6 percent by waterway, and 3 percent by railroad.

The number of men employed in the commercial sand and gravel industry in 1956 totaled 299. The average number of days worked per man was 223, and the average number of hours per man per day 8.5.

TABLE 2.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Uses	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Molding	1,200	$960	$0.80	1,600	$1,280	$0.80
Building	1,151,029	1,018,061	.88	1,117,975	1,043,143	.93
Paving	911,097	778,006	.85	1,188,715	1,077,728	.91
Grinding and polishing	5,700	4,560	.80	7,100	5,680	.80
Other	23,157	7,936	.34	(1)	(1)	
Gravel:						
Building	990,058	1,255,182	1.27	1,033,939	1,254,872	1.21
Paving	540,286	584,388	1.08	471,335	441,892	.94
Railroad ballast	5,400	4,000	.74	20,000	24,000	1.20
Other	242,231	284,965	1.18	159,694	112,767	.71
Undistributed [2]	3,265	2,850	.87	64,601	34,502	.53
Total commercial sand and gravel	3,873,423	3,940,908	1.02	4,064,959	3,995,864	.98
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving	144,990	20,610	.14	240,993	81,593	.34
Gravel:						
Building	350	350	1.00	2,025	709	.35
Paving	326,305	117,793	.36	60,750	22,500	.37
Total Government-and-contractor sand and gravel	471,645	138,753	.29	303,768	104,802	.35
Grand total	4,345,068	4,079,661	.94	4,368,727	4,100,666	.94

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[2] Includes blast sand (1955), engine sand (1956), filter sand, and values indicated by footnote 1.

Stone.—Stone continued to be the principal mineral industry in Connecticut, contributing 55 percent of the total State value. Output increased 22 percent in tonnage and 21 percent in value compared with 1955.

Basalt, limestone, granite, and quartz, in order of decreasing value, were mined in 1956. The basalt was crushed and sold as road material, railroad ballast, and riprap. Except for a small quantity sold as rough construction dimension stone, limestone was crushed and sold as agricultural limestone, flux, road material, whiting, and asphalt filler and for manufacturing lime. Except for a quantity of granite sold as riprap, the granite was marketed as dimension stone. Silica (quartz) was ground and used as foundry sand, filler in plaster, abrasive, and making glass.

TABLE 3.—Stone sold or used by producers, 1955–56, by uses

Uses	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Dimension stone:				
Building stone:				
Rubble	(1)	(1)	1,642	$14,559
Rough architectural	(1)	(1)	42	1,117
Rough monumental			366	38,716
Dressed construction	(1)	(1)	1,858	59,596
Dressed architectural			323	7,774
Curbing and flagging	378	$14,517	434	12,135
Undistributed	[2] 3,954	119,243		
Total dimension stone (quantities approximate in short tons)	4,332	133,760	4,665	133,897
Crushed and broken stone:				
Agricultural	60,053	238,270	(1)	(1)
Riprap	(1)	(1)	60,777	83,464
Concrete, roadstone, railroad ballast	[3] 3,356,808	[3] 4,462,371	[3] 4,181,379	[3] 5,693,864
Quartz (ground)	24,500	178,880	15,500	112,750
Undistributed [4]	196,299	438,269	165,666	565,752
Total crushed and broken stone	3,637,660	5,317,790	4,423,322	6,455,830
Grand total [5]	3,641,992	5,451,550	4,427,987	6,589,727

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes rough construction, dressed monumental, and values indicated by footnote 1.
[3] Incomplete figure, portion not included is combined with "Undistributed."
[4] Includes flux, other crushed and broken stone, portion of concrete, roadstone, and values indicated by footnote 1.
[5] To avoid disclosing confidential information, total is incomplete and excludes crushed granite (1955), and dimension limestone.

METALS

Beryllium.—Production of beryl from the pegmatite areas in Connecticut increased in both tonnage and value compared with 1955. As in 1955, all the beryl was purchased by GSA for its Franklin (N. H.) Depot. The BeO content of the ore ranged from 10.36 to 12.28 percent.

Columbium-Tantalum.—No sales of columbite-tantalite from Connecticut mines were reported in 1956. In 1955 mines were worked in Middlesex and New Haven Counties.

MINERAL FUELS

Peat.—Peat production in Connecticut in 1956 followed the national trend and increased to 22,000 short tons. The average value per ton for peat was $6.83. The peat was recovered from bogs in Hartford, Middlesex, and Tolland Counties. Although classified statistically with fuels, peat was used principally as a soil conditioner.

TABLE 4.—Value of mineral production in Connecticut, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Fairfield	$876,629	(1)	Sand and gravel, stone.
Hartford	3,214,871	$4,130,208	Stone, sand and gravel, clays, peat.
Litchfield	1,318,332	1,535,256	Stone, lime, sand and gravel, beryl.
Middlesex	280,801	470,853	Sand and gravel, clays, feldspar, peat, mica.
New Haven	3,917,616	4,009,427	Stone, sand and gravel, clays, beryl.
New London	(1)	358,212	Stone, sand and gravel.
Tolland	(1)	(1)	Peat.
Windham	(1)	461,300	Sand and gravel, stone.
Undistributed	819,731	910,553	
Total	10,428,000	11,876,000	

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

REVIEW BY COUNTIES

Fairfield.—Production of sand and gravel was reported by seven companies in Fairfield County. Peter B. German, Inc., Fairfield, and The Grasso Construction Co., Inc., Bridgeport, produced sand and gravel for building and paving purposes. The Grasso Construction Co. also sold a quantity of sand under contract to local Government agencies for sanding oily and icy roads. Senior Sand & Gravel Co., Inc., Bethel, produced building sand and gravel and paving sand; John Lomazzo & Sons Corp., Weston, produced and sold paving sand and gravel and building gravel. Ralph L. Vick Co. near New Canaan produced bank-run gravel and sold part of the production under contract to a local Government agency. L. DeLuca's Sons near Greenwich produced road gravel from dredging at a small lake in Fairfield County. The estate of Bernard J. Dolan, Bethel, produced building sand and gravel from a pit and fixed plant.

The only operator of a limestone quarry and preparation plant was the Connecticut Agstone Co., Danbury. Output consisted of dimension stone for use in rough construction and crushed stone as flux and for construction and agricultural purposes.

Hartford.—Hartford County led the State in producing minerals, providing 35 percent of the total value of mineral output. This county also led in producing sand and gravel. Six companies produced basalt during the year. The Edward Balf Co., Newington, and Sherman Sand & Stone Co., Plainville, quarried and sold crushed basalt for use as concrete aggregate and road material. Angelo Tomasso, Inc. (New Britain), Arborio & Sons, Inc. (Farmington), and Materials Service, Inc. (East Granby), quarried and crushed basalt for use as riprap, concrete aggregate, and road material. A part of Angelo Tomasso, Inc., production was used for local government projects. The New Haven Trap Rock Co. produced crushed basalt at the Plainville quarry for use as riprap, concrete aggregate, road material, and railroad ballast.

Twelve companies reported production of sand and gravel for use mainly as structural, paving, and filter material. Smaller quantities of sand and gravel were used as molding sand, as grinding and polishing sand, and for other uses. The leading producers were Dunning Sand & Gravel Co., Inc., Farmington Sand & Gravel Co., and Sherman Sand & Stone Co., all at Farmington; Russak Bros., Inc., Plainville; Manchester Sand & Gravel Co., Manchester; Materials Service, Inc., East Granby; Helming Bros., Bristol; The Certified Sand Co., Rocky Hill; Burlington Sand & Gravel, near Collinsville; and The Avon Construction Co., Avon. Connecticut State Highway Department (Hartford), the town of South Windsor, and the superintendent of public works, Bristol, produced paving sand and gravel and structural gravel for local consumption.

Six operators of open-pit clay mines produced and used miscellaneous clay for manufacturing building brick. The six active companies were Clark Brick Co., South Windsor; Donnely Brick Co., Kensington; The Stiles & Reynolds Brick Co. and The Eastern Brick Co., both at Berlin; Kelsey Ferguson Brick Co., Suffield; and Edward W. Mack & Son, Windsor.

Hartford County was the leading peat-producing county in the State; production increased over 1955. Woodrow Clifford, the only producer of peat, recovered humus peat from a bog near Manchester.

Litchfield.—Building Materials, Inc., merged with Woodbury Trap Rock Co., Inc., and operated a quarry and crushing plant at Woodbury. Crushed basalt was sold for use as concrete aggregate and road material. Producers of crushed limestone for use as flux, agricultural limestone, whiting, and asphalt filler were: The Conklin Limestone Co., Inc., and New England Lime Co., both of Canaan; and United States Gypsum Co., Falls Village. United States Gypsum Co. produced and marketed crushed dolomite as flux, whiting, and filler for stucco and for agricultural use.

Quick and hydrated lime produced at the New England Lime Co., Canaan plant, was marketed for use as building, agricultural, chemical, and industrial lime.

Sand and gravel recovered from pits in Litchfield County was used principally as structural and paving material. The five active producers were State Line Sand & Gravel, Inc., Canaan; Building Materials, Inc., Torrington; The Lime Rock Sand & Gravel Co., Salisbury; Carlson Construction Co., Inc., New Milford; and Benvenuti & Favali Construction Co., Inc., Torrington.

Production of beryl consisted of a small quantity mined by Howard J. Hewitt at the Hewitt mine, New Milford, and sold to GSA Franklin (N. H.) Depot.

Nelco Metals, Inc., continued to operate the 5,000-ton Government-owned silicothermic plant at Canaan. Both calcium and high-purity magnesium were produced.

Middlesex.—Sand and gravel recovered from a bank by Richard Lindemark was screened and used at the company ready-mixed-concrete plant at Portland. Also, a quantity of gravel was sold as building material. Butler Sand Service, Portland, produced and processed sand for building use; Sebastian Ortisi, also of Portland, processed sand and gravel for building use. Shore Line Washed Sand & Stone Co., Inc., Killingworth, produced building and paving sand

and gravel at a pit and fixed plant. This company also sold road sand under contract to local government agencies. Bugg & Heser, Clinton, produced building and paving sand and paving gravel. Stanley Wollock produced building and paving sand and gravel at a pit and fixed plant at Essex.

Miscellaneous clay was produced from an open pit at Middletown and used for manufacturing building brick by The Michael Kane Brick Co.

Production of feldspar in Middlesex County was reported by three companies. The Worth Spar Co. recovered potash-type feldspar from an open-pit mine near Cobalt and ground the crude ore at a local company plant. The ground feldspar was sold for use in making soap and abrasives. Eureka Feldspar Mining & Milling Co., Inc., produced mixed-potash-soda-type feldspar at the Hale quarry near Portland and ground the crude ore at the nearby company-owned grinding plant, marketing the ground feldspar to the pottery industry. Toll Gate Mining Co. mined potash and mixed-potash-soda-type feldspar and a small quantity of hand-cobbed mica at the Toll Gate open-pit mine near Middletown. The crude feldspar was sold to a consumer grinder. The mica was shipped to the GSA, Spruce Pine (N. C.) Depot.

J. Werden Clark, the only producer of peat in Middlesex County, produced humus peat from a bog near Old Saybrook.

New Haven.—New Haven County continued to be the leading stone producer in the State. Crushed basalt was sold or used as concrete aggregate, road material, railroad ballast, and riprap, in order of decreasing importance. Producers were C. W. Blakeslee & Sons, Inc., Hamden; A. N. Farnham, Inc., Foxon Trap Rock Co., Inc., and The New Haven Trap Rock Co. (North Branford and Wallingford quarries), all near New Haven; and The York Hill Trap Rock Quarry Co., Meriden. Dimension granite was produced and sold as dressed architectural stone by Castellucci & Sons, Inc., Branford, under the trade name "Stony Creek."

Thirteen companies recovered sand and gravel from pits, banks, and dredges for sale or use predominantly as structural and paving material. Some of the sand and gravel also was sold or used for government projects. The 10 leading producers were A. N. Farnham, Inc., The Elm City Construction Co., the estate of Stillman H. Rice, all at New Haven; Beard Sand & Gravel Co., Inc., and The Iron Ledge Co., both at Milford; D. J. Carten Sand & Gravel Co., Devon; Meridan Washed Sand & Stone Co., Inc., Wallingford; Tony Calabro Sons, Inc., and Colonial Sand-Gravel Co., both at Waterbury; and The Seymour Sand & Stone Co., Seymour.

North Haven Brick Co. operated an open-pit mine near Hamden, marketing the miscellaneous clay for manufacturing building brick and lightweight aggregate. The company also used some of the miscellaneous clay for producing building brick at a nearby company plant.

Burritt R. Curtis mined beryl at the Southford quarry, Southbury, and sold his entire output to the GSA Franklin (N. H.) Depot.

Connecticut Adamant Plaster Co. imported gypsum from Chever, Nova Scotia, to its New Haven plant. Crude gypsum was sold for agricultural use and calcined gypsum for building purposes.

New London.—Lantern Hill Silica Co. operated a quarry and plant at North Stonington, producing ground silica (quartz) for use as an abrasive, foundry sand, and plaster sand and in manufacturing glass. Dimension granite used as rough monumental stones was quarried by Golden Pink Granite Quarry Co. and E. Locarno & Sons, Niantic. The Millstone Granite Quarry, Inc., Waterford, quarried and sold dimension granite for use as rubble, rough architectural stone, and monumental stone and crushed granite as riprap.

John J. Doyle Sand & Gravel Co., Inc., produced washed sand and gravel at a pit and fixed plant at Montville for building use and for manufacturing ready-mixed concrete. A quantity of the sand and gravel was sold for government projects. Southern New England Contractors Supply Co. produced building and paving sand at a pit and fixed plant near New London. Lorentz & Howard, Inc., produced paving sand and gravel at a portable plant at Fitchville. Lappie Construction Co., Norwich, produced unwashed sand and gravel for paving material.

Tolland.—Bonair Peat Co., Inc., the only mineral producer in Tolland County in 1956, recovered humus peat from a bog near Ellington.

Windham.—Dunning Sand & Stone Co., Wauregan, reported producing sand and gravel for building and paving use and gravel as railroad ballast. R. A. Rawson Sand & Gravel, Putnam, produced building sand and paving sand and gravel. Rawson also sold a quantity of sand and gravel to a local government agency.

Dimension granite sold for use as rough building stone, curbing stone, and capstone, was quarried by R. B. Marriott & Sons at Oneco

The Mineral Industry of Delaware

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Delaware Geological Survey.

By Robert D. Thomson [1] and Mary E. Otte [2]

THE VALUE of mineral production in Delaware in 1956 was $1.2 million, a 26-percent decrease below the total ($1.7 million) recorded in 1955. The decline in value of output was the first decrease since 1953 and resulted mainly from a drop in the volume of output of Government-and-contractor sand and gravel. Slight gains in total value were reported for miscellaneous clay and granite. One or more mineral commodities were produced in each of the three counties in the State; New Castle County led.

In addition to the mineral producers, companies were actually engaged in processing minerals in 1956. The Colorado Fuel & Iron Corp., Claymont, operated 2 open-hearth furnaces, 2 sheared-plate mills, and a pipe mill. Annual steel capacity for this company totaled 499,500 net tons. The American Manganese Steel Division of American Brake Shoe Co. operated 1 electric furnace with an annual capacity of 5,400 tons, producing austenitic manganese castings at its New Castle plant. North American Smelting Co. at Wilmington operated 4 rotary furnaces; 3 sweat, reverberatory and crucible furnaces; and 9 kettles. This plant produced brass and aluminum ingots, solder, type metals, aluminum shot, and die-cast metal.

TABLE 1.—Mineral production of Delaware, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	(2)	(2)	(2)	(2)
Sand and gravel	2,297,074	$1,407,196	1,159,544	$966,508
Stone	78,791	227,450	82,503	232,503
Value of items that cannot be disclosed: Nonmetals and values indicated by footnote 2		22,872		32,725
Total Delaware		1,658,000		1,232,000

[1] Production as measured by mine shipments and mine sales (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.

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[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Clays.—Demand for Delaware miscellaneous clay was less than in 1955 due mainly to a decline in residential building. Nevertheless, the average value per ton increased from $0.51 in 1955 to $0.90 in 1956. All the clay was produced from open-pit mines for use in making building and face brick, 2 of the 3 mines were captive.

Sand and Gravel.—Sand and gravel production continued to be the principal mineral industry in Delaware, although output in 1956 decreased 50 percent in tonnage and 31 percent in value compared with 1955. The decreased activity was due mainly to declining demand for paving materials for Government projects. Commercial demand was slightly greater than in 1955. Sand was marketed for commercial use as structural and paving material, engine sand, and railroad ballast. Gravel was sold for structural, paving, and other uses. Of the total commercial production of sand and gravel, 52 percent was washed or screened, and 56 percent of the output was transported by truck.

Stone.—Production of stone increased slightly compared with 1955; the average value of stone about equaled that in 1955. The stone was produced from a quarry and crushed and marketed as "Blue Granite" for use as roadstone and stone sand (aggregate for concrete or bituminous mixtures)

REVIEW BY COUNTIES

Kent.—St. Jones River Gravel Co. produced washed sand and gravel for paving use at a pit and fixed plant near Dover. Clough & Caulk Sand & Gravel produced and processed washed building sand and gravel and a quantity of unwashed gravel from a pit and fixed plant near Dover. Fisher M. Carpenter, north of Milford in Kent County, produced bank-run gravel for miscellaneous uses. A quantity of paving sand and gravel was produced under contract for the Corps of Engineers, United States Army.

Miscellaneous clay was produced by J. H. Wilkerson & Son from an open pit north of Milford in Kent County for use in manufacturing building brick.

New Castle.—Mineral production in New Castle County in 1956 continued to be the largest in the State, supplying 70 percent of the total value. Delaware Sand & Gravel Co. processed sand and gravel for building purposes and a quantity of unwashed sand for railroad ballast at a dredge and fixed plant near New Castle. Petrillo Bros., Inc., produced washed sand and gravel for building purposes and a quantity of unwashed bank-run gravel for fill from a bank near Minquadale. John C. Green, Jr., Middletown, produced gravel for miscellaneous uses. The Parkway Gravel, Inc., pits at Minquadale and Hares Corner produced unwashed gravel for paving material. Whittington's Sand & Gravel Co. produced and prepared building sand and gravel and unwashed paving gravel from a pit at Bear.

Granite, crushed and sold under the trade name of "Blue Granite," was produced by Petrillo Bros., Inc., from the Shellpot quarry and

crusher near Wilmington. The stone was used as roadstone and stone sand.

J. R. Simeone produced miscellaneous clay from an open pit at Wilmington and sold the clay for manufacturing building brick. Delaware Brick Co., New Castle, produced miscellaneous clay from an open pit and used the clay for manufacturing building brick.

Sussex.—W. Paynter Sharp produced select and common gravel for use as paving and fill from a bar pit at Milton. Melvin Joseph Construction Co., Georgetown, produced gravel for road construction. Lewes Sand Co. produced engine sand at a pit and fixed plant at Lewes. Sand was recovered from a pit and processed at a portable plant by Henry G. Graves & Sons, Lewes, for use as paving and road material.

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The Mineral Industry of Florida

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior and the Geological Survey of Florida.

By James L. Vallely [1] and James L. Calver [2]

FLORIDA'S record-breaking mineral production reached a new high in 1956, with a total value of $140.5 million—29 percent or $31.5 million above 1955. Output of phosphate rock led; tonnage increased 35 percent and value 38 percent over 1955 and 13 and 15 percent in tonnage and value, respectively, over the previous record year, 1954. New records were set in producing cement, titanium concentrates, sand and gravel, stone and zirconium concentrate. Petroleum production remained comparatively unchanged; peat, abrasive garnet, and rare-earth metals declined from 1955.

TABLE 1.—Mineral production in Florida, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	412,766	$4,815,855	432,369	$5,826,468
Gem stones			(2)	100
Lime	(3)	(3)	39,542	490,086
Natural gas, million cubic feet	36	4,000	35	3,000
Peat	61,098	231,829	58,496	203,034
Petroleum, thousand 42-gallon barrels	495	(3)	479	(3)
Phosphate rock, long tons	8,747,282	53,640,301	11,822,145	74,289,758
Sand and gravel	5,065,503	4,349,148	5,814,686	5,033,475
Stone	[4] 17,027,967	[4] 22,966,008	18,778,632	25,183,165
Titanium concentrates:				
Ilmenite	(3)	(3)	283,956	6,651,162
Rutile	9,182	1,122,000		
Zirconium concentrate	28,913	1,425,641	43,794	2,159,540
Value of items that cannot be disclosed: Cement, abrasive garnet, rare-earth-metals concentrates, stone (dimensions limestone, 1955), and values indicated by footnote [3]		22,787,056		21,801,661
Total Florida [5]		108,957,000		140,490,000

[1] Production as measured by mine or plant shipments (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Incomplete total, excludes dimension limestone.
[5] The total has been adjusted to eliminate duplicating the value of clays and stone.

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[2] Geologist, Florida Geological Survey, Tallahassee, Fla.

TABLE 2.—Average unit value of mineral commodities in Florida, 1947–51 (average) and 1952–56

Commodity		1947-51 (average)	1952	1953	1954	1955	1956
Cement:							
Masonry		(1)	(1)	(1)	(1)	$3.78	$4.03
Portland	376-pound barrel	$2.55	$2.76	$2.87	$2.89	2.96	3.21
Clays:							
Fuller's earth	short ton	17.56	17.37	18.84	19.82	21.46	22.37
Kaolin	do	21.37	24.55	23.92	24.49	23.09	25.24
Miscellaneous	do	.77	1.00	1.00	.78	1.03	1.05
Garnet	do	38.07	46.44	46.49	30.00	60.69	25.00
Lime	do	13.21	12.93	12.57	11.97	12.03	12.39
Natural gas	thousand cubic feet	.04	.07	.06	.08	.11	.28
Peat	short ton	4.79	6.50	6.70	4.49	3.79	3.47
Phosphate rock	long ton	5.59	5.88	6.06	6.18	6.13	6.28
Sand and gravel:							
Gravel	short ton	1.21	1.34	1.27	1.50	1.51	1.43
Sand	do	.84	.75	.82	.71	.76	.77
Stone:							
Limestone (crushed)	do	1.21	1.22	1.20	1.25	1.31	1.30
Shell	do					2.28	2.03
Titanium:							
Ilmenite	do	13.94	16.35	15.37	15.36	18.97	(2)
Rutile	do	50.60	103.77	108.54	119.05	122.20	(2)
Zircon	do	47.54	38.57	37.38	45.66	49.31	49.31

[1] Data not available.
[2] Figure withheld to avoid disclosing individual company confidential data.

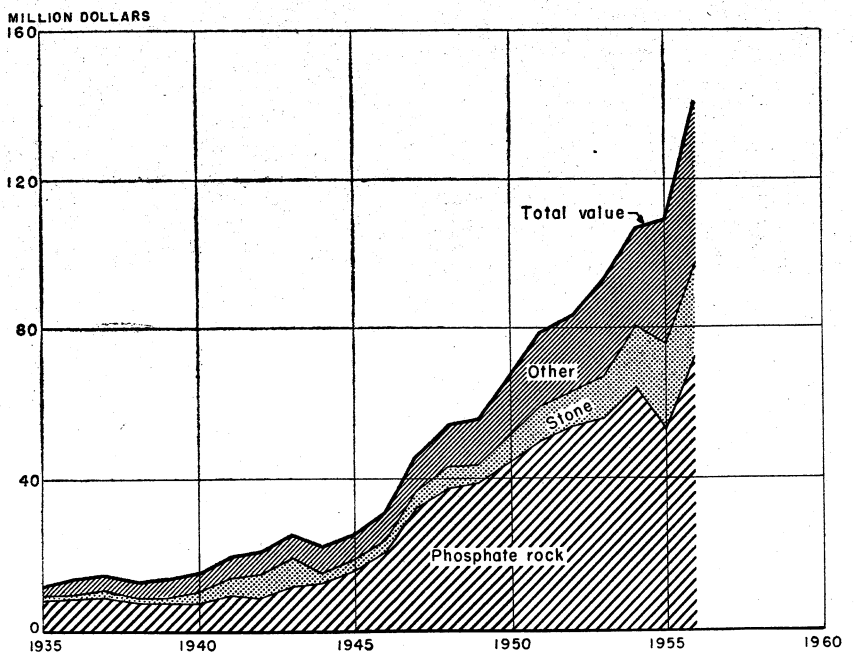

FIGURE 1.—Value of phosphate rock, stone, and total value of mineral production in Florida, 1935–56.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—The cement industry in Florida continued to expand; production of masonry and portland cements reached an alltime high. Total cement production increased 10 percent in tonnage and 19 percent in value.

General Portland Cement Co. operated a cement plant at Tampa and alnnounced plans for a new plant costing $15 million to be built 19 mi es west of Miami. Annual capacity will be 2.5 million barrels. Lehigh Portland Cement Co. operated its cement plant completed in 1952 at Bunnell and planned to build another plant several miles west of .Miami. Capacity will be 2 million barrels annually.

Clays.—Total value of all clays was 21 percent higher than in 1955, although tonnage increased only 5 percent. Fuller's earth increased 20 percent in tonnage and 25 percent in value; kaolin and miscellaneous clay each dropped 8 percent in tonnage. Miscellaneous clay was 7 percent lower in value, but kaolin value was virtually unchanged from 1955.

Fuller's Earth.—Magnet Cove Barium Corp. began producing fuller's earth for insecticide carriers from a new mine and plant near Havana. The Floridin Co., Inc., and Minerals & Chemicals Corp. of America both increased their output. The three companies produced in Gadsden County.

Kaolin.—Edgar Plastic Kaolin Co. and United Clay Mines Corp. in Putnam County produced kaolin.

Miscellaneous Clay.—Only two producers were active in 1956. General Portland Cement Co. mined common clay for use in manufacturing cement; Apalachee Correctional Institute mined clay for brick manufacture.

Garnet (Abrasive).—Garnet production fell to less than 50 percent of 1955. Florida Ore Processing Corp., the only producer, discontinued recovering the mineral in July 1956. Garnet was a byproduct in the production of titanium concentrates.

Gypsum.—Imported crude gypsum was calcined and used in manufacturing building products by the United States Gypsum Co.

Lime.—Production of lime in 1956 was 39,500 tons valued at $490,000. Producers were city of Miami and Dixie Lime Products Co. at Kendrick.

Perlite.—Crude perlite from out of State was expanded into a lightweight material for use in building and construction. Expanding plants were operated by Perlite, Inc., Hialeah; Tennessee Products & Chemical Corp., Jacksonville, and Airlite Processing Corp., Vero Beach.

Phosphate Rock.—The marketable production of phosphate rock jumped from 8.8 million tons valued at $53.6 million in 1955 to 11.8 million tons and $74.3 million, an increase of 35 percent in tonnage and 38 percent in value over 1955 and 13 and 15 percent in tonnage and value, respectively, above 1954—the previous peak year. Land-pebble phosphate, comprising more than 98 percent of total production, supplied the gain; the small increase in output of hard-rock phosphate was more than offset by the decrease in soft rock. Phosphate rock sold or used by producers was 10.5 million tons valued at

$65.6 million—an increase of 10 percent in tonnage and 11 percent in value over 1955.

Land-pebble phosphate was produced by 8 companies from 16 mines in Polk and Hillsborough Counties. Armour & Co. Bartow mine, inactive for many years, resumed operations at the beginning of 1956. International Minerals & Chemical Co. closed its Peace Valley mine about July 1 owing to a greater than seasonal slump in sales of fertilizer and in manufacture of phosphoric acid. American Cyanamid Co. and others also curtailed production in the second half of the year. However, total land-pebble production for the year exceeded that in 1955 by 36 and 39 percent in tonnage and value, respectively, and 14 and 15 percent above the peak year in 1954.

Hard-rock phosphate was up 5 percent in tonnage and 10 percent in value above 1955. Kibler-Camp Phosphate Enterprises, operating in Citrus County, was the only producer. All hard-rock production was used for elemental phosphorus.

TABLE 3.—Marketable production of phosphate rock, 1948–51 (average) and 1952–56

Year	Hard rock		Soft rock		Land pebble		Total	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1948–51 (average)	51,332	$390,076	79,258	$380,227	7,535,352	$43,097,923	7,665,942	$43,868,226
1952	85,900	662,289	83,001	491,775	9,036,237	52,931,460	9,205,138	54,085,524
1953	68,200	537,416	76,781	474,248	9,186,021	55,513,037	9,331,002	56,524,701
1954	78,990	622,440	93,956	575,537	10,264,251	63,301,900	10,437,197	64,499,877
1955	91,200	733,800	69,788	452,301	8,586,294	52,454,200	8,747,282	53,640,301
1956	95,600	808,700	59,022	378,058	11,667,523	73,103,000	11,822,145	74,289,758

TABLE 4.—Phosphate rock sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Long tons	Value [1]	Long tons	Value [1]
Ordinary superphosphate	4,618,100	$28,847,854	5,024,144	$32,674,165
Triple superphosphate [2]	1,598,910	9,703,638	1,534,209	9,663,519
Elemental phosphorus, ferrophosphorus, phosphoric acid	604,911	3,556,235	700,871	4,248,603
Direct application to soil	661,702	4,136,626	637,400	4,146,704
Stock and poultry feed	189,309	1,190,134	228,745	1,485,493
Fertilizer filler				
Other uses [3]	13,056	80,344	7,740	50,387
Exports [4]	1,879,157	11,664,277	2,394,661	13,333,426
Total	9,565,145	59,179,108	10,527,770	65,602,297

[1] Estimated from company reports.
[2] Rock for phosphoric acid (wet process) included with triple superphosphate.
[3] Includes phosphate rock used in calcium metaphosphate, fused tricalcium phosphate, nitraphosphate, pig-iron blast furnaces, parting compounds, research, defluorinated phosphate rock, refractories, and other applications.
[4] As reported by producers.

Soft-rock production declined 15 percent in tonnage and 16 percent in value below 1955. Output came from 5 producers in Citrus County and from 1 producer in each of Columbia and Gilchrist Counties. Soft-rock phosphate was used for stock and poultry feeds and direct application to the soil.

Sand and Gravel.—Sand and gravel production reached an alltime

high, totaling 5.8 million tons valued at $5 million dollars—an increase of 15 percent in tonnage and 16 percent in value. Sand production was up 13 and 14 percent in tonnage and value, respectively, and gravel was 28 and 21 percent higher. Thirty-four operators were active in 16 counties; all produced sand. Four of these companies also produced gravel in Dade, Escambia, Gadsden, and Putnam Counties. Sand and gravel was used principally for building and paving; comparatively small tonnages were classified as blast, engine, filter, and molding sands, fertilizer filler, roofing granules, and railroad ballast.

TABLE 5.—Sand and gravel sold or used by producers, 1951–56

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1951	2,986,862	$2,512,282	1,431,711	$1,788,400	4,418,573	$4,300,682
1952	(1)	(1)	(1)	(1)	4,154,613	3,848,077
1953	3,386,329	2,760,410	345,103	438,958	3,731,432	3,199,368
1954	3,202,364	2,260,825	266,478	400,327	3,468,842	2,661,152
1955	(1)	(1)	(1)	(1)	5,065,503	4,349,148
1956	(1)	(1)	(1)	(1)	5,814,686	5,033,475

[1] Figure withheld to avoid disclosing individual company confidential data.

TABLE 6.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Paving	1,009,891	$938,474	1,029,795	$902,312
Engine sand	9,294	5,025	10,825	5,600
Railroad ballast	17,244	17,244	23,314	20,257
Other [1]	4,029,074	3,388,405	4,750,752	4,105,306
Total	5,065,503	4,349,148	5,814,686	5,033,475

[1] Includes structural sand and gravel, molding sand, blast sand, filter sand, other sand and gravel.

Staurolite.—Staurolite was recovered as a byproduct in concentrating titanium minerals and was marketed principally as an iron and aluminum additive in manufacturing portland cement; a small amount was used for sandblasting monumental stone.

Stone.—Total stone production, including shell and limestone used for cement, reached an alltime high of 18.8 million tons valued at $25.1 million, 10 percent above 1955 in both tonnage and value.

Commercial crushed limestone was produced from 69 quarries in 18 counties by 55 companies. Broward and Dade Counties each had 14 active quarries; Levy had 7 quarries; and Marion, 6 quarries. Dimension limestone was produced in 4 counties by 5 companies and shell by 4 companies in 3 counties.

Dimension limestone was quarried principally for rough and dressed architectural uses. Small tonnages were sold for rubble, curbing, and flagging. Shell was produced principally for concrete, road metal, and agricultural use; a small tonnage was used for poultry grit.

Palm Beach County Highway Department was the only Government-and-contractor producer in 1956.

TABLE 7.—Crushed limestone sold or used by producers, 1947–51 (average) and 1952–56.

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average) [1]	5,044,077	$6,112,239	1954	14,225,356	$16,832,066
1952 [1]	7,836,124	9,572,575	1955	16,303,625	21,312,339
1953 [1]	9,428,959	11,309,421	1956	[2] 18,773,880	[2] 25,029,872

[1] Excludes stone used for cement and lime manufacture.
[2] Includes shell.

TABLE 8.—Crushed limestone sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Concrete and roadstone	13,394,698	$16,732,609	[1] 14,308,602	[1] $19,373,986
Agriculture	392,653	1,324,136	594,198	1,721,388
Railroad ballast	65,745	105,516	35,030	34,868
Riprap	100,000	125,000		
Other	2,350,529	3,025,078	[1] 3,836,050	[1] 3,899,630
Total	16,303,625	21,312,339	18,773,880	25,029,872

[1] Includes shell.

METALS

Rare-Earth Metals.—Monazite was recovered by Humphreys Gold Corp. at the Jacksonville plant as a byproduct in concentrating titanium minerals. Production was considerably below that in 1955.

Titanium.—Ilmenite and rutile-concentrate production totaled $6.7 million in 1956. Ilmenite production increased over 40 percent in both tonnage and value above 1955, and rutile also recorded a substantial gain but considerably less than ilmenite. Humphreys Gold Corp. operated the Highland and Trail Ridge dredges and concentration plants in Clay County for E. I. du Pont de Nemours & Co., Inc., and produced a mixed-titanium concentrate, ilmenite, zircon, and staurolite. Humphreys Gold Corp. also operated a dredge and processing plant for the Rutile Mining Company of Florida at Jacksonville. Both rutile and ilmenite concentrates were produced from this property. Florida Minerals Co. produced ilmenite and rutile from sands mined in Indian River County.

Several other companies continued active in exploration or development of heavy mineral sands throughout the northern part of the State. Among these were: Nuclear Magnetic Mining Co. of St. Augustine, granted a 5-year lease to dredge for titanium minerals in the Salt Run area of Anastasia State Park near St. Augustine; American Smelting and Refining Co.; Bear Creek Mining Co.; Heavy Minerals, Inc.; and Union Carbide & Carbon Corp.

Zirconium.—Production of zirconium concentrate was 43,800 tons valued at $2.2 million, a 52-percent increase in tonnage and value above 1955. Zircon was obtained as a byproduct in separating ilmenite and rutile from heavy sands at the Trail Ridge and Highland plants of Humphreys Gold Corp. and at the plant of Florida Minerals Co.

FUELS

Natural Gas.—Production of natural gas in 1956 was 35 million cubic feet valued at $9,700, compared with 36 million cubic feet valued at $4,000 in 1955. Production came from Collier County.

Peat.—Peat produced for agricultural purposes declined 4 percent in tonnage and 12 percent in value below 1955. Eleven companies were active in 6 counties during the year.

Petroleum.—Petroleum production, all from Collier County, declined 3 percent in quantity from 1955.

REVIEW BY COUNTIES

Mineral production was recorded from 39 of Florida's 67 counties. Limestone was produced in 18 counties, sand and gravel in 16, clays in 3, phosphate rock in 5, and titanium minerals in 3. The five leading counties, in the order of production value, were: Polk, Hillsborough, Flagler, Dade, and Clay, followed by Gadsden, Hernando, Broward, Duval, and Citrus.

TABLE 9.—Value of mineral production in Florida, 1955–56, by counties [1] [2]

County	1955	1956	Minerals produced in 1956 in order of value [2]
Alachua	(3)	$682,276	Limestone.
Bay	$26,139	(3)	Sand.
Brevard	(3)	(3)	Garnet.
Broward	3,861,095	4,768,434	Limestone.
Citrus	[4] 1,292,035	1,595,640	Phosphate rock, clays, limestone.
Clay	(3)	(3)	Ilmenite, zircon.
Collier	(3)	(3)	Limestone.
Columbia	(3)	(3)	Phosphate rock.
Dade	8,006,807	8,432,010	Limestone, sand and gravel, lime.
Duval	(3)	(3)	Rutile, zircon, ilmenite, monazite.
Escambia	(3)	282,500	Sand and gravel.
Flagler	(3)	(3)	Cement.
Gadsden	(3)	5,398,184	Clays, sand and gravel.
Gilchrist	(3)	(3)	Phosphate rock.
Hernando	[4] 5,579,106	5,089,461	Limestone.
Hillsborough	17,591,433	21,506,358	Cement, phosphate rock, shell.
Indian River	(3)	(3)	Rutile, zircon, sand.
Jackson	(3)	7,256	Limestone.
Lafayette	(3)	190,867	Limestone, sand.
Lake	(3)	(3)	Sand.
Leon	(3)	58,918	Do.
Levy	958,230	1,218,820	Limestone.
Manatee	(3)	(3)	Limestone, shell.
Marion	[4] 1,505,916	1,530,592	Limestone, lime.
Monroe	350,828	504,244	Limestone.
Osceola	10,000	(3)	Sand.
Palm Beach	180,899	180,942	Limestone, sand.
Pinellas	120,133	141,303	Sand, limestone.
Polk	49,134,293	67,927,448	Phosphate rock, sand.
Putnam	(3)	1,246,629	Sand and gravel, kaolin.
St. Johns	(3)	(3)	Limestone.
St. Lucie	610	671	Sand.
Sarasota	367,000	451,820	Limestone, shell.
Sumter	(3)	(3)	Limestone.
Suwannee	(3)	(3)	Do.
Volusia	26,696	17,858	Sand.
Washington		26,000	Do.
Undistributed [5]	[4] 19,946,241	18,524,596	
Total Florida	108,957,000	140,490,000	

[1] The following counties are not listed because no production was reported: Baker, Bradford, Calhoun, Charlotte, De Soto, Dixie, Franklin, Glades, Gulf, Hardee, Hendry, Highlands, Holmes, Jefferson, Lee, Liberty, Madison, Martin, Nassau, Okaloosa, Okeechobee, Pasco, Santa Rosa, Seminole, Taylor, Union, Wakulla, and Walton.

[2] Fuels are not listed by counties but are included with "Undistributed." Natural gas and petroleum were produced in Collier County, peat in Broward, Hamilton, Hillsborough, Orange, Palm Beach, and Putnam Counties.

[3] Figure withheld to avoid disclosing individual company confidential data. Included with "Undistributed."

[4] Revised figure.

[5] Includes value of mineral fuels and values indicated by footnote 3.

Alachua.—Crushed limestone—the only mineral produced in the county—totaled 696,000 tons. Ocala Lime Rock Co. reported initial output from the Haile quarry; Williston Shell Rock Co. operated two quarries, and the Newberry Corp. produced from the fourth quarry.

Bay.—Cato Sand Co. was the only mineral producer in the county.

Brevard.—Florida Ore Processing Corp. operated the Palm Bay concentrating plant to recover ilmenite, rutile, zircon, and garnet from sands mined in Indian River County. Florida Ore Processing Co. marketed a small tonnage of garnet.

Broward.—Broward County ranked second in producing crushed limestone in the State. Production totaled 3.9 million tons valued at $4.8 million—an increase of 16 percent in tonnage and 23 percent in value above 1955. Eleven companies operated 14 active quarries. Rozzo Mining Co., Fort Lauderdale, worked out and abandoned 2 of its 4 quarries at the end of 1955; and Meekins, Inc., Hollywood, began operating its new Pompano quarry. Other producers were: Deerfield Rock Corp., Hallandale Rock Corp., Road Rock, Inc., Finley P. Smith, Snyder Paving Co., Inc., and R. H. Wright & Son, Inc., all of Fort Lauderdale; Hollywood Quarries, Hollywood, and Maule Industries, Inc., Miami. Arnold Soil Co. produced peat muck near Fort Lauderdale.

TABLE 10.—Crushed limestone sold or used by producers in Broward County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	630,013	$539,029	1954	2,434,387	$2,433,638
1952	779,255	786,794	1955	3,342,348	3,861,095
1953	1,893,827	2,024,771	1956	3,883,288	4,768,434

Citrus.—Soft-phosphate-rock production decreased 17 and 18 percent, respectively, in tonnage and value below 1955. Producers were Camp Phosphate Co., Kellogg Co., Soil Builders, Inc., Sun Phosphate Co., and Superior Phosphate Co.

Kibler-Camp Phosphate Enterprises was the only hardrock-phosphate producer in the State. Production was 95,600 tons valued at $809,000—a 5-percent increase in tonnage and a 10-percent rise in value over 1955.

General Portland Cement Co. opened a new limestone quarry for producing cement rock for use in its Tampa mill in manufacturing cement. It also mined clay in the same vicinity for use in the cement mill. Golden Dolomite Co. produced crushed and ground limestone for use by power companies for injection with fuel oil.

Clay.—Clay County ranked fifth in value of mineral output owing to production of titanium concentrates. Humphreys Gold Corp., operating the Trail Ridge and Highland mines for E. I. du Pont de Nemours & Co., Inc., produced an ilmenite concentrate, a mixed concentrate containing altered ilmenite, rutile, and leucoxene. Output far exceeded that of previous years owing to added production from the Highland plant for the first full year.

Collier.—Natural-gas and petroleum production continued in the Sunniland field at substantially the same rate as in 1955. Sunniland

Limerock Co. quarried and crushed limestone for concrete aggregate and road stone.

Columbia.—Loncala Phosphate Co. increased production of soft-rock phosphate from its Fort White mine.

Dade.—Dade County ranked fourth as mineral producer in the State as measured by value of production, which totaled $8.4 million—an increase of 5 percent above 1955. Crushed limestone furnished $6.8 million (81 percent) of the total mineral production. At the end of the year 8 producers were active at 13 limestone quarries in the county, compared with 10 companies and 15 quarries in 1955. Maule Industries, Inc., purchased the Seminole Rock Products Co. in the first half of the year, and Three Bays Improvement Co. acquired the Hialeah Crushed Stone Co. in May 1956 and Murphy & Mills Corp. at the end of December. Other producers were: E. E. Collins Construction Co., T. J. James Construction Co., Naranja Rock Co., Oolite Rock Co., Peffer Construction Co., and Troup Quarries, Inc.

The city of Miami recovered 24,000 tons of lime as a byproduct of water purification.

Ideal Crushed Stone Co. produced sand and gravel for building purposes. Des Rochers Sand Co. produced building and paving sand, and T. J. James Construction Co., Inc., marketed unwashed sand for lawn dressing.

The Perlite, Inc., Hialeah plant expanded perlite shipped into the State for use as a lightweight aggregate.

TABLE 11.—Crushed limestone sold or used by producers in Dade County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	2,614,484	$2,915,869	1954	5,193,757	$6,622,989
1952	3,579,192	3,793,305	1955	4,913,760	6,680,940
1953	4,038,367	3,805,333	1956	4,517,382	6,820,809

Duval.—Ilmenite, rutile and byproduct monazite and zircon were recovered in the Humphreys Gold Corp. mill near Jacksonville from sands dredged by the Rutile Mining Co. of Florida in Duval County. The mine of Titanium Division of National Lead Co. was inactive. However, total production of titanium concentrate was only 1 percent lower in tonnage but 5 percent higher in value than in 1955. Zircon production was unchanged from 1955, and monazite was 26 percent less in quantity but considerably higher in value. Crude perlite from out of State was expanded for lightweight aggregates by Tennessee Products & Chemical Corp.

Escambia.—Sand and gravel used principally for building purposes was the only mineral production in the county. Producers were: Campbell Sand & Gravel Co., Clark Sand Co., and Ward Gravel Co.

Flagler.—The county ranked third in value of mineral production owing to output of cement. Lehigh Portland Cement Co. mined and used coquina (limestone) in manufacturing masonry and portland cement in its plant at Bunnell.

Gadsden.—Fuller's earth was the principal mineral produced. In addition to production by the Floridin Co., Inc., and Minerals &

Chemical Corp. of America, whose mines have been active for many years, Magnet Cove Barium Corp. opened a new mine and processing plant at Hinson. Apalachee Correctional Institute mined 8,700 tons of miscellaneous clay for use in manufacturing heavy clay products. Florida Gravel Co. mined sand and gravel for building and paving use.

Gilchrist.—The Loncala Phosphate Co. mined soft phosphate rock, the only mineral produced.

Hamilton.—Tropical Peat Moss Co. produced peat moss near Jasper.

Hernando.—Crushed limestone production totaled 3.2 million tons valued at $5.1 million. Despite increased production by 3 of the 4 active producers, the closing of General Cement Co. quarry at the end of 1955 resulted in losses of 13 and 9 percent in quantity and value, respectively, below 1955. Producers were: Brooksville Rock Co., Inc. (Broco quarry), Camp Concrete Rock Co. (Gay quarry), Florida Rock Products Co. (Lansing quarry), and William P. McDonald Corp. of Florida (Conrock quarry). Florida Rock Products Co. new Diamond Hill quarry and crushing-screening plant was nearing completion at the end of the year; production was expected to begin early in 1957.

TABLE 12.—Crushed limestone sold or used by producers in Hernando County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	911,217	$1,608,711	1954	2,117,071	$3,214,713
1952	1,110,629	1,855,308	1955	3,706,520	5,579,106
1953	1,503,297	2,426,951	1956	3,233,594	5,089,461

Hillsborough.—Cement, shell, and phosphate-rock production made Hillsborough rank second as a mineral producer in the State.

General Portland Cement Co. manufactured masonry and portland cement at its Tampa mill. American Agricultural Chemical Co. (Boyette) and American Cyanamid Co. (Sydney) mined and processed land-pebble-phosphate rock. Bay Dredging and Construction Co. and Radcliff Gravel Co. dredged oystershell for concrete aggregate, roadstone, poultry grit, and agricultural use. Agricultural Organics Corp., Seffner, and Jack O. Holmes, Tampa, produced peat for agricultural use.

Indian River.—Florida Minerals Co. produced sands containing ilmenite, rutile, and zircon at the Vero mine and shipped them to the Palm Bay plant for concentration and separation. Ben Walker mined structural sand, and Airlite Processing Corp. of Florida expanded raw perlite shipped into the State for use as lightweight concrete and plaster aggregate.

Jackson.—West Florida Lime Co. began producing dimension limestone (rough architectural blocks) from its new Fellows quarry.

Lafayette.—Williston Shell Rock Co. mined 172,000 tons of crushed limestone from the Dell quarry for concrete and roadstone. Suwannee River Sand Co. produced 27,000 tons of paving and railroad-ballast sand.

Lake.—Central Sand Co. produced structural and paving sand from its pit near Tavares.

Leon.—Building and paving sand was produced by Asa Paige Sand Co., Middle Florida Sand Co., and Johnson Sand Co., all of Tallahassee. Production totaled 60,000 tons.

Levy.—Crushed limestone production increased 25 percent in tonnage and 27 percent in value above 1955. As in 1955, active producers were: Connell & Shultz (Williston quarry), Dixie Lime Products Co. (Lebanon quarry), Levy County Lime Rock Co. (No. 1 and No. 3 quarries), United Limerock Co., Charles E. Peacock, and W & M Construction, Inc. (Raleigh quarry). The No. 2 quarry of Levy County Lime Rock Co. was inactive.

TABLE 13.—Crushed limestone sold or used by producers in Levy County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	182,189	$310,787	1954	(1)	(1)
1952	400,543	684,073	1955	756,964	$958,230
1953	320,415	651,311	1956	947,521	1,218,820

[1] Figure withheld to avoid disclosing individual company confidential data.

Manatee.—Manatee Dolomite Co. and Southern Dolomite Co. produced crushed limestone for agricultural use. Ernest E. Rainey operated the Cedar Hammock quarry in the first half of the year to produce concrete aggregate and roadstone.

Dimension limestone was quarried by Bradenton Stone Co. (rough architectural blocks) and Florida Travertine Co. (cut stone, rubble, curbing, and flagging). Bradenton Dredging & Shell Co. produced oystershell for concrete and road material.

Marion.—The tonnage of crushed limestone produced in the county declined somewhat below 1955. Limestone was used principally for concrete aggregate and roadstone (69 percent), and agricultural stone (16 percent); the remaining tonnage was used for chemical purposes, lime, filler, and railroad ballast. Producers were the same as in 1955: W. L. Cobb Construction Co., Cummer Lime & Mfg. Co., Dixie Lime Products Co., and Ocala Lime Rock Co. Dixie Lime Products Co. also produced quick and hydrated lime at its kilns at Kendrick using part of its stone production for this purpose.

TABLE 14.—Crushed limestone sold or used by producers in Marion County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average) [1]	533,896	$620,785	1954 [1]	1,171,124	$1,187,158
1952 [1]	748,760	1,010,099	1955	1,090,772	1,281,890
1953 [1]	530,843	722,369	1956	1,006,526	1,288,977

[1] Exclusive of limestone used in manufacturing lime.

Monroe.—Charley Toppino & Sons was the only crushed-limestone producer in the county. Output from the Hoskins Rock quarry and Stock Island quarry increased 15 percent in tonnage and 55 in value. Keystone Art Co. quarried rubble and cut stone on Winley Key.

Orange.—Fernwood Humus Co., Zellwood, and Mulford-Hickerson Peat Humus, Apopka, produced humus peat and Daetwyler Peat mine, Orlando, marketed reed or sedge peat.

Osceola.—A. E. Hoffman produced building sand.

Palm Beach.—Total value of mineral production was almost identical with 1955. Crushed limestone for concrete aggregate and roadstone was quarried by Belle Glade Rock Co., Driskell & Mayo, Walter A. Hobbs, Jr., and the Palm Beach County Highway Department. Hoyt Sand & Muck Co. more than doubled its production of structural sand over 1955. Latham Farms produced humus peat for agricultural use.

Pinellas.—Charles E. Phillips mined a small tonnage of crushed limestone for concrete aggregate and roadstone, and Largo Washed Sand Co. produced 103,000 tons of sand principally for structural use.

Polk.—Polk County—the center of the phosphate industry in the United States—led in both tonnage and value of minerals produced. Output of land-pebble phosphate rock reached a new high; production was 36 percent higher in quantity and 39 percent greater in value than in 1955 and 15 and 16 percent above the record tonnage and value, respectively, of 1954. Producers were: American Agricultural Chemical Co. (South Pierce mine and Pierce mill), American Cyanamid Co. (Saddle Creek mine and Brewster plant), Coronet Phosphate Division, Smith Douglas Co. (Tenoroc mine and mill), Davison Chemical Division of W. R. Grace & Co. (Bonny Lake and Pauway mines and Ridgwood mill), International Minerals & Chemical Corp. (Achan, Noralyn and Peace Valley mines, Noralyn & Mulberry mills), Swift & Co. (Varn and Watson mines, Agricola mill), and Virginia-Carolina Chemical Corp. (Homine & Clear Springs mines and mills, Phosmico and Nichols mills). Armour & Co. resumed mining early in 1956 to supply its Bartow plant with crude phosphate rock, formerly bought from other producers.

Production of sand, principally for building and paving use, was considerably higher than in 1955. Producers were: Davenport Sand Co., Inc., Lake Wales Concrete Sand Co., and Lake Wales Independent Sand Co., all of Lake Wales; MacCalla Bros., Winter Haven; Mammoth Sand Co., Pembroke; Oak Ridge Sand Co., Inc., Mulberry; Standard Sand & Silica Co., Davenport; and Waverly Road Sand Co., Winter Haven (the latter company a new producer in 1956).

Putnam.—United Clay Mines Corp. and Edgar Plastic Kaolin Co. mined kaolin principally for whiteware and floor and wall tile. Edgar Plastic Kaolin Co. was a new sand producer in 1956, having installed equipment to recover building and industrial sands as a byproduct in its kaolin operation. United Clay Mines Corp. was also a producer of structural sand. Other companies mining structural and paving sand were: All-Florida Sand Co., Diamond Interlacken Sand Co., Inc., Keuka Sand Co. and Keystone Sand Co. Glenn St. Marys Nurseries Co., Palatka Peat Humus Co. and Southern States Nurseries, Inc., produced peat humus near Florahome.

St. Johns.—Phillip McLeod—the only active producer in the county—quarried limestone, both cut dimension and crushed, for concrete aggregate and roadstone.

St. Lucie.—Florida East Coast Railway Co. produced a small tonnage of engine sand.

Sarasota.—Florida Dolomite Co. produced 452,000 tons of crushed limestone for agricultural use—a 23-percent increase over 1955.

Sumter.—Central Quarries, Inc., and Sumter Lime Products Co. quarried and crushed limestone for concrete aggregate and roadstone.

Suwannee.—The methods of Suwannee Lime Rock Co. and Live Oak Stone Co. for producing crushed limestone for concrete aggregate and roadstone were described.[3]

Volusia.—White Sand & Materials Co. was the only active sand producer compared with three in the previous year.

Washington.—Miller & Jerkins, a new producer, mined structural and paving sand.

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[3] Walter E. Trauffer, Scarce Concrete Aggregates Produced at New Plant in Northern Florida: Pit and Quarry, vol. 49, No. 3, September 1956, pp. 124–126.

The Mineral Industry of Georgia

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Georgia.

By James L. Vallely [1] and Garland Peyton [2]

THE VALUE of Georgia's mineral production in 1956 was $67.9 million—12 percent higher than the $60.4 million output in 1955. As in previous years, clays, stone, cement, sand and gravel, barite, iron ore, and slate, in that order, were the principal mineral products. Except for slate and sand and gravel, the value of all nonmetallic minerals was higher than in 1955. Of the metals, beryl, iron ore, and manganese increased in value and bauxite declined. Coal and peat also lost in value from 1955.

Mineral production was reported from 68 of Georgia's 159 counties, 16 accounted for $59.8 million or 88 percent of the total production.

TABLE 1.—Mineral production in Georgia, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	2,953,278	$26,144,672	3,047,467	$29,500,993
Coal	12,471	62,360	8,471	42,355
Gem stones	[2]	[2]	[2]	150
Iron ore (usable)—long tons	256,700	994,289	356,735	1,609,093
Iron oxide pigments (crude)	6,139	35,607	[3]	[3]
Mica: Scrap	[3]	353,322	[3]	[3]
Sheet—pounds			20,149	149,459
Peat	55,554	[3]	6,225	47,843
Sand and gravel	2,987,570	2,198,905	2,425,832	2,183,260
Stone	[4] 7,488,452	[4] 14,249,830	[4] 9,196,065	[4] 20,713,651
Talc	53,828	117,656	57,916	122,166
Value of items that cannot be disclosed: Barite, bauxite, beryllium concentrates, cement, feldspar, manganese, slate, sandstone (crushed), marble (crushed) (1955–56), marble (dimension) (1955), and values indicated by footnote 3	----------	17,142,098	----------	14,558,174
Total Georgia [5]	----------	60,417,000	----------	67,912,000

[1] Production as measured by mine shipments, mine sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing of individual company confidential data.
[4] Excludes certain stone, value for which is included with "Items that cannot be disclosed."
[5] The total has been adjusted to eliminate duplicating the value of clays and stone.

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[2] State geologist, Georgia Geological Survey, Atlanta, Ga.

Rated on value of output in the order listed below, Twiggs, Washington, Pickens, Wilkinson, Houston, De Kalb, Bartow, Polk, Gilmer, Richmond, Elbert, Henry, Warren, Fayette, Decatur, and Muscogee were the most important mineral-producing counties in the State; the production of each was valued above $1 million.

Under the Defense Minerals Exploration Administration (DMEA) program to aid in exploring for and developing strategic minerals, 5 contracts were in effect; 2 in Hart County for mica were new, and 2 for mica in Cherokee and Upson Counties and 1 for beryl in Troup County were carried over from 1955. These contracts totaled $32,980, and Government participation was 75 percent, compared with 4 exploration projects totaling $26,072 in 1955.

TABLE 2.—Average unit value of mineral commodities produced in Georgia, 1952–56 [1]

Commodity		1952	1953	1954	1955	1956
Asbestos	short ton	$100.00	$100.00	$100.00		
Barite	do.	11.75	12.82	13.91	$13.73	$18.73
Beryl	do.	596.00		654.75	394.50	618.50
Cement:						
Masonry	376-pound barrel				3.31	3.62
Portland	do.	2.54	2.65	2.71	2.76	3.00
Clays:						
Fuller's earth	short ton	18.11	18.73	19.98	21.43	21.97
Kaolin (china, paper, etc.)	do.	[3] 15.40	15.89	16.49	16.67	17.37
Kaolin (refractory)	do.	[3] 6.37	6.60	7.39	6.80	6.13
Miscellaneous	do.	.97	.93	.80	.40	.40
Coal	do.	5.00	5.00	5.00	5.00	5.00
Feldspar	long ton			8.22	8.40	13.46
Gold	troy ounce		35.00			
Iron ore	long ton	4.50	4.23	3.93	3.87	4.51
Lime	short ton	11.15	10.22	9.92		
Manganese ore	long ton			[2]	[2]	[2]
Manganiferous ore	do.				[2]	[2]
Mica, sheet	pound	1.45	5.25	5.01	11.49	7.42
Mica, scrap and flake	short ton	25.88	24.01	[2]	[2]	13.50
Mineral pigments (crude)	do.	[4]	[4]	3.91	5.80	7.42
Peat	do.	17.67	17.38	11.83	8.90	7.69
Sand and gravel:						
Gravel	do.	[3] 1.53	1.57	1.63	.61	[2]
Sand:						
Ground	do.	10.00	10.00	[5]	[5]	[5]
Structural and paving	do.	.69	.65	.69	.63	.69
All other	do.	1.48	1.70	1.20	1.56	2.31
Slate (crushed and ground)	do.	7.41	7.41	5.63	4.32	3.65
Stone:						
Granite:						
Crushed	do.	1.55	1.56	1.59	1.47	1.43
Dimension	do.	[3] 18.60	19.04	19.03	18.96	28.09
Limestone:						
Crushed	do.	2.87	2.48	2.06	1.48	2.46
Dimension	do.	3.76	2.58	2.79	2.50	1.62
Marble:						
Crushed	do.		8.35	8.43	7.21	6.95
Dimension	do.	130.67	136.65	123.63	123.34	160.39
Miscellaneous:						
Crushed	do.	.25				
Dimension	do.	10.78				
Sandstone:						
Crushed (quartzite)	do.	1.66	1.56	1.42	1.42	1.42
Dimension	do.					25.28
Talc:						
Crude	do.	[4]	3.50	3.50	2.19	2.11
Ground	do.	10.24	10.33	10.05	10.09	10.04

[1] For greater detail on prices, by grades and markets, see volume I, Minerals Yearbook, 1956.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Revised figure.
[4] Data not available.
[5] Included with "All other."

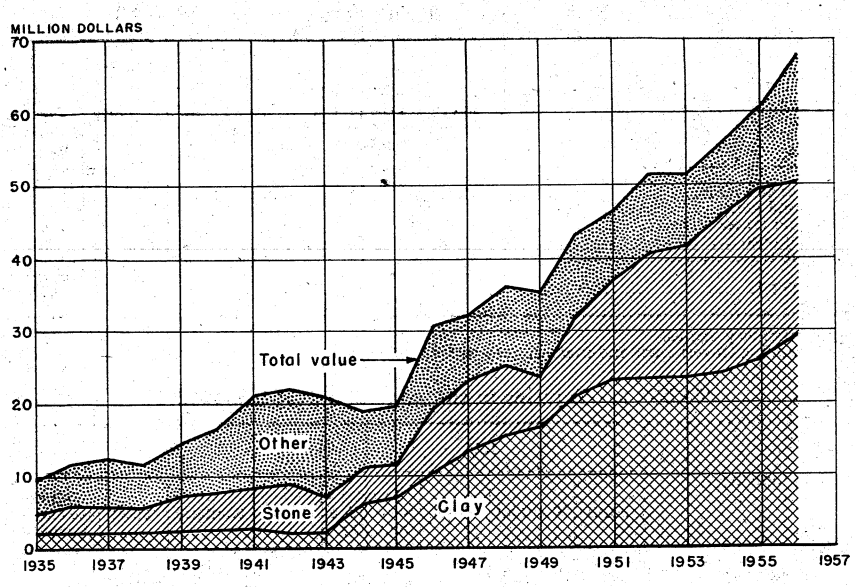

FIGURE 1.—Value of clays and stone and total value of mineral production in Georgia, 1935–56.

TABLE 3.—Defense Minerals Exploration Administration contracts in 1956

County and contractor	Property	Commodity	Contract	
			Date	Total amount [1]
Cherokee: J. R. Beam	Bennett mine	Mica	July 11, 1955	$8,316
Hart:				
Ernest B. Wood	E. B. Wood prospect	do	July 23, 1956	6,348
John Phillips	Bray prospect, No. 1	do	Sept. 5, 1956	6,276
Troup: W. Hugh Allen	Word mine	Beryl	Nov. 21, 1955	6,516
Upson: Edwin H. Schwab	Duke mine	Mica	Oct. 6, 1955	5,524

[1] Government participation, 75 percent of total amount.

EMPLOYMENT AND INJURIES

Reports submitted to the Bureau of Mines indicate that employment in the mineral industries expanded 52 percent above 1955. Employment at quarries and mills increased 24 percent, expanded nearly 3 times at nonmetal mines, was about the same at sand and gravel mines, decreased 12 percent at metal mines, and declined 64 percent at coal mines.

Injury experience improved considerably over 1955; the frequency rate decreased 24 percent below 1955. No injuries were reported at coal mines. The frequency rate declined 46 percent at nonmetal mines and decreased 11 percent at quarries and mills. Four fatal injuries occurred, compared with 1 in 1955.

TABLE 4.—Employment in the mineral industries, 1955–56

Industry	1955			1956 [1]		
	Men working daily	Average active days	Man-days worked	Men working daily	Average active days	Man-days worked
Quarries and mills	1,714	258	441,390	2,044	268	547,834
Nonmetal mines	611	257	156,817	1,666	244	406,932
Sand and gravel mines [2]	254	266	67,548	261	259	67,710
Metal mines	35	198	6,937	28	218	6,097
Coal mines	25	173	4,326	12	128	1,536
Total	2,639	257	677,018	4,011	257	1,030,109

[1] Preliminary figures.
[2] Excluding Government-and-contractor operations.

TABLE 5.—Injuries in the mineral industries, 1955–56

Industry [1]	1955				1956 [2]			
	Fatal	Nonfatal	Total	Injuries per million man-days	Fatal	Nonfatal	Total	Injuries per million man-days
Coal mines		1	1	231				
Nonmetal mines		59	59	376		82	82	202
Quarries and mills	1	125	126	285	4	135	139	254
Metal mines						3	3	492
Total	1	185	186	305	4	220	224	233

[1] Sand and gravel mines not canvassed.
[2] Preliminary figures.

REVIEW BY MINERAL COMMODITIES

METALS

Bauxite.—Production of bauxite was 18 percent higher than the previous year; value, however, was 10 percent lower due to larger tonnages of high-silica bauxite mined. American Cyanamid Co., the only producer operated mines in Floyd, Macon, and Sumter Counties, transferring the crude ore to the Halls Station plant in Bartow County for drying before shipment for chemical uses.

Beryllium.—Beryl production increased considerably over 1955 but was still far below the record output in 1954. The Hogg mine of Mineral Processing Co., Troup County, was the principal producer. W. Hugh Allen continued exploring the Word mine under a DMEA contract.

Iron Ore.—Brown-iron-ore shipments increased in 1956 for the second straight year to 357,000 tons valued at $1.6 million, 39 and 62 percent higher in tonnage and value, respectively, than in 1955. Initial production of 55,000 tons valued at $277,000 from Stewart County, just below the fall line on the western border of the State, combined with increased output from Bartow and Polk Counties, furnished the substantial increase. Twenty-five operators were active during the year, compared with 12 during 1955; 7 of the new companies were mining in Stewart County.

Manganese.—Production of both manganese and manganiferous ores greatly exceeded that of 1955. Manganese ore (plus 35 percent

TABLE 6.—Production and shipments of usable brown iron ore, 1947–51 (average) and 1952–56 [1]

Year	Production	Shipments		Year	Production	Shipments	
	Long tons	Long tons	Value		Long tons	Long tons	Value
1947–51 (average)	271,719	271,719	$829,890	1954	221,576	221,576	$871,901
1952	369,259	319,959	1,439,251	1955	256,700	256,700	994,289
1953	210,664	259,964	1,100,725	1956	356,735	356,735	1,609,093

[1] Includes hematite: 1950—213 tons; 1951—266 tons; 1952—200 tons; 1953—250 tons; 1954—217 tons.

Mn) was sold to the Government through the General Services Administration for stockpiling and manganiferous ore (10 to 35 percent Mn) was sold for use in Alabama blast furnaces. Output came from Bartow and Floyd Counties.

NONMETALS

Barite.—Output of crude barite increased only 1 percent, but its value was up 38 percent over 1955. Barite was sold for use in drilling muds and barium chemicals and as fillers. All production came from Bartow County.

Cement.—Portland-cement production increased 9 percent in quantity and 19 percent in value over 1955. Masonry cement, although down 5 percent in quantity, was up 4 percent in value. Marquette Cement Mfg. Co., Rockmart, manufactured portland and masonry cements and Penn-Dixie Cement Corp., Clinchfield, manufactured portland cement only.

Clays.—Clays continued to lead the State's minerals in terms of value. Total clay production was 3 million tons valued at $29.5 million compared with 2.95 million tons valued at $26.1 million in 1955, increases of 3 percent in tonnage and 13 percent in value. Refractory kaolin for the second year recorded the greatest gains percentagewise, increasing 33 percent in tonnage and 20 in value. Kaolin for china, paper, fillers, etc., totaled 1.5 million tons valued at $25.4 million—advances of 9 percent in tonnage and 14 in value. Fuller's earth reversed a downward trend started in 1952 with production in 1956, increasing 5 and 7 percent in tonnage and value, respectively, over 1955. Two new companies in Jefferson and Thomas Counties started production during the year. Miscellaneous clay decreased 6 percent in both tonnage and value over 1955. Clays were produced in 19 counties, including fuller's earth in Decatur, Grady, Jefferson, Thomas, and Twiggs Counties; and kaolin in Baldwin, Glasscock, Richmond, Twiggs, Washington, and Wilkinson Counties. Other clays were

TABLE 7.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	2,288,793	$18,753,604	1954	2,711,422	$24,106,926
1952	2,562,182	23,137,507	1955	2,953,278	26,144,672
1953	2,651,153	23,455,315	1956	3,047,467	29,500,993

TABLE 8.—Kaolin sold or used by producers, 1947–51 (average) and 1952–56

Year	China clay, paper clay, etc.		Refractory uses		Total kaolin	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	1,009,270	$14,656,057	133,792	$793,010	1,143,062	$15,449,067
1952	1,145,063	17,635,838	183,192	1,166,355	1,328,255	18,802,193
1953	1,170,679	18,606,351	171,046	1,053,274	1,341,725	19,659,625
1954	1,196,211	19,722,623	108,654	803,283	1,304,865	20,525,906
1955	1,339,748	22,333,808	153,235	1,041,960	1,492,983	23,375,768
1956	1,459,627	25,353,611	204,080	1,251,280	1,663,707	26,604,891

TABLE 9.—Miscellaneous clay sold or used by producers, 1947–51 (average) 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	1,000,989	$809,273	1954	1,278,377	$1,020,486
1952	1,050,792	1,020,132	1955	1,356,412	542,608
1953	1,163,766	1,076,891	1956	1,275,128	509,980

mined in Bibb, Columbia, Crawford, Floyd, Fulton, Gordon, Houston, Polk, Richmond, Thomas, and Whitfield Counties.

Feldspar.—Appalachian Minerals Corp. mined feldspar rock and produced flotation concentrate at its mill at Monticello. Output was 58 percent above 1955.

Gem Stones.—Corundum from Towns County and rose quartz from Troup were the only gem stones reported during the year.

Iron Oxide Pigments (Crude).—Crude iron oxide pigments were produced by the New Riverside Ochre Co. from its pit at Cartersville, Bartow County. Although production value was higher, the tonnage of crude material was lower than in 1955. Finished-pigment production in 1956 changed little from the previous year.

Mica.—Although the quantity of both sheet and scrap mica produced in 1956 was greater, the total value of production was considerably less than in 1955. Scrap mica increased 4 percent in tonnage but decreased 26 percent in value. Sheet-mica production in 1956 was 20,000 pounds valued at $149,000, including 2,300 pounds of sheet mica obtained from 58,000 pounds of hand-cobbed mica. Except for uncut punch and circle, all sheet and hand-cobbed mica was sold to the Government through the General Services Administration (GSA) at the Spruce Pine (N. C.) Purchase Depot. Upson was the principal sheet-producing county; other counties mining smaller quantities were Cherokee, Hart, Monroe, Oconee, and Polk Counties. Scrap mica came from Cherokee, Hart, Pickens, and Upson Counties.

Four DMEA mica-exploration contracts were active in 1956—1 each in Cherokee and Upson Counties and 2 in Hart County. The total amount of the contracts was $26,464; Government participation was 75 percent.

Sand and Gravel.—Production of sand and gravel, although ranking third in the State in terms of mineral value, decreased 19 percent in tonnage and 1 percent in value below 1955 to 2.4 million tons valued at $2.18 million compared with 3 million tons at $2.20 million in 1955. Building, blast, and filter sands increased, but all other classes of

sand decreased in both tonnage and value from the previous year. Gravel production was far below that in 1954 and 1955, but figures are confidential company information and may not be revealed.

Sand was produced in 19 counties, gravel in 3, and both sand and gravel in 4. Twenty-nine companies mined from 33 pits and 4 Government-and-contractor agencies operated individual pits in the 26 producing counties.

TABLE 10.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	1,111,033	$825,938	1954	[1] 2,703,281	[1] $2,466,352
1952	2,133,970	2,029,367	1955	[1] 2,987,570	[1] 2,198,905
1953	2,051,058	1,900,987	1956	[1] 2,425,832	[1] 2,183,260

[1] Includes ground sand formerly reported separately.

TABLE 11.—Sand and gravel sold or used by producers, by classes of operations and uses, 1955–56

	1955		1956	
	Short tons	Value	Short tons	Value
Sand—commercial:				
Glass	56,903	$116,257	(1)	(1)
Molding	77,754	194,385	(1)	(1)
Building	1,345,444	910,549	1,617,396	$1,122,671
Paving	330,386	208,014	273,635	176,223
Grinding and polishing	1,133	600	849	467
Blast	21,582	107,910	(1)	(1)
Engine	115,177	5,991	12,564	5,902
Filter	5,247	26,235	(1)	(1)
Railroad ballast	1,045	491	10,742	5,370
Other	[2] 79,026	[2] 106,452	[3] 77,319	[3] 101,010
Total	2,033,697	1,676,884	[3] 1,992,505	[3] 1,411,643
Government-and-contractor	198,775	59,650	6,510	7,700
Total sand	2,232,472	1,736,534	[3] 1,999,015	[3] 1,419,343
Gravel:				
Total	755,098	462,371	(1)	(1)
Sand and gravel:				
Grand total	2,987,570	2,198,905	2,425,832	2,183,260

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes ground sand.
[3] Incomplete total.

Slate.—Production of crushed and ground slate was 8 percent higher in tonnage but was 8 percent lower in value compared with 1955. Funkhouser Co. mined slate near Fairmont, Bartow County, for roofing granules; Lightweight Aggregate Co. quarried slate for use in its lightweight-aggregate plant at Rockmart in Polk County.

Stone.—Total stone production, including all marble, quartzite, and sandstone, which do not appear in the production table, exceeded that in 1955 by 15 and 9 percent in tonnage and value, respectively.

Total crushed stone was higher in both tonnage and value. Crushed granite increased 24 percent in tonnage and 20 in value. Crushed-limestone figures are not comparable for 1955 and 1956, as some

crushed and ground limestone was classed as marble in 1955. Output of crushed sandstone and quartzite was 10 percent lower than in 1955.

Total dimension-stone production was lower in 1956 than in 1955. Dimension granite decreased 33 percent in tonnage; but its value was only 1 percent less than in 1955, and marble decreased in both tonnage and value. Only small tonnages of dimension limestone and sandstone were produced.

Granite was produced in 15 counties; quartzite in Richmond County; sandstone in Pickens County; limestone in Bartow, Dade, Fannin, Floyd, Gilmer, Houston, and Walker Counties; and marble in Gilmer and Pickens Counties.

TABLE 12.—Stone sold or used by producers, 1954–56, in short tons

	1954		1955		1956	
	Short tons	Value	Short tons	Value	Short tons	Value
Crushed stone:						
Granite	5,078,952	$8,080,493	5,923,422	$8,729,902	7,348,901	$10,496,767
Limestone	1,806,899	3,722,108	1,379,607	2,041,352	1,704,412	4,187,368
Marble	218,678	1,843,530	(1)	(1)	(1)	(1)
Sandstone and quartzite	725,000	1,030,000	(1)	(1)	(1)	(1)
Total	7,829,529	14,676,131	[2] 7,303,029	[2] 10,771,254	[2] 9,053,313	[2] 14,684,135
Dimension stone:						
Granite	193,270	3,678,193	181,879	3,447,761	121,014	3,398,720
Limestone	3,065	8,545	2,247	5,615	4,405	7,150
Marble	24,251	2,998,031	(1)	(1)	16,175	2,594,366
Sandstone and quartzite	7,485	23,387	1,297	25,200	1,158	29,280
Total	228,071	6,708,096	[2] 185,423	[2] 3,478,576	142,752	6,029,516
Grand total	8,057,600	21,384,227	[3] 7,488,452	[3] 14,249,830	[2] 9,196,065	[2] 20,713,651

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Incomplete total; excludes crushed marble and crushed sandstone and quartzite.
[3] Incomplete total; excludes marble and crushed sandstone and quartzite.

Talc and Soapstone.—Production of crude talc and soapstone was 58,000 tons valued at $122,000—an increase of 8 percent in tonnage and 4 percent in value compared with 1955. Sales of ground talc and soapstone were 57,500 tons valued at $577,000—8 percent in quantity and 7 percent in value above 1955. Sales of sawed material were a few percent below the previous year, but total value was up 6 percent. All production came from Murray County.

TABLE 13.—Production of crude and sales of ground talc and soapstone, 1947–51 (average) and 1952–56

Year	Production (crude)		Sales (ground)	
	Short tons	Value	Short tons	Value
1947–51 (average)	(1)	(1)	[2] 60,205	[2] $695,126
1952	58,411	(1)	56,181	575,033
1953	57,891	$202,619	57,581	594,900
1954	50,536	176,876	50,248	505,219
1955	53,828	117,656	53,419	538,890
1956	57,916	122,166	57,521	577,475

[1] Data not available.
[2] Includes sawed material.

MINERAL FUELS

Coal.—Bituminous-coal production came from 1 strip mine and 4 underground mines—all in Walker County. Output was 8,500 tons valued at $42,000, decreases of 32 percent in both tonnage and value below 1955.

Peat.—Production of peat in 1956 was 6,200 tons valued at $48,000, 12 percent higher in tonnage but slightly lower in value than in 1955. Peat humus, although classed as a fuel, was used principally for agricultural and horticultural purposes. Only 3 producers were active in the State in 1956—1 each in Charlton, Lowndes, and Screven Counties.

TABLE 14.—Production of peat, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	2,154	$47,200	1954	5,150	$60,920
1952	2,150	38,000	1955	5,554	(1)
1953	2,305	(1)	1956	6,225	47,843

[1] Figure withheld to avoid disclosing confidential company information.

REVIEW BY COUNTIES

Baldwin.—General Refractories Co. mined kaolin from the Wood mine at Stevens Pottery for its own use in manufacturing refractory products.

Bartow.—Mineral production in Bartow County increased for the third successive year and was 27 percent higher than in 1955. In terms of value, barite was the principal mineral of the county, and output was slightly above 1955, but its value was up 38 percent. B. R. Cain, Homer Cox, New Riverside Ochre Co., and Paga Mining Co. were active producers. Although no bauxite was mined in the county in 1956, the Halls Station plant of American Cyanamid Co. continued to dry crude ore shipped from other sections of the State.

Shipments of brown iron ore were 179,000 tons valued at $727,000, declining 3 percent in tonnage but increasing 15 percent in value from 1955. The principal producers, as in 1955, were Bartow Mines, Inc., Hodge Mining Co., Lake Mining Co., and Mosteller Bros. In addition, six new small producers made their first shipments during the year. Crude and finished iron oxide pigments were produced by New Riverside Ochre Co. Manganese and manganiferous ores were mined by Hale-Georgia Minerals Corp. and Sam Dysart.

Stockbridge Stone Co. abandoned its limestone quarry at White, and Marquette Cement Mfg. Co. opened a new limestone quarry

TABLE 15.—Shipments of brown iron ore in Bartow County, 1948–51 (average) and 1952–56

Year	Long tons	Value	Year	Long tons	Value
1948–51 (average)	86,143	$282,916	1954	148,601	$564,778
1952	146,332	585,476	1955	184,892	632,516
1953	113,024	447,169	1956	179,485	726,557

near Cartersville to supply cement rock for its plant at Rockmart. Funkhouser Co. mined slate at its underground mine in the northern part of the county for slate flour and roofing granules.

Bibb.—The total value of mineral production in Bibb County in 1956 was 19 percent higher than in 1955. Hitchcock Corp. and Macon Quarries produced crushed granite for concrete and road metal. Burns Brick Co. and Cherokee Brick & Tile Co. mined clays for manufacturing clay products in their plants at Macon. Cornell-Young Co. operated sand pits near Macon and Warner-Robbins for structural and paving sands.

Brooks.—Bannockburn Sand Co. of Valdosta mined building and paving sands from its pit at Troupeville.

Charlton.—Okefenokee Peat Moss Co. produced peat humus near Cypress.

Chatham.—J. W. Fitzgerald Co., Inc., mined building sand from its pit near Savannah. National Gypsum Co. calcined crude gypsum shipped into the State at its Savannah plant.

Cherokee.—Thompson-Weinman & Co. mined and shipped mica (sericite) from the Brady mine to its grinding plant at Cartersville. Beryl and sheet mica were produced by Frank Cook Mining Co. (Bennett mine) and Glenn Young (Cochran mine). J. R. Beam ex-

TABLE 16.—Value of mineral production in Georgia, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Baldwin	(2)	(2)	Kaolin.
Bartow	$2,934,341	$3,716,987	Barite, iron ore, limestone, slate, manganese.
Bibb	712,282	845,905	Granite, clays, sand and gravel.
Brooks	61,750	38,190	Sand.
Charlton		(2)	Peat.
Chatham	(2)	(2)	Sand.
Cherokee	(2)	(2)	Mica, beryl.
Cobb	494,018	845,392	Granite, sand.
Colquitt		20,000	Sand.
Columbia	(2)	(2)	Clays.
Crawford	246,823	277,973	Clays, sand.
Dade	(2)	33,152	Limestone.
Decatur	(2)	(2)	Fuller's earth.
De Kalb	3,839,858	(2)	Granite.
Dougherty	123,268	122,019	Sand.
Effingham	236,926	(2)	Do.
Elbert	1,483,379	1,523,140	Granite, sand.
Evans	3,850	6,370	Sand.
Fannin	83,178	110,725	Limestone, granite.
Fayette	(2)	(2)	Granite.
Floyd	551,537	704,433	Limestone, manganese, bauxite.
Fulton	89,650	(2)	Granite, sand and gravel, clays.
Gilmer	(2)	(2)	Limestone, marble.
Glascock		(2)	Kaolin.
Glynn	(2)	(2)	Sand.
Gordon	11,290	12,000	Clays.
Grady	(2)	(2)	Fuller's earth.
Gwinnett	134,750	197,093	Granite.
Hancock	(2)	(2)	Do.
Haralson	4,000	5,000	Sand and gravel.
Hart	(2)	(2)	Mica.
Henry	(2)	1,445,443	Granite.
Houston	(2)	(2)	Cement, limestone.
Jasper	(2)	(2)	Feldspar, quartz.
Jefferson		19,475	Fuller's earth.
Jones	(2)		
Lamar	(2)		
Long	(2)	(2)	Sand.
Lowndes	(2)	(2)	Peat.
Macon	(2)	(2)	Bauxite.
Madison	413,337	479,049	Granite.

See footnotes at end of table.

TABLE 16.—Value of mineral production in Georgia, 1955–56, by counties [1]—Continued

County	1955	1956	Minerals produced in 1956 in order of value
Monroe	(2)	(2)	Mica.
Montgomery	(2)		
Morgan	$200		
Murray	117,656	$122,166	Talc, soapstone.
Muscogee	934,556	1,122,131	Granite, sand and gravel.
Oconee		(2)	Mica.
Oglethorpe	558,627	630,121	Granite.
Pickens	(2)	(2)	Marble, sandstone, mica.
Pike	(2)		
Polk	(2)	(2)	Cement, iron ore, slate.
Rabun		3,750	Gravel.
Richmond	2,285,440	2,307,339	Quartzite, kaolin, clays.
Screven	(2)	(2)	Peat.
Stephens	51,869	51,869	Granite.
Stewart		277,427	Iron ore.
Sumter	35,000	(2)	Bauxite.
Talbot	(2)	(2)	Sand.
Taylor		(2)	Do.
Telfair	(2)	(2)	Do.
Thomas	(2)	(2)	Sand, fuller's earth.
Toombs	2,250	5,200	Sand.
Towns		50	Gem stones.
Troup	(2)	(2)	Beryl, gem stones.
Twiggs	14,331,993	16,365,323	Kaolin, fuller's earth.
Union	7,239	3,400	Gravel.
Upson	(2)	134,515	Mica.
Walker	199,349	139,065	Limestone, coal.
Ware	26,074	22,324	Sand.
Warren	(2)	(2)	Granite.
Washington	4,543,775	5,344,237	Kaolin.
Wayne	80,000		
Whitfield	(2)	15,200	Clay.
Wilkinson	4,235,741	(2)	Kaolin.
Undistributed	21,582,750	30,965,311	
Total	60,417,000	67,912,000	

[1] The following counties are not listed, since no production has been reported from them: Appling, Atkinson, Bacon, Baker, Banks, Barrow, Ben Hill, Berrien, Bleckley, Brantley, Bryan, Bulloch, Burke, Butts, Calhoun, Camden, Candler, Carroll, Catoosa, Chattahoochee, Chatooga, Clark, Clay, Clayton, Clinch, Coffee, Cook, Coweta, Crisp, Dawson, Dodge, Dooly, Douglas, Early, Echols, Emanuel, Forsyth, Franklin, Greene, Habersham, Hall, Harris, Heard, Irwin, Jackson, Jeff Davis, Jenkins, Johnson, Lanier, Laurens, Lee, Liberty, Lincoln, Lumpkin, McDuffie, McIntosh, Marion, Meriwether, Miller, Mitchell, Newton, Paulding, Peach, Pierce, Pulaski, Putnam, Quitman, Randolph, Rockdale, Schley, Seminole, Spalding, Taliaferro, Tattnall, Terrell, Tift, Treutlen, Turner, Walton, Webster, Wheeler, White, Wilcox, Wilkes, Worth.

[2] Figure withheld to avoid disclosing individual company confidential data.

plored the Bennett mine under a DMEA contract totaling $8,316; Government participation was 75 percent.

Cobb.—Crushed granite was quarried by Kennesaw Stone Co. and Stockbridge Stone Co.; the latter operated a portable plant at a quarry acquired from Cobb County. Alonzo Field produced structural sand at Smyrna.

Colquitt.—Baxter & Sanders opened a new sand pit near Moultrie.

Columbia.—Georgia Vitrified Brick & Clay Co. mined clay from the Campania mine for use in its clay-products plant at Harlem.

Crawford.—Atlanta Sand & Supply Co. produced sand principally for building purposes from the Rolls pit near Roberts. Middle Georgia Pottery Co. mined clay for use in its plant at Lizella.

Dade.—Dave L. Brown Co. quarried and crushed limestone for concrete and roadstone. No coal was produced in 1956.

Decatur.—Minerals & Chemical Corp. of America mined and processed fuller's earth and was the only mineral producer in the county in 1956.

De Kalb.—Crushed and dimension granite were quarried near Lithonia. Consolidated Quarries, Inc., crushed granite for concrete and roadstone, railroad ballast, and stone sand. Stone Mountain Grit Co. produced concrete and roadstone, stone sand, and poultry grit. Davidson Granite Co. quarried rough and dressed dimension granite, curbing and paving blocks; J. T. Reagan Co. produced curbing and rubble.

Dougherty.—Sand, principally for building purposes, totaled 147,000 tons, a decrease of 1 percent. Producers were Albany Lime & Cement Co., Garrett Base Materials Products Co., Musgrove Sand Co., and Quick Service Sand Co.

Effingham.—Dawes Silica Mining Co. mined sand at the Eden Pit for building, blast, filter, molding, and other uses.

Elbert.—Output of dimension granite was 40,000 tons (482,000 cubic feet) valued at $1.4 million, increasing 4 percent in quantity and about the same in value as in 1955. Ten companies quarried in the vicinity of Elberton and produced monumental stone, exclusively, except for a small quantity of rubble marketed by one company. Rough and dressed stone were produced by Comolli Granite Co., Elbert County Granite Co., and Elberton Granite Industries., Inc. Rough monumental stone only was quarried by American Granite Quarries, Inc., Coggins Granite & Marble Industries, Inc., Continental Granite Co., M. W. Kantala & Sons, Robin Blue Quarries, Inc., and A. G. & M. H. Veal. A small quantity of dressed stone was produced by Elberton City Quarries, Inc. R. V. Venable produced 50,000 tons of crushed granite for concrete and roadstone. Bond Sand & Gravel Co. and Coldwater Sand Co. mined structural and paving sands.

TABLE 17.—Dimension granite sold or used by producers in Elbert County, 1948–51 (average) and 1952–56

Year	Short tons	Cubic feet	Value	Year	Short tons	Cubic feet	Value
1948–51 (average)	37,958	457,325	$1,348,711	1954	43,398	522,864	$1,561,490
1952	35,003	421,725	1,229,813	1955	38,439	463,123	1,401,114
1953	39,254	472,967	1,212,089	1956	39,993	481,846	1,399,140

Evans.—Evans Concrete Products Co. mined sand for building and other uses near Daisy.

Fannin.—Campbell Lime & Stone Co. crushed limestone, and Fannin County Highway Department crushed granite for concrete and roadstone.

Fayette.—Crushed granite was quarried by Tyrone Rock Products Co. for concrete, roadstone, and railroad ballast.

Floyd.—Bauxite was mined by American Cyanamid Co. and manganese ores by Kingman Mines, Inc. Crushed and dimension limestone were quarried by Floyd County Highway Department and crushed limestone for concrete, roadstone, and railroad ballast by Ready-Mix Concrete Co. Oconee Clay Products Co. and Rome Brick Co. mined shale for manufacturing brick and other clay products.

Fulton.—Clays for manufacturing brick were mined by Atlanta Brick & Tile Co. and Chattahoochee Brick Co. J. D. Jones, C. J. Ross, and Thompson Bros. Sand Co. mined structural sand from pits near Atlanta. Three new granite quarries were opened in the county in 1956. Hitchcock Corp. opened the Bellwood quarry, and Stockbridge Stone Co. operated two portable plants at quarries for producing crushed granite.

Gilmer.—Limestone and marble were mined and crushed at Whitestone for agricultural use, aggregates, fillers, roofing, and terrazzo. Willingham-Little Stone Division of Georgia Marble Co. and Marble Products Co. of Georgia were producers in 1956.

Glascock.—Harbison-Walker Refractories Co. resumed production of kaolin at the Gibson mine, and General Refractories Co. reported initial output of kaolin from the new Robson mine.

Glynn.—Crews Sand Co. and Gray Towing Co. mined building and other sands; both were new producers in 1956.

Gordon.—Plainville Brick Co. mined shale for use in its brick plant at Plainville.

Grady.—Cairo Production Co. mined and processed fuller's earth; the Milwhite Co. did not operate in 1956.

Gwinnett.—Crushed granite for concrete aggregate and roadstone was quarried by the Georgia State Board of Corrections and Stockbridge Stone Co.; the latter produced from a new quarry at Norcross.

Hancock.—Weston & Brooker Co. quarried and crushed granite at Granite Hill for concrete and roadstone.

Haralson.—Haralson County Highway Department produced a small tonnage of paving sand for its own use.

Hart.—Funkhouser Co. mined mica schist from which it separated and ground scrap mica. Betty Mining Co. and Payne Bros. produced sheet mica. Two DMEA contracts aiding exploration of strategic mica were active in 1956. Ernest B. Wood explored the E. B. Wood prospect and John Phillips, the Bray No. 1 prospect; the 2 totaled $12,624; Government participation was 75 percent.

Henry.—Stockbridge Stone Co. quarry at Stockbridge produced crushed granite for concrete, roadstone, and railroad ballast.

Houston.—Penn-Dixie Cement Co. manufactured portland cement at Clinchfield, using clay and limestone mined by the company nearby. Georgia Limerock Co. produced crushed limestone, principally for agricultural use.

Jasper.—Appalachian Minerals Co. mined and beneficiated feldspar rock at its flotation plant near Monticello. Ground quartz was obtained as a byproduct.

Jefferson.—Tennessee Absorbent Clay Co. opened a new pit and began producing fuller's earth in September 1956.

Long.—Dawes Silica Mining Co. increased production of structural sand from its pit at Ludowici.

Lowndes.—Georgia Peat Moss Co. produced peat humus from a bog near Twin Lakes.

Macon.—American Cyanamid Co. mined crude bauxite from the Pierce-Norris and Cavender mines in 1956.

Madison.—Coggins Granite & Marble Industries, Inc., of Elberton quarried granite, used principally as monumental stone, at the Piedmont quarry near Carlton.

Monroe.—C. & H. Mines and Spalding Mining Co. produced sheet mica and E. V. Curtis hand-cobbed mica; the entire quantity sold to the Government at the Spruce Pine (N. C.) Purchase Depot.

Murray.—Production of crude talc and soapstone was 58,000 tons valued at $122,000—increases of 8 percent in tonnage and 4 percent in value over 1955. Ground talc and soapstone increased 8 percent in tonnage and 7 percent in value. Sawed-material production showed little change from 1955, but its value increased 6 percent. Cohutta Talc Co., Georgia Talc Co., and Southern Talc Co. operated mines east of Chatsworth and sawing and grinding plants in Chatsworth.

Muscogee.—The value of mineral production was 20 percent higher than in 1955 owing to increased production of crushed granite by Alabama Aggregates Co. and Columbus Rock Corp. Sand and gravel was mined near Columbus by J. J. Brown Sand & Gravel Co. and Calhoun Sand & Gravel Co.

Oconee.—C. F. Thomas mined a small quantity of sheet mica.

Oglethorpe.—Output of dimension granite was virtually the same as in 1955, but value increased 13 percent. Bennie & Harvey, Dixie Granite Quarries, Enterprise Granite Co., and Hoover Granite Quarries produced rough monumental stone; Liberty Granite Co. and Oglethorpe Quarrying Co. produced dressed monumental stone.

TABLE 18.—Dimension granite sold or used by producers in Oglethorpe County, 1952–56

Year	Short tons	Cubic feet	Value	Year	Short tons	Cubic feet	Value
1952	17,265	208,003	$368,655	1955	22,196	254,307	$558,627
1953	22,527	256,912	533,135	1956	22,266	239,168	630,121
1954	23,331	267,595	766,392				

Pickens.—The total value of mineral production was within 1 percent of that of the previous year, but Pickens County was displaced as second highest in value of mineral production. The Georgia Marble Co. quarries and finishing plants at Tate and Nelson marketed crushed and ground marble and dressed building and monumental stone. Carl Johnson and Hardy Johnson quarried sandstone (flagstone). E. Easterwood mined mica (sericite) from the Martin mine for shipment to the Thompson-Weinman grinding plant at Cartersville.

Pike.—McKinley Mica Co. mined hand-cobbed mica from the McKinley mine.

Polk.—Mineral production in Polk County increased 35 percent in value from 1955. Cement, slate, and brown iron ore all gained substantially over the preceding year. Marquette Cement Manufacturing Co. produced masonry and portland cement at its plant at Rockmart. Limestone for the plant was obtained from a new quarry in Bartow County; no production from the Polk County quarry was reported. Clays used came from the Rockmart mine. Crushed slate was mined by Georgia Lightweight Aggregate Co. for its plant at Rockmart.

Brown-iron-ore production increased to 123,000 tons valued at $605,000, 71 and 67 percent higher in tonnage and value, respectively, over 1955. Six operators were active in the Cedartown district com-

TABLE 19.—Shipments of brown iron ore in Polk County, 1948–51 (average) and 1952–56

Year	Long tons	Value	Year	Long tons	Value
1948–51 (average)	110,256	$371,807	1954	72,635	$304,682
1952	165,522	822,802	1955	71,808	361,773
1953	146,690	652,306	1956	122,518	605,109

pared with four the previous year. The principal producers were Acree Mining Co., Albea-York Mining Co., Inc., and Graves Mining Co. Others were E. L. Gammage, Frank Ellis, and Jim Hume.

Rabun.—J. R. Coffey produced a small tonnage of paving gravel.

Richmond.—The total value of mineral production increased 1 percent over 1955. Clay and kaolin output increased considerably; crushed stone and sand and gravel decreased somewhat from 1955. Albion Kaolin Division of Interchemical Corp. mined kaolin for refractories, as well as for pigments and textile uses, at Hepzibah. Georgia-Carolina Brick & Tile Co. and Merry Bros. Brick & Tile Co. produced clay for manufacturing clay products. Superior Stone Co. crushed quartzite at the Dan quarry for concrete and roadstone. Augusta Sand & Gravel Co. (formerly Richmond Sand Co.) and Richmond County Highway Department mined paving sand.

Screven.—Atlanta Peat Co., Sylvania, was the only mineral producer in the county.

Stephens.—Burkhart Quarry & Supplies, Inc., purchased the Toccoa quarry of Toccoa Construction Co. in October 1956 and continued producing crushed granite for concrete and roadstone.

Stewart.—Brown iron ore was mined for the first time in Stewart County in 1956; production totaled 55,000 tons. Seven companies were active; the principal producers were Dunbar & Layton, Price & Jackson Mining Co., and Southern Iron Corp.

Sumter.—American Cyanamid Co. reported production of bauxite from the Holloway mine, a new operation in 1956.

Talbot.—Brown Bros. and Taylor Sand Co. produced structural and paving sand from pits near Junction City.

Taylor.—Howard Sand Co. operated a pit near Howard for producing building and paving sand.

Telfair.—Walker Sand Pit north of Lumber City was the only mineral producer in the county.

Thomas.—Arnold Brick Co. mined clay for use in its brick plant at Thomasville, and Dawes Silica Mining Co. produced building, blast, filter, glass, molding, and other sands at Thomasville. Waverly Petroleum Products Co. opened a new mine for producing fuller's earth near Meigs.

Towns.—A few pounds of corundum was collected near Hiawassee by J. M. Steinoff.

Troup.—Mineral Processing Co. recovered beryl at the Hogg mine; G. W. Withers purchased rose quartz mined in Troup County. W. Hugh Allen explored the Word mine for beryl under a DMEA contract of $6,516.

Twiggs.—Twiggs County maintained its position as the State's leading mineral-producing county in terms of value. Output of kaolin and fuller's earth increased 9 percent in tonnage and 14 in

value. Diversey Corp. mined and processed fuller's earth for absorbents, fillers, and filters; Georgia Coating Clay Co., Georgia Kaolin Co., J. M. Huber Corp., and Southern Clays, Inc., produced kaolin for whiteware, refractories, paper, filler, and other uses.

TABLE 20.—Kaolin and fuller's earth sold or used by producers in Twiggs County, 1952–56

Year	Short tons	Value	Year	Short tons	Value
1952	521,077	$7,487,877	1955	848,565	$14,331,993
1953	486,371	(1)	1956	926,931	16,365,323
1954	750,441	12,543,077			

[1] Figure withheld to avoid disclosing individual company confidential data.

Union.—United States Forest Service produced a small tonnage of paving gravel for its own use.

Upson.—Total mica production in 1956 was valued at $135,000. Output by 6 operators came from 12 mines, compared with only 2 producers in 1955. J. & B. Mining Co. (Adams and Mitchell Creek mines) and Southern Mining Co., Inc. (Barron, Lockheart, and Reynolds mines), produced both sheet and hand-cobbed mica; E. H. Schwab (Duke and other mines) and Thompson and Ferdue (Frank Taylor mine) marketed sheet mica only; and Boyt Mining Co. (Boyt mine) mined hand-cobbed mica. Edwin H. Schwab continued exploration for strategic mica under a DMEA contract dated October 6, 1955, for $5,524.

Walker.—Production of coal and limestone in 1956 was 30 percent less than in 1955. Coal output by 5 companies was 8,500 tons valued at $42,000, compared with 11,000 tons and $56,000 in 1955. Willard Parker and H. R. Perry Stone Co. quarried dimension limestone near Chickamauga, principally for local residential construction. Dave L. Brown Co. crushed limestone at the Rossville quarry.

Ware.—E. W. Pafford dredged sand near Waycross, principally for building purposes.

Warren.—Weston & Brooker Co. quarried at Camak and crushed granite for concrete and roadstone, railroad ballast, stone sand, and riprap.

Washington.—Kaolin production rose to 316,000 tons valued at $5.3 million, increasing 12 percent and 18 percent in tonnage and value, respectively, above 1955. Washington County ranked second in the State in value of its mineral production and as a kaolin producer. Producers were Godfrey L. Cabot, Inc. (Georgia Pigments Div.), Champion Paper & Fiber Co., Minerals & Chemical Corp. of America, Thiele Kaolin Co., and United Clay Mines Corp. Kaolin was used

TABLE 21.—Kaolin sold or used by producers in Washington County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	231,924	$3,400,650	1954	264,195	$4,162,386
1952	259,977	4,069,357	1955	282,411	4,543,775
1953	302,250	4,768,916	1956	316,296	5,344,238

principally for paper coating and as filler, followed by whiteware and rubber.

Whitfield.—Dalton Brick & Tile Co. mined shale for manufacturing clay products at its plant south of Dalton. No limestone production was reported in 1956.

Wilkinson.—Wilkinson County ranked fourth in value of its mineral output, which consisted solely of kaolin. Production was 311,000 tons valued at $4.5 million, a 7-percent increase in tonnage and value above 1955. Evans Clay Co., M & M Clays Co., and Minerals & Chemical Corporation of America mined kaolin for paper coating, paper, rubber, and other fillers. Harbison-Walker Refractories Co., D. C. Hardie, and Oconee Clay Products Co. mined refractory kaolin for manufacturing refractory and other clay products.

TABLE 22.—Kaolin sold or used by producers in Wilkinson County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	358,478	$5,687,201	1954	241,198	$3,692,143
1952	435,528	6,639,300	1955	290,520	4,235,741
1953	454,000	7,467,181	1956	310,528	4,525,537

The Mineral Industry of Hawaii and Pacific-Island Possessions

By L. E. Davis [1]

HAWAII

THE VALUE of the mineral output in the Territory of Hawaii reached an all-time peak in 1956, increasing more than 90 percent over 1955. Although the increase in value was reflected in all but two of the minerals produced, the stone industry showed the greatest growth. The mineral-industry activities that contributed most to the economy of the islands during the year were quarrying basalt, coral, and coral limestone; preparation of lime and coral, sand and gravel; and production of clays, salt, and volcanic cinder. Despite continued interest in the titanium and aluminum-bearing clays of the Territory, no attempt has yet been made to treat them commercially for their metal content.

Markets.—All minerals produced in 1956 were consumed locally and thus contributed appreciably to the Territory's economy. However, civilian and military uses required that substantial quantities of minerals be imported or obtained from continental United States. Included were special construction materials, when locally produced minerals could not meet specifications, and petroleum products, cements, fertilizer materials, natural asphalts, and salt. Many of these minerals were shipped from west coast ports of the United States, and important tonnages of ferrous and nonferrous scrap were shipped to west coast ports from the Territory.

Employment.—Employment in the mineral industries recovered from the decline of 1955 and averaged 200 persons in 1956. Employment in 1955 totaled only 177. Earnings increased substantially to an average weekly wage of $72.82 compared with $66.28 in 1955.

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[1] Commodity-industry analyst, Region II, Bureau of Mines, San Francisco, Calif.

TABLE 1.—Mineral production in the Territory of Hawaii and Pacific Island possessions, 1955–56 [1]

Area and mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
American Samoa:				
Sand and gravel	1,275	$552		
Stone (crushed)	9,011	3,948	2,493	$6,505
Total		4,500		6,505
Canton: Stone (crushed)	500	1,500	1,620	4,860
Guam:				
Sand and gravel			18,668	24,437
Stone (crushed)	1,241,466	3,351,958	341,072	311,248
Total		3,351,958		335,685
Territory of Hawaii:				
Clays	(2)	(2)	1,590	1,988
Lime	6,453	202,005	9,555	305,709
Pumice (volcanic cinder)	130,306	75,906	58,851	91,695
Salt	(2)	(2)	270	18,119
Sand and gravel	165,081	425,760	193,149	502,692
Stone	1,414,304	2,884,354	3,493,717	6,076,040
Value of items that cannot be disclosed		21,818		
Total [3]		3,592,061		6,971,233
Johnston: Stone (crushed)	12,090	32,550		
Midway: Stone (crushed)			203,049	304,574
Wake: Stone (crushed)	1,000	3,000	21,500	21,500

[1] Supplemental production data for American Samoa furnished by the Government of American Samoa; Canton and Wake by the U. S. Department of Commerce, Civil Aeronautics Administration; Guam by the Government of Guam; Midway by the U. S. Department of the Navy.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total has been adjusted to eliminate duplicating the value of limestone used in lime.

REVIEW OF MINERAL COMMODITIES

NONMETALS

Clays.—Production of miscellaneous clay in 1956 was confined to the island of Oahu. Most of the output was used in heavy clay products; a small tonnage was consigned to pottery and stoneware manufacture. The producers were Gaspro, Ltd., and Wilsonite Brick Co., Ltd. The clays of the Territory are not well adapted to structural clay products, porcelain, or refractories, as they shrink excessively on drying and crack when fired. In the future any increased output of clay may be used only as an admixture with other and better clays.

Lime.—Lime was produced in the kiln and hydrator operated by Gaspro, Ltd,. at Honolulu from limestone quarried by the company on Oahu. Most of the output of the plant was hydrated lime; only a few tons of quicklime was produced for the building trades. Approximately 25 percent of the output of hydrated lime also was sold to the building trades, the remainder being used for chemical and other industrial purposes. The carbon dioxide byproduct of the kiln operation was converted to "dry ice." The local demand for lime in 1956 was on a par with that in previous years, and the kiln was operated at near capacity. The price of lime increased slightly after an increase in wages.

Pumice (Volcanic Cinder).—The only production of volcanic ash and cinder in the Territory in 1956 was on the island of Hawaii. Three sugar companies quarried pumice for use in maintaining company roads.

Salt.—Salt was recovered from sea water by solar evaporation. This product, used largely in processing certain special foods, was in light demand, and only a small tonnage (a few tons less than in 1955) was produced. Chum Mew Ting Co. was the only producer in the Territory.

Sand and Gravel.—On the island of Hawaii, Corps Construction, Ltd., produced gravel near Kamuela for the Hawaiian Irrigation Authority; Hawaii Trucking Co., Ltd., prepared paving gravel for the National Guard Reservation at Hilo; Honolulu Builders, Ltd., operated the Hue Hue quarry and prepared building sand and gravel which was sold to the Territory highway department, the county of Hawaii, various building contractors, farmers, and others; and J. M. Tanaka operated a fixed plant near Kona and produced building sand and paving sand and gravel for several contractors, the county of Hawaii, and the Territorial Government. In the Kilauea area of the Hawaiian National Park, the National Park Service prepared building sand and gravel for its own use. On the island of Oahu, Chang's Express produced building sand for the board of water supply, the United States Air Force, and the United States Department of Agriculture; and coral beach sand was prepared by Honolulu Construction & Draying Co., Ltd., near Kailua, and by Pacific Concrete & Rock Co., Ltd., near Waialua, for Federal military agencies and for the Honolulu county and city governments. The Clarke-Halawa Rock Co., Ltd., produced pit-run sand under a subcontract for the Corps of Engineers.

Stone.—*Basalt.*—The substantial increase in basalt production in the Territory in 1956 was due primarily to increased demand for basalt for use at the National Guard Recreation Area on the Island of Hawaii. James W. Glover, Ltd., also produced considerable basalt for local contractors near Hilo who used it in road building and paving. Other producers of basalt on Hawaii were Honolulu Builders, Ltd., the Hawaii County engineer, and the National Park Service. Increased requirements by the Pearl Harbor naval shipyard, which were supplied by Honolulu Construction & Draying Co., Ltd., resulted in a larger output in Honolulu County. Production and requirements of basalt on the Islands of Kauai and Maui remaind substantially the same as in 1955.

Limestone.—Production of limestone in the Territory increased notably in 1956. Virtually all of the increase was made by Gaspro, Ltd., which produced an appreciable tonnage of the crushed material for land fill as a road base. This company also quarried a slightly larger tonnage of limestone for use in making lime in its kiln at Honolulu. Other major producers of crushed limestone in Honolulu County were Kailua Limestone Co. and Nanakuli Paving & Rock Co., which produced the material for concrete and road metal. Kailua Limestone Co. also prepared a small tonnage of the stone for use as rubble. The only other major limestone producer was Grove Farm Co., Ltd., on the island of Kauai. A small part of their output was consigned to agricultural use.

Miscellaneous Stone.—Although only a token tonnage of coral stone was quarried in Hawaii County for concrete and road metal, an important tonnage was produced for the Department of the Navy in Honolulu County by the Hawaiian Dredging & Construction Co., Ltd. The stone was stockpiled for use as rough fill and concrete aggregate. No other production was reported in the Territory.

Vermiculite.—A small tonnage of crude vermiculite was exfoliated by Vermiculite of Hawaii, Ltd., at its Honolulu County plant. The crude material was obtained from the Western United States. The increase in cost due to freight charges resulted in a higher unit retail value for the prepared vermiculite. The expanded material was used for plaster aggregate, acoustical and thermal insulation, and agriculture.

PACIFIC-ISLAND POSSESSIONS

American Samoa.—Basalt was quarried and crushed for concrete aggregate by the Government of American Samoa. A small tonnage of coral was dredged and prepared for use in surfacing roads.

Canton.—Several hundred tons of coral was produced and prepared by a contractor for the Civil Aeronautics Administration for use in surfacing airport runways.

Guam.—Contractors for the Public Works Department, Government of Guam, and the Department of Defense quarried and prepared coral limestone for use as concrete aggregate in building and road paving. F. D. Perez & Bros. Co., one contractor, also produced coral stone for use as riprap by local purchasers.

Midway.—The Hawaiian Dredging & Construction Co., Ltd., produced a considerable tonnage of coral, which was used as concrete aggregate and for road maintenance.

Wake.—A contractor for the Civil Aeronautics Administration prepared several thousand tons of crushed coral for use in airport-runway paving.

The Mineral Industry of Idaho

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the State of Idaho Bureau of Mines and Geology.

By Kenneth D. Baber,[1] Frank B. Fulkerson,[1] Norman S. Petersen [1] and Albert J. Kauffman, Jr.[2]

VALUE of mineral production in Idaho increased $6.7 million in 1956—the first substantial gain in 4 years. However, the $75.2 million total value was well below that in 1948 and again in 1950–52. Copper output advanced $1.5 million and made the largest single contribution among the metals to the rise in the State total. The combined value of lead and zinc also gained $1.5 million, owing to higher metal prices. Silver output declined slightly. These 4 metals supplied 69 percent of the State value. Production of cobalt reached a record total, and mercury also advanced considerably, while output of tungsten ore decreased sharply.

In nonmetals, gains in value for phosphate rock, sand and gravel, and stone totaled $3.1 million; moderate increases were made by

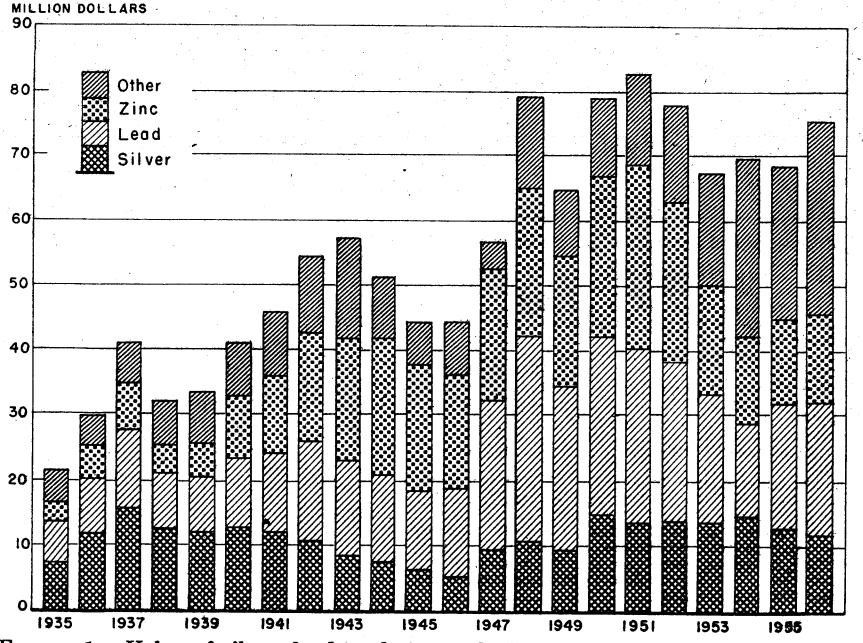

FIGURE 1.—Value of silver, lead, and zinc and total value of mineral production in Idaho, 1935–56.

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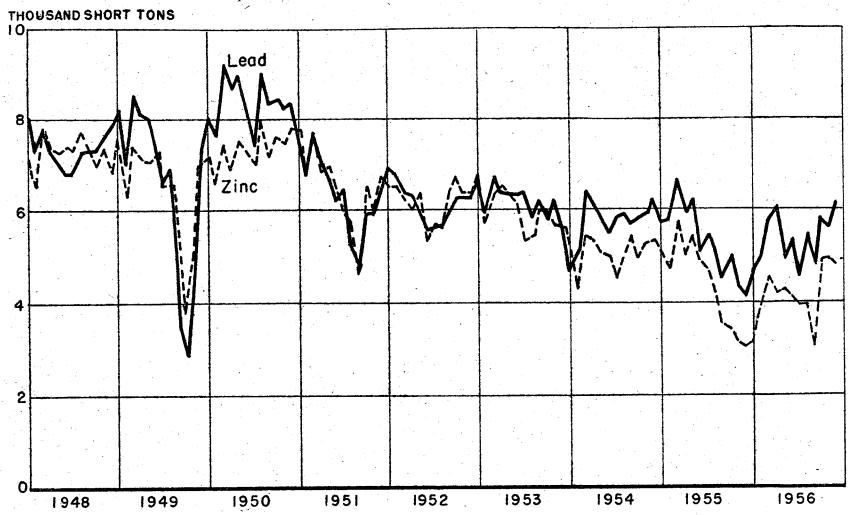

FIGURE 2.—Mine production of lead and zinc in Idaho, 1948–56, by months in terms of recoverable metals.

barite and pumice and pumicite; and a decline was recorded for cement. The continued increase in phosphate-rock mining resulted from activation of a new mine, as well as increased tonnage from one of the established operations.

TABLE 1.—Mineral production in Idaho, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate—antimony content	633	(2)	549	(2)
Clays	35,003	$29,910	[3] 22,620	[3] $13,425
Cobalt (content of concentrate)—pounds	1,691,334	(2)	2,385,013	(2)
Columbium-tantalum concentrate—do	(2)	(2)	215,900	(2)
Copper (recoverable content of ores, etc.)	5,618	4,191,028	6,656	5,657,600
Gold (recoverable content of ores, etc.)—troy ounces	10,572	370,020	10,029	351,015
Iron ore (usable)			800	(2)
Lead (recoverable content of ores, etc.)	64,163	19,120,574	64,321	20,196,794
Mercury—76-pound flasks	1,107	321,417	3,394	882,168
Nickel (content of ore and concentrate)—pounds	65,782	(2)	98,495	(2)
Phosphate rock—long tons	1,329,959	6,038,088	1,438,151	6,539,436
Pumice	(2)	(2)	101,913	206,064
Sand and gravel	8,652,138	3,933,876	7,874,460	5,661,417
Silver (recoverable content of ores, etc.)—troy ounces	13,831,458	12,518,168	13,471,916	12,192,764
Stone	1,524,810	1,866,076	1,791,077	2,752,148
Titanium concentrate (ilmenite)—gross weight	1,330	7,000	48,619	260,460
Tungsten concentrate (60-percent WO_3 basis)	642	(2)	582	(2)
Zinc (recoverable content of ores, etc.)	53,314	13,115,244	49,561	13,579,714
Value of items that cannot be disclosed: Barite, cement, abrasive garnet, gem stones, gypsum (1955), mica (1955), monazite, peat (1955), and values indicated by footnote 2. Excludes value of limestone used in the manufacture of cement		7,001,832		6,885,376
Total		68,513,000		75,178,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originated in Idaho cannot be credited owing to lack of information (see last paragraph of introduction).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Incomplete total—fire clay included with items that cannot be disclosed.

The total quantity of lead and zinc recovered decreased 3,600 tons, despite settlement of a major strike and an increase in metal prices. The number of operations mining lead and lead-zinc ores dropped from 58 in 1955 to 55 in 1956, and announcement was made late in the year that a large mine—the Frisco—was to be closed in January 1957.

Trends and Markets.—Average weighted prices per pound of all grades of refined metal sold in 1956 as compared with 1955 were as follows (1955 prices in parentheses): Copper, $0.425 ($0.373); lead, $0.157 ($0.149); and zinc, $0.137 ($0.123). The demand for lead continued, but the market for zinc weakened in midyear and continued Government purchases for the national stockpile prevented a price decline. Output of tungsten ore and concentrate was affected adversely by decreased Government purchases for the national stockpile, as well as the reduced purchase prices for this material. Mercury production responded to comparatively high and stable price.

Sand and gravel and stone production benefited from increased construction activity. The largest projects under way, besides the highway-building program, were the Bureau of Reclamation Palisades Dam on the upper Snake River, Brownlee Dam in Hells Canyon of the Snake River, and expansion of the Atomic Energy Commission (AEC) test site at Arco. Employment at the Palisades project totaled 475 at the summer peak—a decline from the year-ago total, as the dam neared completion. Idaho Power Co. completed the diversion tunnel at the Brownlee Dam, and excavation for the base of the project also was completed. Employment totaled 850 at year's end. The Brownlee project was the first of three dams that were to be constructed in Hells Canyon by Idaho Power Co. Estimated capacity of the 3 projects was 800,000 kilowatts. Preliminary work was done by the company at the Oxbow site in 1956, and work at the Hells Canyon site was not yet begun. Construction was in progress

TABLE 2.—Employment and wages in mining and mineral manufacturing, 1947–51 (average) and 1952–56, by industries [1]

Year	Mining							
	Metals		Nonmetals		Fuels		Total	
1947–51 (average)	5,250	$19,907,092	242	$790,354	14	$33,548	5,506	$20,730,994
1952	5,231	24,580,580	307	1,327,175	24	153,642	5,562	26,061,397
1953	4,479	21,835,855	326	1,374,802	14	27,223	4,819	23,237,880
1954	4,206	19,753,622	283	1,204,006	9	11,790	4,498	20,969,418
1955	4,112	20,012,050	297	1,333,588	28	88,054	4,437	21,433,692
1956	4,498	23,161,247	268	1,210,320	26	94,146	4,792	24,465,713

Year	Mineral manufacturing							
	Stone and clay products		Primary metals		Chemicals and allied products		Total	
1947–51 (average)	364	$1,114,223	1,003	$3,843,553	212	$814,708	1,579	$5,772,484
1952	406	1,484,672	1,097	5,382,504	1,054	4,774,938	2,557	11,642,114
1953	391	1,524,228	1,041	4,800,556	757	3,372,287	2,189	9,697,071
1954	385	1,499,787	1,147	5,214,121	796	3,614,231	2,328	10,328,139
1955	427	1,690,725	1,120	5,408,913	797	3,993,813	2,344	11,093,451
1956	458	1,894,254	1,173	6,398,533	877	4,655,156	2,508	12,947,943

[1] Employment covered by Idaho Employment Security Act; compiled from State employment security agency tabulations.

on new buildings and roadways at the AEC facility at Arco under an expansion program that would cost $15 million. Government operating personnel at the end of the year totaled 2,700, not including construction crews.

Average employment by construction contractors in Idaho totaled 9,000, as compared with 8,600 in 1955. Increased commercial and industrial construction was reported. The value of building permits authorized by municipalities totaled $39.6 million, compared with $36.5 million in 1955.

In connection with the new highway program authorized by the 1956 Federal Highway Act, estimated Federal grants to Idaho during the period 1957–70 will total $364 million. The National Crushed Stone Association estimated that the tonnage of mineral aggregate needed for the Federal Highway Program in Idaho from 1957 to 1959 would exceed normal requirements by the following: 1957, 5.5 million tons; 1958, 6.3 million tons; 1959, 7 million tons.[3]

Employment and Wages.—In the 10 years 1947–56 the number of workers in the mining industry varied from a high of 5,700 in 1947 to a low of 4,400 in 1955. The 1956 average was 4,800. In January mining employment averaged only 4,200 but increased to 4,600 in February, following settlement of a labor dispute. For the rest of the year employment followed an upward trend to reach 5,000 in December. Over 70 percent of the employment was in Shoshone County. Payrolls totaled $24.5 million, compared with $21.4 million in 1955. Average weekly earnings of production workers (excluding supervisory and administrative personnel) were $97.11 compared with $89.69 in 1955. A drop from $100.49 in January to $95.63 in February was attributed to the hiring of extra workers following settlement of a labor dispute. Average weekly earnings reached a high of $102 in December.

Average weekly hours gained from 40.4 in 1955 to 41.5 in 1956, and average hourly earnings were up 12 cents to $2.34. Employment in mineral manufacturing reached 2,500, highest since 1952, and payrolls totaled $13 million, compared with $11.1 million in 1955.

Defense Minerals Exploration Administration.—The program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial participation by the Government was repayable from royalties on ore discovered and subsequently mined.

In addition to the mineral values credited to Idaho in table 1, some have been omitted owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium selenium, tellurium, gallium, and germanium. The quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues obtained from refining such metals as copper and lead and those obtained in other ways.

It is not possible in many such instances to distribute the mineral product by States of origin, and sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value, the production of which seldom can be separated as to source, is byproduct sulfuric acid.

[3] Rock Products, vol. 60, No. 1, January 1957, pp. 78–79.

TABLE 3.—Defense Minerals Exploration Administration contracts active during 1956

County and contractor	Property	Commodity	Contract		
			Date	Total amount	Government participation, percent
BLAINE					
Silver Star-Queens Mines, Inc.	Queen of the Hills	Lead, zinc	Apr. 25, 1955	$235,780	50
Triumph Mining Co	Triumph	do	Aug. 9, 1954	143,354	50
BONNER					
Whitedelf Mining & Development Co.	Whitedelf	Lead	Oct. 19, 1951	232,950	50
BUTTE					
Ralph M. Taylor et al	Copper mountain	Copper, lead	Oct. 13, 1955	14,250	50
CUSTER					
Highland-Surprise Consolidated Mining Co.	Deer Trail	Lead, zinc	June 17, 1955	[1] 67,840	50
Alfred G. Hoyl & Associates.	The Meadows	Monazite, thorium	Sept. 20, 1956	26,986	75
Idaho Custer Silver-Lead Mines, Inc.	Livingston	Lead, zinc	July 28, 1953	[1] 95,500	50
Salmon River Scheelite Corp.	Tungsten Jim	Tungsten	Apr. 21, 1955	39,040	75
Seagraves Mining Co	Seagraves	Lead, zinc	Oct. 11, 1956	9,960	50
Fred and Earl Shirts	Mountain King	do	Oct. 8, 1954	31,305	50
LEMHI					
Bitterroot Uranium, Inc.	Surprise	Uranium	Sept. 28, 1954	34,175	75
Bradley Mining Co	Ima	Tungsten	Oct. 28, 1952	[1] 224,400	75
Calera Mining Co	Blackbird	Cobalt, copper	Dec. 9, 1953	407,340	70
Idaho Consolidated Mines, Inc.	Twin Peaks	Lead, zinc	Nov. 10, 1955	17,370	50
Idaho Metallurgical Industries, Inc.	Tinkers Pride	Cobalt, copper	Aug. 26, 1955	[1] 345,558	62½
Montana Coal & Iron Co.	Black Pine	Copper	Mar. 25, 1955	125,050	50
Northfield Mines, Inc.	Stevenson	Cobalt, copper	June 2, 1952	233,150	70
Roger Pierce	Gilmore	Lead, zinc	June 29, 1956	82,366	50
SHOSHONE					
Bunker Hill Co	Crescent	Lead, zinc, copper	Feb. 25, 1953	1,098,750	50
Day Mines, Inc.	Hercules	Lead, zinc	Dec. 6, 1956	415,250	50
Hecla Mining Co	Silver Mountain	Lead, zinc, copper	Oct. 21, 1954	1,058,370	50
Polaris Mining Co	Polaris East Exploration.	Copper, lead, antimony, silver.	June 3, 1953	[1] 727,390	50
Sidney Mining Co	Sidney	Lead, zinc	July 3, 1952	523,440	50
Silver Buckle Mining Co.	Vindicator	do	Oct. 12, 1953	229,500	50
Sunset Mines, Inc.	Liberal King	do	Nov. 22, 1954	101,125	50

[1] Amended.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—Sunshine Mining Co., the Nation's only substantial domestic source of antimony in 1956, produced 1.1 million pounds (contained antimony) of electrolytic antimony metal during the year, compared with 1.3 million pounds in 1955 and 1.5 million pounds in 1954. The quantity of material in the company stockpile (3.4 million pounds at the beginning of 1956) declined, however, as a result of large shipments to the reactivated Bradley Mining Co. antimony smelter at Stibnite. The first shipment—a trial lot of 106,000 pounds—was made in October 1955. Subsequently, in June 1956, a contract with Bradley Mining Co. was signed providing for sale of

the accumulated stockpile of cathode metal (approximately 2,000 tons) and shipment of the metal was nearly completed by the end of the year.

Refined antimony from the Bradley smelter was sold to the Government under contract. The success of concurrent Sunshine operations at its own pilot plant designed to eliminate arsenic, the chief impurity in the cathode metal, led to the decision to add a refining furnace, pelletizing equipment, and casting furnace to raise daily capacity to 6,000 pounds. Upon completion of the plant, it was expected that current production could be treated and marketed as Grade B metallic antimony under a Government purchase contract.

Negotiation of a contract to supply refined antimony to the Nation's strategic stockpile was under way during the year. The process involved mixing the cathode metal with flake sodium hydroxide and heating in an electric furnace, followed by water leaching of soluble impurities.

Cathode antimony metal produced by Sunshine was obtained by leaching a high-antimony concentrate, produced from ore from the Sunshine mine and adjoining properties operated by Sunshine on a profit-sharing basis, and subsequent electrolysis of the leach solution. The electrolytic plant, reactivated in April 1953, produced metal containing over 95 percent antimony.

Bradley Mining Co. announced in June that the crushing and concentrating plants at its antimony smelter at Stibnite were to be dismantled and sold. The smelter at the site was reactivated simultaneously to process impure electrolytic antimony metal purchased from Sunshine Mining Co. The facility, which was closed in mid-1952 owing to antimony-marketing conditions, produced a large part of national requirements during the high-demand emergency periods in World War II and the Korean War.

Antimony contained in ores from mines out-of-State as well as within the State was recovered and marketed as antimonial lead at The Bunker Hill Co. smelter at Kellogg.

Cadmium.—The Bunker Hill Co. lead smelter and the company electrolytic zinc plant, both at Kellogg, Shoshone County, recovered byproduct cadmium from domestic and foreign ores. Electrolytic cadmium from the electrolytic zinc plant in 1956 totaled 467,091 pounds compared with 463,356 pounds in 1955, according to the company annual report.

Cobalt.—Resolution of major technical operating problems at the Calera Mining Co. cobalt refinery at Garfield, Utah, permitted substantially increased output from the plant. As a result of the consequent increased requirement for cobalt concentrate, activity at the company Blackbird mine and mill at Cobalt, Lemhi County, was stepped up, and output for the year totaled 2.4 million pounds (cobalt content of concentrate)—a 41-percent increase over 1955. This was well over 60 percent of the total domestic production, ranking Idaho first among the States as a supplier of this strategic metal. The company reported difficulty in obtaining adequate personnel for full-scale operations at the mine during the year.

Successful pilot-plant production of electrolytic cobalt at the Calera Garfield refinery resulted in a decision to proceed with construction of a plant to handle all refinery output. The electrolytic step would replace the final or reduction step of the original process, in which a granular cobalt metal of lower grade was produced. Cost of the new

unit, to be completed late in 1957, was estimated at about $750,000. The Garfield refinery was built for Calera by the Chemical Construction Co. and operated by that company in most of 1954 and 1955, owing to process difficulties encountered. Calera resumed operation of the refinery December 8, 1955.

Articles [4] dealing with mining and milling ore from the Blackbird mine and with processes employed at the Garfield refinery were published during the year.

Copper.—Production records revealed a steadily increasing trend in copper output for Idaho; in 1956 the total of 6,656 tons was over 18 percent above the 1955 level. Copper-cobalt ore extracted from the Calera Mining Co. Blackbird mine, Lemhi County, provided half of the total reported for the State. Substantial tonnages were recovered at the Galena, Sunshine, and Silver Summit silver mines, Shoshone County; byproduct copper also was recovered at several large lead-zinc mines.

A number of small mines and prospects were active during 1956. At the old Empire Copper workings in Custer County, operated by Idaho Alta Metals Corp., production of copper ore during the course of development was reported. A $10,000 blaze interrupted work on the 1,000-level ore body and necessitated replacement of a compressor house and machinery. Lucky Scarlet Uranium Mining & Development Co. of Spokane, Wash., purchased the old Dewey, Delman, and Copper Queen groups of mining claims in Idaho County. Both open-pit and underground operations were planned.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1863–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	172	77	3,462,325	65,196	$2,281,867	12,538,391	$11,347,772
1952	132	29	3,008,230	32,997	1,154,895	14,923,165	13,506,218
1953	114	34	2,090,185	17,630	617,050	14,639,740	13,249,704
1954	101	23	1,960,962	13,245	463,575	15,867,414	14,360,811
1955	109	34	1,960,816	10,572	370,020	13,831,458	12,518,168
1956	104	21	2,071,451	10,029	351,015	13,471,916	12,192,764
1863–1956 [3]	-------	-------	133,101,267	8,251,203	191,931,508	655,911,058	481,598,519

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	1,794	$776,428	84,705	$26,608,511	82,380	$23,086,433	$64,101,011
1952	3,213	1,555,092	73,719	23,737,518	74,317	24,673,244	64,626,967
1953	3,136	1,800,064	74,610	19,547,820	72,153	16,595,190	51,809,828
1954	4,828	2,848,520	69,302	18,988,748	61,528	13,290,048	49,951,702
1955	5,618	4,191,028	64,163	19,120,574	53,314	13,115,244	49,315,034
1956	6,656	5,657,600	64,321	20,196,794	49,561	13,579,714	51,977,887
1863–1956 [3]	140,207	52,891,523	6,710,024	890,512,278	2,016,447	407,914,229	2,024,848,057

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings and old slag re-treated, and ore shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Partly estimated for years before 1901.

[4] Douglas, E. B., Mining and Milling of Cobalt Ore: Min. Eng., vol. 8, No. 3, March 1956, pp. 280–283.
Mitchell, J. S., Pressure Leaching and Reduction at the Garfield Refinery: Min. Eng. vol. 8, No. 11. November 1956, pp. 1093–1095.

TABLE 5.—Gold produced at placer mines, 1947–51 (average) and 1952–56, by classes of mines and methods of recovery

Class and method	Mines producing [1]	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	Average value per cubic yard
Surface placers:					
Gravel mechanically handled:					
Bucketline dredges:					
1947–51 (average)	5	2,517,519	12,706	$444,703	$0.177
1952	3	458,150	2,359	82,565	.180
1953	2	904,000	3,865	135,275	.150
1954	[2] 3	904,300	4,832	169,120	.187
1955	[2] 2	434,000	3,149	110,215	.254
1956	1	319,848	2,125	74,375	.233
Dragline dredges:					
1947–51 (average)	3	363,200	1,639	57,372	.158
1952	6	435,000	1,769	61,915	.142
1953	4	332,000	1,476	51,660	.156
1954	2	289,000	1,308	45,780	.158
1955	4	63,900	285	9,975	.156
1956	2	3,000	52	1,820	.607
Suction dredges:					
1947–51 (average)	2	6,611	38	1,344	.203
1952–56					
Nonfloating washing plants: [3]					
1947–51 (average)	5	273,335	2,237	78,288	.286
1952					
1953	2	16,200	46	1,610	.100
1954	4	26,100	292	10,220	.392
1955	3	21,200	141	4,935	.233
1956	3	25,340	209	7,315	.289
Gravel hydraulically handled:					
1947–51 (average)	7	26,859	163	5,691	.212
1952	5	10,100	101	3,535	.350
1953	9	181,250	425	14,875	.082
1954	7	15,800	193	6,755	.428
1955	13	27,300	283	9,905	.363
1956	7	1,340	98	3,430	2.560
Small-scale hand methods: [4]					
1947–51 (average)	51	13,370	216	7,553	.565
1952	15	2,900	92	3,220	1.110
1953	17	2,800	75	2,625	.937
1954	7	2,900	68	2,380	.820
1955	12	5,550	88	3,080	.555
1956	8	2,450	38	1,330	.543
Underground placers (drift):					
1947–51 (average)	3	857	10	336	.392
1952–56					
Grand total placers:					
1947–51 (average)	76	3,201,751	17,009	595,287	.186
1952	29	906,150	4,321	151,235	.167
1953	34	1,436,250	5,887	206,045	.143
1954	23	1,238,100	6,693	234,255	.189
1955	34	551,950	3,946	138,110	.250
1956	21	351,978	2,522	88,270	.251

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Includes monazite dredge recovering gold as byproduct.
[3] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[4] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Idaho.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Blaine	10		183	$6,405	383,732	$347,297
Boise	1	4	15	525	5	5
Bonner	6		180	6,300	65,517	59,296
Custer	11	1	184	6,440	190,245	172,181
Elmore	5	1	1,392	48,720	8,782	7,947
Gem	1		13	455	143	129
Idaho	3	7	2,440	85,400	507	459
Latah		1	4	140		
Lemhi	15	1	2,767	96,845	142,603	129,063
Shoshone	36	2	2,782	97,370	12,663,214	11,460,848
Undistributed [1]	16	4	69	2,415	17,168	15,539
Total	104	21	10,029	351,015	13,471,916	12,192,764

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Blaine			2,159	$677,926	1,553	$425,522	$1,457,150
Boise							530
Bonner	2	$1,700	74	23,236	9	2,466	92,998
Custer	32	27,200	1,646	516,844	1,203	329,622	1,052,287
Elmore							56,667
Gem							584
Idaho							85,859
Latah							140
Lemhi	3,696	3,141,600	171	53,694	16	4,384	3,425,586
Shoshone	2,889	2,455,650	60,221	18,909,394	46,738	12,806,212	45,729,474
Undistributed [1]	37	31,450	50	15,700	42	11,508	76,612
Total	6,656	5,657,600	64,321	20,196,794	49,561	13,579,714	51,977,887

[1] Includes values and quantities that cannot be shown separately for Ada, Adams, Bannock, Boundary, Butte, Camas, Cassia, Clark, Clearwater, Jerome, Kootenai, Owyhee, and Valley Counties.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	440	995,194	490	4,762	3,108
February	790	1,118,010	539	5,046	3,880
March	380	1,090,358	549	5,846	4,582
April	690	1,246,570	607	6,075	4,177
May	970	1,028,699	556	4,941	4,202
June	920	1,081,075	550	5,309	4,095
July	960	982,054	512	4,546	3,896
August	1,020	1,213,421	625	5,441	3,930
September	970	963,438	624	4,769	3,033
October	872	1,224,287	476	5,810	4,891
November	1,115	1,254,383	547	5,615	4,941
December	902	1,274,427	581	6,161	4,826
Total	10,029	13,471,916	6,656	64,321	49,561

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines[1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Ore:							
Dry gold	10	312	99	105	700		
Dry gold-silver	7	9,634	1,526	40,424		30,000	
Dry silver	12	342,753	1,464	8,787,227	5,081,900	4,828,100	331,600
Total	29	352,699	3,089	8,827,756	5,082,600	4,858,100	331,600
Copper	10	276,561	2,463	7,993	6,933,300	5,400	
Copper-lead [2]	1	(3)	24	133,326	197,800	289,400	
Lead	26	62,836	43	192,361	17,200	5,390,000	239,700
Lead-zinc	29	1,187,344	1,577	4,207,736	779,400	113,145,500	85,952,700
Zinc	1	36		3,508			16,000
Total	67	1,526,777	4,107	4,544,924	7,927,700	118,830,300	86,208,400
Other "lode" material:							
Dry gold:							
Mill cleanings	1		4	1			
Old tailings	2	525	44	106	9,700	300	
Copper: Old tailings	1	3,126	257	1,104	290,300		
Lead-zinc:							
Mill cleanings	5	336	5	2,556	600	87,400	96,300
Old tailings	3	114,840	1	62,796	1,100	1,950,200	870,000
Old slag	1	175		96		16,400	21,600
Zinc:							
Old slag fumed	1	1,199		119		44,600	265,600
Old slag smelted	1	71,774		31,906		2,854,700	11,328,500
Total	15	191,975	311	98,684	301,700	4,953,600	12,582,000
Total "lode" material	104	2,071,451	7,507	13,471,364	13,312,000	128,642,000	99,122,000
Gravel (placer operations)	21	(4)	2,522	552			
Total	125		10,029	13,471,916	13,312,000	128,642,000	99,122,000

[1] Detail will not necessarily add to total, because some mines produce more than 1 class of material.
[2] Includes production from tungsten ore yielding copper-lead concentrates.
[3] Tungsten ore tonnage, 71,742, not included in total.
[4] 351,978 cubic yards.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by types of material processed and methods of recovery, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation	954	566			
Concentration, and smelting of concentrates:					
Ore [1]	5,965	13,317,438	12,713,000	123,237,100	86,505,000
Old tailings	1	62,796	1,100	1,950,200	870,000
Total	5,966	13,380,234	12,714,100	125,187,300	87,375,000
Direct smelting:					
Ore	283	54,681	297,300	451,300	35,000
Old tailings	295	1,205	300,000	300	
Old slag		32,121		2,915,700	11,615,700
Mill cleanings	9	2,557	600	87,400	96,300
Total	587	90,564	597,900	3,454,700	11,747,000
Placer	2,522	552			
Grand total	10,029	13,471,916	13,312,000	128,642,000	99,122,000

[1] Includes production from tungsten ore yielding copper-lead concentrates.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons)	Gold, lode and placer (fine ounces) [1]	Silver, lode and placer (fine ounces) [2]	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
Blaine County:									
Little Wood River and Warm Springs [3]	3	-------	56,833	180	345,233	----------	3,608,300	2,775,300	$1,265,472
Mineral Hill and Camas	7	-------	2,476	3	38,499	----------	709,700	330,700	191,678
Bonner County:									
Clark Fork	2	-------	128	4	7,464	400	85,900	1,000	20,688
Lakeview and Pend Oreille	4	-------	6,991	176	58,053	3,600	62,100	17,000	72,310
Custer County:									
Alder Creek and Alta [3]	5	-------	1,435	31	1,692	30,000	70,700	----------	26,466
Bayhorse	3	-------	46,612	72	187,142	34,000	3,214,300	2,406,000	1,020,610
Yankee Fork	3	1	35	81	1,411	----------	7,000	----------	5,211
Elmore County:									
Black Warrior, Dixie, and Yuba [3]	2	1	17	48	42	----------	----------	----------	1,718
Middle Boise	3	-------	3,907	1,344	8,740	----------	----------	----------	54,949
Gem County: West View	1	-------	21	13	143	----------	----------	----------	584
Idaho County:									
Camp Howard (Salmon River) and Warren [3]	2	[4] 2	78	64	20	----------	----------	----------	2,258
Elk City	1	[4] 4	15	2,370	487	----------	----------	----------	83,391
Ten Mile	-------	1	----------	6	----------	----------	----------	----------	210
Latah County: Hoodoo	-------	1	----------	4	----------	----------	----------	----------	140
Lemhi County:									
Birch Creek, McDevitt, and Yellow Jacket	3	1	601	3	197	20,000	5,700	200	9,704
Blackbird	1	-------	273,704	2,412	6,066	6,656,400	----------	----------	2,918,880
Blue Wing	1	-------	[5]	24	133,326	197,800	289,400	----------	251,008
Eureka	3	-------	5,158	313	1,855	515,200	300	----------	231,641
Eldorado	1	-------	9	4	67	2,200	----------	----------	1,136
Junction and Nicholia [3]	3	-------	260	1	212	----------	21,200	22,100	6,584
Texas	3	-------	84	10	880	400	25,400	9,700	6,633
Shoshone County:									
Beaver	5	-------	21,521	----------	33,118	39,400	1,516,800	2,126,300	576,159
Eagle	-------	1	----------	5	1	----------	----------	----------	176
Evolution	3	-------	252,834	1,096	6,160,630	2,340,400	4,752,200	323,900	7,399,180
Hunter	5	-------	282,390	539	1,100,245	299,200	25,189,000	28,881,900	9,053,295
Lelande	5	-------	67,572	43	125,640	9,000	4,895,300	5,953,800	1,703,274
Placer Center	4	-------	163,729	375	2,796,277	2,702,000	5,554,400	2,248,300	4,872,305
Union	-------	1	----------	1	----------	----------	----------	----------	35
Yreka	14	-------	886,735	723	2,447,303	388,000	78,534,300	53,941,800	22,125,050
Undistributed [6]	17	8	4,306	84	17,173	74,000	100,000	84,000	77,142
Total Idaho	104	21	2,071,451	10,029	13,471,916	13,312,000	128,642,000	99,122,000	51,977,887

[1] Source of gold: 7,507 ounces from lode mines; 2,522 ounces from placers.
[2] Source of silver: 13,471,364 ounces from lode mines; 552 ounces from placers.
[3] Combined to avoid disclosing individual company confidential data.
[4] Includes production from property not classified as a mine.
[5] Tungsten ore yielding copper-lead concentrates.
[6] Includes values and quantities that cannot be shown separately for Boise district, Ada County; Seven Devils district, Adams County; Fort Hall district, Bannock County; Boise Basin, South Fork Payette River and West View districts, Boise County; Port Hill district, Boundary County; Dome district, Butte County; Little Smoky and Carrietown district, Camas County; Black Pine district, Cassia County; Birch Creek district, Clark County; Burnt Creek and Ruby Creek districts, Clearwater County; Snake River district, Jerome County; Wolf Lodge district, Kootenai, County; Carson or French and South Mountain districts, Owyhee County; and Thunder Mountain district, Valley County.

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The Bunker Hill Co. announced that development had been initiated on four silver-copper ore shoots along the Alhambra fault vein in its Crescent mine on Big Creek. The discovery was made during the course of a $1.1 million DMEA project at the property while the Crescent shaft was being deepened. At its lead smelter the company began initial operation of a furnace for treatment of copper matte to produce 97- to 98-percent blister copper.

Gold.—Gold production in the State was the lowest since the earliest mining activities in the middle of the 19th century. A total of 10,029 ounces was recovered in 1956—the sixth consecutive year of declining output. The Calera Mining Co. Blackbird mine (copper-cobalt ore) replaced Clearwater Dredging Co. as Idaho's major producer. Operations at the Boise-Rochester group, Elmore County, by five former employees of Talache Mines, Inc., added to the State total. Most of the remainder of the gold produced in Idaho in 1956 came from placers and as byproduct of ores produced at lead-zinc mines.

At the request of wildlife organizations, which were successful in promoting passage of regulatory dredge legislation, the State checked dredge operations closely. The State Land Board canceled the Clearwater Dredging Co. permit in August because of the operator's failure to maintain reasonable stream clarity. The company, which had operated since 1952 on the Crooked River in Idaho County, announced that the action would be contested. The company planned to challenge the constitutionality of the law on the grounds that it did not establish standards for stream turbidity and was discriminatory by pertaining only to dredges having a daily capacity greater than 500 cubic yards. The Idaho State Land Board granted Idaho Warren Co., Inc., a permit for dredging to recover gold in the Warren area of southern Idaho County; a dragline and washing plant were to be utilized.

Iron Ore.—Production and shipment of a quantity of iron ore by the Inoco Ore Corp. from a deposit near Weiser, Washington County, during the course of development were reported.

Lead.—Lead production was down from its 1950 high of 100,025 tons to 64,321 tons in 1956. Output during the year was about the same level as in 1955. Less metal was recovered from lead-zinc ore extracted from the Bunker Hill and Star mines (The Bunker Hill Co.) in 1956 than in the preceding year. According to The Bunker Hill Co. annual report, the rate of extraction of ore at the Bunker Hill mine again set a new record for tons mined, despite a strike in May that caused a material loss in tonnage for that month. The decrease in metal recovered was due to the mining of lower grade ores. Breakdowns at the Star mine caused the loss of about 1 month of production, with the grade of ore remaining about the same as in 1955. The Bunker Hill and Star mines continued to be the principal sources of lead in Idaho; the Bunker Hill output alone approached half of the State total.

A 5-month strike that paralyzed all mining activity at properties of the "Sixteen Operators" bargaining group ended February 1, 1956, with the majority of workers promptly returning to their former jobs. It was begun August 23, 1955, by members of the International Union of Mine, Mill & Smelter Workers, affected about 850 men, and

was the longest and costliest strike in the history of the district. Most properties resumed limited production quickly. Of the strike-bound mines, the Page recorded a substantial increase and the Frisco decreased somewhat in 1956 (American Smelting & Refining Co. operations). Increases were reported by Day Mines, Inc. (Dayrock, Tamarack, and Hercules mines), and Sidney Mining Co. (Sidney mine). Ore reserves of the Lucky Friday silver-lead mine continued to improve with depth, thus assuring its place as the newest major producer in the Coeur d'Alene district. The operation reported a substantial gain in output above the 1955 level. With continued development, new reserves were anticipated. Lucky Friday ore was custom-milled at the Golconda Lead Mines 200-ton concentrator.

In 1956 Idaho's most prominent lead and zinc producer effected major organizational revisions to facilitate anticipated expansion. The firm's 69-year-old name of Bunker Hill & Sullivan Mining & Concentrating Co. was shortened to The Bunker Hill Co. and company headquarters were transferred to San Francisco. The company acquired full ownership of Northwest Lead Co. of Seattle, having held a controlling interest since 1931. Northwest Lead, producer of sheet lead, lead pipe, alloys, and solder under the Bunker Hill trade name, became the sales and fabrication division of Bunker Hill.

Mercury.—Quicksilver output of 3,394 flasks was more than triple the 1955 total and the highest since 1943, when Bonanza Mines, Inc., produced 4,261 flasks from the Hermes mine in Valley County. Value of production (calculated at an average price for the year at New York of $259.92 per flask) was $882,168. The Hermes mine, renamed the Cinnabar mine and operated by Holly Minerals Corp. after its purchase from United Mercury Mines Corp. in August 1955, was one of the two contributors to the Idaho 1956 total. Operations at the mine were halted on August 19 by a fire, which destroyed ore bins, ore crusher, and the mill building.

By far the greater part of the 1956 total was derived from operations of the Rare Metals Corporation of America at the Idaho-Almaden mine in Washington County. A total of 62,783 tons of ore containing 0.1 percent mercury was taken from 4 shallow open pits and 59,909 tons was fed to the 175-ton-per-day plant. A 5½- by 90-foot Gould rotary furnace was used. The Idaho-Almaden property, active previously in 1939–42 with an output of several thousand flasks, was reopened by the Rare Metals company in September 1955. The deposit was reported to contain approximately 525,000 tons of ore averaging 3.6 pounds of mercury per ton.[5] Four ore bodies were being developed.

Nickel.—Nickel was contained in cobalt concentrate produced at the Calera Mining Co. Blackbird mine, Lemhi County. Output in 1956 was 98,495 pounds of contained nickel—a substantial increase over the 65,782 pounds produced in 1955.

Rare-Earth Metals.—The Porter Bros. Corp. dredging operation in Bear Valley, Valley County, was the only source of columbium (niobium)-tantalum minerals in the State in 1956, as well as the only large producer in the Nation. The company began full-scale operations with 2 dredges early in the year under a contract that provided

[5] Reynolds, John R., Idaho-Almaden Mercury Mine—Mining and Geology: Min. Eng., vol. 8, No. 11, November 1956, pp. 1096–1099.

for purchase by the Government of 1,050,000 pounds of columbium-tantalum pentoxides of 90-percent pentoxide content. The contract was signed in December 1954. Dredge concentrate was trucked to the company plant at Lowman, Boise County, for separation of the various heavy-sand components, and the resulting columbium-tantalum concentrate was shipped to the Mallinckrodt Chemical Co. for processing under terms of the Government contract.

The Baumhoff-Marshall, Inc., and Idaho-Canadian Dredging Co. dredges near Cascade, Valley County, which produced monazite concentrate from 1951 until forced to suspend operations in mid-1955 owing to lack of a market, remained idle throughout the year. The Baumhoff-Marshall separation plant at Boise re-treated the accumulated stockpile of ilmenite concentrate and recovered a quantity of monazite, which was stored pending location of a suitable market. (See Titanium.)

A report was published on the history, location, and uses and outlook for metals from placer concentrations of heavy or "black" sands found in the Northwest, primarily in Idaho.[6]

Silver.—Silver production declined to its lowest level since 1949; output was 3 percent less than in 1955. As in previous years, the bulk of the metal was derived from the Shoshone County operations of the Sunshine Mining Co. (Sunshine mine and adjoining properties), American Smelting & Refining Co. (Galena mine), The Bunker Hill Co. (Bunker Hill mine), and Polaris Mining Co. (Silver Summit mine). The Sunshine operations alone supplied more than a third of the State total.

Of the State's principal silver producers, decreases in output were reported by the Sunshine (silver ore), Bunker Hill (lead-zinc ore), and Silver Summit (silver ore) mines, while the Galena (silver ore) and Lucky Friday (lead-zinc ore) mines showed an increased yield. Shoshone County mines produced 94 percent of the State total. Outside Shoshone County the Triumph lead-zinc mine of Triumph Mining Co. in Blaine County was an important source of silver.

Titanium.—Baumhoff-Marshall, Inc., treated a large portion of its stockpiled ilmenite concentrate at the Boise separation plant. The bulk of the upgraded concentrate was shipped to the National Lead Co., St. Louis, Mo. The ilmenite stockpile, comprising the ilmenite and titaniferous magnetite fraction of dredge concentrate treated by electromagnetic and electrostatic methods to recover monazite, was accumulated during 1951–55 as a result of dredging alluvial heavy-sand deposits in Valley County just south of Cascade. (See Rare-Earth Metals.)

Tungsten.—Output of tungsten ore and concentrate declined 9 percent in quantity and 13 percent in value owing to cessation of purchases for the Government stockpile during a part of the year and to purchases by the Government at reduced prices during the remainder of the year. The Bradley Mining Co. Ima mine, Lemhi County, continued to supply a large part of the State total. The company produced 71,742 tons of crude ore from which were extracted a high-grade huebnerite (manganese tungstate) concentrate, scheelite (calcium tungstate) concentrate, and sulfide concentrate containing

[6] Kauffman, A. J., Jr., and Baber, K. D., Potential of Heavy-Mineral-Bearing Alluvial Deposits in the Pacific Northwest: Bureau of Mines Inf. Circ. 7767, 1956, 36 pp.

gold, silver, copper, and lead. The Cordero Mining Co. Wild Horse mine in Custer County was operated during the year; the mine was opened in 1954, and initial shipments were made in 1955. Other producers during the year were Hells Canyon Tungsten Mines, Inc. (Alaska mine, Adams County), and McRae Tungsten Corp. (Snowbird mine, Valley County). In Custer County activity was evident at the Salmon River Scheelite Corp. Tungsten Jim property. Exploration with DMEA participation was conducted and milling equipment was installed. Production was first reported for the property in 1954. A report on tungsten deposits was published during the year.[7]

Uranium.—Although uranium activities were considerably more limited in Idaho in 1956 than in its sister State, Washington, there still was evidence that the "fever" existed. Prospecting and limited development were reported in Blaine, Boundary, Custer, Idaho, and Lemhi Counties.

Zinc.—Output of zinc was 7 percent (3,753 tons) less than in 1955 and was the lowest since 1939. The Star mine continued to be the largest producer in the State, despite a sizable drop in output from 1955. The Bunker Hill mine ranked second in quantity of zinc produced, displacing old-slag-fuming operations at the Bunker Hill smelter that yielded substantially less zinc, owing in part to a 6-week shutdown to effect extensive renovations. Output from the Page mine increased considerably. Other important contributors were, in order of output, the Sidney, Frisco, Triumph, Clayton, and Morning mines. Among these, the Sidney, Clayton, and Morning operations reported increased output for 1956. Of the principal producers mentioned, all except the Triumph (Blaine County) and Clayton (Custer County) were in Shoshone County.

According to The Bunker Hill Co. annual report, production from the company electrolytic zinc plant at Kellogg again exceeded all previous records. Interruptions due to labor disputes were avoided, and there was no lack of zinc concentrate to process. Maximum production was maintained throughout the year by all four electrolytic-cell units simultaneously, with construction work on the new fifth and sixth units, addition of which was estimated to cost more than $7 million.

NONMETALS

Barite.—The J. R. Simplot Co. continued active during the year at the open-pit Sun Valley barite mine near Hailey, Blaine County. Crude barite was shipped to the company plant at Pocatello for processing and grinding before marketing for use in rotary-drilling fluids. Production of crude and ground barite increased substantially, compared with 1955.

Cement.—Idaho Portland Cement Co. continued to operate its cement plant at Inkom, Bannock County. Production and shipments decreased 7 and 8 percent, respectively, in 1956, compared with the preceding year. The Inkom plant continued to be the only cement-producing plant in the State during 1956. Limestone, the principal raw material, was obtained from the company-operated Inkom quarry.

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[7] Cook, E. F., Tungsten Deposits of South-Central Idaho: Idaho Bureau of Mines and Geology Pamph. 108, June 1956, 40 pp.

Clays.—Output of clays in Idaho decreased sharply compared with 1955. Fire-clay production was recorded from one operation in Latah County, and miscellaneous clay was mined in Ada, Bonneville, and Cassia Counties. E. N. Bennett of Payette reported production of a small quantity of bentonite from the Ben-Jel mine near Oreana, Owyhee County. The material was marketed chiefly for use in sealing potato cellars; a smaller quantity was used in rotary-drilling muds. The operation was active part of the year.

The A. P. Green Co. of Mexico, Mo., during the year purchased the properties of the Troy Firebrick Co. at Troy, Latah County. Reserves of fire clay were developed by the company, and production of firebrick and refractories was to be continued at this plant. The Jensen Brick Co. of Payette, Payette County, reported its pit and plant inactive during 1956.

Construction of a plant in the Moscow area, Latah County, to produce alumina (aluminum oxide) from extensive local clay deposits was in prospect at the close of 1956. The Anaconda Co. announced that small-scale production of alumina—the primary raw material used by aluminum-reduction plants—had been achieved at its test plant at Anaconda, Mont. A pilot plant having a capacity of 50 tons of clay per day to confirm test-plant results was scheduled for construction at Anaconda at a cost of about $1 million. Clay reserves in the vicinity of Moscow were taken under option by the company, a subsidiary of which (Anaconda Aluminum Co.) was operating a new aluminum-reduction plant at Columbia Falls, Mont., using alumina derived from bauxite from southern States and foreign sources.

The J. R. Simplot Co. investigated clay deposits in the Bovill area, Latah County. Test drilling and sampling were conducted to study the quality of these clay deposits as possible sources of raw material for ceramic purposes and as a filler material for use in manufacturing paper.

Clay was the subject of two publications released during the year.[8]

Garnet.—Idaho Garnet Abrasive Co. continued operating its Emerald Creek deposit near Fernwood, Benewah County. Lessened demand for abrasive garnet resulted in a 17-percent production decrease compared with 1955. Output was the lowest since 1950.

Gem Stones.—Gem-material collection was largely the product of numerous hobbyists, vacationers, and individual collectors from out-of-State; such material included stones of the semiprecious variety, suitable for cutting and polishing. Polished and cut stones were used in making costume jewelry and for decorative purposes, such as bookends, carvings, and a wide variety of miscellaneous ornamental purposes. Gem-quality sillimanite having such chatoyancy that it was a very attractive gem material was reported recovered in Nez Perce County. Sillimanite of this quality was in demand because of its relative scarcity.

Gypsum.—The Rock Creek gypsum mine, 20 miles northwest of Weiser, Washington County, was reported inactive during 1956 by

[8] Kelly, H. J., Strandberg, K. G., and Mueller, J. I., Ceramic Industry Development and Raw-Material Resources of Oregon, Washington, Idaho, and Montana: Bureau of Mines Inf. Circ. 7757, 1956, 77 pp.
Hubbard, C. R., Clay Deposits of North Idaho: Idaho Bureau of Mines and Geology, Pamph. 109, July 1956, 36 pp.

Kenneth Steck, owner. Gypsum from the deposit has been used as a fertilizer and soil conditioner.

Mica.—No mica production was reported in Idaho during 1956. The last commercial operation in the State—the Muscovite mine of the Idaho Beryllium & Mica Corp.—was closed in mid-1955 and final shipment was made at that time. Production in recent years was marketed to the Government for stockpiling purposes.

Phosphate Rock.—Output of marketable phosphate rock in Idaho advanced to 1.4 million long tons in 1956—an 8-percent rise over that in 1955. This was the fourth consecutive year in which production of this commodity in the State increased. Larger output reported by the Monsanto Chemical Co. from the Ballard surface mine in Caribou County and initial production from the J. R. Simplot Co. Centennial mine on the Idaho-Montana border (Clark County) were the principal reasons for the advance in production. Phosphate rock sold or used during 1956 totaled 1.2 million long tons. This was an 8-percent increase over the 1.1 million long tons reported sold or used in 1955. The largest single use for phosphate rock mined in the State was for manufacturing elemental phosphorus; smaller quantities were used in making phosphoric acid and triple superphosphate and superphosphate fertilizers.

The Anaconda Co. mined phosphate rock from the Conda mine at Conda, Caribou County. Rock was crushed and beneficiated before shipment to the company fertilizer plant at Anaconda, Mont. During the year the underground No. 3 mine was closed owing to high operating costs. The company also reported temporary shutdown of its strip mine during the second half of 1956. Increased demand for ammonium-type fertilizers in preference to the straight phosphate fertilizers resulted in The Anaconda Co. starting to construct an ammonium phosphate fertilizer plant at Anaconda. This facility was scheduled for completion in 1957. The Conda operations produced at a decreased rate compared with 1955.

The J. R. Simplot Co. operated the Gay mine (an open pit) east of Fort Hall, Bingham County. Production of phosphate rock was used at the company fertilizer plant at Pocatello for manufacturing wet-process phosphoric acid and triple superphosphate and superphosphate fertilizers. Phosphatic shale also produced at this mine was marketed to the Westvaco Mineral Products Division, Food Machinery & Chemical Corp. for processing to elemental phosphorus. Output of phosphate rock and phosphatic shale from the Gay mine remained at substantially the 1955 level. In August, the initial shipment of phosphate rock was made from the J. R. Simplot Co. Centennial Mountain mine. The rock was trucked to a rail siding at Monida, Mont., and shipped to Canadian fertilizer plants.

Monsanto Chemical Co. mined phosphate rock from the Ballard surface mine north of Soda Springs, Caribou County, at a sharply increased rate compared with 1955. Production was used at the company elemental-phosphorus plant at Soda Springs.

Westvaco Mineral Products Division, Food Machinery & Chemical Corp., operated the Fort Hall phosphate mine in Bingham County and the electric-furnace elemental-phosphorus plant at Pocatello. Phosphatic shale mined at the Gay mine (J. R. Simplot Co.) and rock

from the company-operated Fort Hall mine were reduced to elemental phosphorus at the Pocatello plant.

San Francisco Chemical Co. obtained phosphate rock from the Waterloo surface mine east of Montpelier, Bear Lake County. Output, which was sold for use at phosphate fertilizer plants, was at a reduced rate compared with the previous year. J. A. Terteling & Sons mined phosphate rock from a surface mine in Caribou County. Bingham County continued to be the principal producing county due to the large tonnage of phosphatic shale mined at the J. R. Simplot Co. Gay mine. Caribou, Bear Lake, and Clark Counties also reported active operations with an output of marketable phosphate rock.

Potash Company of America carried out experimental and development work at the McIlwee phosphate property near Paris, Bear Lake County. The company reported this as a prospect only; it was closed indefinitely at the year end.

During the year Stauffer Chemical Co. investigated phosphate claims in Bear Lake County. San Francisco Chemical Co. was developing these deposits in cooperation with Stauffer geologists. Estimates of reserves of phosphate rock at the property exceeded 5 million tons. The company operated fertilizer plants at Tacoma, Wash., and Richmond and Vernon, Calif. Central Farmers Fertilizer Co. continued to develop the Georgetown Canyon phosphate property in Bear Lake County. The company announced plans for constructing a $7.5 million phosphate-fertilizer processing plant at Georgetown.

A Bureau of Mines report of investigations published during the year detailed progress in research toward adaptation of a planing machine, such as had been developed for coal mining, to the mining of underground seams of phosphate rock.[9]

Pumice.—Production of 102,000 tons of crude and prepared pumice from 3 operations in Bonneville County was reported for 1956. Pumice, Inc., operated the Katie Lee pit and preparation plant near Ammon; Gemstone Insulation Products Co. mined and prepared pumice from the Albino pit, 8 miles east of Idaho Falls; and Idaho Falls Pumice Co. mined pumice from the Indian Siding pit at Idaho Falls. Production was used chiefly as concrete-aggregate material. The pumice operations of the Idaho Falls Brick & Tile Co., Bonneville County, and Sun-ite Corp., Blaine County, were reported idle during 1956. Development work consisting of stripping the overburden from the Rock Top pumice pit was reported by the Idaho Falls Brick & Tile Co.

Producers reported a good demand for the pumice product during 1956 but also reported that competition from expanded-shale lightweight-aggregate material was increasing.

Sand and Gravel.—A gross output of 7.9 million tons of sand and gravel valued at $5.7 million was reported for 1956; this was a 9-percent decrease in tonnage and a 44-percent increase in total value of sand and gravel produced. In 1956 commercial producers supplied 2.5 million tons valued at $2.4 million, and Government-and-contractor production was 5.4 million tons valued at $3.3 million. In 1955 the yield from commercial operations totaled 1.7 million tons

[9] Howard, T. E., Design and Development of a Pneumatic Vibrating-Blade Planer for Mining Phosphate Rock: Bureau of Mines Rept. of Investigations 5219, 1956, 30 pp.

valued at $1.5 million, and Government-and-contractor production was 6.9 million tons valued at $2.4 million.

TABLE 11.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956			Percent of change in—	
	Short tons	Value	Average	Short tons	Value	Average	Tonnage	Average value
COMMERCIAL OPERATIONS								
Sand and gravel:								
Building	759,977	$905,408	$1.19	640,720	$765,501	$1.19	−16	
Road material	744,018	547,132	.74	1,460,298	1,307,541	.90	+96	+22
Railroad ballast	(1)	(1)		(1)	(1)			
Other [2]	244,900	53,787	.22	423,969	322,925	.76	+73	+500
Total	1,748,895	1,506,327	.86	2,524,987	2,395,967	.95	+44	+10
GOVERNMENT-AND-CONTRACTOR OPERATIONS								
Sand and gravel:								
Building	3,015,026	962,121	.32	1,750,381	164,158	.09	−42	−72
Road Material	3,888,217	1,465,428	.38	3,599,092	3,101,292	.86	−7	+126
Total	6,903,243	2,427,549	.35	5,349,473	3,265,450	.61	−23	+74
ALL OPERATIONS								
Sand and gravel:								
Building	3,775,003	1,867,529	.49	2,391,101	929,659	.39	−37	−20
Road material	4,632,235	2,012,560	.43	5,059,390	4,408,833	.87	+9	+102
Railroad ballast	(1)	(1)		(1)	(1)			
Other [2]	244,900	53,787	.22	423,969	322,925	.76	+73	+500
Grand total	8,652,138	3,933,876	.45	7,874,460	5,661,417	.72	−9	+60

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Includes blast, filter, and ballast sands and sand and gravel used for miscellaneous unspecified purposes.

The 1.6 million-ton drop in the Government-and-contractor production category was due primarily to the decreased use of sand and gravel by the Bureau of Reclamation at the Palisades project, Bonneville County, and by the Idaho Department of Highways. The rise in overall value during 1956, despite a decrease in tonnage produced, was caused by the quality of material contracted for by the Idaho State Department of Highways. There was a large increase in the quantity of prepared sand and gravel and a decrease in the quantity of lower value pit-run material used by this agency.

Sixty-four percent of the 7.9 million tons of sand and gravel produced in 1956 was used for road-building and maintenance purposes, 30 percent for building and construction projects, and the remaining 6 percent for other miscellaneous uses, including railroad ballast and special railroad and construction sands. Production was reported from operations in 36 of the State's 44 counties. Output in Bonneville County ranked the county first in tonnage of sand and gravel produced, with Twin Falls and Bannock Counties in second and third positions.

Del Monte Properties, Inc., acquired the silica deposit and plant of the Gem Silica Co., Emmett, Gem County. Production of special building sand was continued at this facility, but at a reduced level compared with 1955.

Stone.—Output of 1.8 million tons of stone valued at $2.7 million was reported for 1956; this represented increases of 17 percent in tonnage and 47 percent in value compared with the preceding year. A rise in the quantity of crushed stone used for road building and maintenance by the Idaho Department of Highways was the principal reason for the increase.

The output of crushed limestone remained substantially the same as in 1955. Production was recorded from operations of the Idaho Portland Cement Co., Bannock County, and Lewiston Lime Co., Lewis County. Output was used principally in manufacturing cement and at metallurgical works, paper mills, and sugar refineries. A small quantity of crushed limestone was used for agricultural purposes. Quartzite for electric-furnace flux at phosphate-processing plants was produced by Wells Cargo, Inc., Bannock County, and by the Monsanto Chemical Co., Caribou County. Morrison-Knudsen Co., Inc., crushed quartzite for railroad ballast from a quarry near Inkom, Bannock County.

Fifty-nine percent of the 1.8 million tons of stone produced in 1956 was used for road-building and maintenance purposes compared with 51 percent for 1955. Production of stone was reported from 16 of the State's 44 counties.

Sulfuric Acid.—Production of byproduct sulfuric acid was continued during the year by The Bunker Hill Co. at Kellogg. In its 1956 annual report to shareholders, the company reported production of 45,860 tons of salable acid. The acid plant, adjacent to the company electrolytic zinc plant at Kellogg, utilized waste stack gases (SO_2) to make sulfuric acid.

REVIEW BY COUNTIES AND DISTRICTS

Ada.—The sand-separation plant of Baumhoff-Marshall, Inc., at Boise was reactivated during the year to reprocess ilmenite (titanium-iron oxides) concentrate stockpiled at the plant from 1951–55 as a byproduct of monazite (a rare-earth phosphate mineral) production. The plant—which treated concentrate from dredges operating in Valley County—had been closed in mid-1955 owing to loss of the company market for monazite. The upgraded ilmenite concentrate produced in 1956 was shipped to the National Lead Co. in St. Louis, Mo., for use in making titanium products. Monazite recovered during the reprocessing was stockpiled.

Sand and gravel for building and road use was produced by Quinn-Robbins Co., Inc., and Chaussee Swan Gravel Co., both of Boise, and prepared road gravel was processed by Virgil Thompson of Gooding. County crews and one contractor supplied the gravel requirements of the county road department. Clay for use in making building brick and tile was mined by the Pullman Brick Co., Inc., at Boise. Production was above the 1955 level.

Boise District.—Ore containing recoverable gold and silver was shipped to the Midvale, Utah, smelter by R. W. Cox and A. Elmestrom. Joseph F. Kallas, Sr., recovered gold and silver from old tailing.

TABLE 12—Value of mineral production in Idaho, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Ada	$321,049	$333,600	Sand and gravel, clays, gold, silver.
Adams	(1)	70,605	Stone, tungsten, copper, silver, gold.
Bannock	(1)	(1)	Cement, stone, sand and gravel, copper, lead, silver, gold.
Bear Lake	(1)	(1)	Phosphate rock, sand and gravel.
Benewah	(1)	(1)	Garnet, stone.
Bingham	(1)	(1)	Phosphate rock, sand and gravel.
Blaine	(1)	1,823,676	Lead, zinc, silver, sand and gravel, barite, gold.
Boise	6,364	530	Gold, silver.
Bonner	938,779	286,414	Sand and gravel, stone, silver, lead, gold, zinc, copper.
Bonneville	673,178	738,088	Sand and gravel, pumice, stone, clays.
Boundary	73,064	29,416	Sand and gravel, lead, stone, silver, zinc.
Butte	13,689	69,183	Sand and gravel, lead, silver.
Camas	58,348	39,172	Sand and gravel, gold, silver.
Canyon	202,991	254,516	Sand and gravel, stone.
Caribou	(1)	(1)	Phosphate rock, stone, sand and gravel.
Cassia	229,585	142,930	Sand and gravel, clays, silver, zinc.
Clark	(1)	(1)	Phosphate rock, sand and gravel, copper, silver.
Clearwater	(1)	227,760	Stone, sand and gravel, silver, gold.
Custer	(1)	1,348,314	Lead, zinc, silver, sand and gravel, tungsten, copper, gold.
Elmore	213,280	152,111	Sand and gravel, gold, silver.
Franklin	34,940	51,619	Sand and gravel.
Fremont	47,190	274,892	Do.
Gem	73,374	80,427	Sand and gravel, stone, gold, silver.
Gooding	78,803	230,900	Sand and gravel.
Idaho	337,439	970,073	Sand and gravel, stone, gold, silver.
Jefferson	73,773	(1)	Sand and gravel.
Jerome	75,235	75,620	Sand and gravel, gold, silver.
Kootenai	104,037	149,920	Sand and gravel, stone, silver.
Latah	218,389	741,598	Stone, clays, gold.
Lemhi	6,343,967	7,874,962	Cobalt, copper, silver, sand and gravel, gold, nickel, lead, zinc.
Lewis	(1)	(1)	Stone, sand and gravel.
Lincoln	(1)	(1)	Sand and gravel.
Madison	72,000	41,549	Sand and gravel, stone.
Minidoka	34,610	3,332	Do.
Nez Perce	(1)	232,712	Sand and gravel.
Oneida	85,778	----------	Do.
Owyhee	104,118	72,062	Copper, silver, zinc, lead, gold, clays.
Payette	(1)	9,000	Sand and gravel.
Power	26,448	41,117	Do.
Shoshone	44,319,737	45,894,066	Lead, zinc, silver, copper, antimony, gold.
Teton	----------	113,106	Sand and gravel.
Twin Falls	249,973	581,277	Do.
Valley	711,288	560,551	Titanium, mercury, columbium, tantalum, gold, silver.
Washington	145,769	714,742	Mercury, iron ore.
Undistributed [2]	12,646,038	10,948,542	Sand and gravel, stone, gem stones.
Total	68,513,000	75,178,000	

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[2] Includes value of sand and gravel, stone, and gem stones that cannot be assigned to specific counties and value of minerals for counties indicated by footnote 1. (Adjusted to eliminate duplicating the value of stone.)

Adams.—Hells Canyon Tungsten Mines, Inc., shipped a substantial quantity of tungsten concentrate from its Alaska property to the Salt Lake Tungsten Co. plant in Salt Lake City, Utah.

Crushed roadstone contracted for by the Idaho Department of Highways was the only nonmetal commodity produced in the county.

Seven Devils District.—Otto Russell and Melvin Howell shipped copper ore containing some silver and gold from separate operations.

Bannock.—Bannock County ranked second in the State in output value of nonmetal commodities. Cement, stone, and sand and gravel

were produced in the county during the year. In addition, phosphate rock, phosphatic shale, and barite obtained from out-of-county sources were processed by firms within the county. Idaho Portland Cement Co. operated the only cement plant in the State at Inkom. The company mined and processed limestone from the Inkom quarry to meet raw-material requirements of the plant. Morrison-Knudsen Co., Inc., prepared railroad ballast from quartzite quarried near Inkom and from gravel. Wells Cargo, Inc., crushed quartzite for use as electric furnace flux in manufacturing elemental phosphorus. A small quantity of stone for road use was produced at county-operated crushers. Patton & Linton, Inc., produced prepared sand and gravel at a fixed plant at Pocatello. Contractors supplied the State highway department with road gravel, and county road crews dug pit-run gravel for road use. J. R. Simplot Co. manufactured phosphate fertilizers at its Pocatello plant. Phosphate rock was obtained from the company-operated Gay mine in Bingham County. Barite shipped from the J. R. Simplot Co. Sun Valley mine at Hailey, Blaine County, was ground and processed at the Pocatello plant. Westvaco Mineral Products Division, Food Machinery & Chemical Corp., continued operating its elemental phosphorus plant, also at Pocatello.

Fort Hall District.—A substantial quantity of copper ore containing some lead, gold, and silver was shipped from the Kopper King mine by John E. Smith.

Bear Lake.—Phosphate rock continued to be the principal nonmetal commodity produced in the county in 1956. San Francisco Chemical Co. mined phosphate rock from the Waterloo pit east of Montpelier. Production (sold for use in manufacturing phosphate fertilizers) was at a reduced rate compared with 1955. Central Farmers Fertilizer Co. built and operated a phosphate-beneficiation pilot plant at Georgetown and continued to develop the Georgetown Canyon phosphate properties. The company announced plans for constructing a $7.5 million phosphate-rock processing facility and calcium metaphosphate manufacturing plant at Georgetown. Stauffer Chemical Co. was active in developing phosphate properties near Bear Lake. San Francisco Chemical Co. personnel, with the aid of Stauffer geologists, did the testwork. Potash Company of America conducted exploration at the McIlwee phosphate property near Paris. The company reported that work at the project had been terminated at the year end. A quantity of road gravel supplied to the Idaho Department of Highways by W. W. Clyde Construction Co. was the other mineral production in the county.

Benewah.—Idaho Garnet Abrasive Co. produced abrasive garnet from its Emerald Creek deposit at Fernwood. This was the only active garnet producer in the State in 1956. The other recorded mineral output in the county was crushed stone, prepared by the Idaho Department of Highways crews for road maintenance and surfacing.

Bingham.—Output of phosphate rock and sand and gravel during 1956 ranked the county third in the State in value of nonmetals produced and first in tonnage of marketable phosphate rock prepared. J. R. Simplot Co. continued activities at the Gay mine during the year. Phosphate rock and phosphatic shale were mined to supply the requirements of the company phosphate fertilizer plant and the Westvaco

Mineral Products Division, Food Machinery & Chemical Corp., elemental phosphorus plant, respectively. Both plants are at Pocatello, Bannock County. Production from the Gay mine remained at substantially the 1955 level. Westvaco Mineral Products Division mined phosphate rock from the Fort Hall mine for utilization in the manufacture of elemental phosphorus at the company plant. Two contractors supplied road gravel to the Idaho Department of Highways; and the Bureau of Reclamation contracted for production of a small quantity of paving gravel. Contractors furnished the county road department with crushed gravel for road use, and county highway crews dug pit-run road gravel.

Blaine.—Two contractors supplied the Idaho Department of Highways with crushed road gravel, and Aslett Construction Co. contracted to supply road-surfacing gravel to the Bureau of Public Roads. J. R. Simplot Co. mined barite from its Sun Valley mine near Hailey. Crude barite was shipped to the company plant at Pocatello for grinding and processing. The pumice pit and plant of the Sun-ite Corp. at Hailey was reported idle during 1956.

Little Wood River District.—Eugene Glahn reported shipment of lead ore mined from the Scorpion claim during assessment work.

Mineral Hill and Camas District.—Silver Star-Queens Mines, Inc., reported production of 2,348 tons of lead-zinc ore containing 47,529 ounces of silver, 400 tons of lead, and 204 tons of zinc from its property near Bellevue—more than twice the 1955 total. A number of smaller properties also were active in the district. The Anderson Development Corp. shipped silver ore from the Bulldog mine, and lead and zinc ores were shipped by Tom Jackson (Barite Lode mine), George Castle (Edres mine), Charles H. Sheppard (Hillbilly mine), Robert Stefanich (Mogul mine), and Arne Friestad (West Lake group).

Warm Springs District.—Output of lead-zinc ore by the Triumph Mining Co. dropped from 77,400 tons in 1955 to 56,555 in 1956. Gross metal content of ore mined was 3,097 ounces of gold, 373,821 ounces of silver, 3,917,922 pounds of lead, and 3,567,721 pounds of zinc. Ore was processed in the company 300-ton flotation mill. A total of 1,406 feet of drifting, 1,144 feet of crosscut tunneling, 756 feet of slusher drifting, and 1,618 feet of raising was reported. A quantity of silver ore was reported shipped by Gutches & Everman from the Hyndman Peak property.

Boise.—*Boise Basin District.*—F. J. Clement and E. L. Breen shipped a small quantity of gold ore to the Tacoma, Wash., smelter. Placer output of gold and silver was reported by Don A. Morrison (Comeback), Milton E. Sharp (Red Jack), and John Corder.

South Fork of Payette River District.—A few ounces of gold and silver was recovered from a placer by A. W. Josué.

West View District.—John W. Davis recovered some gold from the Bender Creek placer.

Bonner.—Sand and gravel and stone were produced in the county during the year. Two contractors furnished road-surfacing gravel to the Bureau of Public Roads, and railroad ballast gravel was produced by the Spokane International Railroad Co. at an operation near Clagstone. Crushed stone was supplied by contractors for use by the

United States Forest Service. Pacific Northwest Alloys, Inc., reported its quartzite quarry inactive during 1956.

Clark Fork District.—Whitedelf Mining & Development Co. reported output of a little more than 100 tons of ore at the Whitedelf mine and completion of 724 feet of drifting. Lead ore from the mine was treated in the company 50-ton flotation mill, and concentrate was shipped to the Bunker Hill smelter at Kellogg. Full-scale production from the mine was resumed late in the year following completion of an exploration program under a DMEA contract. Production in the preceding 3 years was limited to ore recovered during exploration. Don Haefner worked the Lawrence mine from January to April and recovered a quantity of lead ore. A portion of the Lawrence mine, under lease to Anderson & Helms, also yielded lead ore.

Lakeview District.—Development was continued by Conjecture Mines, Inc., at the Conjecture lead-zinc mine during the year. Rehabilitation and development of the old property was begun in 1951 by Donald Majer and Lyle Funnell. Conjecture Mines, Inc., was organized in 1955 to continue the work. The company reported addition of a new headframe, new hoist, a dry and compressor building, flotation cells, classifier, crusher, and compressor during the year. Also, the diesel-electric power source employed previously was replaced by tapping power from the Washington Water Power Co. 230,000-volt Cabinet Gorge transmission line. Installation of a special 52-ton transformer in the remote region was required.

A lease and operation agreement between Federal Uranium Corp. and Conjecture Mines, Inc., became effective on November 16. Federal Uranium Corp. reportedly was to spend $200,000 to extend the depth of workings on the Conjecture vein 200 feet and to carry out exploratory drifting on the resulting 700 level. Increasing output to 300 tons per day was planned, and the 1½-compartment shaft was to be enlarged to 2 compartments. A flotation mill also was planned if development proved successful.

At the nearby Weber mine, two companies reported output. Austin-Meyer Corp. conducted an open-pit operation on the upper workings of the Weber mine from June to December, and 5,696 tons of silver ore was recovered. The open-pit operation, which was begun in 1949, was reported by company officials to be approaching an economic limit owing to the difficulty of expanding the pit, which was about 150 feet deep. Ore from the mine was shipped directly to the Tacoma (Wash.) smelter because of its high silica content, which had added value as a flux in smelting. New Rainbow Mining Co. was active at the mine from June through September and a small quantity of ore was produced. The company completed 1,079 feet of drifting, 70 feet of diamond drilling, and 25 feet of raises.

Pend Oreille District.—V. Anderson operated the Peak Lode mine for 1 month in the fall and recovered a quantity of silver ore which was treated in a 50-ton mill. Haefner & Schlict produced a small quantity of lead ore from the Little Senator mine.

Bonneville.—As a result of the output of relatively large quantities of low-value gravel for use at the Bureau of Reclamation Palisades project, Bonneville County ranked first in the State in tonnage of sand and gravel produced in 1956. Pumice, stone, and clay were other nonmetals mined in the county during the year. Pickett &

Nelson operated a portable sand and gravel plant at Idaho Falls for preparation of paving and road gravel, and Clark Concrete Construction Corp. prepared sand and gravel for use in manufacturing concrete building products. Contractors supplied the Bureau of Reclamation with gravel for fill, building, and paving purposes at the Palisades project, and six contractors supplied the Idaho Department of Highways with gravel for road surfacing and maintenance. County crews and two contractors supplied the gravel requirements of the county road department.

The Gemstone Insulation Products Co. operated the Albino pumice pit 8 miles east of Idaho Falls, and Pumice, Inc., operated the Katie Lee pit near Ammon. Both companies mined and prepared pumice, which was marketed for use as concrete aggregate. Idaho Falls Pumice Co. reported production of crude pumice, which also was marketed as lightweight aggregate. Idaho Falls Brick & Tile Co. reported development work on the Rock Top pumice pit, but there was no production of pumice from this operation in 1956. The company produced heavy clay products at its Idaho Falls plant. A good demand was reported for the clay products during the year.

Boundary.—Exploratory work on a thorite occurrence near Porthill was carried out by Hall Mountain Thorite Co.

Morrison-Knudson Co., Inc., supplied a small quantity of basalt rubble to the Great Northern Railway Co. from a quarry operation near Bonners Ferry. Contractors supplied road gravel to the United States Army Corps of Engineers.

Port Hill District.—Output of lead ore by Jireh Mining Co. from the Idaho-Continental mine was reported.

Butte.—Sand and gravel, the only nonmetal commodity produced in the county, was supplied to the Idaho Department of Highways by two contractors.

Dome District.—A quantity of lead ore was shipped to the Tooele (Utah) smelter by H. W. Anderson of Arco.

Camas.—The Idaho Department of Highways contracted for its requirements of road-surfacing and maintenance gravel.

Little Smokey and Carrietown District.—The Golden Nugget mine was operated by Golden Nugget Mines & Milling, Inc., and a small quantity of gold-silver ore was produced.

Canyon.—Five commercial operators processed sand and gravel for building and road use in 1956. Contractors supplied the Idaho Department of Highways and the county road department with gravel for road surfacing and maintenance. County crews also dug a quantity of pit-run road gravel.

Caribou.—Caribou County ranked first in the State in 1956 in total value of nonmetals produced. Commodities produced, in order of output value, were phosphate rock, stone, and sand and gravel. Monsanto Chemical Co. mined phosphate rock at the Ballard surface mine for use at the company elemental phosphorus facility at Soda Springs. The company also obtained and crushed quartzite from the Bannock quarry for flux. The Anaconda Co. mined phosphate rock at the Conda mine for shipment to the company fertilizer plant at Anaconda, Mont. The No. 3 underground mine at the Conda operation was closed during the year, and a temporary shutdown of the surface pit also was reported. J. A. Terteling & Sons also mined

phosphate rock in the county during the year. Production of marketable phosphate rock in the county increased over the 1955 level.

Marion J. Hess, Fife Construction Co., and Wangsgaard Construction Co. supplied the Idaho Department of Highways with gravel for road surfacing and maintenance.

Cassia.—Sand and gravel output was reported from three commercial operations during 1956. Bishop Sand & Gravel Co. (Rupert) and Long Sand & Gravel Co. and Zemke Sand & Gravel Co. (both of Burley) produced sand and gravel for building, paving, and road uses. In addition, two contractors furnished gravel to the Idaho Department of Highways, and crews of the Burley highway district produced prepared and pit-run road gravel. Murtaugh highway district crews dug a quantity of pit-run gravel for road use. Burley Brick & Sand Co., Inc., mined clays for use in manufacturing heavy clay products at the Burley plant. Production from this operation was reduced from the level of the previous year.

Black Pine District.—Zinc ore was produced by Black Pine Mining Co.

Clark.—Phosphate rock and sand and gravel were the nonmetal commodities produced in the county. Initial output was recorded in August from the J. R. Simplot Co. Centennial mine in the Centennial Mountains on the Idaho-Montana border. The rock was trucked to a rail siding at Monida, Mont., for shipment to Canadian fertilizer plants. Idaho Department of Highways crews and county highway crews processed gravel for paving and road use.

Birch Creek District.—Don Louderbough shipped silver ore containing recoverable silver and copper from the Valley View property.

Clearwater.—The Idaho Department of Highways contracted for its crushed-stone requirements for road surfacing and maintenance from Wangsgaard Construction Co.; Goodfellow Bros., Inc., supplied the Bureau of Public Roads with road-surfacing gravel.

Burnt Creek District.—The Grub Stake mine was worked by C. E. Fread, and a quantity of silver ore was produced.

Ruby Creek District.—John M. Walker operated the open-pit Noah Lode mine from July 20 to September 28 and produced a small quantity of silver ore.

Custer.—Cordero Mining Co. reported output of 28 tons of tungsten concentrate averaging 71 percent WO_3 from the Wild Horse mine. About 34 tons of concentrate was sold to the Government for stockpiling.

A. D. Stanley, Boise, supplied road gravel to the Bureau of Public Roads under contract.

Alder Creek District.—Shipment of copper ore from the old Empire mine to the Combined Metals Reduction Co. Bauer mill in Utah was begun late in October by Idaho Alta Metals Corp., which purchased the mine in 1955. The company reported completing 1,700 feet of drifting, 110 feet of raises, 200 feet of diamond drilling, and 18,921 cu. ft. of stoping during the year. About 15 men were employed at the property. Installation of a 100-ton-per-day mill reportedly was planned. Development work was delayed earlier in the year by fire, which destroyed a compressor house and machinery. Small quantities of ore were shipped from the Blue Jay copper mine by

Charles B. Kane, and gold and lead ores were shipped by L. A. Owing and Elmer Enderlin, respectively.

Alta District.—Ivan I. Taylor shipped lead ore to the Midvale (Utah), smelter from the Phi Kappa lease.

Bayhorse District.—Clayton Silver Mines operated its Clayton mine throughout the year and produced 39,901 tons of ore, from which was obtained 2,384 tons of lead concentrate and 2,044 tons of zinc concentrate containing a total of 66 ounces of gold, 183,284 ounces of silver, 39,105 pounds of copper, 3,127,039 pounds of lead, and 2,489,016 pounds of zinc. Development work during the year totaled: Drifting, 359 feet; raises, 51 feet; and crosscuts, 556 feet. According to the company annual report, the 100-ton flotation mill ran at capacity 7 days a week. Also, the report stated that the ore reserve at the end of the year was estimated at 120,120 tons—an increase of 43 percent over the reserve at the end of 1955.

The partnership of Buchman, Breckon, & Norden reported that the Red Bird mine was operated intermittently by a lessee. Crude ore mined totaled 699 tons and development work consisted of 50 feet of raising. Floods in the early summer damaged roads and the plant and caused interruption of operations. J. F. Young operated the Young copper mine and recovered a small quantity of ore.

East Fork District.—The Sunshine Mining Co. annual report stated that an exploratory project at the Deer Trail mine under a DMEA contract and in cooperation with the Highland-Surprise Consolidated Mining Co. was abandoned late in the year. According to the report, extensive surface diamond drilling and bulldozing (together with underground drifting, crosscutting, and diamond drilling) failed to develop a large enough tonnage of ore to justify the high expense of building a permanent camp and constructing a mill. All equipment was removed, and the property was returned to the owners late in the year. The exploration project was begun in August of 1955.

Yankee Fork District.—Three lode mines and 1 placer mine were active during the year. Lead ore was shipped from the McFadden mine by Charles H. Heisen, and gold-silver ore was shipped from the Yankee Park mine by Estes Gold Mines, Inc. A. W. McGown sluiced and panned stream gravel from May 23 to September 7 and recovered a considerable quantity of gold and silver.

Elmore.—Sand and gravel was the only nonmetal commodity produced in the county. Wilson & Dodge processed sand and gravel for building, paving, and road uses at a fixed plant near Mountain Home. Wesley Shockley reported production of special sands for railroad use from an operation at Glenns Ferry. The Idaho Department of Highways contracted for its gravel requirements, and three contractors supplied the Mountain Home highway district with road gravel.

Black Warrior District.—J. Q. Wakeman recovered some gold and silver by amalgamation at the Boise River mine.

Dixie District.—Index-Daley Mines Co. shipped a small quantity of gold ore to the Midvale (Utah) smelter.

Middle Boise District.—Operations at the Talache Mines, Inc., Boise-Rochester group continued to be about the same as in 1955. A total of 3,813 tons of ore was produced. Gold-silver concentrate

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was shipped to the Tacoma smelter, and gold and silver recovered by amalgamation were sold to the San Francisco mint. D. T. Seaton recovered gold and silver by amalgamation at the Golden Stringer mine between March 1 and August 1. Gold ore was produced at the Hazel Queen mine by John Rippen.

Yuba District.—A. Christensen reported recovering a small quantity of gold from a placer operation.

Franklin.—Pit-run sand and gravel for road and fill purposes was produced by Charles O. Ainscough & Sons from a pit near Preston. The Idaho Department of Highways contracted for road materials, and Franklin County Highway Department crews and contractors processed gravel for road-building and maintenance purposes.

Fremont.—One commercial operator reported producing a small quantity of sand and gravel for building purposes. The Idaho Department of Highways and the Bureau of Public Roads contracted for their requirements of road-building and maintenance gravel.

Gem.—Gravel for structural and road uses was produced by City Transfer, Emmett, and road gravel was prepared by State highway department crews and contractors for highway maintenance. Del Monte Properties, Inc., mined and processed silica sand from a deposit formerly operated by the Gem Silica Co. Special building sand was produced from this operation at a reduced rate compared with 1955.

West View District.—Don Elmquist shipped gold-silver ore from the Golden Sun mine.

Gooding.—Titus, Inc., processed sand and gravel to road and building materials at a fixed plant near Tuttle, and Gooding highway district crews produced pit-run gravel for county road use.

Idaho.—Production of sand and gravel was reported by five commercial operations in the county. Output that ranked the county fourth in the State in tonnage of sand and gravel produced in 1956 was utilized chiefly for paving and road use. Contractors supplied the road-gravel and crushed-stone requirements of the Idaho Department of Highways. J. F. Konen Construction Co. crushed basalt for roadstone at a quarry near Cottonwood.

Camp Howard (Salmon River) District.—A small quantity of gold was produced by R. E. Walling. The Lyons Bar placer was worked by Glenn Worle, and some gold and silver were recovered. Chris Martin recovered a small quantity of gold while prospecting.

Elk City District.—The Clearwater Dredging Co. activity on Crooked River continued during the year. A bucketline dredge, which had sixty-four 2-cubic-foot buckets, was operated from April 12 to December 4 and processed 319,848 cubic yards of gravel. The dredging permit of the company was revoked by the Idaho Land Board early in August. The action of the board reportedly was based upon the claim that the dredging company had failed to maintain a reasonable clarity downstream from its dredge. The company—contending that the law was unconstitutional because it did not establish standards of stream turbidity and because it was discriminatory in applying only to dredges handling more than 500 cubic yards of material per day—refused to recognize cancellation of the permit by the Idaho Land Board and appealed the case to the Idaho State Supreme Court.

Other placering also was reported. Lester J. Strack worked the Crooked River and Blue Moon placers from October to November with a dragline and nonfloating washing plant. Donald E. Behrens worked the Gold Point placer June 1 to November 1, using a dragline excavator and nonfloating washing plant; about 12,000 cubic yards of gravel was processed. The Johnson placer was operated by Clair Johnson during the course of assessment work, and Verel C. and Nora A. Ross sold gold and silver recovered during operations in 1955 at the Ross placer. W. J. Meyer used a long tom and pan intermittently from June to November and recovered a quantity of gold and silver while prospecting a number of placers. Walter Haldi and Alphie Claunch sold gold from the Haystack lode mine.

Ten Mile District.—The Silver Spur placer was operated from April to October by Frank Windmaiser.

Warren District.—Gold and silver recovered in 1955 at the Ole placer by Robert Newcomb and sold in 1956 were credited to State totals. A small quantity of gold ore from the Rescue mine was treated by amalgamation by Gem Mines, Inc.

Jefferson.—Carl E. Nelson Construction Co. produced a small quantity of road gravel for utilization by the Idaho Department of Highways, and pit-run road gravel was dug by State highway crews.

Jerome.—Contractors mined and processed road gravel to supply the Idaho Department of Highways and the county highway district. County highway district crews also produced prepared and pit-run gravel for road use.

Snake River District.—Gold was recovered from the Hard Luck and the Sunnyside placers by Dwight S. Brooks and R. E. Sherwood, respectively.

Kootenai.—Three companies mined and processed sand and gravel for structural, paving, and road uses, and the Chicago, Milwaukee, St. Paul, & Pacific Railroad Co. produced a quantity of railroad-ballast gravel. Idaho Department of Highways crews crushed basalt for road building and maintenance. County highway crews processed sand and gravel for road and construction work, and the United States Forest Service contracted for a supply of road gravel for forest access roads.

Wolf Lodge District.—Silver was shipped to The Bunker Hill Co. smelter at Kellogg from the Idaho Goldfields property by Arlie Airhart and Clyde Napier.

Latah.—Potlatch Forests, Inc., contracted production of crushed stone for forest access roads and three contractors crushed basalt to supply road-surfacing materials used by the Idaho Department of Highways. The A. P. Green Co. (formerly Troy Firebrick Co.) mined fire clay from an open pit near Helmer. Output, which was utilized in manufacturing refractories, was less than in 1955.

Latah County clays were intensively investigated during 1956. During the year The Anaconda Co. announced successful laboratory-scale recovery of alumina from high-alumina clays. A test plant was being constructed at Anaconda, Mont., to confirm, on a large-scale production basis, the laboratory process for producing alumina from clay. The company reportedly took large reserves of clay under option in the Moscow area in the event that the process proves to be commercially feasible. J. R. Simplot Co. extensively test-drilled and

sampled clay deposits in the Bovill area to determine if they were usable as a source of raw materials for ceramic purposes and as a filler in the manufacture of paper. A detailed review of Latah County clays was presented in a publication.[10] Aluminum-bearing clay reserves were estimated at a minimum of 250 million to a possible 500 million tons.

Hoodoo District.—Assessment work on the Adam Luntz placer on Poorman Creek by Clyde Thornall yielded a small quantity of gold.

Lemhi.—A small quantity of gravel was produced from 1 commercial operation, and 2 contractors crushed gravel to be utilized by the Idaho Department of Highways for paving and road purposes. Monroe Phippen reported development of a bentonite deposit near Salmon.

Birch Creek District.—Lead ore was extracted from the Worthing mine by S. S. Eldridge.

Blackbird District.—The Calera Mining Co. Blackbird mine was operated throughout the year and continued to be the leading domestic source of cobalt in the Nation, as well as a principal source of copper and gold in the State. Output from the mine, in a remote area south and west of Salmon, was 273,704 tons of ore, which was treated in the company 1,000-ton flotation mill; the resulting copper concentrate was shipped to the Tacoma (Wash.) smelter, and cobalt concentrate was shipped to the Calera refinery at Garfield, Utah. The company reported completing 89 feet of shaftwork, 5,418 feet of drifting, 20,482 feet of diamond drilling, and 20,674 feet of raises. Difficult ground conditions in the mine presented a major mining problem, in that it was necessary to modify the mining method used according to the particular local condition encountered. Both timbered and open stopes were employed in conjunction with a cut-and-fill mining method, using sand tailing pumped from the mill as fill.

Blue Wing District.—The Bradley Mining Co. Ima mine near Patterson continued to be the principal producer of tungsten in the State and one of the leading domestic sources. The company also produced a substantial quantity of sulfide concentrate containing recoverable gold, silver, copper, and lead. A total of 71,742 tons of ore, averaging 0.62 percent WO_3, was mined during the year—a substantial increase over the 63,400 tons produced in 1955. Output of high-grade hübnerite concentrate (71 percent WO_3) totaled 476 tons; and 437 tons was shipped, primarily to the Government stockpile. Scheelite-concentrate production was 29 tons, and 25 tons averaging 20 percent WO_3 was shipped to the Salt Lake Tungsten Co., Salt Lake City, Utah. Sulfide concentrate totaling 2,420 tons was shipped to the Selby (Calif.) smelter. A 150-ton flotation-gravity mill was used; however, facilities for re-treatment of tailing, added to mill equipment in 1955, were not operated in 1956.

Eureka District.—Mel Parks and Gunderson & Mays loaded and shipped a considerable quantity of old copper tailing from the Pope Shenon mine. Old tailing from the mine also was shipped by Hugh B. Hublinger. The Grandview mine was worked by Rulon Young. Ore containing recoverable gold, silver, and copper was shipped.

[10] Work cited in footnote 8.

Eldorado District.—Don Smith and partners worked the Hungry Hill mine for a few days during the summer and shipped 1 truckload of copper ore.

Junction District.—Lead ore was extracted from the Brown Bear mine by Frank Proul.

McDevitt District.—Copper ore was produced by Big Four Mines & Trust Association and by Robertson & Steeples at the Big Four and Grandview mines, respectively.

Nicholia District.—Joe E. Zook produced 5 tons of lead ore from the Nicholia mine between July and November, and Edward Anderson shipped old slag containing recoverable silver, lead, and zinc from the Nicholia smelter dump.

Texas District.—Lead-zinc ore was shipped from the Hill Top and Rainbow mines by Rosebud Mining Co. and Joe E. Zook, respectively. The United Idaho mine was operated by Roger Pierce, and 1 truckload of lead ore was shipped.

Yellow Jacket District.—The Yellow Jacket placer claim was worked by Herb S. Steen, and a small quantity of gold was recovered.

Lewis.—Limestone and sand and gravel were the only mineral commodities produced in the county. Lewiston Lime Co. quarried and crushed limestone, which was used chiefly by paper plants, sugar refineries, and metallurgical works. Crews of the Perry highway district processed gravel for road use.

Lincoln.—Gravel (the only mineral commodity produced in the county during 1956) was prepared by C. C. Metts of Gooding for paving and road purposes. A. D. Stanley Construction Co. contracted to supply the Idaho Department of Highways with gravel for road surfacing and maintenance.

Madison.—George Garner & Sons, Rexburg, produced sand and gravel for road use, and contractors supplied road gravel to the Idaho Department of Highways and the Madison County Highway Department. County highway crews operated crushers to supply stone for constructing and maintaining county roads.

Minidoka.—The only mineral production in the county reported during 1956 was a small quantity of gravel and crushed basalt utilized by the Bureau of Reclamation at its Minidoka project.

Nez Perce.—A report published during the year described mineral deposits in the county and emphasized the possible importance of its large reserves of industrial minerals.[11]

Asphalt & Paving Co. of Lewiston produced gravel for road use, and Dunclick, Inc., also of Lewiston, processed sand and gravel for building and road materials. Hugh P. Terteling produced special high-quality sand for plaster, masonry, blast, and filter purposes from an operation near Genesee. Installation of a rod mill for use in preparing glass and foundry sands was planned. Two contractors supplied crushed road gravel for the Idaho Department of Highways.

Owyhee.—E. N. Bennett of Payette reported producing a small quantity of bentonite from the Ben-Jel mine near Oreana. Quinn-Robbins Co., Inc., contracted to supply the road gravel requirements of the Idaho Department of Highways in the area during 1956.

[11] Hubbard, Charles R., Geology and Mineral Resources of Nez Perce County: Idaho Bureau of Mines and Geology, County Rept. 1, August 1956, 17 pp.

Carson or French District.—A small quantity of gold and silver was recovered by Florida Mountain Joint Venture from the Ontario placer. The Blue Gravel placer was worked from April to October by Charles Andrus and Bob Lawrence.

South Mountain District.—Copper-lead-zinc concentrate was produced and shipped from the South Mountain property by South Mountain Mining & Concentrating Co.

Payette.—Sand and gravel was prepared by the Logsdon Sand & Gravel Co. for building and construction uses, and the Idaho Department of Highways contracted for road gravel. The Jensen Brick Co., Payette, reported its pit and clay plant idle during the year.

Power.—A quantity of sand and gravel for building purposes was the only mineral commodity reported produced in the county during 1956.

Shoshone.—The value of metals produced in the county remained about the same as in the preceding 3 years, with gold, copper, and lead making nominal increases and silver and zinc declining somewhat. Mining in the county accounted for over 60 percent of the total value of minerals produced in the State, and the county continued to be a leading domestic source of lead, zinc, silver, and antimony. In 1956 The Bunker Hill Co. was the district's largest producer, with nearly half of the total tonnage of ore mined. Three companies (The Bunker Hill Co.—Bunker Hill and Star mines; American Smelting & Refining Co.—Page, Morning, Frisco, and Galena mines; and Sunshine Mining Co.—Sunshine, Polaris, Silver Dollar, Silver Syndicate, and Sunshine Consolidated properties) furnished about 83 percent of the district ore production. Significant tonnages also were produced from the Dayrock, Silver Summit, Sidney, and Lucky Friday mines.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in the Coeur d'Alene region, Shoshone County, 1947–51 (average), 1952–56, and total 1884–1956, in terms of recoverable metals

Year	Mines producing		Material sold or treated (short tons)	Gold, lode and placer (fine ounces)	Silver, lode and placer (fine ounces)
	Lode	Placer			
1947–51 (average)	62	3	2,668,329	2,942	11,535,066
1952	58	2	2,327,536	2,476	13,752,081
1953	43	------	1,788,426	2,376	13,636,680
1954	37	------	1,630,250	2,047	14,898,699
1955	41	------	1,637,121	1,777	12,984,323
1956	36	2	1,674,781	2,782	12,663,214
1884–1956	------	------	(1)	419,232	55,7,897,750

Year	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1947–51 (average)	1,528	79,013	79,703	58,342,129
1952	1,862	67,330	70,316	58,459,368
1953	2,100	69,885	68,650	47,729,814
1954	2,566	64,812	58,736	45,515,124
1955	2,637	59,820	50,527	44,036,867
1956	2,889	60,221	46,738	45,729,474
1884–1956	85,059	6,249,201	1,890,347	1,656,106,674

[1] Complete data not available; 1904–56, 99,630,902 short tons.

A strike of members of the International Union of Mine, Mill & Smelter Workers, which began on August 24, 1955, and seriously affected the 1955 production totals, continued until early February. This strike halted output from the mines and mills of the 16-operator bargaining group, and about 850 workers were idled. The strike was settled when a new contract was accepted that called for substantial wage increases, more liberal vacation provisions, a seventh paid holiday, strengthened union security, weekly paydays, improved and broadened health and welfare benefits, and recognition of union stewards. The wage increases (which were retroactive to July 1, 1955) ranged from $13.67 to $14.58 per 8-hour shift at the bottom of the grading system and $17.03 to $18.18 at the top. Provision also was made for upgrading the positions of a number of classes of miners and plant workers. The 2,500 employees of The Bunker Hill Co. were covered under a 3-year contract signed in November. Provisions of the contract were similar to the agreement reached earlier by the 16-operator group, with the addition of a provision for a combined life insurance and savings plan paid for jointly by employees and the company.

One of the newer innovations in mining techniques was introduced into the Coeur d'Alene mining area by the American Smelting & Refining Co. at the Galena mine.[12] Ground supports, consisting of arch or ring sets of U-shaped rolled-steel segments heavily flanged to resist torsion and designed to nest into one another at points of overlap where they are clamped together with heavy U-bolts, were installed in the main haulageway on the 3,000 level of the mine. The design of the supports permits yielding under heavy pressures, relieving the load without damaging the supports.

The Bunker Hill Co. lead smelter and electrolytic zinc plant west of Kellogg continued to process material from domestic and foreign sources. According to the company annual report, records for the lead smelter were broken for the second consecutive year in both lead production and sales. Production of lead from the smelter for the year totaled 101,714 tons, and sales were 96,391 tons of lead, 17,500 tons of zinc in fume, 103,461 pounds of cadmium, 4,932,098 ounces of silver, 317 tons of antimony, 729 tons of copper, and 7,520 ounces of gold. A slight decline in the sales of zinc in fume was attributed to a 6-week shutdown of the slag-fuming plant to effect extensive renovations.

Many improvements in equipment were effected during the year, and a new straight-line ingot-casting machine and a copper-enrichment furnace were placed in operation. Ingot-casting capacity was increased from 3 tons to 15 tons per man-shift by installation of the new casting machine. Production of 97- to 98-percent blister copper was made possible with the copper-matte enrichment furnace.

At the Bunker Hill electrolytic zinc plant, production again exceeded all past records, according to the company report. Maximum production from four electrolytic-cell units was maintained without serious interruption, and construction work was continued on the new fifth and sixth electrolytic units. Output totaled 57,799 tons of high-grade zinc and 467,091 pounds of cadmium, and sales totaled 51,432

[12] Inland Empire Miner, Dec. 25, 1956.

tons of zinc and 434,094 pounds of cadmium. The sulfuric acid plant operated at about 50 percent of capacity throughout the year. Nearly 46,000 tons of salable acid was produced.

Beaver District.—Five Day Mines, Inc., properties were operated for varying periods by lessees during the year. Ore was taken from the Mountain Goat, Silver Tip, Sitting Bull, Sunset Lease, and Tuscumbia workings. The bulk of the material was derived from Korsage-Smith subleases on the Silver Tip mine and Sunset Lease, from Kennedy & Zanetti lease operations on the Mountain Goat property, and from the Zanetti Bros. sublease on the Sunset deposit. Ore was processed at the Rex mill and at the Golconda Lead Mines mill. The Sunset Lease (70 percent owned by Day Mines, Inc.) yielded 5,829 tons of milling ore averaging 1.5 ounces silver per ton, 3.2 percent lead, and 4.5 percent zinc, according to the annual company report.

Eagle District.—Gordon Hess worked the Kleppinger Fraction placer claim for 2 months and recovered a small quantity of gold and silver.

Evolution District.—Output from the Sunshine Mining Co. Sunshine mine and adjoining properties (operated by Sunshine on a profit-sharing basis) dropped for the second consecutive year. Ore mined and milled totaled 200,028 tons with an average grade of 26.30 ounces of silver per ton and 1.29 percent lead, according to the company annual report. Output from the several areas was: Sunshine, 28,583 tons; Omega, 80,850 tons; Rambo, 22,690 tons; Rotbart, 47,331 tons; Suncon, 18,820 tons; and Yankee Girl, 1,484 tons. The estimated ore reserve of the company was reported to have declined by 120,000 tons to a total of 439,000 tons. About 80,000 tons of new ore was developed as compared with 200,000 tons mined. Development for the year totaled 190 feet of shaft work, 6,256 feet of drifting, 3,104 feet of raises, and 1,018 feet of crosscuts. An average of 331 underground shifts daily was worked in 1956 as compared with 383 in 1955.

The company 1,200-ton flotation mill operated 250 days and produced 5,715 tons of lead-silver concentrate, 3,195 tons of copper-silver-antimony concentrate, and 156 tons of silver-pyrite concentrate. The total of metals contained in concentrates was 4,996,044 pounds of lead, 1,909,254 pounds of copper, and 5,127,617 ounces of silver.

With minor exceptions, all departments operated on a 5-day work schedule during the year.

The company entered into an agreement with Bradley Mining Co. in June for the sale of an accumulated stockpile of electrolytic antimony metal. By the end of the year, 3,519,031 pounds of the metal containing 3,343,079 pounds of antimony had been shipped to the Bradley smelter at Stibnite.

Polaris Mining Co., which owned and mined the Silver Summit property and, with a 59-percent interest, operated the New Purim area (participating in income and costs with Silver Dollar Mining Co.), reported treating 50,806 tons of silver ore in its 300-ton plant. The company completed 4,231 feet of drifting, 11,851 feet of diamond drilling, 1,270 feet of raises, and 582 feet of crosscuts. The company also owned a one-half and one-third interest, respectively, in the Omega and Rotbart areas operated by Sunshine Mining Co. In its annual

report for 1956, the Polaris concern reported that the reserve in the Silver Summit and New Purim areas was 26,996 tons assaying 34.28 ounces of silver and 0.81 percent copper. Production was 45,336 tons assaying 20.71 ounces of silver and 0.49 percent copper.

The Polaris company continued work on its East Exploration Project during the year. The project, consisting of a lateral driven from the Silver Summit shaft eastward through adjoining properties under a profit-sharing agreement, was being financed with DMEA assistance. The main heading of the project was advanced 2,173 feet during the year, and areas north and south of the lateral were explored, with a total of 8,210 feet of diamond drilling.

Concentrate produced by Zanetti Bros. from lead-zinc old tailing from the DeBlock tailing deposit was received at the Bunker Hill smelter; the material contained substantial quantities of silver, lead, and zinc, as well as some gold and copper.

Hunter District.—Output from The Bunker Hill Co. Star mine declined somewhat in 1956, owing to a series of breakdowns during the summer. About 1 month of production was lost. A total of 189,821 tons of ore from the mine was milled; gross metal content of the ore was 14,172,000 pounds of lead, 26,648,000 pounds of zinc, and 207,017 ounces of silver. The mine reserve declined from 1,476,340 tons at the end of 1955 to 1,372,684 tons at the end of 1956, according to the company annual report. The company reported completion of 2,813 feet of drifting, 4,107 feet of diamond drilling, 2,352 feet of raises, and 805 feet of crosscuts. A cut-and-fill mining method was used.

Golconda Lead Mines produced 4,400 tons of ore from the Golconda mine and completed 375 feet of raising and 320 feet of drilling, as well as major timber repairs to the main adit tunnel and a new connection to the main ventilation raise, according to the company annual report. The mine and mill were closed until early February by the strike of the International Union of Mine, Mill & Smelter Workers. The company reported that high labor and supply costs reduced the profitable ore reserve to a minimum and that future mining operations would be on a severely curtailed basis. The Golconda mill treated 54,000 tons of custom ores during its 10½-month operating period, with the bulk of the ore treated coming from the Lucky Friday mine. Ore from the company Golconda mine yielded 255 tons of lead concentrate and 347 tons of zinc concentrate containing a total of 5 ounces of gold 13,153 ounces of silver, 2,646 pounds of copper, 369,377 pounds of lead, and 410,859 pounds of zinc.

Lucky Friday Silver Lead Mines Co. reported that 41,457 tons of ore from the Lucky Friday mine was milled in the Golconda mill during the year; 5,125 tons of lead concentrate and 496 tons of zinc concentrate with a gross metal content of 400 ounces of gold, 722,246 ounces of silver, 180,818 pounds of copper, 7,005,934 pounds of lead, and 1,262,006 pounds of zinc were produced. Exploration at the mine, one of the newer and more successful developments in the county, totaled 288 feet of shaft work, 1,180 feet of drifting, 315 feet of tunneling, 839 feet of diamond drilling and 687 feet of raises. A shaft-deepening project was begun at the mine in the latter part of the year using a Cryderman shaft mucker, a recent development in sinking equipment. It was planned to extend the shaft to the 3,000 level.

American Smelting & Refining Co. milled 45,946 tons of ore from its Morning mine in the 1,250-ton flotation mill on the property. The company reported completing 587 feet of drifting, 94 feet of raises, and 75 feet of crosscuts. Prospects for future activity at the old mine, the lower levels of which were closed late in 1953 owing to declining lead-zinc prices, increased costs, and decreasing ore reserve, received a boost late in the year when a new ore strike was made on the Noonday vein on the 1,250 level. The Morning mine was reported as employing 150 men and yielding 200–250 tons of ore per day from the upper levels. Work in the mine was confined to salvage operations following the cessation of large-scale production in 1953. A substantial quantity of lead-zinc old tailing was recovered from a creek bed by Chester Uhl and milled at the Golconda mill.

Lelande District.—The American Smelting & Refining Co. Frisco mine, closed in January by the strike that affected operations at a number of the district's producers, was operated the remaining 11 months of the year and yielded 42,253 tons of ore, which was treated at the Morning mill. An announcement by the company late in the year stated that the mine would be closed indefinitely on December 31 owing to increasing mining costs and lower prices for lead and zinc. The company reported a total of 661 feet of drifting and 53 feet of crosscutting during the year.

Operations at the Frisco mine dated back to 1884, when it was located as the Helena-Frisco mine. The property had been operated continuously since 1942 by the American Smelting & Refining Co. or its subsidiary, Federal Mining & Smelting Co. The 80 employees working at the mine were to be moved to other plants of the company in the district. Company officials reported that the principal ore body on the Frisco vein was smaller on each successive lower operating level.

The Hull lease on the Frisco mine also was operated 11 months of the year. A total of 6,603 tons of ore was produced.

Ore was produced from the Day Mines, Inc., Hercules and Sherman properties. Ore from the Hercules mine was treated at the Burke 300-ton flotation mill. The company reported completing 406 feet of drifts, 312 feet of diamond drilling, and 1,078 feet of raises. According to the company annual report, Hercules mine development and stope preparation continued through 1956, and a new DMEA contract was approved late in the year to sink a winze from the west 1,600 level and open a new 1,900 level on the Rambler vein. Work on the project was to begin in 1957.

Heidt & Siers, lessees, were active at the company Sherman mine. Work was confined to cleaning up pillars and old workings. The company stated in its annual report that "A small tonnage produced by a lessee from the Sherman mine finished all expected mining at this once rich property." The Benton Mine Syndicate shipped a small quantity of crude ore from the Benton mine during the summer.

Placer Center District.—American Smelting & Refining Co. operated the Galena mine from February through December; 87,925 tons of ore was milled. Exploration and development work done in the mine comprised drifting, 372 feet; crosscutting, 582 feet; raises, 1,101 feet; winze sinking, 168 feet; and diamond drilling, 1,994 feet. The Galena mine leased from Vulcan Silver Lead Co. by American Smelting & Refining Co. (75-percent interest) and Day Mines, Inc. (25-percent

interest), produced at approximate mill capacity through the last 3 quarters of 1956. Output was chiefly silver-copper ore, although a small tonnage of lead-silver ore from development work was milled separately.

During 1956 the Callahan shaft was deepened to the 2,400 level and connected to the Silver vein workings at 2,200 and 2,400 levels. A hoistroom was excavated, and hoisting facilities for the new service shaft were to be installed early in 1957. A winze to explore the Silver vein from the 3,400 to the 4,000 levels also was begun in 1957. The company previously had invested considerable time and money in enlarging the old main Galena shaft from the collar to the 1,000 level and deepening it an additional 2,000 feet to reach deep-seated ore bodies that were proved to exist beneath old workings in which the ore had pinched out at a depth of about 1,600 feet. Ore production from the new development was begun in 1955.

Day Mines, Inc., operated its Dayrock mine 11 months of the year. A modified cut-and-fill method of mining, with sand filling of stopes, was employed. The company reported completing 1,315 feet of drifts and 783 feet of raises. Ore was treated in the company 250-ton flotation plant. The company reported that Dayrock-mine development included an extension of the 500-level Freeman vein and completion of the 1,100 drift on the Ohio vein. A new vein (probably the California) was partly developed on the 1,100 level. Late in 1956 preparations were made for deepening the Dayrock shaft for a new 1,250 level. The Day Mines Tamarack mine was active from February 6 to December 31. The company reported that the Tamarack mine, operated mainly by leasing, produced 26,837 of zinc-lead-silver milling ore, which was milled in the company-operated concentrator. Development included 103 feet of drifts and 396 feet of raises.

Union District.—A small quantity of gold was recovered from old tailing on Pritchard Creek by Emil Bowen.

Yreka District.—The rate of extraction of ore from the Bunker Hill mine again set a new record for tons mined, even though a strike in May caused a material loss in tonnage for that month, according to The Bunker Hill Co. annual report. The report also stated that metal production was lower than in 1955, due to mining of lower grade ores. A total of 531,334 tons of ore from the mine was milled, and metals recovered were: Lead, 31,555 tons; zinc, 10,686 tons; and silver, 2,028,535 ounces. The ore reserve at the end of 1956, as shown in the company report, was 3,103,126 tons, the highest at any time in the preceding 10 years. Ore was milled in the Bunker Hill 2,500-ton flotation mill. Exploration and development during the year totaled 14,135 feet of drifting, 1,265 feet of raises, and 4,452 feet of diamond drilling.

At the company Crescent mine, a DMEA contract was completed. The company annual report stated that development work produced 2,411 tons of ore, from which 18,051 ounces of silver was recovered. A raise from the 3,200- to the 2,400-foot level was started to develop a series of ore shoots encountered near the east end of the Alhambra fault.

The large John George leasing operation in the old upper workings of the Bunker Hill mine was purchased on March 13 by Frank N.

Marr and rehabilitation of the undergound workings and the mill was undertaken. About 25 men were employed.

Production during 11 months of operation at the American Smelting & Refining Co. Page mine was 109,586 tons of ore. Ore was milled in the company 500-ton flotation plant. The company completed 190 feet of shaftwork, 1,351 feet of drifts, 1,144 feet of raises, and 896 feet of crosscuts and employed one of the new Cryderman shaft muckers to deepen the main shaft.

Sidney Mining Co. reported production of 38,847 tons of ore from the Sidney mine. The company completed 1,897 feet of drifting, 3,686 feet of diamond drilling, and 142 feet of raises. The gross metal content of ore produced was 83,710 ounces of silver, 3,783,697 pounds of lead, and 7,846,605 pounds of zinc.

Lead-zinc ore from the Liberal King mine, operated by Sunset Mines, Inc., and leasers, was treated in the company 100-ton flotation mill. Completion of 2,867 feet of diamond drilling was reported, and a total of 6,436 tons of ore was milled.

Jim Doyle sold concentrate obtained during the course of cleanup operations at the Highland-Surprise, Douglas, Constitution, Amy Matchless, and Sidney mills. The Highland-Surprise mine was not operated during the year. Nabob Silver-Lead Co. produced lead and zinc concentrates from development ore extracted during winze-sinking operations at the Nabob mine. The work was being done under a DMEA contract.

Teton.—Sand and gravel, dug and processed for road materials, was the only mineral commodity produced in the county during 1956. Contractors supplied road, paving, and surfacing materials to the Idaho Department of Highways and the Bureau of Public Roads. A small quantity of pit-run sand and gravel for road use was dug by the State highway crews.

Twin Falls.—Production of 781,000 tons of sand and gravel enabled the county to rank second in the State in output of this commodity during 1956. Six commercial operations processed sand and gravel for building and road purposes, and Niesen & Smith Construction Co. under contract, supplied the road-gravel requirements of the Idaho Department of Highways. The Twin Falls highway district contracted for a supply of road gravel, and district highway crews dug pit-run gravel for utilization on county roads. Buhl and Filer highway district crews also produced road gravel. The principal commercial sand and gravel producers in the county during the year were Idaho Rock, Inc., and Twin Falls Construction Co., both of Twin Falls; McCarty Gravel Co., Kimberly; and Sumner Sand & Gravel Co., Buhl.

Valley.—Porter Bros. Corp. began dredging in Bear Valley on the upper reaches of the Salmon River early in the year. Columbium-tantalum concentrate was produced. Mercury output at the old Hermes mine, renamed the Cinnabar mine, was continued by Holly Minerals. A fire in the surface plant in August halted all operations for the remainder of the year. The company reported that ore blocked out in the mine contained an estimated 5,000 flasks of mercury.

Bradley Mining Co. reactivated its antimony smelter at Stibnite to upgrade for sale to the Government stockpile about 2,000 tons of electrolytic antimony metal purchased from Sunshine Mining Co.

Arsenic was the chief impurity to be removed. The crushing and concentrating units of the smelter were to be dismantled and sold. McRae Tungsten Corp. extracted 1,704 tons of tungsten ore averaging 0.65 percent WO_3 from the Snowbird mine. High-grade concentrate was shipped to the Government stockpile, and low-grade concentrate was shipped to Salt Lake Tungsten Co.

Thunder Mountain District.—Mill cleanup work by Jack Kittock yielded a few ounces of gold.

Washington.—Rare Metals Corporation of America completed its first full year of operation at the Idaho-Almaden open-pit mine near Weiser—the largest of two mercury producers in the State. The company estimated that ore blocked out contained over 1.7 million pounds of mercury. Inoco Ore Corp. shipped a quantity of iron ore from workings on Iron Mountain near Weiser.

The Rock Creek gypsum mine, 20 miles northwest of Weiser, was reported inactive during 1956. In previous years gypsum had been mined from the deposit for use as fertilizer and soil conditioner.

The Mineral Industry of Illinois

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, U. S. Department of the Interior, and the Illinois State Geological Survey.

By Matthew G. Sikich [1]

MINERAL output in Illinois in 1956 was valued at $572 million—an increase of over 7 percent above 1955. The principal factors were greater consumption of coal, chiefly by electric-power utilities, and greater demand for sand and gravel and stone for the accelerated highway program and other heavy-construction activities. Marked increases in total values of production over 1955 were reported for coal, fluorspar, natural-gas liquids, petroleum, sand and gravel, stone, and zinc. Other commodities produced in 1956 increased in values of output, except lead, silver, and elemental sulfur.

Mineral fuels continued to be the major commodity group, constituting over three-fourths of the total value of mineral production in the State in 1956. Nonmetals as a group supplied one-fifth of the total value, and metals furnished the remainder.

TABLE 1.—Mineral production in Illinois, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement:				
Portland ---376-pound barrels	8,654,735	$22,886,351	8,629,432	$24,866,396
Masonry ---do	742,363	2,145,170	671,757	2,397,398
Clays	2,338,579	3,978,972	2,257,875	4,005,440
Coal [2]	45,932,114	167,937,815	48,102,041	184,677,877
Fluorspar	166,337	7,838,471	178,254	8,469,450
Lead (recoverable content of ores, etc.)	4,544	1,354,112	3,832	1,203,248
Lime	644,181	9,416,136	(3)	(3)
Natural gas ---million cubic feet	8,033	1,036,000	6,177	933,000
Peat	(3)	(3)	14,451	157,573
Petroleum (crude) ---thousand 42-gallon barrels	81,423	236,940,000	82,346	241,274,000
Sand and gravel [4]	26,362,360	28,138,973	31,238,583	33,254,379
Silver (recoverable content of ores, etc.) troy ounces	3,075	2,783	1,580	1,430
Stone	28,865,724	35,621,394	31,854,984	40,859,248
Zinc (recoverable content of ores, etc.)	21,700	5,338,200	24,039	6,586,686
Value of items that cannot be disclosed: Natural-gas liquids, elemental sulfur, tripoli, and values indicated by footnote 3	----	[5] 12,666,081	----	26,047,811
Total Illinois [6]	----	[5] 533,062,000	----	572,321,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Exclusive of mines producing less than 1,000 net tons.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Includes friable sandstone.
[5] Revised figure.
[6] Total has been adjusted to eliminate duplicating value of clays and stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

Many ores contain valuable minor constituents, such as cadmium, gallium, and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to the mine of origin. These minor constituents are recovered at plants frequently treating mixtures of materials from many sources, including residues from the refining of such metals as zinc, lead, etc. In many such instances distribution of mineral products by States of origin is impossible, and an accurate separation as to domestic and foreign sources may be difficult to obtain. The valuable byproduct sulfuric acid usually cannot be separated as to source.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Illinois, continuing as one of the major coal-producing States, ranked fourth in the Nation. Approximately 48.1 million tons of bituminous coal valued at nearly $185 million, was produced in the State in 1956; quantity increased 5 percent and value, 10 percent over 1955. Average mine value per ton in 1956 was $3.84 compared with $3.66 the previous year. The principal market outlets for Illinois coal were industrial plants and electric-power utilities. A substantial quantity was sold for local consumption. Sales to railroads continued to decline.

Output was reported from 175 mines in 36 counties. The major producing counties, in order of decreasing tonnage, were Williamson, Christian, Fulton, Perry, Franklin, St. Clair, and Saline. The following companies reported producing over 1 million tons of coal in Illinois: Bell & Zoller Coal Co., Carmac Coal Co., Chicago, Wilmington & Franklin Coal Co., Fairview Collieries Corp., Freeman Coal Mining Corp., Midland Electric Coal Corp., Old Ben Coal Corp., Peabody Coal Co., Perry Coal Co., Sahara Coal Co., Inc., Southwestern Illinois Coal Corp., Stonefort Corp., Truax-Traer Coal Co., Union Colliery Co., and The United Electric Coal Cos. The Peabody No. 10 underground mine in Christian County was the leading producing bituminous-coal mine in the United States in 1956.

Approximately 59 percent of the total production came from underground mines and the remainder from strip pits—about the same percentage breakdown as in 1955. Coal was crushed and/or treated at 86 mines in 1956. About 86 percent of the State output was mechanically cleaned at 61 plants.

Peat.—Production of peat in Illinois increased to 14,451 net tons valued at $157,573. Output was reported by three producers in Cook, Lake, and Tazewell Counties. All peat produced in the State in 1956 was used as a soil conditioner.

Petroleum, Natural Gas, and Natural-Gas Liquids.—Crude-petroleum output in Illinois increased slightly in both quantity and value over 1955, chiefly because of secondary recovery practices. Waterflooding and hydraulic-fracture treatment had been important factors in reversing the downward trend of oil output in 1953 and later helped to sustain production. At the end of 1956 approximately 31,000 oil wells were producing in the State.[2]

[2] Illinois Department of Mines and Minerals, Division of Oil and Gas, Seventy-fifth Coal Report: 1956, p. 10.

TABLE 2.—Bituminous coal production, value, and number of mines operated in 1956, by counties

(Exclusive of mines producing less than 1,000 net tons)

County	Production (net tons)			Value		Number of mines operated		
	Underground	Strip	Total	Average per ton	Total	Underground	Strip	Total
Bureau		765,398	765,398	$4.24	$3,245,288		1	1
Christian	5,725,068		5,725,068	3.42	19,575,794	2		2
Clinton	162,591		162,591	3.92	637,705	3		3
Douglas	386,915		386,915	4.33	1,677,170	1		1
Franklin	4,745,077		4,745,077	4.26	20,208,174	4		4
Fulton	66,425	5,296,651	5,363,076	3.86	20,720,321	6	13	19
Gallatin	109,960	116,587	226,547	2.98	675,250	4	9	13
Greene		5,108	5,108	5.09	26,019		1	1
Grundy		217,991	217,991	4.86	1,058,879		1	1
Hancock		28,691	28,691	6.36	182,490		1	1
Henry	88,852		88,852	4.50	399,653	3		3
Jackson	663,521	591,803	1,255,324	3.61	4,529,949	3	4	7
Jefferson	2,654,179		2,654,179	4.08	10,831,249	1		1
Johnson		(1)	(1)	(1)	(1)		1	1
Kankakee		621,087	621,087	4.86	3,017,026		1	1
Knox		(1)	(1)	(1)	(1)		4	4
La Salle		(1)	(1)	(1)	(1)		2	2
Livingston		2,595	2,595	8.76	22,735		1	1
Logan	13,602		13,602	6.61	89,969	1		1
Macoupin	327,965		327,965	3.92	1,285,582	3		3
Madison	1,075,843		1,075,843	3.86	4,149,416	4		4
Marion	9,050		9,050	3.72	33,653	1		1
Menard	14,715		14,715	6.26	92,187	3		3
Montgomery	1,678,543		1,678,543	4.26	7,143,862	1		1
Peoria	32,024	393,054	425,078	4.30	1,829,829	7	5	12
Perry	1,166,613	3,694,565	4,861,178	3.62	17,621,732	3	5	8
Randolph	933,601	114,735	1,048,336	3.67	3,848,062	3	2	5
St. Clair	2,355,126	1,616,025	3,971,151	3.39	13,469,188	6	3	9
Saline	1,948,213	1,081,694	3,029,907	3.75	11,347,675	4	9	13
Sangamon	109,205		109,205	3.20	349,312	2		2
Schuyler	12,281	7,574	19,855	5.49	109,103	2	2	4
Tazewell	3,100		3,100	5.07	15,717	1		1
Vermilion	65,184	929,709	994,893	4.24	4,220,121	4	2	6
Washington	25,315		25,315	4.73	119,796	2		2
Will		155,154	155,154	5.50	853,534		1	1
Williamson	4,053,737	2,377,223	6,430,960	3.86	24,821,723	20	17	37
Undistributed		1,659,692	1,659,692	3.90	6,469,714			
Total	28,426,705	19,675,336	48,102,041	3.84	184,677,877	[2] 92	[2] 83	[2] 175

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Total has been adjusted to eliminate duplicating mine count for operations extending into 2 counties.

Production of natural gas in the State decreased 23 percent in quantity and 10 percent in value below 1955. Output of natural-gas liquids in Illinois increased 7 percent in quantity and 29 percent in value over the preceding year.

NONMETALS

Cement.—The total value of shipments of portland and masonry cements from Illinois plants increased 9 percent over 1955, although the total quantity decreased slightly below the preceding year. Four cement plants were operated in the northern part of the State, in La Salle and Lee Counties.

The total annual finished-cement capacity for the State was approximately 9.1 million barrels. Nearly 207 million kw.-hrs. of electrical energy were used; approximately 86 percent of the power was generated by the cement companies, and the remainder was purchased. The cement companies quarried and used about 2.5 million tons of limestone in producing portland cement in Illinois.

Clays.—Total quantity of clays produced in 1956 decreased about 3 percent below 1955, whereas the total value increased slightly over that in the previous year. Fire-clay output was reported by 12 producers in Brown, Greene, Grundy, La Salle, McDonough, Madison, and Rock Island Counties. Material was used for refractory purposes, stoneware, and heavy clay products.

Miscellaneous clay was produced in 24 Illinois counties in 1956 and used principally for manufacturing brick and other heavy clay products. Smaller quantities were used for manufacturing cement, lightweight aggregate, art pottery, and oil and grease absorbent.

TABLE 3.—Finished portland cement produced and shipped, 1947–51 (average) and 1952–56

Year	Active plants	Production (barrels)	Shipments from mills		
			Barrels	Value	
				Total	Average per barrel
1947–51 (average)	4	7,866,760	7,788,202	$16,367,816	$2.10
1952	4	8,514,443	8,710,621	20,600,347	2.36
1953	4	8,869,342	8,651,385	21,961,761	2.54
1954	4	8,841,848	9,109,076	23,147,871	2.54
1955	4	8,809,655	8,654,735	22,886,351	2.64
1956	4	8,822,611	8,629,432	24,866,396	2.88

TABLE 4.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds

Year	Fire clay		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	414,412	$1,313,350	1,980,440	$1,840,748	[1] 2,411,809	[1] $3,337,754
1952	450,444	1,544,668	1,886,299	2,324,583	2,336,743	3,869,251
1953	367,385	1,473,859	1,937,817	3,099,142	2,305,202	4,573,001
1954	313,679	675,407	1,713,413	2,807,043	2,027,092	3,482,450
1955	363,385	747,660	1,975,194	3,231,312	2,338,579	3,978,972
1956	440,981	869,627	1,816,894	3,135,813	2,257,875	4,005,440

[1] Includes 16,957 tons of fuller's earth valued at $183,656.

Fluorspar.—Illinois led the Nation in producing fluorspar, furnishing 54 percent of the total domestic output. Illinois output in 1956 increased 7 percent in quantity and 8 percent in total value over 1955. The increase was attributed partly to the purchases of Metallurgical-grade fluorspar by the General Services Administration for the Government stockpile. Approximately 8 percent of Illinois production was sold to the Government. Consumption of fluorspar in the United States reached an alltime high in 1956. The increased demand was met by rising domestic production and imports. The Government imported Acid-grade fluorspar under contracts bartering surplus agricultural commodities for it. Mexico furnished 65 percent of the total imports (485,600 tons) in 1956. In July the Congress authorized the Government to begin purchasing 250,000 short tons of newly mined domestic Acid-grade fluorspar at a base price of

TABLE 5.—Fluorspar shipped from mines, 1947–51 (average) and 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1947–51 (average)	163,910	$6,499,620	$39.65	1954	107,830	$5,989,219	$55.54
1952	188,293	9,481,223	50.35	1955	166,337	7,838,471	47.12
1953	163,303	8,567,026	52.46	1956	178,254	8,469,450	47.51

$53.00 per short ton, with bonuses and penalties for the silica content. However, the program was not developed in time to affect State fluorspar output for 1956.

Nearly 49 percent of fluorspar shipped from Illinois was used by the aluminum and chemical industries to manufacture hydrofluoric acid. Approximately 15 percent of the output was for steel and foundry use. The glass and enamel industries consumed 13 percent of the total production. The remainder of the output supplied miscellaneous uses, including sales to the Government. Nearly 60 percent of State fluorspar shipments in 1956 were classified as Acid grade and almost 25 percent as Metallurgical; Ceramic grade supplied the remainder. The value of Acid grade in 1956 averaged $54.40 compared with $58.75 in 1955; Metallurgical grade, $33.50 (1956) and $29.10 (1955); and Ceramic grade, $43.28 (1956) and $42.72 (1955).

Leading producers in the State in 1956 were Aluminum Company of America, Mackey-Humm Mining Co., Minerva Oil Co., and Ozark-Mahoning Co. The entire output of finished fluorspar in Illinois in 1956 was credited to Hardin County, although some crude material was mined in Pope County.

One DMEA contract for exploration for fluorspar in Pope County was in effect during the early part of 1956. Work had begun on the contract in July 1955 and was ended in February 1956. The Government share of the actual cost of the project was approximately $7,000.

Lime.—Six lime plants were operated in Illinois in 1956 in Adams, Cook, and St. Clair Counties. The total output of quick and hydrated lime decreased slightly in quantity below 1955. The total value, however, was greater in 1956 than in the preceding year, reflecting the rise in operating costs. New labor contracts granting wage increases were signed in 1956. Output was used for building, refractory, chemical, and industrial purposes. Producers were Aluminum Company of America, Marblehead Lime Co., Menke Stone & Lime Co., and Standard Lime & Cement Co.

Perlite.—Perlite-processing plants were operated in Champaign, Cook, Lake, and Will Counties in 1956. Sales of expanded perlite totaled 22,400 tons valued at $1,209,000—an increase of 35 percent in quantity and 27 percent in total value over 1955. Crude material processed at the plants was mined in Arizona, Colorado, and New Mexico. The expanded product was employed chiefly as a lightweight aggregate in plaster and concrete, for filter purposes, and other uses.

Sand and Gravel.—Illinois ranked third in the Nation in quantity of sand and gravel produced in 1956. The total output was approximately 31.2 million tons valued at over $33 million—an increase of

TABLE 6.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Class of operation and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:[1]						
Glass	1,155,359	$2,670,748	$2.31	1,316,721	$3,175,237	$2.41
Molding	853,110	1,922,344	2.25	1,030,859	2,583,222	2.51
Building	6,590,497	5,360,272	.81	8,224,086	6,553,423	.80
Paving	1,962,809	1,477,777	.75	2,664,363	2,080,129	.78
Grinding and polishing	135,388	338,470	2.50	154,271	401,054	2.60
Blast	228,754	1,191,556	5.21	210,562	1,221,375	5.80
Fire or furnace	6,005	14,412	2.40	7,620	23,413	3.07
Engine	82,299	100,693	1.22	86,347	114,584	1.33
Filter	15,399	11,303	.73	24,790	22,584	.91
Railroad ballast	95,641	68,982	.72	63,548	43,332	.68
Ground	265,984	2,441,256	9.18	264,960	2,611,054	9.85
Other	484,835	1,148,230	2.37	496,876	1,366,086	2.75
Total	11,876,080	16,746,043	1.41	14,545,003	20,195,493	1.39
Gravel:						
Building	5,766,453	4,994,533	.87	7,721,934	6,711,023	.87
Paving	6,118,534	4,765,494	.78	6,249,004	4,673,035	.75
Railroad ballast	644,432	449,069	.70	616,909	404,977	.66
Other	364,433	220,036	.60	513,190	531,488	1.04
Total	12,893,852	10,429,132	.81	15,101,037	12,320,523	.82
Total sand and gravel	24,769,932	27,175,175	1.10	29,646,040	32,516,016	1.10
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	950	328	.35	1,112	278	.25
Paving	159,685	100,991	.63	161,354	57,417	.36
Total	160,635	101,319	.63	162,466	57,695	.36
Gravel:						
Building	63,862	19,918	.31	79,455	29,015	.37
Paving	1,367,931	842,561	.62	1,350,622	651,653	.48
Total	1,431,793	862,479	.60	1,430,077	680,668	.48
Total sand and gravel	1,592,428	963,798	.61	1,592,543	738,363	.46
ALL OPERATIONS						
Sand	12,036,715	16,847,362	1.40	14,707,469	20,253,188	1.38
Gravel	14,325,645	11,291,611	.79	16,531,114	13,001,191	.79
Grand total	26,362,360	28,138,973	1.07	31,238,583	33,254,379	1.06

[1] Includes friable sandstone.

18 percent in both quantity and value over 1955. The increase was due chiefly to the rise in building and road construction. Production was reported from 69 counties in the State. Counties from which over 1 million tons were produced in 1956 were Kane, La Salle, McHenry, Peoria, Will, and Winnebago.

Nearly 85 percent of the quantity produced in the State in 1956 was for building and paving uses. Substantial quantities were employed in manufacturing glass, for molding purposes, grinding and polishing, sandblasting, engine use, and railroad ballast.

Approximately 95 percent of the total output was produced at commercial operations and the remaining 5 percent at Government-and-contractor operations. Nearly 61 percent of the shipments to

consumers was by truck and 26 percent by rail; water transportation supplied the remaining 13 percent.

Major producers of sand and gravel in Illinois in 1956 were: Chicago Gravel Co., Consumers Co., Material Service Corp., and Wedron Silica Co., all of Chicago; Elmhurst-Chicago Stone Co., Elmhurst; McGrath Sand & Gravel Co., Lincoln; Ottawa Silica Co. and Standard Silica Co., both of Ottawa; Rowe Construction Co., Bloomington; and Wyanet Sand & Gravel, Wyanet.

Stone.—The total production of stone in Illinois in 1956 was nearly 32 million tons valued at $41 million—an increase of 10 percent in quantity and 15 percent in value over 1955. The chief reason for the marked rise in output was the increased consumption of crushed limestone for concrete aggregate and roadstone as a result of the great activity in building and road construction in the State. Substantial increases were also recorded in producing crushed limestone for agricultural purposes and railroad ballast. Stone production in the State consisted almost entirely of limestone, however, a small quantity of sandstone was produced in Alexander County for refractory purposes.

Nearly 99 percent of the stone produced in Illinois came from commercial sources; the remainder, from Government-and-contractor operations. Output of crushed and broken limestone was recorded from 58 counties in the State in 1956. Major producing counties

TABLE 7.—Limestone sold or used by producers in 1955–56, by uses [1]

Use	1955			1956		
	Quantity	Value		Quantity	Value	
		Total	Average per unit of measure		Total	Average per unit of measure
Dimension:						
Rubble, short tons	914	$4,883	$5.34	2,018	$9,770	$4.84
Rough architectural [2] cubic feet	8,371	3,532	.42	3,937	2,889	.73
Dressed (cut), do	2,700	6,800	2.52	2,224	5,670	2.55
Curbing and flagging, do	18,401	12,427	.68	7,180	5,351	.75
Total dimension equivalent short tons [3]	3,419	27,642	8.08	3,152	23,680	7.51
Crushed and broken:						
Riprap, short tons	173,098	214,306	1.24	153,007	197,810	1.29
Flux, do	298,675	531,206	1.78	280,500	496,724	1.77
Refractory, do	18,900	24,570	1.30	(4)	(4)	(4)
Concrete aggregate and roadstone, short tons	20,825,065	26,711,592	1.28	23,175,590	30,709,970	1.33
Railroad ballast, do	839,866	987,725	1.18	982,979	1,258,465	1.28
Agriculture, do	2,600,215	3,341,049	1.28	3,094,594	4,014,372	1.30
Other uses, do	4,105,892	3,769,218	.92	[4] 4,164,415	[4] 4,150,757	[4] 1.00
Total crushed and broken short tons	28,861,711	35,579,666	1.23	31,851,085	40,828,098	1.28
Grand total, do	28,865,130	35,607,308	1.23	31,854,237	40,851,778	1.28

[1] Includes both commercial and Government-and-contractor production.
[2] Figures for rough construction and rough architectural uses are combined and shown under "Rough architectural" in order to avoid disclosing individual company confidential data.
[3] Average weight of 170 pounds per cubic foot used to convert cubic feet to short tons.
[4] Figures for refractory (1956) are combined with "Other uses" to avoid disclosing individual company confidential data.

were Cook, La Salle, St. Clair, and Will. About 73 percent of the total limestone output was used for concrete aggregate and roadstone. Almost 10 percent was used for agricultural purposes. Substantial quantities were used for railroad ballast, riprap, flux, cement and lime, and other purposes. Dimension limestone was produced in Kane, Kankakee, McHenry, Madison, Monroe, St. Clair, and Williamson Counties in 1956.

The principal producers of limestone in the State were: Allied Chemical & Dye Corp., Columbia Quarry Co., Consumers Co., Dolese & Shepard Co., East St. Louis Stone Co., Lehigh Stone Co., Lincoln Stone Co., Marquette Cement Manufacturing Co., Material Service Corp., and Mississippi Lime Co. The only producer of sandstone in Illinois was Western Fire Brick Co.

Sulfur.—Elemental sulfur was recovered by the Pure Oil Co. as a byproduct at its Lemont Refinery in Cook County.

Tripoli.—Tripoli (amorphous silica) was mined by two companies in northern Alexander County. Production of crude and prepared material was about the same as in 1955. Output was used chiefly for abrasive and filler.

Vermiculite.—Total output of exfoliated vermiculite increased slightly over 1955. Plants in Cook, Macoupin, and Will Counties processed vermiculite from material mined in Montana, South Carolina, and South Africa. The exfoliated product was used principally in manufacturing insulating materials, as a lightweight aggregate in plaster and concrete, as a loose insulating filler, and for other purposes.

METALS

Lead, Silver, and Zinc.—Metals produced in Illinois in 1956 and credited to the State were lead, silver, and zinc. Mines in Jo Daviess County (Northern Illinois district) furnished 61 percent of zinc output and 45 percent of lead produced in Illinois in 1956. The remainder of the zinc, over half the lead, and all of the silver were recovered as byproducts or coproducts of fluorspar mining in Hardin County (Southern Illinois district). Zinc output in the State increased 11 percent in quantity over 1955; lead production decreased 16 percent below the preceding year. Continuing Government purchases of zinc for the national stockpile contributed to the rise in output of zinc. Silver was recovered as a byproduct of refining lead to obtain a silver-free lead product.

TABLE 8.—Mine production of silver, lead, and zinc, 1952–56, in terms of recoverable metals

Year	Mines producing	Material sold or treated [1] (short tons)	Silver		Lead		Zinc		Total value
			Fine ounces	Value	Short tons	Value	Short tons	Value	
1952	21	930,526	3,781	$3,422	4,262	$1,372,364	18,816	$6,246,912	$7,622,698
1953	21	700,844	2,338	2,116	3,391	888,442	14,556	3,347,880	4,238,438
1954	21	603,675	1,160	1,050	3,232	885,568	14,427	3,116,232	4,002.850
1955	13	839,555	3,075	2,783	4,544	1,354,112	21,700	5,338,200	6,695,095
1956	23	851,285	1,580	1,430	3,832	1,203,248	24,039	6,586,686	7,791,364

[1] Data include fluorspar ore from which lead and/or zinc were recovered as follows: 1952—384,203 tons; 1953—353,570 tons; 1954—202,478 tons; 1955—309,311 tons; and 1956—336,635 tons.

TABLE 9.—Mine production of silver, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Northern Illinois		Southern Illinois			Total Illinois		
	Lead (short tons)	Zinc (short tons)	Silver (fine ounces)	Lead (short tons)	Zinc (short tons)	Silver (fine ounces)	Lead (short tons)	Zinc (short tons)
January	125	1,360	240	260	965	240	385	2,325
February	150	1,125	330	300	950	330	450	2,075
March	165	1,350	250	325	1,050	250	490	2,400
April	130	1,110	300	225	850	300	355	1,960
May	200	1,390	190	175	890	190	375	2,280
June	185	1,300	60	155	725	60	340	2,025
July	125	890	150	70	620	150	195	1,510
August	175	1,145	55	70	650	55	245	1,795
September	135	1,100	--------	165	685	--------	300	1,785
October	130	1,350	--------	95	805	--------	225	2,155
November	100	1,265	5	150	680	5	250	1,945
December	104	1,223	--------	118	561	--------	222	1,784
Total	1,724	14,608	1,580	2,108	9,431	1,580	3,832	24,039

The principal producers of metals in Jo Daviess County in 1956 were Eagle-Picher Co. and Tri-State Zinc, Inc.; and in Hardin County, Aluminum Company of America, Ozark-Mahoning Co., and Minerva Oil Co.

Prices used to calculate total values in 1956 were silver $0.9050505 per fine ounce, lead 15.7 cents per pound, and zinc 13.7 cents per pound. In 1955 the silver price was the same; lead was 14.9 cents per pound and zinc 12.3 cents per pound.

Pig Iron.—In spite of the 34-day steel strike, which began on July 1, pig-iron production in Illinois increased slightly over 1955. Production of all classes totaled approximately 6.5 million net tons. Annual capacity of blast furnaces in the State at the end of 1956 was 7,467,700 net tons.[3] Of the 10.4 million net tons of iron ore (containing less than 5 percent Mn, natural) consumed in Illinois blast furnaces (excludes ore consumed in sintering plants and steel furnaces), about 99.6 percent came from domestic mines, and the remainder was imported. Quantities of other materials consumed in blast furnaces in the State in 1956 included: Purchased scrap, 256,166 net tons; home scrap, 142,847 net tons; mill cinder and roll scale, 304,688 net tons; open-hearth and bessemer slag, 934,755 net tons; coke, 5,463,493 net tons; limestone, 1,940,642 net tons; and sinter, 1,072,769 net tons. Approximately 678,000 net tons of flue dust was recovered at Illinois blast furnaces n 1956. Most of this material was consumed in making sinter.

Thorium, Uranium, and Rare-Earth Metals.—A contract between the Defense Minerals Exploration Administration (DMEA) and William G. Reynolds of Anchorage, Ky., for the exploration for thorium, uranium, and rare earths in Hardin County was in effect during part of 1956. Work was begun on the contract in April 1956 and was ended in August; the Government share of the actual cost of the project amounted to about $3,450.

[3] American Iron and Steel Institute, Annual Statistical Report: 1956.

REVIEW BY COUNTIES

Adams.—Quick and hydrated lime for building, chemical, and industrial uses was produced at plants operated by Marblehead Lime Co. near Marblehead and by Menke Stone & Lime Co. near Quincy. Both companies also mined limestone underground in the county. Output was for concrete aggregate and roadstone, agricultural purposes, metallurgical uses, and mineral food. Missouri Gravel Co. and Western Ill. Stone Co. operated portable crushing plants and reported output of crushed limestome for agricultural and road purposes. The Black & White Limestone Co. underground limestone mine produced crushed and broken limestone for riprap, flux, concrete aggregate and roadstone, agricultural purposes, asphalt filler, mineral food, and various other uses.

Quincy Sand Co. dredged near Quincy and produced sand and gravel for building and road construction and other uses. Blick's Construction Co. produced sand for miscellaneous uses.

Alexander.—H. H. Halliday Sand Co. operated a dredge on the Ohio River near Cairo and reported output for building and road purposes and engine use. Sand and gravel for road use was produced under contract for the State highway department.

Clay for manufacturing heavy clay products was produced near Thebes from a pit owned by Illinois Minerals Co.

TABLE 10.—Value of mineral production in Illinois, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Adams	$1,212,320	$1,377,859	Stone, lime, sand and gravel.
Alexander	[3] 214,937	247,535	Tripoli, sand and gravel, stone, clays.
Bond	87,469	88,805	Clays, sand and gravel, stone.
Boone	147,004	162,338	Stone, sand and gravel, clays.
Brown	143,650	42,700	Sand and gravel, clays.
Bureau	3,531,567	(2)	Coal, sand and gravel, clays.
Calhoun	17,341	21,005	Stone, sand and gravel.
Carroll	180,579	118,281	Sand and gravel, stone.
Cass	500	200	Sand and gravel.
Champaign	170,449	161,657	Do.
Christian	19,358,702	19,575,794	Coal.
Clark	324,062	547,107	Stone, sand and gravel.
Clay	133,500	26,912	Stone.
Clinton	659,642	699,277	Coal, stone, sand and gravel.
Coles	275,905	(2)	Stone, sand and gravel.
Cook	22,757,216	25,867,660	Stone, lime, clays, sand and gravel, sulfur, peat.
Crawford	97,870	96,490	Sand and gravel.
Cumberland	35,809	42,590	Do.
De Kalb	523,195	458,104	Sand and gravel, stone.
De Witt		(2)	Sand and gravel.
Douglas	1,376,737	1,677,170	Coal.
Du Page	1,507,527	1,740,788	Stone, sand and gravel.
Edwards	53,250	55,950	Clays.
Effingham	85,000	(2)	Stone.
Fayette	53,847	83,679	Sand and gravel, clays.
Ford	104,901	93,716	Sand and gravel.
Franklin	19,211,041	20,208,174	Coal.
Fulton	20,257,683	20,906,957	Coal, sand and gravel.
Gallatin	571,563	721,309	Do.
Greene	152,252	185,423	Stone, clays, coal.
Grundy	2,356,962	2,324,148	Coal, sand and gravel, clays.
Hancock	440,727	297,914	Coal, stone.
Hardin	11,185,703	11,999,726	Fluorspar, zinc, lead, stone, sand and gravel, silver.
Henderson	147,378	183,990	Stone.
Henry	484,410	531,441	Coal, sand and gravel.
Jackson	4,119,237	(2)	Coal, stone, sand and gravel.
Jefferson	6,432,152	10,831,249	Coal.
Jersey	(2)	36,391	Stone, sand and gravel.
Jo Daviess	3,968,921	4,685,338	Zinc, lead, stone, sand and gravel.

See footnotes at end of table.

TABLE 10.—Value of mineral production in Illinois, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Johnson	(2)	(2)	Stone, coal.
Kane	$1,229,378	$1,471,452	Sand and gravel, stone.
Kanakee	4,477,631	(2)	Coal, stone, clays, sand and gravel.
Kendall	(2)	311,677	Stone, sand and gravel.
Knox	6,889,732	(2)	Coal, clays, stone, sand and gravel.
Lake	502,803	615,657	Sand and gravel, clays, peat.
La Salle	31,006,707	34,903,809	Cement, sand and gravel, stone, clays, coal.
Lawrence	113,439	82,863	Sand and gravel.
Lee	5,482,209	(2)	Cement, stone, sand and gravel, clays.
Livingston	1,561,257	1,679,487	Stone, sand and gravel, clays, coal.
Logan	652,566	571,880	Sand and gravel, stone, coal.
Macon	242,838	(2)	Sand and gravel.
Macoupin	1,276,141	1,285,773	Coal, stone.
Madison	4,991,689	5,495,406	Coal, stone, sand and gravel, clays.
Marion	----------	33,653	Coal.
Marshall	(2)	570,394	Sand and gravel, clays.
Mason	----------	697	Sand and gravel.
Massac	109,852	16,472	Sand and gravel, stone.
McDonough	332,094	425,487	Stone, clays.
McHenry	1,514,744	1,906,230	Sand and gravel, stone.
McLean	622,356	(2)	Do.
Menard	239,241	378,388	Stone, coal, clays.
Mercer	168,175	132,941	Stone, clays.
Monroe	(2)	(2)	Stone, sand and gravel.
Montgomery	(2)	(2)	Coal, stone, sand and gravel.
Ogle	1,197,135	1,421,841	Sand and gravel, stone.
Peoria	3,443,575	3,620,831	Coal, sand and gravel, stone.
Perry	13,675,426	17,621,732	Coal.
Pike	240,705	302,259	Sand and gravel, stone.
Pope	7,906	4,893	Sand and gravel.
Pulaski	(2)	(2)	Stone, clays.
Putnam	----------	35,565	Sand and gravel.
Randolph	4,738,899	(2)	Coal, stone, sand and gravel.
Rock Island	790,630	879,172	Stone, sand and gravel, clays.
St. Clair	13,929,783	17,139,879	Coal, stone, lime, sand and gravel, clays.
Saline	10,992,039	11,347,675	Coal.
Sangamon	847,441	844,491	Sand and gravel, coal, clays.
Schuyler	151,488	155,647	Coal, sand and gravel, stone.
Scott	194,353	(2)	Stone, sand and gravel.
Shelby	(2)	(2)	Do.
Stark	27,500	----------	
Stephenson	144,100	197,041	Stone, sand and gravel.
Tazewell	855,402	1,057,640	Sand and gravel, peat, clays, coal.
Union	376,472	354,431	Stone.
Vermilion	4,404,642	5,202,705	Coal, stone, clays, sand and gravel.
Wabash	(2)	249,134	Sand and gravel.
Warren	----------	86,234	Stone.
Washington	131,692	145,356	Coal, stone.
Wayne	20,430	----------	
White	228,640	(2)	Sand and gravel.
Whiteside	312,427	377,759	Stone, sand and gravel.
Will	5,340,752	7,937,900	Sand and gravel, stone, coal.
Williamson	24,041,155	24,862,098	Coal, stone.
Winnebago	1,830,859	1,974,023	Sand and gravel, stone.
Woodford	81,600	120,574	Sand and gravel.
Undistributed	261,263,104	300,402,517	
Total	[3] 533,062,000	572,321,000	

[1] County figures exclude petroleum, natural gas, natural-gas liquids, and some stone and sand and gravel for which data by counties are not available; these are included with "Undistributed." The following counties are not listed, because no production was reported: Edgar, Hamilton, Iroquois, Jasper, Morgan, Moultrie, Piatt, Richland.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[3] Revised figure.

Sandstone for refractory purposes was produced by Western Fire Brick Co.

Tripoli was produced at underground mines near Elco and Tamms by Ozark Minerals Co. and Tamms Industries, Inc., respectively. Output was used principally for abrasives and filler material.

Bond.—Sand and gravel for building use was produced by the Greenville Gravel Co., Inc., at a fixed plant near Greenville. Cyril Munie produced gravel for building and road purposes.

Crushed limestone for road use was produced by the Bond Stone Co.

Clay was produced near New Douglas by the Richards Brick Co. for use in manufacturing heavy clay products.

Boone.—The Belvidere Lime Quarry, Charles Lee & Sons, and Ewald Winkelman portable crushing plants produced limestone for agricultural and road use.

Sand and gravel for building and road construction was produced by Vincent Spencer Sand & Gravel. Road gravel was produced by Christenson & Smith and under contract for the county highway department.

Munson Bros. & Co. produced clay near Capron for use in manufacturing draintile.

Brown.—T. F. Hollembeak & Sons produced sand and gravel for road use. Bridgewater & Gaskill reported output of gravel for miscellaneous purposes.

Clay used in manufacturing heavy clay products was produced near Mount Sterling by Frederic Brick & Tile Co.

Bureau.—Midland Electric Coal Corp., at a strip mine near Mineral was the only bituminous-coal producer in Bureau County in 1956. The entire output was cleaned by jigging methods.

Hansen Bros. and Swanson Bros. reported output of road gravel. Floyd Clapp produced gravel near Walnut for building and road use. Western Sand & Gravel Co. produced sand and gravel for building and road construction at a fixed plant near Spring Valley. Wyanet Sand & Gravel produced molding sand and gravel for building use near Wyanet. The county highway department produced gravel for building use and contracted for road gravel. Sand and gravel for road construction was produced under contract for the State highway department.

Clay was produced at Sheffield by the Sheffield Shale Products Co. for use in manufacturing heavy clay products.

Calhoun.—Crushed limestone was produced in the county by Calhoun Quarry Co., Paul C. Herter, and Sievers Quarry. Output was for agricultural and road purposes.

West Point Sand Plant produced building and blast sand at a dredge near Batchtown. Road gravel was produced under contract for the State highway department.

Carroll.—Nicol Sand Co. produced sand for molding, engine, and paving uses at a fixed plant near Savanna. Howard Nelson produced road gravel. The Oliver Heisler fixed sand and gravel plant near Mount Carroll reported output for building use.

Crushed limestone for agricultural use, concrete aggregate, and roadstone, fertilizer filler, and for manufacturing lime was produced in the county. Producers in 1956 included Allen Boyer, Roscoe Francke, Kingery and Messmer, Minor Bros., and Earl Randecker.

Cass.—Paving sand was produced under contract for the State highway department.

Champaign.—Sand and gravel for building and road construction was produced near Mahomet by the Mahomet Sand & Gravel Co., Inc., and W. H. Troike & C. R. Plankenhorn. Gibson Bros. and West Champaign Gravel Co. produced road gravel near Champaign. The State highway department contracted for gravel for road purposes. The Ryolex Corp. processed perlite at its plant in Champaign. The

expanded product was used chiefly as lightweight aggregate in plaster and concrete.

Christian.—Christian County ranked second in the State in coal production. Peabody Coal Co. operated two underground mines—the No. 10 mine near Pawnee and the No. 17 near Pana. The No. 10 mine was the leading producing bituminous-coal mine in the United States in 1956. Most of the county coal output was shipped to consumers by rail.

Clark.—Crushed and broken limestone was produced in the county for riprap, agricultural use, and roadstone. Producers during the year were Casey Stone Co., Ralph E. Montgomery, and Quality Lime Co.

Sand and gravel for building and road construction was produced by Barthelemy & Lawrence and Stanfield Gravel Co. The latter company dredged near Darwin.

Clay.—Iola Stone & Material Co. crushed limestone near Iola for road use.

Clinton.—Coal, limestone, and sand and gravel were produced in the county in 1956. Coal from three underground mines was produced by the Breese Coal Co., Inc., Citizens Coal Co., and the Marion County Coal Mining Corp. (its mine also extended into Marion County).

Buehne Quarry Co. and Huelsmann Quarry crushed limestone for road use.

W. D. Lindsay operated a portable plant near Keyesport and reported output of road gravel. The county highway department produced gravel for building purposes. Road gravel was produced under contract for the State highway department.

Coles.—Olen Humphres Stone Quarry produced crushed and broken limestone near Ashmore for riprap, roadstone, agricultural use, and asphalt filler. Charleston Stone Co. and Lang Stone Quarry crushed limestone for road use.

Martin's Sand & Gravel dredged near Ashmore and produced sand and gravel for building use. Verlin Pinnell produced road gravel near Charleston.

Cook.—Clays, lime, limestone, peat, sand and gravel, and elemental sulfur were produced in Cook County in 1956. The Material Service Corp.'s four limestone quarries reported output for concrete aggregate and roadstone. Consumers Co. crushed limestone for refractory use, concrete aggregate and roadstone, railroad ballast, asphalt filler, and agricultural purposes. Dolese & Shepard Co. quarried limestone for use as concrete aggregate and roadstone, railroad ballast, flux, and agricultural stone. Stearns Lime & Stone Co. produced crushed limestone chiefly for road use.

Chicago Gravel Co. reported output from a fixed sand and gravel plant near Elgin for building and road construction, railroad ballast, and fill. Paving sand was produced under contract for the State highway department.

The Marblehead Lime Co. lime plants at South Chicago and Thornton produced quick and hydrated lime for building, chemical, and industrial uses. Quicklime for refractory use was produced at La Grange by the Standard Lime & Cement Co.

Clays were produced in the county for use in manufacturing building brick and other heavy clay products. Producers included Carey Brick Co., Chicago Brick Co., Illinois Brick Co., and Tuthill Building Materials Co.

The Pure Oil Co. recovered sulfur as a byproduct at its Lemont Refinery.

Peat was produced by Henry Frenzer for use as a soil conditioner.

The American Bildrok Co. and Silbrico Corp. processed perlite in their plants at Chicago. Material processed at the plants was mined in western States. Output was used principally as a lightweight aggregate in plaster and concrete.

The Zonolite Co. exfoliated vermiculite at Chicago from material mined in Montana, South Carolina, and South Africa.

Blast furnaces and coke-oven plants were operated in the vicinity of Chicago. Coke producers in the county included Interlake Iron Corp., International Harvester Co., Peoples Gas Light & Coke Co., Republic Steel Corp., and Youngstown Sheet & Tube Co. Most of the coke produced was consumed in State blast furnaces. In spite of the 5-week steel strike in midsummer, approximately 6 million net tons of pig iron was produced in Cook County—a slight increase over 1955. Pig-iron producers included Interlake Iron Corp., International Harvester Co., Republic Steel Corp., United States Steel Corp., and Youngstown Sheet & Tube Co.

Crawford.—Bowman's Gravel Pit produced sand and gravel near Palestine for building and road construction. William J. Wyke produced sand and gravel for building and road use and other purposes. Montgomery Township produced road gravel.

Cumberland.—Sand and gravel for building and road construction was produced by the A. B. C. Gravel Co. and Casey Stone Co. The latter company operated a fixed plant near Greenup.

De Kalb.—Sand and gravel for building and road construction was produced by Kirkland Gravel Yard, Elmer Larson, Inc., and Donald Tyrrell. The State highway department contracted for sand and gravel for road use.

Crushed limestone was produced by the county highway department for road purposes.

De Witt.—The H. M. Rickgauer portable sand and gravel plant near Clinton reported output for road use. Road gravel was produced under contract for the McLean County Highway Department and the State highway department.

Douglas.—The Moffat Coal Co. mined coal underground at Murdock. The entire putput was mechanically cleaned by jigging methods.

Du Page.—The Elmhurst-Chicago Stone Co. quarried limestone near Elmhurst for use as concrete aggregate and roadstone, railroad ballast, and agricultural purposes. The company also produced sand and gravel near Winfield for building and road construction. Purnell's Gravel Pit produced road gravel.

Edwards.—The Albion Brick Co. produced miscellaneous clay at Albion for use in manufacturing heavy clay products.

Effingham.—Crushed limestone for agricultural and road use was produced near Altamont by Winters Stone Quarry.

Fayette.—Sand and gravel for building and road construction was produced at a fixed plant near Vandalia by Burtschi Sand & Gravel

Co. Charles D. Lutz & Sons produced molding sand near Mulberry Grove. The State highway department contracted for road gravel.

The St. Elmo Brick & Tile Co. produced clay near St. Elmo for use in manufacturing heavy clay products.

Ford.—W. V. Williams produced gravel, chiefly for road use. Paving sand was produced under contract for the State highway department.

Franklin.—Four underground coal mines were operated in the county in 1956: The Old Ben Coal Corp. No. 9, No. 14, and No. 22 mines and the Chicago, Wilmington & Franklin Coal Co. No. 2 mine.

Fulton.—Fulton County ranked third in the State in producing bituminous coal in 1956. Output was reported by 17 companies from 13 strip and 6 underground mines. Operators of the underground mines were: Bruketta & Sons Coal Co., Glore & Fritz Coal Co., Maccanelli Coal Co., Pine Bluff Coal Co., Pschirrer Coal Co., and Putt Creek Coal Co., Inc. Strip-mine operators in 1956 included: Big Ten Coal Co., Fairview Collieries Corp., J. & J. Coal Co., Inc., Layne's Coal Co., Lingenfelter Coal Co., Little Sister Coal Corp., Lump Coal Co. (2 mines near Cuba), Peabody Coal Co. (mine formerly operated by Key Coal Co.), Walter Richard Coal Co., Truax-Traer Coal Co., and The United Electric Coal Cos. (No. 9 mine near Cuba and No. 17 mine near Canton).

Sand and gravel for building and road purposes was produced by Liverpool Materials Co. Road gravel was produced under contract for the State highway department.

Gallatin.—Bituminous coal was produced by 13 companies from 4 underground mines and 9 strip pits in the county in 1956. Producers during the year were: B. & W. Coal Co., Blu-Blaz-Bloc Coal Co., Inc., M. & L. Coal Co., Pekin Coal Co., Acme Coal & Stone Co., Eagle Valley Coal Co., R. C. Jennings Coal Co., Mathis Bros. Coal Co., New Oak Hill Coal Co., Randall Coal Co., Richardson Coal Corp., Wenzel Construction Co., and Beecher Williams. The Randall Coal Co. strip mine was permanently abandoned in December 1956. Approximately 90 percent of the county coal production was shipped by barge on the Ohio River.

Miller Sand & Gravel Co. produced road gravel. Sand and gravel for building use was produced by the county highway department and for road use under contract for the State highway department.

Greene.—Crushed limestone for agricultural and road use was produced in the county. Producers included Orton Quarry, Lyle B. Moushon, and Valstad Quarry.

Clay used for manufacturing fire brick and block was produced near Roodhouse by Lyndall W. Wyatt.

The Birch Creek Coal Co. reported coal production from a strip mine near Roodhouse.

Grundy.—Coal was produced near Wilmington by the Northern Illinois Coal Corp. from its strip mine, which also extended into Kankakee County.

Material Service Corp. produced sand and gravel near Morris for buildings and other purposes.

Clay for refractory use was produced near Coal City and Morris by the Illinois Clay Products Co.

Hancock.—Crushed and broken limestone for riprap, concrete aggregate and roadstone, and agricultural use was produced in Hancock County in 1956. Operators included The Gray Quarries, W. F. Hamma Quarry, Colchester Stone Co., and R. L. O'Neal & Sons.

The sole producer of coal in the county was the Triple S Mines strip mine near Augusta. The entire output was consumed locally.

Hardin.—Hardin County continued to be the leading source of fluorspar in the United States, furnishing 54 percent of total domestic output. Principal producers during the year were Aluminum Company of America, Minerva Oil Co., Ozark Mahoning Co., and Mackey-Humm Mining Co. Mining at Aluminum Company of America was conducted from shafts varying from 160 to 800 feet deep. Mining was done in shrinkage stopes. Company ore and custom ore were treated at the company mill near Rosiclare. Concentration processes included dense-medium separation, followed by flotation. Mill products were fluorspar, lead, and zinc concentrates.

Minerva Oil Co. operated several mines and the Minerva No. 1 and Crystal mills near Cave in Rock. The company Jefferson mine was closed in May 1956, and the Rose Creek mine was idle the entire year. At the Minerva No. 1 mine the use of a conveyor belt for long haulage to the shaft was discontinued because of high maintenance and high replacement costs. Diesel-truck roads were improved all the way to the shaft. Pocket improvements were made for the quick turnaround of haulage trucks. The experimental use of polythlene large-diameter tubing for stope ventilation at the Minerva No. 1 mine proved successful. The Minerva Oil Co. rehabilitated the Addison shaft at the Victory mine, and a truck road was developed at this mine, tying together all parts of the underground workings to a hillside adit. The company treated 225,000 short tons of ore at its mills. Most of the material treated was mined by the company; however, approximately 1,500 tons was purchased from other companies. The Minerva No. 1 plant, in addition to Ceramic grades, began producing Acid-grade fluorspar in late 1956. Zinc concentrate produced at the Minerva No. 1 plant was shipped to Josephtown, Pa., by barge on the Ohio River.

Ozark-Mahoning Co. operated its mines near Cave in Rock and the Rosiclare mill during 1956. Company-mined ore and custom ore were treated at the mill, which uses flotation concentration processes, with separate lead, zinc, and fluorspar circuits. Part of the fluorspar concentrate was pelletized.

Mackey-Humm Mining Co. operated its mine and mill near Rosiclare. Mining was conducted from one vertical shaft, about 300 feet deep and was principally open stoping. Custom ores were also treated at the company mill. Although all of its mines were idle in 1956, Rosiclare Lead & Fluorspar Mining Co. reported sales of finished fluorspar. The company sold a quantity of tailing for treatment at other mills. Several other operators produced fluorspar ore, some of which contained lead and/or zinc minerals. Virtually all of this ore was processed at one of the custom mills in the area.

A contract between DMEA and William G. Reynolds, of Anchorage, Ky., covering the exploration for thorium, uranium, and rare earths in Hardin County was in effect during part of 1956. Work was begun on the contract in April 1956 and ended in August.

Crushed limestone for agricultural and road purposes was produced near Cave in Rock by Okerson Quarry Co. and Rigsby & Barnard. P. R. Brown Stone Co. quarried limestone near Shellerville for road use. J. L. Bean Stone Co. crushed limestone for road use and railroad ballast.

Road gravel was produced under contract for the Pope County Highway Department.

Henderson.—Raid Bros. Construction Co. produced crushed and broken limestone for riprap, road use, and railroad ballast. Galbraith Stone Co. and Olson Bros. quarried limestone for road use. Charles J. Moore operated a portable crushing plant near Dallas City and reported output of limestone for riprap, roadstone, and agricultural purposes. The county highway department crushed limestone for road use.

Henry.—Coal production was reported from three underground mines in the county—Bugos-White Coal Co. and Alpha Coal Co. mines near Alpha and the Gem Coal Mine (formerly Jim Mine, Inc.) at Coal Valley.

Collinson Bros. produced road gravel near Kewanee. Oberlaender Sand Co. produced sand near Colona for molding, building, and road uses. Sand and gravel for building and road purposes and railroad ballast was produced near Cleveland by the Schadt Service Co.

Jackson.—Coal was produced from three underground mines and four strip pits in Jackson County in 1956. A new strip pit was opened in May 1956 by the C. &. M. Coal Co. Other producers included Elk Coal Co., Johns Coal Co., Ed Blumenstock Coal Co., Mt. Carbon Coal Co., and Truax-Traer Coal Co. (both a strip pit and an underground mine).

Crushed and broken limestone for riprap, roadstone, and agricultural use was produced near Ava by the Illinois Quarry Co.

Paving sand was produced under contract for the State highway department.

Jefferson.—The only coal producer in Jefferson County was the Freeman Coal Mining Corp. at the Orient No. 3 underground mine near Waltonville. The mine ranked fifth in the United States in bituminous-coal production in 1956. The entire output (over 2.5 million tons) was mechanically cleaned.

Jersey.—Crushed and broken limestone was produced in the county for riprap, road use, and agricultural purposes. Producers included Grafton Quarry, Jersey Quarry Co., and Magnesium Lime Co.

The county highway department produced road gravel.

Jo Daviess.—Lead, zinc, limestone, and sand and gravel were produced in the county in 1956. Producers of zinc and/or lead were Eagle-Picher Co., Tri-State Zinc, Inc., and Hickory Hill Mining Co. Eagle-Picher Co. operated the Graham, Snyder, Spillane, and Feehan properties (considered as one operation) throughout the year. Open-stope mining methods were employed; zinc ore was hoisted from a 270-foot shaft. Ore was treated at the company Graham mill, utilizing jigs and flotation processes of concentration, Zinc ore, mined by Eagle-Picher Co. at one of its Wisconsin mines, and zinc-lead custom ore were also treated at the Graham mill. Tri-State Zinc, Inc., mined zinc-lead ore from the Amelia and Gray

mines. The Gray mine, consisting of a group of properties, was operated throughout the entire year. Mining methods employed were open stoping and modified shrinkage stoping. Ore was hauled directly to the Gray mill by diesel trucks through an inclined adit approximately 1700 feet in length. At the mill about a half mile from the portal of the adit the ore was concentrated by jigging and flotation.

The Amelia mine, near the Gray mine, was newly operated beginning the middle of May 1956. The company closed down entirely for vacation, July 1–15. Ore was mined by open stoping and hauled by truck to the Gray mill for processing. Hickory Hill Mining Co. mined and shipped nearly pure galena from a near-surface deposit. This company also produced some zinc-lead ore from an adjacent ore deposit. Material was treated at the Graham mill of Eagle-Picher Co.

Crushed limestone for agricultural and road purposes was produced in the county. Quarry operators included: W. E. Broege, Virgil Hardacre, Kingery & Messmer, Rees Construction Co., G. A. Watson, Westaby Construction Co., and E. Wienen & Sons.

The Dubuque Sand & Gravel Co. fixed sand and gravel plant near East Dubuque produced material for building use.

Johnson.—The Charles Stone Co. crushed limestone near Cypress for agricultural use, roadstone, and railroad ballast. Southern Illinois Stone Co., Inc., crushed limestone for agriculture, roadstone, asphalt filler, and other uses.

R. C. Jennings & Sons Coal Co. produced bituminous coal from a strip mine near New Burnside. The entire output was shipped to consumers by rail.

Kane.—Sand and gravel for building and road construction, railroad ballast, and other uses was produced in Kane County in 1956. Commercial operators during the year were: Fox Valley Gravel Co., Krahn Gravel Co., Material Service Corp., Raymond Sand & Gravel, Edward R. Schneider, and Warren Sellen. Road gravel was produced by the city of Aurora. The State and county highway departments contracted for sand and gravel for road use.

The Fox River Stone Co. produced dimension limestone for rough construction, rubble, and flagging and crushed limestone for flux, roadstone, fertilizer, and asphalt filler.

Kankakee.—Clays, coal, limestone, and sand and gravel were produced in the county in 1956. Northern Illinois Coal Corp. produced coal from a strip mine, which extended into Grundy County. The Kankakee County part yielded 74 percent of the total production of the mine in 1956. Output was nearly 13 percent greater than in 1955.

Dimension limestone for rubble, stone veneer, and flagging was produced near Bourbonnais by the Bourbonnais Stone Quarry. Lehigh Stone Co. reported the output of crushed limestone for roadstone, railroad ballast, and agricultural purposes. Manteno Limestone Co. quarried limestone near Manteno for agricultural and road uses.

Miscellaneous clay was produced by the Eastern Illinois Clay Co. and St. Anne Brick & Title Co. near St. Anne and by Kankakee Clay

Products Co. near Kankakee. Output was used for manufacturing building brick and other heavy clay products.

Portage-Manley Sand Co. produced sand near Essex for molding use. Paving sand was produced under contract for the State highway department.

Kendall.—Central Limestone Co. produced crushed limestone for flux, roadstone, and agricultural use. O. Gunnerson quarried limestone near Lisbon for use as roadstone. Elmer Larson, Inc., produced sand and gravel near Plano for building and road construction. Sand and gravel for road use was produced under contract for the State and county highway departments.

Knox.—Bituminous coal was produced from 4 strip mines operated by Midland Collieries, Inc., Stonefort Corp., and Midland Electric Coal Corp. The last company operated 2 mines in 1956—the Middle Grove No. 2 and Rapatee No. 3. The No. 5 mine of Midland Collieries, Inc., was opened in December 1956. Over 99 percent of the county coal output was mechanically cleaned.

The Purington Brick Co. produced clay near Galesburg for use in manufacturing heavy clay products. Crushed limestone for agricultural and road purposes was produced by the Abingdon Rock Co., Inc. The L. K. Bandy Construction Co. portable sand and gravel plant near London Mills reported output for road use and fill.

Lake.—Sand and gravel for building and road construction and other purposes was produced during the year. Commercial operators in 1956 were: Carl L. Barthel, Big Hollow Sand & Gravel Co., Inc., Consumers Co., and the Elgin, Joliet & Eastern Railway Co. Paving sand was produced by the county highway department.

The National Brick Co. produced clay near Deerfield for use in manufacturing heavy clay products.

Peat was produced by the Millburn Peat Co. near Lake Villa for use as a soil conditioner.

Coke for foundry use was produced at the Waukegan Plant of Chevrolet & Saginaw Grey Iron Foundry, Division of General Motors Corp.

The Lake Zurich Concrete Products Co. processed perlite at a plant at Lake Zurich. Material processed was mined in Arizona and Colorado. Output was used as lightweight aggregate in plaster and concrete and for filter purposes.

La Salle.—Mineral products of La Salle County in 1956 included portland and masonry cements, clays, coal, limestone, and sand and gravel. Portland and masonry cements were produced by Alpha Portland Cement Co., Lehigh Portland Cement Co., and Marquette Cement Mfg. Co. The three companies quarried their own limestone used in manufacturing cement. Other producers of limestone in the county were Sheridan Stone Co., Troy Grove Stone Co., and Utica Stone Co. Output was used for agricultural and road purposes.

Clay used in manufacturing building brick and other heavy clay products was produced by Conco-Meier Co., Arthur Mart, and the Streator Drain Tile Co. Output of clay for Alpha Portland Cement Co. and Marquette Cement Mfg. Co. was used entirely in cement manufacture. LaClede-Christy Co. and Matthiessen & Hegeler Zinc Co. produced clay for refractory purposes. LaClede-Christy Co. also produced coal for its own use in conjunction with its clay pit

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near Ottawa. The Dubach Coal Co. strip mine in Lake County produced coal for local consumption.

Sand and gravel produced in the county was used for a variety of purposes, including building and road construction, railroad ballast, and special uses, such as glass manufacture, molding, grinding and polishing, sandblasting, engine use, filter purposes, fire or furnace sand, as filler, for pottery and other uses. Commercial sand and gravel operators in the county included: The American Silica Sand Co., Inc. (operating several pits in the county), E. C. Bellrose Sand Co., General Silica Corp, Illinois Silica Sand Co., Ray LaBolle, La Salle County Portable, Inc., La Salle Silica Co., Edward O. Olson, Ottawa Silica Co., G. H. Pendergast & Co., River Industries, Inc., Spicer Gravel Co., Standard Silica Co., Wedron Silica Co., and Western Sand & Gravel Co. Road gravel was produced under contract for the State and county highway departments.

Lawrence.—Gregory Gravel Co. dredged near Lawrenceville and produced sand and gravel for building use and road gravel. The Vincennes Gravel Co., Inc., fixed sand and gravel plant near Lawrenceville reported output for building and road purposes. The State highway department contracted for sand and gravel for road use.

Lee.—The Medusa Portland Cement Co. produced portland and masonry cements at its plant near Dixon. The company also produced clay and limestone in the county for use as raw material in cement manufacture. Crushed limestone for agricultural and road purposes was produced by Wilmer Gerdes Quarry, Ward McGinnis, and Stoneridge Limestone Co. Oregon Stone Quarries produced crushed limestone near Dixon for use as roadstone and railroad ballast. Frank N. Butler Co. and Butler Sand & Gravel Co. quarried limestone for agricultural use. The latter company's fixed sand and gravel plant near Nelson reported output for building and road construction. Rock River Ready Mix produced sand and gravel near Dixon for building and road construction and other purposes. C. C. Macklin produced gravel near Steward for building and road uses. Sand and gravel for road purposes was produced under contract for the State highway department.

Livingston.—Crushed limestone for agricultural and road purposes was produced by Chenoa Stone Co., Pontiac Stone Co., and Wagner Stone Co. The Livingston Stone Co. quarried limestone near Pontiac for agricultural use, roadstone, asphalt filler, and rock dust for coal mines. Crushed limestone for asphalt filler, agricultural use, and roadstone was produced by the Ocoya Stone Co.

Estep Gravel Co. produced gravel for miscellaneous uses. Road gravel was produced by Valley View Dirt & Gravel Co.under contract for the State highway department.

Clay was produced by Diller Tile Co., Inc., near Chatsworth for use in manufacturing heavy clay products.

The one producer of coal in the county was Baiett & Talbot Coal Co., at a strip mine near Streator. The entire output was consumed locally.

Logan.—The Lincoln Sand & Gravel Co. dredged sand and gravel near Lincoln for building and road purposes and sand for engine and filter use. The Rocky Ford Limestone Co. crushed limestone near Lincoln for agricultural use and roadstone. Coal was produced from an underground mine between January and September 7 by the Deer

Creek mine and during the rest of the year by Lincoln Coal Mining Co. Part of the output was crushed and treated with oil.

Macon.—Decatur Sand & Gravel Co. dredged sand and gravel for building and road construction, fill, and other purposes. Road gravel was produced near Mount Zion by Kirk's Gravel Pit. The State highway department contracted for sand and gravel for road use.

Macoupin.—Coal output was reported from three underground mines in the county by the following companies: Little Dog Coal Co., Mt. Olive & Staunton Coal Co., and Virden Mining Corp. The Mt. Olive & Staunton No. 2 mine extended into Madison County; the Macoupin County part furnished about 20 percent of total output from the mine. John Bowers crushed limestone near Mount Olive for road use.

International Vermiculite Co. exfoliated vermiculite at Girard from material mined in Montana. Output was used in high-temperature block, pipe covering, and insulating cements and as industrial loose fill.

Madison.—The four following underground coal mines were operated in the county in 1956: Lumaghi Coal Co. and Glen Carbon Mines, Inc., near Collinsville; the Livingston-Mt. Olive Coal Co. No. 1 mine near Livingston; and Mt. Olive & Staunton Coal Co. No. 2 mine near Staunton. Part of the last mine was in Macoupin County.

C. M. Lohr, Inc., near Godfrey and Mississippi Lime Co. near Alton crushed limestone for agricultural and road purposes. Reliance Whiting Co. produced dimension, crushed, and broken limestone near Alton for rough construction, flagging, riprap, roadstone, agricultural use, putty filler, rubber filler, pottery, rock dust for coal mines, asphalt filler, and other uses.

Mississippi Lime Co. produced sand for paving, engine use, and other purposes. Alton Sand Co. produced sand for building use. Gary Dredging Co. reported output of sand for building and paving uses. Paving sand was produced near Granite City by Thompson Asphalt Co. and also under contract for the State highway department.

Alton Brick Co. produced clay near Alton for use in manufacturing heavy clay products and for lightweight aggregate.

Granite City Steel Co. operated coke ovens, blast furnaces, and open-hearth steel furnaces at Granite City.

Marion.—The only producer of coal in the county, the Marion County Coal Mining Corp., operated the Glenridge underground mine near Centralia. The mine also extended into Clinton County. In 1956 the Marion County part furnished about 17 percent of the total output of the mine. Some crushing and oil-treating of the coal were performed.

Marshall.—Consumers Co. produced sand and gravel for building and road use at its fixed plant at Lacon. Road gravel was produced near La Rose, Toluca, and Henry by Vernon Henry and under contract for the State highway department. Miscellaneous clay for use in manufacturing heavy clay products was produced near Sparland by the Hydraulic-Press Brick Co.

Mason.—The State highway department contracted for road gravel.

Massac.—Road gravel was produced under contract for the Pope County and State Highway Departments. Crushed limestone for

agricultural and road purposes was produced near Mermet by the Columbia Quarry Co.

McDonough.—Crushed and broken limestone for riprap, agricultural use, and roadstone was produced in the county by Colchester Stone Co., John McClure Quarry, and Olson Bros. Frank Nelson and J. R. Purtscher produced clay near Colchester for use in manufacturing heavy clay products. Clay used in manufacturing pottery and stoneware was produced near Colchester by Baird Clay mine and Western Stoneware Co.

McHenry.—Sand and gravel for building and road construction, railroad ballast, and other purposes was produced in McHenry County in 1956. Commercial operators included: The Chicago & Northwestern Railway Co., Consumers Co., Crystal Lake Trucking & Excavating Co., Garden Prairie Stone Co., Inc., Floyd M. Greibel, McHenry Sand & Gravel Co., Inc., Wayne Nolan, and Tonyan Bros. Sand and gravel was produced under contract for the State highway department. The Garden Prairie Stone Co., Inc., also produced dimension and crushed limestone near Marengo for flagging, roadstone, and agricultural purposes.

McLean.—Road gravel was produced by John Howes, McDowell & Heidelberg, Rowe Construction Co., and the county highway department. McGrath Sand & Gravel Co. produced sand and gravel near Bloomington for building and road construction and fill. Crushed limestone for road use was produced near Hayworth by Van Horn.

Menard.—Athens Stone Quarry and Indian Point Limestone Products crushed limestone for agricultural and road use.

Coal was produced in the county from underground mines operated by Indian Creek Coal Co., Wilcox-Verna Coal Co. near Petersburg, and Lloyd Coal Co. near Tallula. The entire output was consumed locally.

Clay for manufacturing heavy clay products was produced near Springfield by Springfield Clay Products Co.

Mercer.—Independent Materials Co. produced crushed limestone near Viola for roads and other uses. The Hydraulic-Press Brick Co. produced clay near Aledo for use in manufacturing heavy clay products.

Monroe.—Columbia Quarry Co. produced crushed and broken limestone near Valmeyer for riprap, metallurgical uses, roadstone, rock dust for coal mines, mixed feeds, and agricultural purposes. Dimension, crushed and broken limestone were produced near Maeystown by the Maeystown Quarry Co. for rubble, riprap, roadstone, agricultural use, and filter purposes. Paving sand was produced under contract for the State highway department.

Montgomery.—Freeman Coal Mining Corp., at an underground mine near Farmersville, was the only producer of coal in the county. The entire output was mechanically cleaned.

Litchfield Stone Co. crushed limestone for agricultural and road use, and Nokomis Quarry, for road purposes.

Road gravel was produced under contract for the State highway department.

Ogle.—Crushed limestone for road use was produced by Kutz Bros., Earl McKnight, Ogle Construction Co., Rockford Blacktop Construction Co., William Seitz, and the Tri-County Stone Co. Output of

crushed and broken limestone for riprap, roadstone, and agricultural purposes was reported by Clarence Lenstrom. Oregon Stone Quarries crushed limestone near Oregon for road use and railroad ballast. Macklin Bros. and N. & L. Construction quarried limestone near Rochelle and Polo, respectively, for agricultural and road purposes. Crushed limestone and gravel for road use were produced under contract for the county highway department.

Sand and gravel was produced in Ogle County for building and road construction, engine use, molding purposes, filler, pottery, and other uses. Producers in 1956 included: Byron Sand & Stone Co., Kutz Bros. Co., McGrath Sand & Gravel Co., The National Silica Co., Howard Nelson, Rockford Blacktop Construction Co., Shilling's Gravel Pit, Valley Ready Mix, Inc., Floyd Weigle, and the Leaf River Township Highway Department.

Peoria.—Coal output was reported from 12 mines in Peoria County in 1956. Big Bear Coal Co., Charter Oak Coal Co., Collins Bros. Coal Co., Lee Coal Mining Co., Lightbody Coal Co., Superior Mining Co. (ceased mining in March 1956), and Zaborac Coal Co. mined underground. Strip mines were operated by Howard Albrecht Coal Co., J. & J. Coal Co., Inc., Morgan Coal Co., Pioneer Collieries Co., and Howard Scott Coal Co. About 75 percent of county production was consumed locally; the remaining 25 percent was shipped to markets by barge.

Crushed limestone for agricultural and road use was produced by Chipman Stone Quarry Co., Lamar Stone Co., Long Rock Co., and Trivoli Stone Co. Princeville Stone Co. crushed limestone for road use and railroad ballast.

Sand and gravel was produced in the county for building and road purposes, railroad ballast, and other uses. Producers during the year included: Chillicothe Gravel Co., Construction Materials Co., Coogan Gravel Co., McGrath Sand & Gravel Co., Stevers, Inc., and C. L. Swords & Son. Road gravel was produced under contract for the State and the Stark County Highway Departments.

Perry.—Coal was produced from 8 mines—3 underground and 5 strip—in the county in 1956. Operating companies were: Big Five Coal Co., Cutler Coal Co., Inc., Southwestern Illinois Coal Corp., Truax-Traer Coal Co. (2 strip mines near Pinckneyville), Union Colliery Co., The United Electric Coal Cos., and White Bros. Coal Co. (opened a new strip mine near Creal Springs in November 1956). Nearly 97 percent of the county output was shipped to consumers by rail. The Streamline strip mine, operated by Southwestern Illinois Coal Corp., extended into Randolph County; however, about 95 percent of the mine output was credited to Perry County.

Pike.—O. A. Booth & Sons and Victor Callender produced road gravel near Nebo and Pittsfield, respectively. Missouri Gravel Co. operated two fixed sand and gravel plants in the county and reported output for building and road purposes and railroad ballast.

Crushed limestone for agricultural and road uses was produced near Pearl. Quarry operators were Lacey & Bauer and the Pearl Stone Co.

Pope.—Road gravel was produced under contract for the State and county highway departments.

Fluorspar was mined in Pope County but processed at mills in Hardin County, Ill., and in Kentucky. Operators were Egyptian

Mining Co., Hicks Creek Mining Co., and P. M. T. Mining Co.

A contract between DMEA and Ozark Mahoning Co. for the exploration of fluorspar, lead, and zinc was in effect during early 1956. Work had begun on the contract in July 1955 and was ended in February 1956.

Pulaski.—Columbia Quarry Co. produced crushed and broken limestone near Ullin for riprap, roadstone, railroad ballast, and agricultural use. The American Charcoal Co. produced clay near Olmstead. Output was used for oil- and grease-absorbent purposes.

Putnam.—Road gravel was produced under contract for the State highway department.

Randolph.—Coal was produced from five mines in the county in 1956. Operators of underground mines were: Midwest Utilities Coal Corp., Moffat Coal Co., and Western Coal Co. The No. 2 mine of the Moffat Coal Co. was permanently abandoned in February 1956. Strip mines were operated by Ritter Coal Co. and Southwestern Illinois Coal Corp. (its Streamline mine is partly in Perry County).

Crushed limestone for agricultural and road purposes was produced by the Illinois State Penitentiary, Chester Quarry Co., and Al Stotz Quarry. The latter two producers operated underground mines near Chester and Prairie du Rocher, chiefly for chemical purposes.

Southern Illinois Sand Co. operated a dredge near Chester and reported output of sand for building, engine, filter, and road purposes.

Rock Island.—Blackhawk Aggregates, Inc., and Builders Sand & Gravel Co. produced sand and gravel near Milan and Albany, respectively, for building use. Moline Consumers Co. dredged sand and gravel for building and road purposes.

Collinson Stone Co. near Milan and Cordova Quarry, Inc., near Cordova crushed limestone for agricultural use, roadstone, and railroad ballast. Midway Stone Co., Inc., produced crushed and broken limestone near Hillsdale for riprap, roadstone, filter use, and agricultural purposes.

Clay used in manufacturing flue liners was produced near Carbon Cliff by the Van-Packer Co., Division of Flint-Kote Co., which acquired Blackhawk Clay Products Co. in August 1956.

St. Clair.—Clay, coal, lime, limestone, and sand and gravel were produced. Approximately 3.9 million tons of coal was obtained from 16 underground mines and 3 strip pits. Underground mines included: Belle Valley Coal Co., East Side Coal Co., Mid-Continent Coal Corp., Perry Coal Co., Schubert Coal Co., and Shiloh Valley Coal Co. The Schubert Coal Co. mine was permanently abandoned in May 1956. Strip-mine operators were Midwest Radiant Corp., Morgan Coal Co., and Seminole Coal Corp.

Limestone for rubble, rough architectural use, flagging, riprap, roadstone, railroad ballast, and agricultural purposes was produced in the county. Quarry operators were: East St. Louis Stone Co., Hecker Quarry, Inc., Columbia Quarry Co., and Casper Stolle Quarry.

Missouri-Illinois Material Co. dredged sand near East St. Louis and reported output for building, paving, sand blasting, engine use, and other purposes.

Quick and hydrated lime were produced by the Aluminum Company of America at its East St. Louis plant for building, chemical, and other industrial uses.

The Hill Brick Co. produced clay near Belleville for use in manufacturing heavy clay products. Hydraulic-Press Brick Co. produced clay at French Village for use as lightweight aggregate.

Saline.—Saline County was one of the major coal-producing counties in the State in 1956. Over 3 million tons of coal was produced by 9 companies from 4 underground mines and 9 strip pits. Companies mining underground during the year included Peabody Coal Co. (No. 43 mine), and the Sahara Coal Co., Inc. (No. 5, No. 7, which was reopened in the latter part of 1956 after a period of inactivity, and No. 16 mines). Strip mines were operated by Robert Franklin Nutty Coal Co., Houston Coal Co., New Oak Hill Coal Co., Richardson Coal Corp., Sahara Coal Co., Inc., Vinyard Coal Co., Beecher Williams Coal Co., and the Saxton Coal Corp., which operated 2 mines, 1 of which was abandoned in August 1956 and the other, a new mine, was opened in September 1956.

Sangamon.—Coal for local consumption was produced from two underground mines operated near Cantrall by the Cantrall Coal Co. and Eddy Coal Co.

Sand and gravel for building and road construction and other uses was produced in the county. Commercial producers included Buckhart Sand & Gravel Co., Clear Lake Sand & Gravel Co., and Springfield Sand & Gravel Co. Paving sand was produced under contract for the State highway department.

Poston Brick & Concrete Products Co. produced clay near Springfield for use in manufacturing heavy clay products and for lightweight aggregate. Springfield Clay Products Co. also mined clay near Springfield for use in manufacturing heavy clay products.

Schuyler.—Coal was produced from 2 underground mines and 2 strip pits during the year. The entire county output was consumed locally. D. & D. Coal Co. and Wheelhouse Coal Co. mined underground. Eddington Coal Co. and Green Coal Co. strip-mined.

Road gravel was produced by Lyle B. Moushon and under contract for the State highway department.

Vern Mitchell Quarry Co. crushed limestone near Browning for agricultural and road purposes. Western Ill. Stone Co. quarried limestone near Brooklyn for road use.

Scott.—Thomas Quarry crushed limestone for agricultural and road uses. Krueger Quarry produced limestone for agricultural purposes near Winchester. Homer E. Grady produced sand for railroad ballast near Exeter.

Shelby.—Crushed limestone for road use was produced under contract for the county highway department. Sand and gravel for building and road purposes was produced by Hanfland Sand & Gravel Co. The county highway department produced road gravel.

Stephenson.—Limestone was produced in the county for concrete aggregate and roadstone, riprap, fertilizer, and agricultural purposes. Producers in 1956 included: Ray Askey, W. E. Broege, Russell E. Cox, Ed. Finkbeiner & Sons, Fortner Limestone Co., Kutz Bros., Rees Construction Co., Rockford Blacktop Construction Co., Scofield & Co., V. H. Stich, Arthur Zimmerman, and the county highway department.

Road gravel was produced by Rein & Dahl, Inc., Scofield & Co., and under contract for the Loran Township Highway Department.

Tazewell.—Sand and gravel for building and road construction, engine use, railroad ballast, and filter purposes was produced in the county in 1956. Commercial operators were: Hoffer Construction Co., Inc., McGrath Sand & Gravel Co., C. A. Powley, and Spring Lake Sand & Gravel. Sand and gravel for road use was produced under contract for the State highway department.

Clay used in manufacturing heavy clay products was produced near East Peoria by the Peoria Brick & Tile Co.

Manito Filler Co. produced peat from a bog near Manito for use as a seed inoculant.

Lakeside Coal Co. produced coal from an underground mine near Pekin. The company ceased operations in October 1956.

Union.—Anna Quarries, Inc., operated a limestone quarry near Anna and reported output for riprap, concrete aggregate and roadstone, asphalt filler, and agricultural purposes. Crushed limestone for agricultural use was also produced near Anna by the Jonesboro Stone Co.

Vermilion.—Production of coal in the county in 1956 increased slightly over the previous year. Underground mines were operated by the B–10 Coal Co., Blue Lake Coal Co., Deep Valley Coal Co., and V-Day Coal Co. Fairview Collieries Corp. and The United Electric Coal Cos. operated strip mines. All coal mining was conducted in the vicinity of Danville and Catlin in the east-central part of the county.

Material Service Corp. crushed limestone near Fairmont for road use.

Sand and gravel producers in 1956 included Blakeney Gravel Co., Lewis & Co., Jesse Speranza, and Elton Wagner Co. Output was for building and road construction, fill, and other uses. Road gravel was produced under contract for the State highway department.

Western Brick Co. produced clay near Danville for use in manufacturing heavy clay products and for lightweight aggregate.

Wabash.—Mt. Carmel Sand & Gravel Co. near Mount Carmel produced sand and gravel for building and road construction, railroad ballast, and other purposes. Allendale Gravel Co. produced sand and gravel near Allendale for building and road use. Dunbar Sand & Gravel Co. produced sand and gravel for road use. The State highway department contracted for road gravel.

Warren.—Monmouth Stone Co. produced crushed and broken limestone near Monmouth for riprap, roadstone, and agricultural purposes.

Washington.—Bois Coal Co. near DuBois and Venedy Coal Co., near Venedy, produced coal from underground mines.

Radom Quarry produced crushed limestone near Radom for agricultural and road purposes. Limestone for road use was also produced by Pitts Quarry and under contract for the county highway department.

White.—Eastwood Sand & Gravel and Frashier Bros. dredged sand and gravel for building and road purposes. Road gravel was produced by Miller Sand & Gravel Co. and under contract for the State highway department.

Whiteside.—Cordova Quarry, Inc., crushed limestone near Erie for agricultural use, roadstone, and railroad ballast. Alldritt Bros.

quarried limestone near Morrison for road use and fertilizer filler. Fred R. McKenzie & Co. reported output of crushed and broken limestone for riprap, roadstone, and agricultural pruposes. Crushed limestone for road use was produced by Johnson Coal Co., Butler Sand & Gravel, and Rein & Dahl, Inc., and under contract for the county highway department.

Anderson Ready Mix produced sand and gravel for building use and other purposes. Ernest Johnson produced gravel near Lyndon for miscellaneous uses. William L. Taber reported output for building use from gravel pit near Prophetstown. Road gravel was produced by Midwest Sand & Gravel Co. and Jordan Township.

Will.—The Chicago Gravel Co. operated fixed sand and gravel plants near Plainfield and Joliet, producing material for building and road construction, railroad ballast, and fill. Elmhurst-Chicago Stone Co. produced sand and gravel near Lisle for building and road purposes. Road gravel was produced by C. N. Monk. The State highway department contracted for sand and gravel for road use. Material Service Corp. produced sand and gravel for building use and other purposes. The company also quarried limestone near Lockport for use as concrete aggregate and roadstone. The Lincoln Stone Co. produced crushed limestone near Joliet for agricultural use, roadstone, railroad ballast, and flux. National Stone Co. quarried limestone near Joliet for agricultural use, roadstone, railroad ballast, and other purposes. The Illinois State Penitentiary produced crushed limestone for agricultural and road use.

Bituminous coal was produced by Wilmington Coal Mining Corp. from a strip mine near Braidwood.

United States Steel Corp. produced coke at its Joliet Works for use in blast furnaces.

F. E. Schundler & Co., Inc., exfoliated vermiculite and expanded perlite at Joliet from a material mined in Western States. Output was used chiefly as lightweight aggregate in plaster and concrete and for insulation purposes.

Williamson.—Williamson County led in coal production in the State. A total of 37 mines (20 underground and 17 strip) was operated by the following companies: Barbara Kay Coal Co, Bell & Zoller Coal Co., Big 3 Coal Co., Black Crystal Coal Co., Blue Bell Coal Co., Blue Bird Coal Co., Blue Blaze Coal Co. of Carterville, C. & C. Coal Co., Carmac Coal Co., Bert Chamness Construction Co., Cherry Hill Coal Co., Farley Bros. (Black Dot Coal Co.), Forsyth Carterville Coal Co., Freeman Coal Mining Corp., Harrisburg Coal Co., R. C. Jennings & Son Coal Co., McHorn Coal Co., McLaren Coal Co., Moore & Son Coal Co., New Black Diamond Coal Co., New Walnut Valley Coal Co., P. & R. Coal Co., Parton Coal Co., Peabody Coal Co., Stilley Coal Co., Stonefort Corp., Strobel Coal Co., Tregoning Coal Co., Wenzel Construction Co., Wilco Coal Co., Wilkins Coal Co., Wilkins Construction Co., and Wyvan Coal Co. The Morgan-Herrin mine, formerly owned by Morgan Mines, Inc., was purchased by Peabody Coal Co. during the year and renamed "Energy". Carmac Coal Co. acquired the Delta mine from Delta Collieries in March 1956. P. & R. Coal Co. opened up a new strip mine near Benton in November 1956. Over 95 percent of the county coal output was shipped to markets by rail; the remainder was consumed locally.

The county highway department produced dimension limestone for use as rubble and crushed limestone for road purposes.

Winnebago.—Sand and gravel output in the county in 1956 was employed for building and road construction, engine use, railroad ballast, and fill. Producers during the year included: Anderson Sand & Gravel Co., Consumers Co., Illinois-Wisconsin Sand & Gravel Co., Kelley Sand & Gravel Co., Larson Bros. Sand & Gravel, Northwest Gravel Co., Sahlstrom & Sons, and South Beloit Sand Co.

Crushed limestone for agricultural and road purposes was produced by Charles Lee & Sons, William Nordhop, and Porter Bros. Output of limestone for road use was reported by Charles Ind Co., operating the Byrne and Mulford Quarries by Rockford Blacktop Construction Co., and by Pecatonica Township.

Woodford.—Road gravel was produced near Secor by the Wood-Mar Construction Co. and under contract for the McLean County Highway Department.

The Mineral Industry of Indiana

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey, Indiana Department of Conservation.

By Donald F. Klyce [1] and John B. Patton [2]

FURTHER inflation was reflected in Indiana's 1956 minerals production, as its value increased nearly 7 percent to $196 million; its volume held close to the 1955 quantities. Output value of 5 mineral commodities furnished over 90 percent of the State total. Coal production increased in tonnage and value 6 and 10 percent, respectively. Cement production was about the same as in 1955, but its value rose 13 percent. Petroleum volume and value were each 5 percent more than in 1955. Sand and gravel tonnage declined 2 percent; its value was slightly higher than in 1955. Dimension-limestone tonnage decreased 18 percent, and value dropped 23 percent; crushed limestone increased about 5 percent over 1955.

Higher coal production was due to increased power requirements in the Ohio Valley—the continuation of a trend that began in 1955 with the development of atomic-energy facilities in that area.

Decrease in building, combined with increasing popularity of new types of construction using metallic facings, adversely affected building-stone output. The decline was more marked in the last quarter of 1956. Increased demand for crushed stone, particularly for road construction and agricultural use, partially offset the decline in dimension stone.

1956 was the first full year of gypsum mining in Indiana. The Martin County deposits yielded over twice as much crude gypsum as was produced in 1955.

In heavily industrialized Lake County over 10 percent of the Nation's pig iron was produced. Coke, anhydrous ammonia, dead-burned dolomite, and industrial refractories also were produced in that area.

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TABLE 1.—Mineral production in Indiana, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasives (whetstones)	(2)	(2)	3	$5,322
Clays	1,729,299	$2,938,010	2,050,620	3,457,110
Coal	16,149,310	58,000,085	17,089,433	64,061,096
Lime	(2)	(2)	80	960
Marl, calcareous	17,080	10,543	99,561	65,755
Natural gas—million cubic feet	1,226	152,000	791	96,000
Peat	9,053	49,924	11,383	78,594
Petroleum (crude)—thousand 42-gallon barrels	10,988	31,980,000	11,513	33,733,000
Sand and gravel	17,081,982	14,306,348	16,666,985	14,353,088
Stone	14,124,406	34,679,589	14,700,025	31,574,890
Value of items that cannot be disclosed: Cement, gypsum, recovered elemental sulfur, and values indicated by footnote 2		43,837,863		50,597,967
Total Indiana [3]		183,479,000		195,674,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total has been adjusted to eliminate duplicating value of clays and stone.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Coal continued to be Indiana's most valuable mineral product. Value of shipments in 1956 was about 10 percent higher than in the previous year. As in 1955, mines in the southwestern part of the State furnished a large share of the total. Warrick County again led the State in coal production and supplied nearly a third of the total. Coal mining in this area was spurred by the power requirements of atomic-energy developments in the Ohio Valley.

During 1956, 3 mobile loading machines, 1 continuous mining machine, 8 shuttle cars, and 1 "mother" conveyor were added to the equipment of Indiana mining operations.[3]

A Bureau of Mines report on analyses of tipple and delivered coal included data showing composition and quality of samples of coal from 11 Indiana mines.[4]

The Indiana Geological Survey published a map showing the coal geology of Clay County.[5]

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[3] Coal Age, February 1957, pp. 72–74.
[4] Aresco, S. J., Haller, C. P., and Abernethy, R. F., Analyses of Tipple and Delivered Samples of Coal; Bureau of Mines Rept. of Investigations 5270, 1956, 66 pp.
[5] Indiana Geological Survey, Distribution, Structure, and Mined Areas of Coals in Clay County, Ind.; Prelim. 1956.

TABLE 2.—Bituminous coal production, value, and number of mines operated in 1956, by counties

(Exclusive of mines producing less than 1,000 net tons)

County	Production (net tons)			Value		Number of mines operated		
	Underground	Strip	Total	Average per ton	Total	Underground	Strip	Total
Clay		849,183	849,183	$3.84	$3,257,047		8	8
Daviess		69,825	69,825	4.33	302,542		2	2
Dubois	34,777		34,777	2.70	93,898	4		4
Fountain		45,894	45,894	6.31	289,454		1	1
Gibson	533,130	161,138	694,268	4.26	2,957,776	2	1	3
Greene	14,379	1,443,439	1,457,818	4.00	5,825,435	3	10	13
Knox	945,788	339,686	1,285,474	3.80	4,882,203	4	1	5
Martin		10,075	10,075	4.14	41,683		1	1
Owen		(1)	(1)	(1)	(1)		2	2
Parke		20,649	20,649	5.98	123,454		3	3
Pike	50,344	2,419,625	2,469,969	3.57	8,808,003	6	8	14
Spencer	4,643	(1)	(1)	(1)	(1)	1	2	3
Sullivan	498,624	448,975	947,599	4.00	3,786,215	4	4	8
Vermillion	23,495	248,898	272,393	4.00	1,088,938	3	2	5
Vigo	2,539,976	545,230	3,085,206	3.92	12,081,096	6	3	9
Warrick	529,881	5,078,176	5,608,057	3.48	19,512,032	10	10	20
Undistributed		233,603	238,246	4.24	1,011,320			
Total	5,175,037	11,914,396	17,089,433	3.75	64,061,096	43	58	101

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.

Peat.—Peat production was reported from six counties during 1956—Blackford, De Kalb, Grant, Hamilton, Marion, and Wells. The output was sold for soil conditioning.

TABLE 3.—Production of peat, 1947–56

Year	Number of producers reporting	Short tons	Value	Year	Number of producers reporting	Short tons	Value
1947	4	3,957	$14,760	1952	9	10,115	$49,775
1948	3	2,288	11,576	1953	6	6,919	41,049
1949	7	7,949	28,537	1954	8	12,041	59,149
1950	5	5,793	18,966	1955	6	9,053	49,924
1951	5	5,699	22,824	1956	7	11,383	78,594

Petroleum and Natural Gas.—Petroleum production in 1956 increased over one-half million barrels to 11.5 million barrels. Natural-gas production totaled 791 million cubic feet in 1956.

The total number of wells drilled was 699, of which 488 were in proved fields and 211 were wildcats. This total figure included 251 oil producers, 9 gas producers, and 439 dry holes. Thirty-three successful exploratory wells, all in southwestern Indiana, resulted in the discovery of 10 new fields (including 1 gasfield), 13 extensions, and 10 new pays. Of these, the extensions were the most significant.[6]

Proved oil reserves in 1956 totaled approximately 67.8 million [7] barrels, as compared with 62 million barrels reported for 1955.

[6] Petroleum Section, Indiana Geological Survey.

[7] Carpenter, G. L., and Walker, F. H., Black Gold in Indiana; Ind. Business and Ind., Ind. Business Mag., Inc., vol. 1, No. 4. 1956.

TABLE 4.—Production of crude oil, 1956, by major fields [1]

Field	County	Year discovered	Area (acres)	1956 production (barrels)	Number of wells, 1956	
					Producing	Completed
Caborn Consolidated	Posey	1940	1,400	315,336	109	5
College Consolidated	do	1941	520	338,288	44	2
Erskine	Vanderburgh	1931	480	127,930	65	0
Fairbanks	Sullivan	1950	420	206,987	19	0
Griffin Consolidated	Gibson and Posey	1938	6,090	2,402,695	596	19
Heusler Consolidated	Posey and Vanderburgh	1938	1,400	145,868	84	0
Inman East	Posey	1943	340	120,870	30	3
Lamott Consolidated	do	1941	740	209,546	57	14
Monroe City Consolidated	Knox	1950	1,720	173,639	110	2
Mount Carmel Consolidated	Gibson and Knox	1941	1,660	262,484	159	0
Mount Vernon Consolidated	Posey	1941	1,800	557,616	159	8
Mumford Hills	Gibson and Posey	1940	680	137,114	52	8
Owensville East Consolidated.	Gibson	1948	790	320,030	78	1
Owensville North	do	1943	1,710	120,703	100	3
Patoka East	do	1947	770	216,661	68	8
Plainville	Daviess	1950	350	117,831	57	0
Rochester	Gibson	1948	430	286,139	43	1
Rock Hill (New)	Spencer	1953	430	220,028	31	1
Spencer	Posey	1948	510	280,423	48	(2)
Springfield Consolidated	do	1946	1,900	440,416	226	12
Terre Haute East	Vigo	1951	380	106,859	19	1
Union-Bowman Consolidated (New).	Gibson, Knox, and Pike	1941	11,750	941,921	433	48
Vienna	Vanderburgh	1933	310	268,183	47	(2)
Welborn Consolidated	Posey	1941	1,320	382,714	112	3
Undistributed				3,076,719	1,498	112
Total				11,777,000	4,244	251

[1] Adapted from Dawson, T. A. and Carpenter, G. L., Oil Development and Production in Indiana during 1956: Indiana Department of Conservation, Geol. Survey Min. Econ. Ser. 3; Table 1.
[2] Correct entry not determinable.

NONMETALS

Abrasive Materials.—Natural whetstones were produced from the Hindostan quarry near Orleans in Orange County. Indiana Sandstone Co. (Bedford) quarried a substantially increased output over the previous year.

Cement.—Indiana cement shipments remained about the same as in 1955. The price per barrel of both portland and masonry cements increased, resulting in a 13-percent rise in the value of shipments in 1956. Portland and masonry cements were produced by Louisville Cement Co., Speed; Universal Atlas Cement Co., Buffington; Lehigh Portland Cement Co., Mitchell; and Lone Star Cement Corp., Limedale. Natural cement also was produced at the Speed plant by Louisville Cement Co.

Clays.—Clay production in 1956 was substantially greater than in 1955. Tonnage of miscellaneous clay mined increased 17 percent; fire-clay production was 22 percent higher than in 1955. Production was reported from 26 counties. Miscellaneous clay was mined in 24 counties and used to manufacture cement and heavy clay products (brick, tile, and related products). Fire clay was mined in eight counties and used in refractories, firebrick, stoneware, art pottery, high-grade tile, and heavy clay products.

Midwest Aggregates, Inc., expanded shale for use as lightweight aggregate at a plant in Brooklyn. The raw material was mined from the New Providence shale of the Borden group.

TABLE 5.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Fire clay		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	428,037	$729,721	896,984	$782,804	1,325,021	$1,512,525
1952	397,336	732,025	933,962	968,184	1,331,298	1,700,209
1953	582,639	1,163,687	1,071,473	1,350,540	1,654,112	2,514,227
1954	374,081	700,044	1,571,988	2,290,672	1,946,069	2,990,716
1955	529,310	1,020,703	1,199,989	1,917,307	1,729,299	2,938,010
1956	645,254	1,201,863	1,405,366	2,255,247	2,050,620	3,457,110

The Indiana Geological Survey estimated the value of products manufactured from clays at $27 million.

Gypsum.—Gypsum deposits near Shoals, Martin County, were mined by National Gypsum Co. and United States Gypsum Co. The crude gypsum was processed in mills adjoining the mines, and wallboard, lath, prepared plasters, and other products were manufactured.

Lime.—The Indiana State Farm, Putnam County, produced a small quantity of quicklime for its own use. The limestone used in lime manufacture was quarried on the property.

Marl, Calcareous.—Marl production was reported in 7 counties in northern Indiana: Elkhart, Fulton, Kosciusko, Lagrange, La Porte, Noble, and Steuben. The output was used for agricultural purposes.

TABLE 6.—Production of calcareous marl, 1951–56

Year	Number of producers reporting	Short tons	Value	Year	Number of producers reporting	Short tons	Value
1951	4	12,960	$18,129	1954	6	28,536	$18,515
1952	5	16,414	9,021	1955	5	17,080	10,543
1953	4	13,540	6,398	1956	8	99,561	65,755

Perlite.—Crude perlite, mined in Western States, was expanded for use as lightweight aggregate for plaster and concrete by Federal Cement Tile Co., Chicago, Ill., at its plant at Hammond and by Airlite Processing Corp. (Vienna).

Sand and Gravel.—Sand and gravel was produced throughout the State in 67 counties. Production was about 2 percent less than in 1955, but total value was slightly higher in 1956 due to increased prices. Increases in the use of sand and gravel for road construction were offset by declines in the tonnages used for building construction and industrial purposes.

The Indiana Geological Survey released a publication concerning beneficiation of sand for glass and other high-silica purposes,[8] and exploration by private industry resulted in the location of a 25-million-ton deposit of sand suitable for beneficiation in Harrison County. The deposit is 1½ miles from the Ohio River in the Ohio River formation.

[8] Pinsak, A. P., High-Silica-Sand Potentialities of the Ohio River Formation: Indiana Dept. Cons., Geol. Survey Bull. 9, 1956, 54 pp.

The 10 leading producers of sand and gravel were: American Aggregates Corp., Greenville, Ohio; Irving Bros. Gravel Co., Marion; Kickapoo Sand & Gravel Corp., Peru; Koch Sand & Gravel Co., Evansville; Material Service Corp., Chicago, Ill.; Myers Gravel & Sand Co., Inc., Anderson; Portage-Manley Sand Co., Rockton, Ill.; Spickelmier Co., Indianapolis; Standard Materials Corp., Indianapolis; and Western Indiana Gravel Co., Lafayette.

TABLE 7.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Molding	891,641	$1,129,676	$1.27	410,338	$569,589	$1.39
Building	4,005,960	2,667,631	.67	3,097,941	2,308,873	.75
Paving	2,448,005	1,876,079	.77	3,120,180	2,649,660	.85
Grinding and polishing	16,381	7,977	.49			
Engine	109,801	80,454	.73	95,497	71,551	.75
Other	107,803	81,807	.76	128,740	87,989	.68
Undistributed [1]	69,644	61,841	.89	170,000	203,943	1.20
Total sand	7,649,235	5,905,465	.77	7,022,696	5,891,605	.84
Gravel:						
Building	3,300,897	3,231,593	.98	3,262,212	2,989,025	.92
Paving	4,716,481	4,321,254	.92	5,289,760	4,762,624	.90
Railroad ballast	485,416	392,777	.81	412,335	345,618	.84
Other	372,607	227,712	.61	232,124	155,355	.67
Total gravel	8,875,401	8,173,336	.92	9,196,431	8,252,622	.90
Total sand and gravel	16,524,636	14,078,801	.85	16,219,127	14,144,227	.87
GOVERNMENT-AND-CONTRACTOR						
Sand: Paving				25,102	10,650	.42
Gravel:						
Building				43,056	17,222	.40
Paving	557,346	227,547	.41	379,700	180,989	.48
Total gravel	557,346	227,547	.41	422,756	198,211	.47
Total sand and gravel	557,346	227,547	.41	447,858	208,861	.47
ALL OPERATIONS						
Sand	7,649,235	5,905,465	.77	7,047,798	5,902,255	.84
Gravel	9,432,747	8,400,883	.89	9,619,187	8,450,833	.88
Grand total	17,081,982	14,306,348	.84	16,666,985	14,353,088	.86

[1] Includes fire or furnace, filter, glass, and railroad ballast sands to avoid disclosing individual company confidential data.

Slag.—Slag, a byproduct of blast-furnace operations in the Lake County industrial area was crushed for use as aggregate and as a raw material in the manufacture of cement, and expanded for use as insulating material and lightweight aggregate.

Stone.—Stone produced in Indiana was valued at $31.6 million—a decrease of over $3 million from 1955. Dimension-limestone sales

declined 23 percent. Two factors explained the decline—a decreased amount of building generally and an increased use of competitive materials in facing buildings. Building-stone production was centered in Lawrence and Monroe Counties, where the Salem limestone formation has been quarried for 150 years. Quarries and mills are located in and near the towns of Bedford and Bloomington. A map showing geology and other economic aspects of this dimension stone district was published by the Indiana Geological Survey.[9]

Leading producers of dimension limestone were: Indiana Limestone Co., Ingalls Stone Co., and Heltonville Limestone Co., Bedford; Bloomington Limestone Corp., Empire Stone Co., B. G. Hoadley Quarries, Inc., and Victor Oolitic Stone Co., Bloomington.

The production and value of crushed limestone increased 5 percent over 1955. Larger tonnages of crushed limestone for agricultural use and in concrete aggregate and road construction furnished much of the gain. Production was reported from 39 counties. The leading counties, in order of value, were: Putnam, Clark, Lawrence, Monroe, and Allen. Major producers of crushed stone included Erie Stone Co., Louisville Cement Co., Mulzer Bros., Ohio & Indiana Stone Corp., and Pipe Creek Stone Co. A map published by the Indiana Geological Survey showed the distribution of crushed-stone quarries throughout the State.[10]

Dimension sandstone was quarried in Lawrence County by Indiana Sandstone Co., Inc., of Bedford and in Martin County by French Lick Sandstone Co., Inc., of French Lick. John H. Hinkle of Bloomington opened a quarry in Monroe County in June 1956 to produce dimension sandstone.

General Refractories Co., Philadelphia, Pa., quarried in a quartz-pebble conglomerate of the Mansfield formation near Shoals in Martin County. The material was washed and sized and shipped by rail for refractory purposes.

The Indiana Geological Survey issued a directory of crushed-limestone producers in Indiana during 1956. The report reviewed the history of the crushed-stone industry in the State, provided data on distribution and stratigraphy of various rock systems, and listed limestone producers.[11]

A report on drift thickness by the Indiana Geological Survey showed general overburden conditions for quarrying in the northern three-fifths of the State.[12]

Sulfur.—Byproduct sulfur was recovered from crude petroleum by the Standard Oil Co. of Indiana at Whiting. The Mathieson-Fluor process was used.

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[9] Smith, N. M., Map of Bedford Bloomington Dimension Stone Belt Showing Mills, Quarries, and Outcrop of Salem Limestone; Indiana Geol. Survey Atlas of Min. Res. Map 8, 1956.

[10] McGregor, D. J., Patton, J. B., and Smith, N. M., Map of Indiana Showing Crushed Stone and Dimension Stone Operations Outside of Bedford-Bloomington Dimension Stone Belt, Indiana: Geol. Survey Atlas of Min. Res. Map 7, 1956.

[11] McGregor, D. J., Directory of Crushed-Limestone Producers in Indiana; Indiana Geol. Survey Directory 4, 1956, 56 pp.

[12] Wayne, W. J., Thickness of Drift and Bedrock Physiography of Indiana North of the Wisconsin Glacial Boundary; Indiana Geol. Survey Rept. of Prog. 7, 1956, 70 pp.

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TABLE 8.—Limestone sold or used by producers, 1955–56, by uses

Use	1955			1956		
	Quantity	Value		Quantity	Value	
		Total	Average per ton		Total	Average per ton
Dimension:						
Building:						
Rough architectural cubic feet	3,725,392	$4,204,560	$1.13	3,185,090	$3,592,069	$1.13
Dressed (cut and sawed) cubic feet	5,547,378	14,289,137	2.58	3,612,995	10,546,860	2.92
Flagging and rubble cubic feet	276,676	35,568	.13	1,059,090	211,352	.20
Total (short tons approximate) [1]	692,335	18,529,265	26.76	569,645	14,350,281	25.19
Crushed and broken:						
Riprap short tons	455,815	487,673	1.07	359,329	171,256	.48
Flux do	118,930	147,296	1.24	135,210	169,267	1.25
Concrete aggregate, roadstone, etc short tons	8,302,582	10,060,054	1.21	8,677,549	10,721,535	1.24
Railroad ballast do	270,255	308,536	1.14	158,140	191,663	1.21
Agriculture do	2,078,669	2,575,569	1.24	2,446,561	3,143,022	1.28
Other [2] do	2,181,694	1,993,418	.91	2,277,993	2,009,326	.88
Total crushed and broken short tons	13,407,945	15,572,546	1.16	14,054,782	16,406,069	1.17
Grand total do	14,100,280	34,101,811	2.42	14,624,427	30,756,350	2.10

[1] 145 pounds per cubic foot.
[2] Includes limestone for refractory, calcium carbide plants, glass factories, paint and rubber filler, pottery, asphalt, fertilizer, dust for coal mines, mineral food, mineral wool, cement, and other uses.

REVIEW BY COUNTIES

Adams.—The Krick Tyndall Co. (Findlay, Ohio) mined clays from a pit near Decatur for use in heavy clay products. Sand and gravel for building construction and miscellaneous use was produced by Lybarger Gravel Co. (Geneva). Crushed limestone for construction aggregate and agricultural use was quarried by John W. Karch Stone Co., Bryant; and Meshberger Bros. Stone Corp., Linn Grove.

Allen.—Miscellaneous clay for use in heavy clay products was mined by Walter A. Bolyard Tile Co. (Monroeville). Sand and gravel for building and road construction was produced by Paul C. Brudi Stone & Gravel Co. and May Sand & Gravel Corp., Fort Wayne; and W. W. Gravel Co., Inc., Roanoke. May Sand & Gravel Corp. also quarried and crushed limestone for construction aggregate.

Bartholomew.—Sand and gravel for building construction was produced by Driftwood Gravel Co. (Columbus) from a site near Edinburg. The county highway department contracted for road sand and gravel. Meshberger Stone Co. (Columbus) quarried and crushed limestone for construction aggregate and agricultural and refractory use.

Benton.—Gravel for road maintenance was produced by Mount Gilboa Gravel Co. (Fowler), from a site near Remington.

TABLE 9.—Value of mineral production in Indiana, 1955–56, by counties [1] [2]

County	1955	1956	Minerals produced in 1956 in order of value [2]
Adams	$576,479	$510,736	Stone, clays, sand and gravel.
Allen	841,629	1,287,103	Stone, sand and gravel, clays.
Bartholomew	291,673	342,139	Stone, sand and gravel.
Benton	5,738	2,910	Sand and gravel.
Blackford	144,000	127,622	Stone, peat, clays.
Boone	36,511	32,035	Sand and gravel.
Carroll	(3)	(3)	Stone, sand and gravel.
Cass	494,136	(3)	Do.
Clark	(3)	(3)	Cement, stone, sand and gravel, clays.
Clay	3,719,541	4,074,119	Coal, clays, sand and gravel.
Clinton	9,475	30,322	Sand and gravel.
Crawford	(3)	(3)	Stone.
Daviess	338,522	477,158	Coal, clays, sand and gravel.
Dearborn	194,780	209,266	Sand and gravel.
Decatur	231,029	(3)	Stone.
De Kalb	223,145	286,729	Sand and gravel, peat.
Delaware	574,192	487,941	Stone, sand and gravel.
Dubois	154,894	151,847	Coal, clays, sand and gravel.
Elkhart	287,422	286,281	Sand and gravel, marl.
Fayette	93,565	97,841	Sand and gravel.
Fountain	668,108	606,447	Coal, sand and gravel, clays.
Franklin	900	(3)	Clays.
Fulton	46,066	74,594	Sand and gravel, marl.
Gibson	2,881,093	3,071,174	Coal, sand and gravel.
Grant	1,224,426	1,271,637	Stone, sand and gravel, peat.
Greene	5,014,027	6,110,449	Coal, clays, sand and gravel, stone.
Hamilton	483,543	(3)	Stone, sand and gravel, peat.
Hancock	72,136	83,509	Sand and gravel.
Harrison	89,727	107,450	Stone.
Hendricks	79,006	(3)	Sand and gravel.
Henry	32,930	33,851	Do.
Howard	400,900	386,499	Stone, sand and gravel.
Huntington	(3)	(3)	Stone, clays.
Jackson	348,699	323,469	Clays, sand and gravel.
Jasper	275,240	195,000	Stone, sand and gravel.
Jay	81,600	(3)	Stone.
Jennings	249,397	(3)	Do.
Knox	4,822,178	5,172,969	Coal, sand and gravel.
Kosciusko	293,722	371,745	Sand and gravel, marl.
Lagrange	(3)	(3)	Do.
Lake	(3)	(3)	Cement, sulfur, clays, sand and gravel.
La Porte	510,956	(3)	Sand and gravel, marl.
Lawrence	15,454,700	12,808,478	Stone, cement, sand and gravel.
Madison	745,862	713,479	Stone, sand and gravel.
Marion	2,589,898	2,240,318	Sand and gravel, peat.
Marshall	86,296	71,575	Sand and gravel, clays.
Martin	(3)	2,455,500	Gypsum, stone, clays, coal.
Miami	509,183	484,955	Sand and gravel.
Monroe	9,279,291	8,639,679	Stone.
Montgomery	102,140	100,541	Clays, sand and gravel.
Morgan	389,180	386,827	Do.
Newton	579,000	598,000	Stone.
Noble	28,825	18,891	Sand and gravel, marl.
Orange	698,810	301,482	Stone, abrasives.
Owen	1,386,160	1,542,738	Coal, stone, clays, sand and gravel.
Parke	493,195	576,135	Clays, sand and gravel, coal, stone.
Perry	(3)	(3)	Stone, clays.
Pike	7,272,793	8,808,003	Coal.
Porter	377,102	349,826	Sand and gravel, clays.
Posey	116,923	127,151	Sand and gravel.
Pulaski	579,225	519,616	Stone, clays, sand and gravel.
Putnam	(3)	(3)	Cement, stone, clays, sand and gravel, lime.
Randolph	212,348	205,183	Stone, sand and gravel.
Ripley	169,310	163,156	Do.
Rush	185,951	238,399	Do.
St. Joseph	621,542	775,024	Sand and gravel.
Scott	265,951	257,507	Stone.
Shelby	569,853	548,529	Stone, sand and gravel.
Spencer	(3)	(3)	Coal, sand and gravel.
Starke	(3)	59,510	Sand and gravel.
Steuben	244,788	206,677	Sand and gravel, marl.
Sullivan	4,883,367	3,941,419	Coal, sand and gravel.
Switzerland	60,450	81,773	Stone.
Tippecanoe	703,189	769,700	Sand and gravel.
Vanderburgh	(3)	436,980	Sand and gravel, clays.
Vermillion	1,487,716	1,739,377	Coal, sand and gravel, clays.
Vigo	11,045,094	12,249,865	Do.
Wabash	49,857	53,404	Sand and gravel.
Warren	1,000	(3)	Do.

See footnotes at end of table, p. 10.

TABLE 9.—Value of mineral production in Indiana, 1955–56, by counties [1] [2]—Con.

County	1955	1956	Minerals produced in 1956 in order of value [2]
Warrick	$17,902,693	$19,673,032	Coal, stone, sand and gravel.
Wayne	567,914	605,363	Sand and gravel, stone.
Wells	345,329	297,055	Stone, peat, sand and gravel.
White	418,400	580,600	Stone.
Whitley	[3]	[3]	Sand and gravel.
Undistributed	77,264,728	88,185,193	
Total	183,479,000	[4] 195,674,000	

[1] The following counties are not listed because no production was reported: Brown, Floyd, Jefferson, Johnson, Ohio, Tipton, Union, and Washington.
[2] Except for natural gas and petroleum, which was not available by counties. Value of these commodities is included with "Undistributed."
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[4] Total has been adjusted to eliminate duplicating value of clays and stone.

Blackford.—Miscellaneous clay for use in heavy clay products was mined by Inman Tile Co., (Hartford City). Reed or sedge peat was produced by Hartford Peat & Gravel Co. from a bog near Hartford City. Montpelier Stone Co. (Montpelier) quarried and crushed limestone for construction aggregate and agricultural stone.

Boone.—Sand and gravel for building, road construction, and miscellaneous use was produced by Harold Blacker, Colfax; W. K. Murray, Frankfort, near Thorntown; Glen Reagan, Lebanon; and Routh Gravel Plant, Zionsville. Harold Blacker and W. K. Murray produced by dredging.

Carroll.—Brim Gravel Transit Mix Co., Inc. (Flora), Chester Brovont (Camden), and Lloyd Gangwer (Cutler), produced sand and gravel for building and miscellaneous use. Stuntz-Yeoman Co. (Delphi) quarried and crushed limestone for concrete aggregate and agricultural stone.

Cass.—Building sand was produced by Greenville Gravel Co. (Logansport) and the county highway department contracted for road gravel. Near Logansport, Cass County Stone Co., (Logansport) and The France Stone Co. (Toledo, Ohio) quarried limestone for use as flux, aggregate, railroad ballast, and agricultural stone.

Clark.—Louisville Cement Co. (Louisville, Ky.) produced masonry, natural, and portland cements at its plant at Speed. The company also mined clays and quarried limestone to manufacture cement. In addition to the Louisville Cement Co., other producers of crushed limestone in the county were T. J. Atkins & Co., Jeffersonville; and Sellersburg Stone Co., Sellersburg. The limestone was used for riprap, aggregate, and agricultural purposes. Yoder Same (Jeffersonville) produced sand for building purposes.

Clay.—Coal from strip mines was the principal mineral produced in the county. Producers were: Ayrshire Collieries Corp., Brown Coal Co., G & F Corp., Gillespie Coal Co., Log Cabin Coal Co., Quality Coal Corp., Ren Coal Co., and Turner, Thompson & Albin Coal & Clay Co. Fire and miscellaneous clays, for use in pottery and stoneware, refractories, and heavy clay products, were mined by American Vitrified Products Co., Cleveland, Ohio, near Brazil; G & F Corp., Log Cabin Coal Co., Love Bros. Clay & Coal Co., Ren Coal Co., and S. L. Turner Coal & Clay Co., all of Brazil; and Brown Coal Co. and Quality Coal Co., both of Centerpoint. Clyde Bullerdick Gravel

Co. (Poland) produced sand and gravel for road construction by dredging near Brazil.

Clinton.—Joe Conrad (Frankfort) produced road gravel from dredging near Jefferson. The county highway department contracted for road gravel.

Crawford.—Limestone for riprap, aggregate, and agricultural use was mined underground and crushed by Hy-Rock Products Co. (Marengo). Mulzer Bros. (Tell City) operated a large quarry and crushing plant near Eckerty.

Daviess.—Clays for use in heavy clay products were mined by Kretz Brick Co. (Washington) near Montgomery. Hicks Coal Co. and Loogootee Block Coal Co. strip-mined coal. John E. Mize (Elnora) and Western Sand & Gravel (Plainville) dredged sand and gravel for use in building, road construction, and miscellaneous purposes.

Dearborn.—Dearborn Gravel Co. (Lawrenceburg) and Laughery Gravel Co., Inc. (Aurora) produced sand and gravel for building and road construction.

Decatur.—Limestone for riprap, construction aggregate, and agricultural use was quarried by Harris City Stone Co., Greensburg; Layton Stone Co., Westport; and New Point Stone Co., Batesville, from a site near New Point.

De Kalb.—Moss and humus peat was produced by Humus Peat Moss Co., Corunna. Sand and gravel for building and road construction was produced by Burtzner Bros. & Wilhelm, Waterloo; Tom Day, and Flegal, Inc., both of Hamilton; Irving Gravel Co., Inc., Harlan (from a site near Spencerville); and Harold J. Krafft, Spencerville.

Delaware.—Muncie Excavating Co. and Park Sand & Gravel, Inc., (both of Muncie) produced sand and gravel for building, road construction, and miscellaneous uses. Crushed limestone for aggregate was produced by J & K Stone, Inc. (Muncie).

Dubois.—Fire and miscellaneous clays for use in heavy clay products were mined by Hugo H. Bartelt and Huntingburg Brick Co. (both of Huntingburg). Fire clay for stoneware and pottery was mined by Louisville Pottery Co. from a pit near Huntingburg. Production came from underground and open pits. Coal from underground mines was produced by Simon Ackerman Coal Mine, Mehringer & Frick, Stenftenagel Coal Co., and Tedrow Coal Co. Hoffman Sand & Gravel Co. (Jasper) produced building sand.

Elkhart.—Marl for agricultural purposes was mined from open pits by Ashliman & Weirich (Goshen) and E. M. Ulmer & Sons (Etna Green) from a site near Elkhart. Sand and gravel for building, road construction, and miscellaneous use, was reported by Christner Gravel Co., Inc., Goshen; Goshen Sand & Gravel, Goshen (from a site near New Paris); and Yoder Ready Mix Concrete Co., Inc., Elkhart.

Fayette.—Sand and gravel for building and road construction was produced by Connersville Gravel Co., Inc., and Grubbs Bros. (both of Connersville). Grubbs Bros. production came from dredging.

Fountain.—Clays for use in heavy clay products and chemicals were mined from open pits by Hydraulic-Press Brick Co., Crawfordsville; Poston-Herron Brick Co., Attica; and Rostone Corp., Lafayette. Morgan Coal Co. mined coal from a strip operation. Sand and gravel

for building and road construction was produced by Neal Gravel Co., Inc., Covington; and Towell & Towell, Kingman.

Franklin.—Herman H. Wessel Co. (Batesville) mined clays for use in heavy clay products from an open pit near Huntersville.

Fulton.—Marl for agricultural purposes was mined by Clarence Sampsel & Sons, Rochester (from a site near Akron), and M. E. Zellers, Kewanna. Production of sand and gravel for building and road construction was reported by Bert & Cecil Davis, Leiters Ford; C. G. Smith, Akron; and George E. Metzger and Van Duyne Block & Gravel Co., Rochester.

Gibson.—Coal was mined underground by Princeton Mining Co. and Somerville Coal Co. and from a strip mine by Saxton Coal Corp. Charles A. Griffin (Princeton) and Jewel Guller (Owensville) dredged sand and gravel for road construction near Johnson.

Grant.—Moss peat was produced by Glacier Peat Moss Co. (Jonesboro). Railroad ballast and sand and gravel for building and road construction were produced by Irving Bros. Gravel Co., Inc. (Marion). Pipe Creek Stone Co. (Marion) produced dimension and crushed limestone near Swayzee, for use as flagging, riprap, flux, aggregate, and railroad ballast and for agricultural purposes.

Greene.—Bloomfield Brick Co., Inc. (Bloomfield) mined clays for use in heavy clay products. Coal was the principal mineral produced in the county and came from 3 underground and 10 strip mines. Producers were: Monarch Coal Co., Inc., Richardson Coal Co., and South Linton Coal Co. (all underground); and Ax Coal Corp., Comet Collieries, Inc., Lambright Coal Co., Al Lohr Coal, Inc., Maumee Collieries Co., Rose Hill Coal Co., and Sherwood-Templeton Coal Co. (all strip). Sand and gravel for building, road construction, and miscellaneous use was produced by Concrete Silo Co., Inc., and Nocus & Schofield Gravel Plant (both of Bloomfield). Gordan & Shepherd Stone Co. quarried and crushed limestone for aggregate and agricultural use.

Hamilton.—Fox Prairie Products, Inc. (Indianapolis) produced moss peat near Noblesville. Filter sand and sand and gravel for building, road construction, and miscellaneous use were produced. Producers operating in the county were: Curt Ayers, Lebanon (from a site near Bakers Corner); Carmel Gravel Corp., Carmel; F. Beaver & Sons, Inc., Clark Materials, Chauncey Craig (from dredge operations), Newton Gravel Co., and Mrs. Clarence Russell, all of Noblesville; and Irving Materials, Inc., Fortville (the Reservoir plant). Stony Creek Stone Co. (Noblesville) quarried and crushed limestone for aggregates.

Hancock.—Delbert L. Reeves and Ed. Strubbe & Son (both of Greenfield) produced gravel for building and road construction.

Harrison.—Davis Crushed Stone & Lime Co. (Ransey) and Mathes Stone Co. (Corydon) quarried limestone for riprap, aggregate, and agricultural use.

Hendricks.—Sand and gravel for building and paving was produced by Standard Materials Corp. (Indianapolis).

Henry.—Sand and gravel for building and road construction was produced by Cooper & Priest, Frances L. Craig (from a site near Greensboro), Harry I. McNew & Sons, all of Knightstown; Irving Materials, Inc., Fortville (operating the New Castle plant); Jasper L.

McDonald, Honey Creek; and Alpha Riley, Middletown. Road gravel was produced by and for the county highway department.

Howard.—Dimension and crushed limestone was produced by Yeoman Stone Co. (Kokomo) for flagging, aggregate, and agricultural use. Some sand and gravel also was produced in the county.

Huntington.—Clays for heavy clay products were mined by Majenica Tile Co. (Huntington) from a site near Majenica. The Erie Stone Co. (Toledo, Ohio) quarried limestone near Huntington for flux, aggregate, railroad ballast, and agricultural and other miscellaneous uses.

Jackson.—Lehigh Portland Cement Co. (Allentown, Pa.) mined clays for use in manufacturing cement from a pit near Brownstown. Medora Brick & Tile Co. (Medora) mined clays for use in heavy clay products. Production of sand and gravel for building and road construction was reported by Medora Concrete Block Plant, Brownstown (from dredging near Vallonia); and Spray Gravel Co., Seymour.

Jasper.—Sand and gravel for building and road construction was produced by Peter Dziabis (from dredging) and Rensselaer Gravel Co. (both of Rensselaer). W. C. Babcock Construction Co., Inc. (Rensselaer) quarried and crushed limestone for aggregate and agricultural use.

Jay.—Dolomite for aggregate and agricultural use was quarried and crushed by Rockledge Products Co. (Portland).

Jennings.—Paul Frank, Inc. (North Vernon) quarried and crushed limestone for aggregate and agricultural use.

Knox.—Coal was mined underground by Diamond Coal Co., Enoco Collieries, and Wolfe-Koenig Corp. and from a strip operation by Shasta Coal Corp. Production of sand and gravel for building, road construction, and miscellaneous use, was reported by Lenahans & Konen, Inc., White River Materials Co. (both from dredging), and Knox County Sand Co. (all of Vincennes).

Kosciusko.—E. M. Ulmer & Sons (Etna Green) mined marl for agricultural use from a site near Atwood. Engine sand and sand and gravel for building, road construction, and miscellaneous use was produced in the county. Producers were Fuller's General Hauling, Estate of Roy R. Ruse, and Seth Yeiter, all of Warsaw; Sturm & Dillard Gravel Co., Syracuse; Western Indiana Gravel Co., Lafayette (from a site near Leesburg); and the county highway department.

Lagrange.—Marl from underground quarrying was produced by Glen Hesher (Howe). It was used for agricultural purposes. Sand and gravel for building, road construction, and miscellaneous use was produced by Northup Gravel Co. and Vern A. Pant, both of Lagrange; Wolcottville Sand & Gravel Corp., Wolcottville; and the county highway department.

Lake.—Universal Atlas Cement Co. (New York, N. Y.) produced portland and masonry cements at the company plant at Buffington. Clays from an open pit were mined by National Brick Co. (Chicago, Ill.), at a site near Munster. Output was used in manufacturing heavy clay products. John N. Bos Sand Co. (Chicago, Ill.) produced molding, building, road, and engine sand from a site near Gary. J. K. Hall & Sons (Lowell) produced building and road sand from dredging. Standard Oil Co. of Indiana (Chicago, Ill.) recovered

byproduct sulfur by the Mathieson-Fluor process. The entire production was used in its refinery at Whiting.

La Porte.—E. M. Ulmer & Sons (Etna Green) mined marl for agricultural use from a site near Walkerton. Molding and engine sand and sand and gravel for building and road construction were produced in the county. Producers were Clyde A. Bean, Rolling Prairie; J & A Gravel Co., Walkerton (from dredging); Portage-Manley Sand Co. (Rockton, Ill.) and Producers Core Sand Corp., both at Michigan City; and Gus Swanson, La Porte.

Lawrence.—Lehigh Portland Cement Co. (Allentown, Pa.) produced portland and masonry cements and limestone at Mitchell for use in manufacturing cement. Production of road gravel was reported by the C. E. Flynn Estate (Bedford). Indiana Sandstone Co., Inc. (Bedford) quarried dimension sandstone for architectural use. Dimension limestone for building purposes was quarried and milled by Heltonville Limestone Co., Indiana Limestone Co., Inc., and Ingalls Stone Co., all of Bedford. Several other fabricators processed purchased stone. Producers of crushed limestone were Oolitic Ground Limestone Co., Bedford; Mitchell Crushed Stone Co., Inc., Mitchell; and Ralph Rogers & Co., Inc., Bloomington (quarry at Springville). Uses were for riprap, aggregate, railroad ballast, glass, and agricultural and other miscellaneous purposes. Bedford Ground Limestone Co. crushed spalls at Bedford from building stone mills.

Madison.—Sand and gravel for building, road construction, and miscellaneous use was produced by Armfield Gravel Co., Myers Gravel & Sand Co., Inc., Riggs Equipment Co., and Western Indiana Gravel Co. (all at Anderson). Standard Materials Corp. (Lapel) quarried limestone for riprap, aggregate, and agricultural purposes.

Marion.—Humus peat was produced by Peat Moss Indianapolis, Inc. (Indianapolis). Sand and gravel for building, road construction, and railroad ballast was produced in the county. Producers were: American Aggregates Corp., Greenville, Ohio (from two sites near Indianapolis); and Schuster Coal Co., Standard Materials Corp., and Spickelmier Co., all of Indianapolis.

Marshall.—Bremen Tile & Sawmill, Inc. (Bremen) mined clays for use in heavy clay products. Sand and gravel for building, road construction, and miscellaneous use, was reported by David Stayton, Argos; Mutti Gravel Pit and Noble Reese, both of Bremen; Burr Oak Sand & Gravel Co., Culver; and Fred Appleman, Floyd Bottorff, Sr., and O. S. Goss & Sons, all of Plymouth.

Martin.—Clays for heavy clay products were mined by Loogootee Clay Products Corp. (Loogootee). Coal was strip-mined by Loogootee Block Coal Co., Inc. National Gypsum Co. and United States Gypsum Co. (both at Shoals) mined gypsum for manufacturing plaster and wallboard and for use as a portland-cement retarder, in agriculture (land plaster), and for industrial purposes. General Refractories Co. (Philadelphia, Pa.) quarried a quartz-pebble conglomerate near Shoals for use in manufacturing silica brick. The French Lick Sandstone Co., Inc., quarried dimension sandstone near Trinity Springs.

Miami.—Kickapoo Sand & Gravel Co. and Jess Richardson (both of Peru) and J. C. O'Connor & Sons, Inc. (Fort Wayne, operating

from a site near Peru), produced sand and gravel for building, road construction, railroad ballast, and miscellaneous use.

Monroe.—Nearly three-fifths of the dimension limestone produced in Indiana came from Monroe County quarries. Active quarries in the Bloomington area were: Bloomington Limestone Corp., Empire Stone Co., B. G. Hoadley Quarries, Inc., Independent Limestone Co., Midwest Quarries Co., Inc., Solomito Stone Co., Inc., Texas Quarries, Inc., Victor Oolitic Stone Co., Woolery Stone Co., Inc., The Carl Furst Co., Indiana Limestone Co., and Ingalls Stone Co. In addition to mills operated in conjunction with some of the quarries, purchased stone was cut and dressed by 12 mills in the area. Several additional companies sawed stone and split it for veneer, and others split stone purchased in sawed form. Stone was crushed by Bloomington Crushed Stone Co., Inc., at Bloomington. The Indiana Calcium Corp. (Bloomington) fine-grinding plant produced high-calcium limestone from mill spalls purchased from local stone mills. The output was sold for filler, coal mine rock dust, mineral food, and for agricultural use.

Montgomery.—American Vitrified Products Co. (Cleveland, Ohio, from a pit near Crawfordsville) and Hydraulic-Press Brick Co. (Crawfordsville) mined clays for use in heavy clay products. Sand and gravel for road construction and miscellaneous use was produced by Kitts Gravel Co., Harry Petro, Jr., and Lloyd E. Smith (all of Crawfordsville).

Morgan.—Adams Clay Products Co. (Martinsville) and Brooklyn Brick Co., Inc., Indiana Drain Tile Co., Inc., and Midwest Aggregates Inc. (all of Brooklyn), mined clays for use in manufacturing heavy clay products and lightweight aggregates. Sand and gravel for building, road construction, and miscellaneous use was produced in the county. Producers reporting were: Perle F. and Bobby Hill and Waverly Sand & Gravel, Martinsville. Waverly Sand & Gravel production came from dredging near Waverly.

Newton.—Newton County Stone Co., Inc., at a quarry, crusher, and mill near Kentland, produced crushed limestone for aggregate and agricultural purposes.

Noble.—Small quantities of gravel for buildings and roads were reported by Forest Geiger, Ed Tipton, and Furlow Burd. Luther and Haney operated four marl pits.

Orange.—A small quantity of whetstones was produced by Indiana Sandstone Co., Inc. (Bedford), from the Hindostan Whetstone quarry near Orleans. French Lick Sandstone Co., Inc. (French Lick), milled dimension sandstone, producing sawed and split stone for architectural use. Limestone for aggregate and agricultural purposes was quarried and crushed by Calcer Quarries, Inc., Paoli; William M. Cave, French Lick; and Radcliff & Berry, Inc., Orleans.

Owen.—Fire clay for use in heavy clay products, architectural terra cotta, and other purposes, was mined by Maumee Collieries Co. (Terra Haute) from an open pit near Coal City. Coal was strip-mined by Burcham Bros., Inc., and Maumee Collieries Co. Sand and gravel for building and road construction was produced from dredging by Gosport Gravel Co., Inc. (Gosport). Ingalls Stone Co. (Bedford) quarried dimension limestone at Romona, and Dunn

Limestone Co., Inc. (Spencer) quarried and crushed limestone for flux, aggregate, and agricultural purposes.

Parke.—Fire and miscellaneous clays for use in heavy clay products were mined by Cayuga Brick & Tile Co., Bloomingdale; and Clay City Pipe Co., Uhrichsville, Ohio. Coal was strip-mined by Gerrard & Presley Coal Co., Maple Grove Mine, and S. L. Turner Coal & Clay Co. Western Indiana Gravel Co. (Lafayette) produced sand and gravel near Montezuma for road construction and railroad ballast. Limestone for concrete aggregate and agricultural purposes was quarried and crushed by Cumberland Quarries, Inc. (Indianapolis) from a site near Wallace.

Perry.—Fire and miscellaneous clays were mined for use in manufacturing heavy clay products by Cannelton Sewer Pipe Co. (Cannelton) from an underground mine and by United States Brick Co. (Tell City) from an open-pit mine. Mulzer Bros. (Tell City) quarried and crushed limestone near Derby for aggregate and agricultural purposes.

Pike.—Coal mined in the county came from 6 underground mines and 8 strip mines; most of the production resulted from strip-mine operations. Arnold & Willis Coal Co., Meyers Coal Co., Miley Coal Co., Min-Win Coal Co., and R. & H. Coal Co., mined underground and Ayrshire Collieries Corp., Blackfoot Coal & Land Corp., Conder Coal Co., Cornell Excavating, Inc., Davis Excavating Co., and Enos Coal Mining Co., operated strip mines.

Porter.—Fire clay was mined and sold by Charles H. Schrock, Chesterton, for use in pottery, stoneware, and refractories. Molding sand was produced near Gary by John N. Bos Sand Co., of Chicago, Ill.; near Miller by Consumers Co., of Chicago, Ill.; and at Dune Park by Portage-Manley Sand Co., of Rockton, Ill. John N. Bos Sand Co. and Consumers Co. also produced building, road, and engine sand. Fire or furnace sand was produced by Crisman Sand Co., Inc. (Gary).

Posey.—Sand and gravel for building, road construction, and railroad ballast was produced in the county. Production was reported by Koch Sand & Gravel Co., Evansville; Stoy Huges Gravel Co., Mount Vernon; and New Harmony Sand & Gravel, New Harmony.

Pulaski.—Francesville Tile Co. (Francesville) mined clays from an open-pit mine for use in heavy clay products. Carl and James Doty (Monterey) produced sand and gravel for building and road construction. Limestone was quarried, crushed, and milled by Francesville Stone Co., Inc. (Francesville) for aggregate and agricultural purposes.

Putnam.—Lone Star Cement Corp. (Indianapolis) produced portland and masonry cement, mined clays, and quarried limestone for use in manufacturing cement at its plant at Limedale. Clark & Sons (Brazil) produced sand and gravel for building, road construction, and miscellaneous use from dredging near Reelsville. Crushed limestone for riprap, aggregate, agricultural and chemical purposes was produced by Cloverdale Stone Co., Cloverdale; Manhattan Crushed Stone Co., Greencastle (quarry at Reelsville); and Russellville Stone Co., Russellville. The Ohio & Indiana Stone Corp. (Toledo, Ohio) operated a quarry and two mills at Greencastle; its output was sold for asphalt roofing, fertilizer, coal-mine rock dust,

animal feed, riprap, railroad ballast, metallurgical use, aggregate, and agricultural stone. The Indiana State Farm at Greencastle mined clays for heavy clay products, manufactured agricultural lime, and quarried limestone for aggregate and agricultural purposes. The entire output was used by the Indiana State Farm or other State agencies.

Randolph.—Sand and gravel for building, road construction, and miscellaneous use, was produced in the county. Production was reported by Ernest L. Habben, Modoc (near Economy); Hutchens Gravel Co., Lynn; and Marshall Retz, Winchester. H. & R. Stone Co. (Ridgeville) quarried and crushed limestone for aggregate and agricultural purposes.

Ripley.—The county highway department produced road sand. Crushed limestone was produced by Cord Stone Co., Versailles; Paul Frank, Inc., North Vernon (quarry near Versailles); Napoleon Quarries, Inc., Napoleon; and Southeastern Materials, Inc., Osgood. Uses were for riprap, aggregate, and agricultural purposes.

Rush.—Frank Alexander (Carthage, from a site near Arlington) and W. P. Wolfal Co. (Rushville) produced sand and gravel for building, road construction, and miscellaneous use. Limestone quarried and crushed by McCorkle Stone Co. and Rush County Stone Co. (both of Milroy) was used for riprap, aggregate, and agricultural purposes.

St. Joseph.—Production of sand and gravel for building, road construction, and miscellaneous use was reported by Concrete Products Corp., Mishawaka; H. B. Gravel Co., Goshen; Jacob Rose, La Porte; Lincolnway West Gravel Co., C. D. Smelser Co., Inc. (from dredging near Mishawaka), and South Bend Sand & Gravel Corp., all of South Bend; and Western Indiana Gravel Co., Lafayette (from a site near South Bend).

Scott.—Scott County Stone Co. (Scottsburg) quarried and crushed limestone for aggregate and agricultural purposes.

Shelby.—Sand and gravel for building and road construction was produced by Blue River Packing Co. and Elmer Caldwell, both of Morristown; and E. T. Burnside, Inc., Shelbyville. Cave Stone Co. (Flat Rock, from a site near Norristown) and St. Paul Quarries, Inc. (Indianapolis, from a site near St. Paul) quarried and crushed limestone for use as riprap, flux, aggregate, railroad ballast, and agricultural purposes.

Spencer.—Boehmann Bros. and Mulzer Bros. strip-mined coal and St. Meinrad's Arch Abbey mine operated underground. Molding sand was produced by Hardy Sand Co. (Evansville) from a site near Richland.

Starke.—Gravel for building and road construction was reported by Al Amidei, North Judson (from a site near Bass Lake); Albert C. Christensen, English Lake (from dredging); Bruce Fletcher, Knox; and the county highway department.

Steuben.—Cleveland & Taylor (Fremont) quarried marl for agricultural use. Sand and gravel for building, road construction, and miscellaneous use was produced by Herbert Alleshouse, Pleasant Lake; Angola Sand & Gravel Co. and Stonestreet Gravel Co., Inc., both of Angola; Emery Spade, Orland; and the county highway department.

Sullivan.—Coal was mined underground by Buck Creek Coal Co., Fairview Collieries Corp., North Wilford Coal Co., and Pandora Coal Co. and from strip mines by Hale Coal Co., Maumee Collieries, S. A. Coal Corp., and Tri State Mining Corp. Engine sand and sand and gravel for building, road construction, railroad ballast, and miscellaneous use were produced in the county. Producers were: The Merom Gravel Co., Indianapolis (from dredging near Merom); and West Carlisle Sand & Gravel, Carlisle.

Switzerland.—Limestone for aggregate and agricultural purposes was quarried and crushed by Tri County Stone Co. (Osgood) near Cross Plains.

Tippecanoe.—Western Indiana Gravel Co. (Lafayette) produced sand and gravel for road construction and railroad ballast.

Vanderburgh.—Standard Brick & Tile Corp. (Evansville) mined clays for use in heavy clay products. Koch Sand & Gravel Co. (Evansville) produced engine sand, road and railroad-ballast gravel, and sand and gravel for building construction. Bedford Nugent Co. processed sand and gravel dredged from the Ohio River.

Vermillion.—Production of clays for heavy clay products was reported by Arketex Ceramic Corp., Brazil (from a pit near Dana); and Cayuga Brick Corp., Cayuga. Coal from 3 underground and 2 strip mines was produced by Big Oak Coal Co., Blanford Coal Co., Inc., K. M. & F. Coal Co., Inc., Ayshire Collieries, and Reed Coal Co. Material Service Corp. (Chicago, Ill.) and Standard Materials Corp. (Indianapolis) produced building and road construction sand and gravel from sites near Cayuga and Clinton, respectively, and Nellie Ramsey (Perrysville) produced road gravel.

Vigo.—Terre Haute Vitrified Brick Works, Inc. (Terre Haute) mined clays for use in heavy clay products. Mount Pleasant Mining Corp., Oak Grove Coal Co., Snow Hill Coal Corp., Tri-K Mining Co., and Viking Coal Corp. mined coal underground, and Frazier Coal Co., Lone Star Coal Co., and Maumee Collieries Co. strip-mined coal. Sand and gravel for building, road construction, and miscellaneous use was produced in the county. Producers were: Standard Materials Corp., Indianapolis; and G. A. Monninger, Quinn Gravel Co. (near Prairie Creek), and Wabash Sand & Gravel Co., Inc. (from dredging), all of Terre Haute.

Wabash.—Gravel for building, road construction, and miscellaneous use was produced by Hubert Baker and Floyd Dyson, both of Wabash; Frank & Miller Gravel & Ready Mix Co., Somerset; D. R. Keim, Roann; Earnest Lines, La Fontaine; and the county highway department. The county highway department also contracted for road sand.

Warren.—Neal Gravel Co. (Covington) produced gravel in Mound Township.

Warrick.—Warrick was the leading coal-producing county in the State. Output came from 10 underground and 10 strip mines. Producers were Boone Coal Co., Decker Coal Co., Houston Mining Co., Ingle Coal Corp., Polk Patch Mining Co., Inc., Reed Mining Co., Rose Mining Co., Inc., Rudolph Coal & Oil Co., Shaw Mining Co., and Simpson Mining Co. (all from underground mines), and A. B. C. Coal Corp., Booneville Collieries Corp., E. W. Kennedy Coal Corp., Lynnville Coal Co., Ezra Nixon Coal Co., Peabody Coal Co., Scales Coal Corp., Tecumseh Coal Corp., and Victoria Coal Corp. (all from strip

mines). Lemmons & Co., Inc. (Lynnville) quarried and crushed limestone for aggregate and agricultural purposes. A small quantity of road gravel also was produced in the county.

Wayne.—Production of sand and gravel for building, road construction, railroad ballast, and miscellaneous use was reported by American Aggregates Corp., Greenville, Ohio (from a site near Richmond); De Bolt Concrete Co., Inc., Richmond; Fisher Gravel Co., Hagerstown; and Kirkpatrick Gravel Co., Inc., Cambridge City. Building and road gravel was produced by and for the county highway department. De Bolt Concrete Co., Inc., also quarried and crushed limestone for riprap, aggregate, and agricultural purposes.

Wells.—Moss peat was produced by Ballards Peat Moss, Warren (from a bog near Jackson); and humus peat was produced by William Graves, Montpelier (from a bog near Warren). Building and road gravel was produced by Irvin Gravel & Supply (Bluffton). The Erie Stone Co. (Toledo, Ohio) quarried limestone near Bluffton for flux, and Heller Stone Co. (Bluffton) quarried dimension limestone for flagging; output of both companies was used for aggregate and agricultural purposes.

White.—Limestone for aggregate, railroad ballast, and agricultural purposes, was quarried and crushed by Monon Crushed Stone Co., Inc. (Monon).

Whitley.—Elmer A. Lauer (Columbia City) produced road gravel by dredging, and Allen-Whitley County Gravel Co. produced sand and gravel for building and road construction and miscellaneous uses.

The Mineral Industry of Iowa

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Iowa.

By Samuel A. Gustavson [1]

THE VALUE of minerals produced in Iowa was about $66.5 million in 1956, a 5-percent increase over 1955. Although not usually thought a mining State, Iowa ranked 4th in the United States in production of gypsum and 10th in production of cement. In order of value, minerals produced in the State in 1956 were: Portland cement, stone, sand and gravel, coal, gypsum, masonry cement, peat, and lime. No metallic minerals were produced in Iowa in 1956.

TABLE 1.—Mineral production in Iowa, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	(2)	(2)	[3] 852,020	[3] $1,077,642
Cement:				
Portland ---- 376-pound barrels	9,914,977	$27,837,413	10,333,425	31,158,508
Masonry ---- do	514,966	1,701,574	426,765	1,664,181
Coal [4]	1,258,357	4,401,857	1,358,250	4,731,969
Gypsum (crude)	1,337,160	4,176,710	1,177,488	3,919,032
Peat	(2)	(2)	27,375	(2)
Sand and gravel	11,770,836	8,344,832	12,895,253	9,524,685
Stone	15,705,412	18,555,176	14,034,841	17,256,566
Value of items that cannot be disclosed: Fire clay (1956), lime, peat, and values indicated by footnote 2	----	1,252,282	----	467,382
Total Iowa [5]	----	63,555,000	----	66,529,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing company confidential data.
[3] Incomplete figure; fire clay included with "Value of items that cannot be disclosed."
[4] Relates only to mines with a production of 1,000 tons or more.
[5] The total has been adjusted to avoid duplication in the value of clays and stone used in the production of cement and lime.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Portland and masonry cements were produced at 5 plants, of which 2 were in Cerro Gordo County, 2 in Polk County, and 1 in Scott County. Types I and II, general-use and moderate-heat, were produced at all 5 plants; type III, high-early-strength, was produced at 4 plants; air-entrained cement was produced at all 5 plants; and masonry cements were produced from portland cement at 2 plants. Shipments of portland cement increased in 1956, paralleling the increase in

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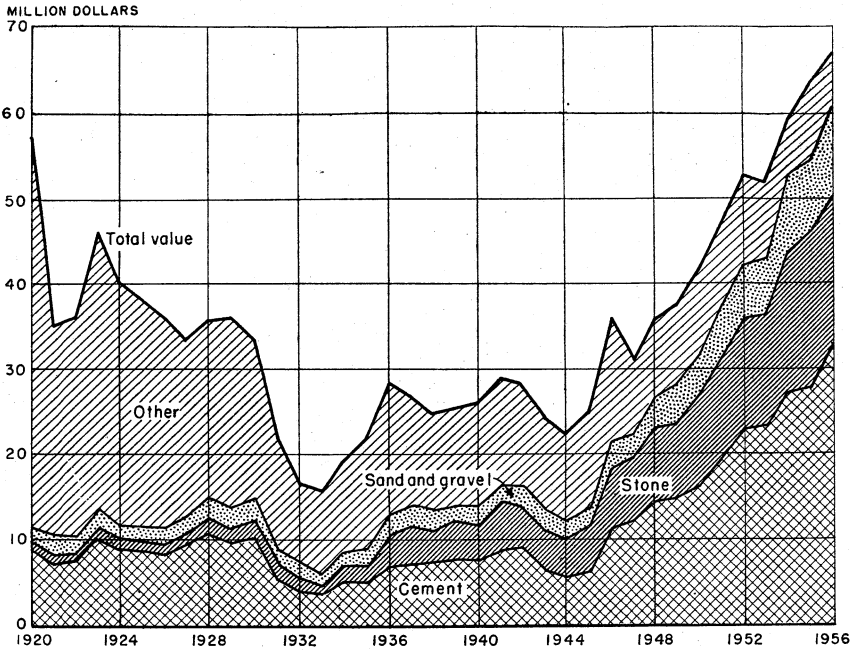

FIGURE 1.—Value of cement, stone, sand and gravel, and total value of mineral production in Iowa, 1920–56.

highway paving, whereas shipments of masonry cement declined. The average value of portland cement was $3.02 per barrel in 1956 and $2.81 in 1955, and the average value of masonry cement was $3.90 per barrel in 1956 and $3.30 in 1955.

The 5 operating companies consumed 231 million kw.-hr. of electricity, of which 47 percent was generated at company plants and 53 percent purchased. The 25 operating kilns ranged in size from 110 feet in length by 7 feet in diameter to 465 feet in length by 11 feet 6 inches in diameter. Most of the cement produced in Iowa was sold for use in Iowa and Minnesota. Substantial shipments also were made to Illinois and Wisconsin and smaller shipments to Indiana, Kansas, Michigan, Nebraska, North Dakota, and South Dakota.

Clays.—Clays produced in Iowa were used primarily in manufacturing cement and heavy clay products, such as drain tile and common brick. Clay classed as fire clay was produced for use in manufacturing refractories. The increased demand for cement caused an increase in the output of clay for use in cement; however, local decreases in demand for other construction materials and drain tile caused a decrease in the output of clay for use in manufacturing brick, sewer tile, and related products. Production was reported from pits in 15 Iowa counties.

Gypsum.—Production of gypsum followed the decrease in building and housing and was about 12 percent less in 1956 than in 1955. The gypsum industry of Iowa was concentrated in Webster County. Four companies operated mines in 1956, of which 3 also manufactured gypsum board. The fourth company announced plans for construct-

ing a board plant, expecting completion in 1957. Products included premixed perlite plasters, gypsum lath, wallboard, sheathing, and other preformed gypsum products. Calcined gypsum was sold in bulk for use in cement and plasters. Small quantities of gypsum were used in the glass and pottery industries; for art molding and casting; and in dental and orthopedic plaster.

Lime.—Quick lime and hydrated lime were produced in Scott County by Linwood Stone Products Co., Inc. Most of the quicklime was sold for metallurgical use. Hydrated lime was used principally for building and water purification. Small quantities were used for manufacturing calcium carbide, as a filler in insecticides, and as a filter in petroleum refining. Sales increased over 1955.

Perlite.—Crude perlite was expanded by 1 company in Polk County and 2 in Webster County. In Webster County perlite-expanding plants were operated in conjunction with gypsum plants, where the expanded perlite was used in manufacturing premixed lightweight plaster. Much of the material produced in Polk County was also used in lightweight plasters. Production and sales were slightly below 1955. The crude perlite was mined in Colorado.

Sand and Gravel.—Sand and gravel operations were reported in 69 Iowa counties in 1956. Tonnage output increased nearly 10 percent over 1955. Most of this increase was due to expansion in highway construction, as building and housing projects decreased. A relatively small tonnage of sand and gravel was sold for industrial uses and railroad ballast. The bulk of the output was used in the building industries and for road construction.

In 1956, 113 commercial producers reported output. Of these, the 10 leading companies accounted for 38 percent of the value of production in the State. The 10 leading producers were:

Acme Fuel & Material Co., Muscatine.
Beu & Sons Co., Grundy Center.
Concrete Materials Co., Waterloo.
Coon Valley Gravel Co., Des Moines.
Estherville Sand & Gravel Co., Estherville.
L. G. Everist, Inc., Sioux Falls, S. Dak.
Hallett Construction Co., Crosby, Minn.
Maudlin Construction Co., Webster City.
Pound Construction Co., Scranton.
Vanden Brink Bros., Dallas Center.

In Iowa, as in other States, a trend toward improving the quality of sand and gravel was noticeable in 1956. Sand and gravel was upgraded by gravity separation to eliminate objectionable material, such as bits of wood, coal particles, and sometimes soft or reactive materials. Some sand and gravel was upgraded by careful screening and elimination of certain sizes. More attention was given to controlling sizes of particles and percentages of sizes, particularly in sand. The need for upgrading sand and gravel, resulted primarily from more rigid specifications for concrete aggregate.

An index of aggregate resources was compiled by the Iowa State Highway Commission. The index summarizes data in the files of the Iowa Highway Commission and saves duplication of effort in locating and evaluating these data. The index should prove a valuable aid to contractors and material producers in locating deposits of the type of material desired. Further information on the index may be obtained from the Iowa State Highway Commission, Ames, Iowa.

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TABLE 2.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Building	2,428,972	$1,915,831	$0.79	2,514,501	$2,049,568	$0.82
Engine	12,800	11,760	.92	37,828	48,737	1.29
Paving [1]	1,087,379	829,948	.76	1,734,050	1,193,696	.69
Railroad ballast	26,434	10,682	.40	22,300	4,000	.18
Other	147,688	85,844	.58	89,691	49,043	.55
Undistributed [2]	210,778	355,418	-------	128,279	337,958	-------
Total	3,914,051	3,209,483	.82	4,526,649	3,683,002	.81
Gravel:						
Building	1,190,092	1,652,695	1.39	1,372,847	1,882,572	1.37
Paving [1]	3,171,202	2,246,724	.71	3,793,191	2,652,141	.70
Railroad ballast	70,492	39,642	.56	35,876	15,139	.42
Other	40,135	24,159	.60	86,387	122,017	1.41
Total	4,471,921	3,963,220	.89	5,288,301	4,671,869	.88
Total sand and gravel	8,385,972	7,172,703	.86	9,814,950	8,354,871	.85
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving [1]	598,077	217,924	.36	172,966	51,951	.30
Gravel: Paving [1]	2,786,787	954,205	.34	2,907,337	1,117,863	.38
Total sand and gravel	3,384,864	1,172,129	.35	3,080,303	1,169,814	.38
ALL OPERATIONS						
Sand	4,512,128	3,427,407	.76	4,699,615	3,734,953	.79
Gravel	7,258,708	4,917,425	.68	8,195,638	5,789,732	.71
Grand total	11,770,836	8,344,832	.71	12,895,253	9,524,685	.74

[1] Includes materials used in bridges, culverts, etc.
[2] Value of items that cannot be disclosed: Molding, blast, and filter sand (1955–56).

TABLE 3.—Limestone sold and used by producers, 1955–56, by uses

Use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Commercial:						
Agriculture	1,399,844	$1,988,306	$1.42	1,563,775	$2,153,714	$1.38
Dimension	903	1,255	1.39	10,023	25,683	2.56
Fluxing stone	(1)	(1)	-------	47,505	67,493	1.42
Railroad ballast	(1)	(1)	-------	39,055	55,082	1.41
Riprap	588,371	707,739	1.20	455,079	505,098	1.11
Concrete aggregate, roadstone, etc.	9,841,582	11,773,423	1.20	9,034,207	11,192,519	1.24
Other [2]	2,861,205	3,093,754	1.08	2,207,732	2,651,563	1.20
Total	14,691,905	17,564,477	1.20	13,357,376	16,651,152	1.25
Noncommercial, all uses (concrete aggregate, roadstone, riprap)	1,013,507	990,699	.98	677,465	605,414	.89
Total commercial and noncommercial	15,705,412	18,555,176	1.18	14,034,841	17,256,566	1.23

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."
[2] Includes limestone for cement and lime, and data indicated by footnote 1

Stone.—Limestone production was reported from 57 Iowa counties in 1956. About 64 percent of the output was crushed for concrete aggregate, roadstone, and agricultural stone; the remainder was used chiefly for manufacturing cement and lime and for various chemical and industrial uses.

The tonnage of limestone produced in 1956 was nearly 10 percent less than in 1955. Unit value was slightly higher, averaging $1.23 a ton in 1956 compared with $1.18 in 1955. The decline in output was due partly to use of less limestone for secondary roads of the State; also, although more cement was manufactured, less limestone was produced for this use, the requirement differences being met from stocks. Use of crushed limestone as a concrete aggregate also decreased. Consumption of limestone for minor uses increased or remained about the same. Minor uses include: Agricultural lime, filler, and metallurgical flux. The 10 leading commercial producers, who supplied 41 percent of the limestone reported in 1956, were:

Beu & Sons Co., Grundy Center.
Concrete Materials & Construction Co., Cedar Rapids.
Kaser Construction Co., Des Moines.
Lehigh Portland Cement Co., Allentown, Pa.
Linwood Stone Products Co., Inc., Buffalo.
Marquette Cement Mfg. Co., Chicago, Ill.
Missouri Valley Limestone Co., Oakland.
Northwestern State Portland Cement Co., Mason City.
Penn-Dixie Cement Corp., Nazareth, Pa.
E. I. Sargent Quarries, Inc., Des Moines.

MINERAL FUELS

Coal.—Bituminous-coal production was reported from 10 counties in 1956; 31 strip and 33 underground mines were in operation. Virtually all of the coal produced was consumed in Iowa, chiefly for generating electric power and for heating State, county, and municipally owned buildings or institutions; a relatively small part was used for heating homes and business establishments. The increased production in 1956 reflected the increased demand for electric power.

TABLE 4.—Bituminous coal production, value, and number of mines operated in 1956, by counties

(Exclusive of mines producing less than 1,000 net tons)

County	Production (net tons)			Value		Number of mines operated		
	Underground	Strip	Total	Average per ton	Total	Underground	Strip	Total
Appanoose	95,635	13,671	109,306	$4.78	$522,834	13	1	14
Davis	5,333	48,959	54,292	3.36	182,603	1	2	3
Mahaska	3,000	142,144	145,144	3.44	498,604	1	9	10
Marion	95,815	684,673	780,488	3.25	2,540,412	9	9	18
Monroe	59,224	63,425	122,649	3.30	404,617	6	3	9
Polk	----------	9,886	9,886	3.50	34,601	----------	1	1
Van Buren	----------	25,971	25,971	5.12	133,030	----------	2	2
Wapello	6,498	95,800	102,298	3.74	382,382	1	4	5
Other counties [1]	8,216	----------	8,216	4.00	32,886	2	----------	2
Total	273,721	1,084,529	1,358,250	3.48	4,731,969	33	31	64

[1] Lucas and Warren Counties.

Peat.—Moss peat, reed or sedge peat, and humus were produced in Worth County. Production was about one-third greater than in 1955. This increase can be attributed to wider distribution and improved marketing. The product of the two producers in Iowa was sold in bulk and packaged in small bags for home use, either as peat or mixed with soil and fertilizers.

REVIEW BY COUNTIES

Adair.—Crushed limestone for agricultural use and concrete aggregate was sold by K. H. Buttler, Guthrie Center; and E. F. Schildberg, Greenfield.

Adams.—Missouri Valley Limestone Co. (Oakland) quarried limestone for use as concrete aggregate.

Allamakee.—Sand and gravel for building and road construction was produced by Carlson Materials Co., Inc. (Decorah), and Francis Schwartzhoff (Dorchester).

Sales of limestone for agricultural stone and concrete aggregate were reported by Andrew Bresnahan and R. J. Cooney Construction Co., Waukon; H. L. Leas, Monona; Joe F. Pavlovec, Calmar; and Roverud Construction Co., Spring Grove, Minn.

Appanoose.—Clays, bituminous coal, and limestone were produced in the county.

Iowa Clay Products Co. (Centerville) produced miscellaneous clay for manufacturing heavy clay products.

Bituminous coal was mined at 13 underground mines and 1 strip mine. Underground mines were operated by Appanoose Coal Co., Clarke Coal Co., D. C. Coal Co., K–K Coal Co., Long Branch Coal Co., Monitor Coal Co., New Block Coal Co., New Gladstone Coal Co., Old King Coal Co., Riverside Coal Co., Shamrock Coal Co., and Sunshine Coal Co. (2 mines). The Titomic Mining Corp. operated a strip mine.

TABLE 5.—Value of mineral production in Iowa, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Adair	(2)	(2)	Stone.
Adams	$207,909	$102,240	Do.
Allamakee	149,952	127,807	Stone, sand and gravel.
Appanoose	892,313	907,414	Coal, stone, clays.
Audubon	25,279	----------	
Benton	112,075	201,817	Stone, sand and gravel, clays.
Black Hawk	1,050,445	1,174,353	Stone, sand and gravel.
Boone	216,185	255,971	Sand and gravel.
Bremer	(2)	(2)	Stone.
Buchanan	164,741	186,385	Stone, sand and gravel.
Buena Vista	196,379	65,039	Sand and gravel.
Butler	95,327	178,182	Stone, sand and gravel.
Calhoun	31,190	354,613	Sand and gravel.
Carroll	92,573	102,564	Do.
Cass	312,447	64,255	Stone.
Cedar	318,147	176,121	Do.
Cerro Gordo	13,627,113	15,459,373	Cement, stone, sand and gravel, clays.
Cherokee	92,914	111,247	Sand and gravel.
Chickasaw	141,364	(2)	Stone.
Clarke	----------	15,654	Do.
Clay	105,364	178,215	Sand and gravel.
Clayton	(2)	(2)	Sand and gravel, stone.
Clinton	109,320	88,200	Sand and gravel.
Crawford	83,196	111,965	Do.
Dallas	255,348	216,973	Clays, sand and gravel.
Davis	285,475	182,603	Coal.
Decatur	(2)	248,594	Stone.
Delaware	177,634	310,560	Stone, sand and gravel.
Des Moines	249,420	265,615	Do.
Dickinson	(2)	(2)	Sand and gravel.
Dubuque	(2)	501,230	Stone, sand and gravel.
Emmet	163,419	178,297	Sand and gravel.
Fayette	258,376	472,194	Stone, sand and gravel.
Floyd	287,541	146,814	Stone, clays, sand and gravel.
Franklin	150,512	421,891	Sand and gravel, clays, stone.
Fremont	(2)	(2)	Stone.
Greene	254,380	121,854	Sand and gravel.
Grundy	75,794	66,170	Sand and gravel, stone.
Guthrie	(2)	(2)	Sand and gravel.
Hamilton	23,690	42,492	Do.
Hancock	112,562	156,684	Do.

See footnotes at end of table.

TABLE 5.—Value of mineral production in Iowa, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Hardin	$826,992	$924,556	Stone, sand and gravel.
Harrison	268,677	378,091	Do.
Henry	180,666	205,178	Sand and gravel, clays.
Howard	47,270	91,970	Stone, sand and gravel.
Humboldt	259,406	499,780	Do.
Jackson	144,607	(2)	Do.
Jasper	117,263	187,418	Do.
Jefferson	36,840	85,000	Stone.
Johnson	(2)	(2)	Stone, sand and gravel.
Jones	57,024	63,500	Sand and gravel, stone.
Keokuk	(2)	(2)	Stone, clays.
Kossuth	221,228	169,320	Sand and gravel.
Lee	247,002	469,983	Stone, sand and gravel.
Linn	733,337	755,845	Do.
Louisa	(2)	254,866	Do.
Lucas		(2)	Coal.
Lyon	81,756	134,268	Sand and gravel.
Madison	308,964	931,658	Stone, sand and gravel.
Mahaska	767,179	958,280	Coal, stone, sand and gravel, clays.
Marion	2,737,960	3,080,498	Coal, stone, sand and gravel.
Marshall	483,914	(2)	Stone, sand and gravel.
Mills		204,734	Stone.
Mitchell	240,412	232,323	Stone, sand and gravel.
Monona	3,038	23,773	Sand and gravel.
Monroe	322,659	451,715	Coal, stone.
Montgomery	328,608	246,479	Stone.
Muscatine	407,579	655,405	Sand and gravel, stone.
O'Brien	(2)	50,519	Sand and gravel.
Osceola	98,914	154,596	Do.
Palo Alto	37,899	83,791	Do.
Plymouth	83,270	248,721	Do.
Pocahontas	(2)	(2)	Stone, sand and gravel.
Polk	10,368,715	12,234,309	Cement, sand and gravel, stone, clays, coal.
Pottawattamie	645,195		
Sac	251,171		
Scott	8,751,246	10,110,376	Cement, stone, lime, clays, sand and gravel.
Sioux	343,416	480,785	Sand and gravel.
Story	228,450	362,000	Stone, sand and gravel, clays.
Tama	(2)	(2)	Stone, sand and gravel.
Taylor	72,203		
Union		98,799	Stone, sand and gravel.
Van Buren	364,844	354,270	Stone, coal, sand and gravel.
Wapello	652,639	788,119	Coal, stone, sand and gravel, clays.
Warren	32,370	59,943	Clays, coal.
Washington	331,790	(2)	Stone.
Webster	4,594,405	4,291,346	Gypsum, clays, stone, sand and gravel.
Winnebago	79,516	96,006	Sand and gravel.
Winneshiek	207,317	292,874	Stone, sand and gravel.
Woodbury	(2)	267,404	Sand and gravel.
Worth	453,049	324,350	Peat, stone, sand and gravel.
Wright	85,614	89,977	Sand and gravel.
Undistributed	6,732,257	5,213,754	
Total [3]	63,555,000	66,529,000	

[1] The following counties are not listed because no production was reported: Ida, Iowa, Page, Poweshiek, Ringgold, Shelby, and Wayne.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] The 1956 total has been adjusted to avoid duplication in the value of clays and stone used in the production of cement and lime.

Limestone for agricultural stone and concrete aggregate was quarried by W. P. Farnsworth, L. & W. Construction Co., Inc., and Porter & Magnall Construction Co., all of Centerville.

Benton.—Clays, sand and gravel, and stone were produced in the county.

Production of clays for manufacturing heavy clay products was reported by Garrison Brick & Tile Works, Garrison.

Beu & Sons Co. (Grundy Center) operated the Vinton and Zeinie Pits and produced gravel for road construction.

Crushed limestone for agricultural stone, concrete aggregate, and riprap was produced by B. L. Anderson, Inc., Cedar Rapids; W. E. Dake, Garrison; and Vinton Lime & Rock Co., Vinton.

Black Hawk.—Sand and gravel and stone valued at more than $1 million were produced in Black Hawk County. Output of sand and gravel for building and road construction was reported by Bernard Assink (at Cedar Falls), Concrete Materials Co. (at Waterloo), and Larsen Construction Co., all of Cedar Falls; Jay B. Bagenstos & Son., La Porte City; Beu & Sons Co., Grundy Center (operating the Bochaus, Burk Siding, and Matthais pits); and Hanson & Son Sand & Gravel Co., C. W. Shirey Co., and Waterloo Dredging Co., all of Waterloo.

Beu Limestone Co. (Waterloo) operated the Newton Quarry; Beu & Sons Co. (Grundy Center) the Yokom Quarry; Concrete Materials & Construction Co. (Cedar Rapids) a quarry near Waterloo; and Pint Soft Lime Products Co. (Raymond) quarries in the county. Limestone was crushed for agricultural stone, blast-furnace flux, concrete aggregate, and fertilizer filler.

Boone.—Sand and gravel for building and road construction was produced in the county by Hallett Construction Co., Crosby, Minn., operating the Boone Plant (Mondt and Rutherford Pits); J. W. Lehman, Sheldahl; Dan Leininger, Boone; and I. B. Welder, Madrid.

Bremer.—Beu & Sons Co. (Grundy Center) operated the Denver and Fredericka limestone quarries. Paul Niemann Construction Co. (Sumner) and Schield Soft Lime Quarry (Waverly) produced crushed limestone for concrete aggregate and agricultural stone.

Buchanan.—Sales of road-construction gravel were reported by Beu & Sons Co. (Grundy Center) from the Winthrop pit.

Production of limestone for agricultural stone and concrete aggregate was reported by Beu & Sons Co. (Grundy Center) operating the Edgerton Quarry; Hewitt Bros., Fredericksburg; Light Construction Co., Manchester; Paul Niemann Construction Co., Sumner; and E. F. Patton Co., Independence.

Buena Vista.—Paving gravel was produced by the highway departments of Buena Vista and Winnebago Counties. The highway departments of Clay and Winnebago Counties contracted for paving gravel.

Butler.—Sand and gravel and stone were produced in Butler County. Sales of sand and gravel for building, road construction, and miscellaneous uses were reported by Beu & Sons Co. (Grundy Center), operating the Brooks, Greene, and Hurd pits; Meyer & Muller and Charles Willeke & Sons, Aplington; and Waverly Gravel & Tile Co., Shell Rock. Crushed limestone for agricultural stone and concrete aggregate was produced by Greene Limestone Co., Greene; Neymeyer Limestone Co., Aplington; Shell Rock Lime Co., Inc., Shell Rock; and Willman Construction, Cedar Rapids.

Calhoun.—Output of sand and gravel for building and road construction was reported by Hallett Construction Co., Crosby, Minn., at Lake View. The County highway department produced and contracted for paving gravel.

Carroll.—Carroll Sand & Gravel Co. (Carroll), Leo H. Korwes (Carroll near Maple River), McClue Gravel Co. (Lanesboro), and Robert H. Walters (Glidden) produced sand and gravel for building and road construction. The county highway department contracted for paving sand.

Cass.—Crushed stone for concrete aggregate was produced by the Missouri Valley Limestone Co. (Oakland).

Cedar.—Limestone was produced for asphalt filler, agricultural stone, concrete aggregate, and riprap by C. B. Dewees Construction Co., Marion; Light Construction Co., Manchester; Perry Construction Co., Cedar Rapids; and Robinson Bros., Tipton.

Cerro Gordo.—Cement, clays, sand and gravel, and stone were produced in the county.

Lehigh Portland Cement Co. and Northwestern States Portland Cement Co., operating plants at Mason City, produced masonry and portland cement. Clays and limestone for use in the manufacture of cement were produced locally. The Lehigh Portland Cement Co. operated 6 kilns, each 140 feet in length and 9 feet, 6 inches in diameter at the upper end and 9 feet in diameter at the lower end. The plant was idle 51 days because of a labor strike. Northwestern States Portland Cement Co. operated 10 kilns ranging in size from 110 feet in length and 7 feet in diameter to 165 feet in length and 11 feet in diameter. One of the larger kilns was installed and placed in operation in 1956.

Mason City Brick & Tile Co. (Mason City) mined clay for manufacturing brick and tile.

Sand and gravel for building, road construction, railroad ballast, and miscellaneous uses was produced by Clear Lake Sand & Gravel Co., Inc., Clear Lake; Ideal Sand & Gravel Co., Mason City; and Maudlin Construction Co., Webster City.

Limestone for use in cement and crushed stone for agricultural stone, concrete aggregate, and fertilizer were produced by Fertile Limestone Co., Fertile; Greene Limestone Co., Greene; Grupp Construction Co., Riceville; and Ideal Sand & Gravel Co., Mason City.

Cherokee.—Road-construction gravel was produced by Maudlin Construction Co., Webster City. Shea Sand & Gravel Co. (Cherokee) produced sand and gravel for building, road construction, and miscellaneous uses.

Chickasaw.—Crushed limestone for concrete aggregate was produced by the Bouska Construction Co., Protivin. Beu & Sons Co. (Grundy Center), operating the Chickasaw and Erwine Quarries, produced limestone for agricultural stone and concrete aggregate.

Clarke.—Limestone was produced by E. I. Sargent Quarries, Inc. (Des Moines), for use as concrete aggregate.

Clay.—Maudlin Construction Co. (Webster City) and Stolley Sand & Gravel Co. (Spencer) produced sand and gravel for building, road construction, and miscellaneous uses. The county highway department contracted for paving gravel.

Clayton.—Concrete Materials Co. (Cedar Rapids) operating near Clayton, produced building and molding sand. H. L. Leas (Monona) quarried limestone for concrete aggregate and agricultural stone.

Clinton.—Sand and gravel output was reported by Hass Gravel Pit, Clinton, near Camanche; Fred R. McKenzie & Co., Galesburg, near Clinton; and Weaver Construction Co., Iowa Falls, operating the Wheatland Pit. Products were engine sand and concrete aggregate.

Crawford.—L. J. Adams (Denison), James Ballantine (Arion), and Mauer Construction Co. (Sac City) produced sand and gravel for building, road construction, and miscellaneous uses. The county engineer, Crawford, produced and contracted for paving gravel.

Dallas.—Clay pits were operated near Adel by Adel Clay Products Co., West Des Moines; Redfield Brick & Tile Co., Redfield; and United Brick & Tile Co., Kansas City, Mo. The output was used for manufacturing heavy clay products.

Sand and gravel, chiefly for building and road construction, was produced by Booneville Gravel Co., Booneville; Breeden Sand & Gravel Co., Des Moines; Concrete Materials Co., Cedar Rapids, operating near Booneville; and Perry Sand & Gravel Co., Perry.

Davis.—Bituminous coal was produced from strip mines by Continental Mining Corp. and Davis County Coal Co. Shute & Lewis Coal Co. operated an underground mine.

Decatur.—Output of crushed limestone for agricultural stone and concrete aggregate was credited to Grand River Limestone Co., Grand River; E. I. Sargent Quarries, Inc., Des Moines; and Twin State Quarries, Inc., Allerton.

Delaware.—Beu & Sons Co., Grundy Center, operating the Henderson Pit, and Dyersville Sand & Gravel, Dyersville, produced sand and gravel for building and road construction.

Limestone was produced by Beu & Sons Co., operating the Walston Quarry; Weber Dehn and Light Construction Co., both of Manchester; Dyersville Sand & Gravel, Dyersville; Kuhlman Construction Co., Colesburg; and Madlom Brothers, Edgewood. The output was used for concrete aggregate and agricultural stone.

Des Moines.—Spring Sand & Gravel Co. (Davenport) produced sand and gravel for building and road construction.

J. T. Leonhard (Columbus Junction), operating near Mediapolis, produced crushed stone for concrete aggregate and agricultural stone. Rough dimension stone and crushed stone for agricultural stone, concrete aggregate, and riprap was produced by Raid Brothers Construction Co. (Burlington), at the Charbonneaux and Mediapolis Quarries.

Dickinson.—Concrete Sand & Materials Co. (Milford) produced sand and gravel for building and road construction.

Dubuque.—Dubuque Sand & Gravel Co. and Molo Sand & Gravel Co. (Dubuque) produced building sand and gravel.

Limestone quarries were operated by Dubuque Stone Products Co., Dubuque; Light Construction Co., Manchester; and the county highway department. The stone was crushed for use as concrete aggregate.

Emmet.—Don Billings Sand & Gravel Co. and Estherville Sand & Gravel Co. (both of Estherville) and Hoien Gravel Pit (Armstrong), produced sand and gravel for building, road construction, and miscellaneous uses. Gravel for railroad ballast was produced by the Chicago, Rock Island & Pacific Railroad Co. The county highway department produced and contracted for paving gravel.

Fayette.—Sand and gravel operations in the county were reported by Oelwein Sand & Gravel Co., Oelwein; Riesner Sand & Gravel Co., Sumner; and Carl Zupke & Son Sand & Gravel, Randalia. The output was used for building and road construction.

Limestone was quarried by Fayette Stone Co. (Fayette), Hewitt Brothers (Fredericksburg), Paul Niemann Construction Co. (Sumner), and the county highway department for use as agricultural stone, concrete aggregate, and riprap.

Floyd.—Rockford Brick & Tile Co. (Rockford) operated a clay pit and produced miscellaneous clay for use in heavy clay products.

Limestone for agricultural stone and concrete aggregate was quarried by Walter Beine, Charles City, and Heckman-Reynolds, Inc. (Floyd). The county highway department contracted for paving gravel.

Franklin.—Sheffield Brick & Tile Co. (Sheffield) produced clay for use in heavy clay products.

Sand and gravel pits were operated by Vanden Brink Brothers, Dallas Center; Hallett Construction Co., Crosby, Minn., operating near Geneva; Maudlin Construction Co., Webster City; and Louis C. Toft, Dows. The output was used for building, road construction, and miscellaneous purposes. The county engineer reported production and contracts for paving gravel.

Limestone was produced by R. W. Phillips (Hampton), and Rieken Limestone Co. (Ackley) at the Humke Quarry, for agricultural stone and concrete aggregate.

Fremont.—Fred Wenke (Thurman), and the county highway department produced limestone for concrete aggregate.

Greene.—Building and road-construction sand and gravel was produced by Ferguson-Diehl Construction Co. (Jefferson). The Minneapolis & St. Louis Railway produced railroad-ballast gravel.

Grundy.—Ben Ankes (Wellsburg) produced sand for road construction. The county highway department contracted for paving gravel. Beu & Sons Co. (Grundy Center) operated the Rieken Quarry and produced limestone for agricultural stone and concrete aggregate.

Guthrie.—K. H. Buttler (Guthrie Center) produced road-construction gravel.

Hamilton.—Maudlin Construction Co. (Webster City) produced gravel for road construction. The county highway department contracted for paving gravel.

Hancock.—Sand and gravel was produced by Sankey Sand & Gravel (Britt) for building and road construction. The county highway department contracted for paving gravel.

Hardin.—Sand and gravel pits were operated by Clary Concrete Materials, Eldora, near Gifford; Iowa Falls Sand & Gravel Co., George Janssen, and Weaver Construction Co., all of Iowa Falls; and Maudlin Construction Co., Webster City. The output was used for building and road construction.

Beu & Sons Co. (Grundy Center) operated the Jeske, Pierce, and Vigars limestone quarries. Limestone quarries also were operated by Iowa Limestone Co., of Des Moines, at Alden, and Weaver Construction Co., of Iowa Falls. The output was dimension stone for rubble and crushed stone for agricultural stone, asphalt filler, concrete aggregate, mineral food, and other uses.

Harrison.—Schemmer Limestone Quarry (Logan) produced limestone for agricultural stone, concrete aggregate, riprap, and rubble. The county highway department contracted for paving gravel.

Henry.—Winfield Brick & Tile Co. (Winfield) produced miscellaneous clay for heavy clay products.

Production of crushed limestone for agricultural stone, concrete aggregate, and riprap was reported by Camanche Stone Co., Davenport; Kaser Construction Co., Des Moines, operating the Kopock quarry; and the county engineer, Mount Pleasant.

Howard.—Ed Kubik, Zobeck Limestone & Gravel Co. (Elma), and the county highway department produced gravel for paving and road construction. Bouska Construction Co. (Provitin) and Grupp

Construction Co. (Riceville) produced limestone for concrete aggregate.

Humboldt.—Sand and gravel was produced by Iowa Sand & Gravel Co. (Humboldt) for building, road-construction, and miscellaneous uses. The county highway department contracted for paving gravel.

Limestone for agricultural stone, concrete aggregate, and riprap was credited to Place Brothers (Scranton) and Welp & McCarten, Inc. (Fort Dodge) at Humboldt.

Jackson.—Bellevue Sand & Gravel Co. (Bellevue) produced sand and gravel for road construction.

Jasper.—Sand and gravel for building, road construction, and miscellaneous uses was produced by Eben Van Dusseldorp, Colfax; Maudlin Construction Co., Webster City; Newton Rock & Gravel Co., Newton, at Reasnor; and Earl Wagner, Monroe.

Jefferson.—Crushed limestone for agricultural stone and concrete aggregate was produced by Triangle Construction Co. (Fairfield).

Johnson.—Sand and gravel for building and road construction was produced by Stevens Sand & Gravel Co., Inc. (Iowa City). Limestone for agricultural stone, concrete aggregate, railroad ballast, and riprap was quarried by River Products Co., Iowa City; and Schroeder Co., McGregor, at Cou Falls.

Jones.—Jensen Sand & Gravel (Anamosa) and Reichart Sand & Gravel Co. (Monticello) produced sand and gravel for building and road construction.

Limestone for concrete aggregate was produced by B. L. Anderson, Inc. (Cedar Rapids).

Keokuk.—John Nelson & Sons (What Cheer) produced clay for use in heavy clay products.

Kaser Construction Co. (Des Moines) quarried limestone at Sigourney for agricultural stone and concrete aggregate.

Kossuth.—The county highway department produced and contracted for paving sand and gravel.

Lee.—Horn's Sand Pit (Fort Madison) produced building and engine sand. Raid Brothers Construction Co. (Burlington), operating the Stationary and Hawkeye Quarries, and the county highway department produced limestone for agricultural stone, concrete aggregate, railroad ballast, and riprap.

Linn.—Sand and gravel for building and road construction was produced by Concrete Materials & Construction Co. and King's Crown Plaster Co (Cedar Rapids) and Frank J. Meyer (Mount Vernon). Limestone for agricultural stone, asphalt filler, concrete aggregate, and riprap was produced by B. L. Anderson, Inc., Concrete Materials & Construction Co., and L. Crawford Lime & Quarry Co., all of Cedar Rapids; C. B. Dewees Construction Co., Marion, operating the Paralta Quarry; and E. D. Robbins, Palo.

Louisa.—Beu & Sons Co. (Grundy Center) operating the Oakville Pit, produced road-construction gravel. Limestone was quarried by Camanche Stone Co., Davenport; Dillon Stone Co., and Stone Products Co., Inc., Columbus Junction; and Louisa County Lime Products, Wapello. Production was used for agricultural stone, concrete aggregate, and riprap.

Lucas.—Bituminous coal was produced from an underground mine by Big Ben Coal Co.

Lyon.—Production of gravel for road construction was reported by Maudlin Construction Co. (Webster City). The county highway department produced and contracted for paving gravel.

Madison.—Production of limestone for agricultural stone, cement, and concrete aggregate was reported by Concrete Materials & Construction Co., Cedar Rapids; Gendler Stone Products, Des Moines; Marquette Cement Manufacturing Co., Chicago, Ill., at Earlham; E. I. Sargent Quarries, Inc., Des Moines; and the county highway department.

The county highway department contracted for paving sand and gravel.

Mahaska.—What Cheer Clay Products Co. (What Cheer) and Oskaloosa Clay Products Co., (Oskaloosa) mined fire clay and miscellaneous clay for use in heavy clay products.

Bituminous coal was mined from 1 underground mine by Edwards Coal Co. and from 9 strip mines by Angus Coal Co., Carbon Hill Coal Co., Engnes Coal Co., Knight Coal Co., Lost Creek Coal Co., Mich Coal Co., Patik Coal Co., Star Coal Co., and VerSteeg Coal Co.

The Concrete Materials Co. (Cedar Rapids) produced sand and gravel for building and road construction. Limestone was produced by the county engineer (Oskaloosa) and Kaser Construction Co. (Des Moines, at Fremont) for agricultural stone and concrete aggregate.

Marion.—Marion was the leading coal-producing county in Iowa in 1956. Nine strip mines and nine underground mines were operated. Strip-mining was reported by Beard Coal Co., Husted Brothers Coal Co., Jude Coal Co., Inc., Kirkville Coal Co., Newton Coal Co., Ruby Coal Co., VerSteeg Coal Co., Weldon Coal Co., and Wilkinson Coal Co. Coal was mined underground by Cedar Creek Coal Co., Desplanque Coal Co., Furnald Coal Co., Godfrey Coal Co., Good Coal Co., Liberty Coal & Mining Co., Liter Coal Co., Inc., Lovilia Coal Co., and Twin City Coal Co.

E. Groenendyk & Son (Bussey) and Pella Construction Co. (Pella) produced sand and gravel for building, road construction, and miscellaneous uses. Limestone was quarried by C. D. Hess & Son and Rock Material Co., Lacona; Kibbey Limestone Co., Carlisle, near Knoxville; and Pella Limestone Co., Pella. Agricultural stone, concrete aggregate, and riprap were produced.

Marshall.—Empire Sand & Material Co. (Marshalltown) produced sand and gravel for building, road construction, railroad ballast, and miscellaneous uses. Concrete Materials & Construction Co. (Cedar Rapids) quarried and produced concrete aggregate and agricultural stone.

Mills.—Limestone for agricultural stone and concrete aggregate was produced by Henningson Construction Co., Atlantic; Missouri Valley Limestone Co., Oakland; and Jack Stanley, Thurman.

Mitchell.—Sand and gravel for building, filter, road construction, and miscellaneous uses was produced by Lawrence H. Decklever and Seeber & Wetter, Osage; and L. R. Falk, St. Ansgar. L. R. Falk (St. Ansgar), operating near Osage, and Edd Kollman (Osage) produced limestone for agricultural stone and concrete aggregate.

Monona.—Maudlin Construction Co. (Webster City) produced road-construction gravel.

Monroe.—Bituminous coal was mined from six underground mines by Acme Coal Co., Airline Coal Co., Karpan Coal Co., Maple Coal Co., O'Brien Coal Co., and White Oak Coal Co. Halverson Coal Co., C. N. Knox Coal Co., and Weldon Coal Co. mined coal from strip mines.

The county engineer (Albia) produced limestone for concrete aggregate.

Montgomery.—Kaser Construction Co. (Des Moines) at Red Oak and Missouri Valley Limestone Co. (Oakland) produced limestone for agricultural stone and concrete aggregate.

Muscatine.—Sand and gravel was produced by Acme Fuel & Material Co., Hahn Brothers Sand & Gravel Co., and Northern Gravel Co., Muscatine. Blast, engine, and filter sand were produced, also sand and gravel for building, road construction, and miscellaneous uses. Otto Wendling, Muscatine, quarried limestone for concrete aggregate.

O'Brien.—Gilbert Bruegman (Hartley) and Maudlin Construction Co. (Webster City) produced building and road construction sand and gravel. The highway departments of Clay and O'Brien Counties contracted for paving gravel.

Osceola.—Sand and gravel was produced by Beu & Sons Co., Grundy Center, operating the Osceola Pit; Hallett Construction Co., Crosby, Minn., operating the Aston No. 1 and 2 plants; Hogan & Faber, Rock Rapids; and Van Drie Construction Co., Ocheyedan. The output was used for building, road construction, and miscellaneous purposes. The county highway department contracted for paving sand.

Palo Alto.—Sand and gravel for building and road construction was produced by Bauck Construction Co., Emmetsburg; and John Dorweiler Sand & Gravel Co., West Bend. The county highway department contracted for paving gravel.

Plymouth.—Beu & Sons Co. (Grundy Center) operating the Plymouth Pit, Higman Sand & Gravel Co. (Akron), Maudlin Construction Co. (Webster City), Wiltgen Ready Mixed Concrete (Le Mars), and the county highway department produced building, paving, and road-construction sand and gravel.

Pocahontas.—Hallett Construction Co. (Crosby, Minn.), with operations at Plover and Sioux Rapids, and the county highway department produced sand and gravel for building, paving, and road construction.

Midwest Limestone Co., Inc. (Gilmore City), quarried limestone for agricultural stone, concrete aggregate, and riprap.

Polk.—Polk County yielded minerals valued at more than $12 million. Included were cement, clays, coal, sand and gravel, and stone.

Clay pits of Des Moines Clay Co. and Iowa Pipe & Tile Co. (Des Moines) and United States Brick & Tile Co. (Kansas City, Mo.), operating their No. 3 plant near Des Moines, yielded fire clay and miscellaneous clay for manufacturing heavy clay products.

Bituminous coal was produced from a strip mine by Hopkins Coal Co.

Portland and masonry cements were produced by Hawkeye Portland Cement Co. of Iowa (a subsidiary of the Marquette Cement Mfg. Co.), Chicago, Ill., and Penn-Dixie Cement Corp., Nazareth, Pa.; both operated near Des Moines. These companies also produced

clay and limestone for use in cement manufacture. The Hawkeye Portland Cement Co. operated two kilns: One was 475 feet long and the other 465 feet long; both were 11 feet 6 inches in diameter. In 1956 a raw mill and a finish mill were added to the plant. Penn-Dixie Cement Corp. operated two-240-foot by 8-foot-10-inch upper- and 10-foot-1-inch lower-end-diameter kilns.

Sand and gravel was produced by I. J. Bishop, Mitchellville, at Des Moines; Concrete Materials Co., Cedar Rapids; Coon Valley Gravel Co., West Des Moines Sand Co., and Keefner Sand & Gravel Co., Des Moines; J. W. Lehman, Sheldahl; Maudlin Construction Co., Webster City; and the city engineer. Production was used for building, paving, road construction, and miscellaneous purposes.

Dresser Trap Rock Co. (Dresser) and Gendler Stone Products, Keefner Sand & Gravel Co., and E. I. Sargent Quarries, Inc. (Des Moines) produced limestone for concrete aggregate.

Scott.—Dewey Portland Cement Co. (Kansas City, Mo.) produced portland and masonry cements at Davenport. The company operated 5 kilns, of which 2 were reactivated in 1956. The company also produced clay and cement rock locally and produced and sold crushed stone.

Linwood Stone Products Co., Inc. (Buffalo) produced quick and hydrated lime for building, chemical, and industrial uses. The plant has 1 rotary and 2 shaft kilns, also a continuous-type hydrator.

Building sand was produced by Builders Sand & Gravel Co., Davenport.

Le Claire Quarries (Le Claire), Linwood Stone Products Co., Inc. (Buffalo), and the county highway department produced dimension rubble and flagging, as well as crushed stone for use as asphalt filler, agricultural stone, concrete aggregate, flux, rock dust for coal mines, lime, mineral food, railroad ballast, and riprap.

Sioux.—Sand and gravel production was reported by L. G. Everist, Inc., Sioux Falls, S. Dak.; Floyd Gravel Co., Orange City; Hawarden Gravel Co., Hawarden; Maudlin Construction Co., Webster City; Rock Valley Cement Block & Tile Co., Rock Valley; and Roos Sand & Gravel, Boyden. The output was used for building, road construction, and miscellaneous purposes.

Story.—Nevada Brick & Tile Co. (Nevada) produced clays for use in manufacturing heavy clay products. Building sand and gravel was produced by Roberson Brothers, Ames. The limestone quarry and gravel pit of Cook Construction Co. (Ames) yielded material for use in asphalt filler, agricultural stone, concrete aggregate, and road construction.

Tama.—Flint Crushed Gravel Co. (Des Moines, at Tama) produced sand and gravel for building and road construction.

B. L. Anderson, Inc. (Cedar Rapids) and Joseph Wenke (Toledo) produced crushed stone for agricultural stone, concrete aggregate, and riprap.

Union.—Production of crushed stone for concrete aggregate was credited to E. F. Schildberg (Greenfield). The county highway department contracted for paving gravel.

Van Buren.—Hamlin Bros. Coal Co. and Laddsdale Coal Co., Inc., operated strip mines. Valley Limestone & Gravel, Inc. (Farmington), produced sand and gravel for building and road construction.

Douds Stone, Inc. (Douds) and Triangle Construction Co. (Fairfield) produced limestone for agricultural stone and concrete aggregate.

Wappelo.—Oskaloosa Clay Products Co. (Oskaloosa, operating near Ottumwa), and Ottumwa Brick & Tile Co. (Ottumwa), mined clays for use in manufacturing heavy clay products.

Bituminous coal was produced from 1 underground mine by New Globe Coal Co. (Ottumwa) and from 4 strip mines by Homer Haines Coal Co., Inc., Lanning Coal Co., Munterville Coal Co., Inc., and Star Coal Co.

Sand for building and road construction was produced by Combs Sand Co. (Ottumwa).

Kaser Construction Co. (Des Moines), operating near Eddyville, and Wapello Stone Quarries (Ottumwa) produced limestone for agricultural stone and concrete aggregate.

Warren.—Carlisle Brick & Tile Co. (Carlisle) and Goodwin Tile & Brick Co. (Des Moines, operating near Carlisle), mined clays for use in heavy clay products.

S. & R. Coal Co. (Carlisle) mined coal underground.

Washington.—Hayes Quarry (Washington) produced limestone for concrete aggregate.

Webster.—Clays, gypsum, sand and gravel, and stone were produced in the county.

Clays for heavy clay products were produced by Johnston Clay Works, Inc., Kalo Brick & Tile Co., Lehigh Sewer Pipe & Tile Co., and Vincent Clay Products Co., all at Fort Dodge.

Crude gypsum was mined and processed in the Fort Dodge area by Bestwall Gypsum Co. (formerly Certain Teed Products Corp.), The Celotex Corp., National Gypsum Co., and United States Gypsum Co. All had board plants except the Celotex Corp., which announced plans for such a plant, with completion scheduled for 1957.

John Bloomquist and Derrald Carlson (Dayton), Casey Sand & Gravel and Wayne Goodrich (Lehigh), and Welp & McCarten, Inc. (Fort Dodge), produced sand and gravel for building and road construction. The highway departments of Calhoun and Webster Counties produced and contracted for paving gravel.

Limestone was quarried underground by Fort Dodge Limestone Co. (Fort Dodge), for agricultural stone, concrete aggregate, and filter beds.

Winnebago.—Hallett Construction Co. (Crosby, Minn.) at Forest City and the county highway department produced sand and gravel for building, paving, road construction, and miscellaneous uses.

Winneshiek.—Carlson Materials Co., Inc. (Decorah) produced sand and gravel for building and road construction.

Limestone was quarried by Bouska Construction Co., Protivin; Bruening Rock Products, Inc., and Seegmiller Construction Co., Decorah; J. F. Pavlovec, Calmar; and Roverud Construction Co., Spring Grove, Minn. The output was used for agricultural stone and concrete aggregate.

Woodbury.—Concrete Materials Co. (Cedar Rapids, operating near Correctionville), Maudlin Construction Co. (Webster City), and Westfork Sand & Gravel Co. (Sioux City, operating near Moville) produced sand and gravel for building and road construction.

Worth.—Peat was dug from bogs near Hanlontown by Eli Colby Co. and Colby Pioneer Peat Co.

L. R. Falk (St. Ansgar) and Maudlin Construction Co. (Webster City) produced gravel for road construction.

Limestone Products Co. (Fertile) produced limestone for agricultural stone and concrete aggregate.

Wright.—Maudlin Construction Co. (Webster City), Oscar Nelson (Belmond) and the county highway department produced sand and gravel for building, paving, road construction, and railroad ballast.

The Mineral Industry of Kansas

This chapter has been prepared with the cooperation of the State Geological Survey of Kansas.

By Harvard Eng,[1] Walter H. Schoewe,[2] and Edwin D. Goebel [2]

FOR THE SEVENTH consecutive year a new high in mineral value has been established in Kansas as mineral production ($493 million) exceeded the 1955 record year by approximately $22 million.

A 236-mile, 4-lane, Kansas Turnpike was completed in October and highlighted construction activities during 1956. Approximately $21 million was spent on county road construction and maintenance during 1956. A new salt industry for the manufacture of salt petrochemicals was established near Wichita. Exploratory drilling resulted in discovery of 179 oil and gas fields, of which 5 fields were revived. Discovery of gas in Wallace County opened a new gas area in the northwestern part of the State. Water was reported as a mineral commodity in Kansas for the first time. One hundred and two of the 105 counties in Kansas reported mineral production in 1956.

Crude petroleum composed 70 percent of the total mineral value in 1956, and mineral fuels represented 85 percent of this total. Other leading minerals, following petroleum in order of value, were: Natural gas, cement, stone, and natural-gas liquids. Eighteen counties had mineral production valued at more than $10 million. These counties, in order of rank, were: Barton, Ellis, Russell, Butler, Rooks, Greenwood, Stafford, Rice, Graham, Cowley, Cherokee, Grant, Allen, Barber, Stevens, McPherson, Sedgwick, and Pawnee. All minerals except gypsum, pumice, and stone increased in value from 1955.

[1] Chemical engineer, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] Geologist, State Geological Survey of Kansas, University of Kansas, Lawrence, Kans.

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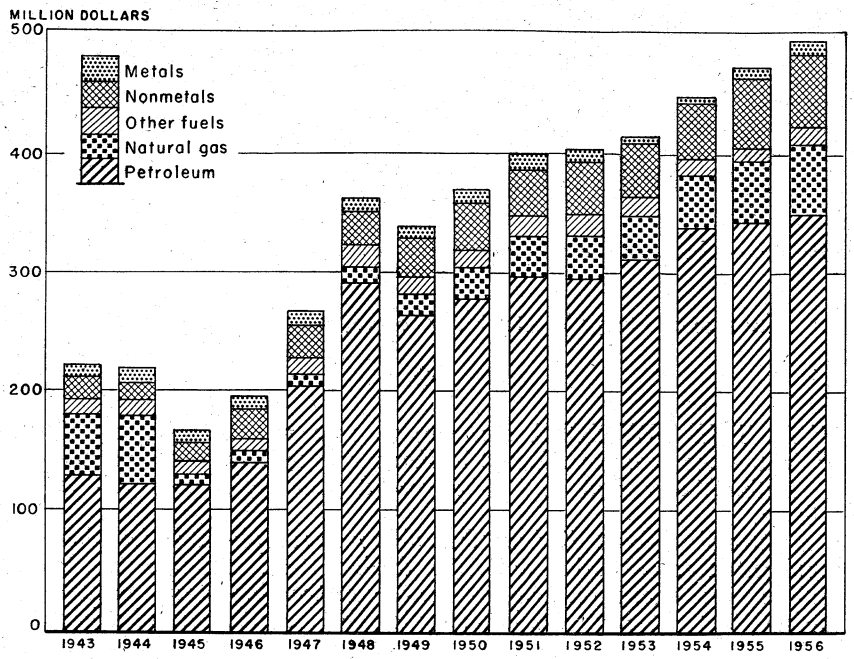

FIGURE 1.—Value of mineral production in Kansas, 1943–56

TABLE 1.—Mineral production in Kansas, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement: [2]				
Portland 376-pound barrels	9,071,747	$24,520,533	10,239,578	$29,370,845
Masonry do	382,523	1,333,504	358,739	1,324,928
Clays	[3] 767,662	873,016	977,099	1,169,048
Coal	742,282	3,165,868	883,877	3,856,330
Helium cubic feet	42,750,000	662,619	45,035,200	698,000
Lead (recoverable content of ores, etc.)	5,498	1,638,404	7,635	2,397,390
Natural gas million cubic feet	471,041	52,286,000	526,091	59,448,000
Natural-gas liquids:				
Natural gasoline and cycle products thousand gallons	118,599	6,318,000	105,482	5,928,000
LP-gases do	92,596	2,643,000	90,287	3,843,000
Petroleum (crude) thousand 42-gallon barrels	121,669	340,670,000	124,204	346,529,000
Pumice	2,320	59,710	(4)	(4)
Salt	910,866	8,432,325	1,004,042	9,167,364
Sand and gravel	10,664,986	6,909,666	12,515,164	8,022,312
Stone	12,483,380	15,946,190	13,433,852	15,703,345
Zinc (recoverable content of ores, etc.)	27,611	6,792,306	28,665	7,854,210
Value of items that cannot be disclosed: Gypsum (crude), natural cement, and values indicated by footnote 4		1,615,934		1,465,012
Total Kansas [5]		470,830,000		493,307,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes natural cement, value for which is included with "Value of items that cannot be disclosed."
[3] Excludes fire clay, value for which is included with "Value of items that cannot be disclosed."
[4] Figures withheld to avoid disclosing individual company confidential data.
[5] The total has been adjusted to eliminate duplicating values of clays and stone.

TABLE 2.—Average unit value of mineral commodities produced in Kansas, 1951–56

Commodity	1951	1952	1953	1954	1955	1956
Cement:						
Portland, 376-pound barrel	$2.38	$2.38	$2.51	$2.63	$2.70	$2.87
Masonry, do					3.49	3.69
Natural, do	2.69	3.01	2.98	2.96	2.95	3.16
Clays, short ton	1.00	1.19	1.12	1.20	1.26	1.20
Fire clay, do	2.09	2.18	2.00	2.00	2.34	2.22
Miscellaneous, do	.96	1.30	1.06	1.22	1.28	1.04
For cement manufacture, do		1.00	1.00	1.00	1.00	1.00
Coal, do	3.94	3.90	3.92	4.02	4.27	4.36
Gypsum, do	1.66	1.62	1.67	1.55	2.09	1.82
Gravel, do	.55	.54	.54	.69	.65	.61
Helium, per thousand cubic feet	12.44	12.75	13.18	15.81	15.50	15.50
Lead, pound	.173	.161	.131	.137	.149	.157
Natural gas, per thousand cubic feet	.081	.083	.086	.106	.111	.113
Natural-gas liquids:						
Natural gasoline and cycle products, per gallon	.062	.063	.056	.050	.053	.056
LP-gases, do	.036	.040	.034	.031	.029	.043
Petroleum, per 42-gallon barrel	2.57	2.56	2.69	2.81	2.80	2.79
Pumice, short ton	3.20	7.86	11.42	3.96	25.74	20.72
Salt, do	7.37	7.51	8.26	8.87	9.26	9.13
Brine, do						3.50
Evaporated, do	12.91	13.31	14.26	15.37	16.09	17.03
Rock, do	3.67	3.75	4.10	4.43	4.76	5.19
Sand, do	.65	.63	.70	.69	.65	.65
Stone:						
Limestone: Crushed, do	1.31	1.38	1.35	1.23	1.34	1.30
Dimension, do	18.28	16.22	15.65	18.71	17.90	24.09
Miscellaneous, do	.30	.37	.40	.35	.41	.38
Sandstone: Crushed, do	1.60	1.65	1.35	1.87	1.64	1.58
Dimension, do	.80	1.25		7.89	19.62	19.62
Limestone for cement manufacture, do				.89	1.00	.90
Zinc, pound	.182	.166	.115	.108	.123	.137

EMPLOYMENT AND INJURIES

The estimated average annual employment of the mining industries in Kansas was the same as 1955, with an average of 19,000 persons. Lead-zinc mines and quarries reported increases of 12 and 11 percent, respectively. Employment in lead-zinc mining increased with larger mine and smelter output during the year.

Nonmetallic mineral mining and quarrying showed a greater annual employment, which resulted, in part, from increased construction activity. Limestone quarries reported the highest estimated average with 853 people, and sand and gravel operations employed an estimated average of 649 persons, according to the Employment Security Division, Department of Labor. Total nonmetallic mining, excluding sand and gravel operators, employed 3,259; 2,272 in stone quarrying. Employment in the mining industries remained the smallest part of the total of the nonagricultural industries in the State.[3]

TABLE 3.—Average annual employment, mining industries and products of petroleum and coal, 1947–51 (average) and 1952–56 [1]

Industry group	1947–51	1952	1953	1954	[2] 1955	1956
Mining (total)	17,240	18,900	18,500	18,400	19,000	19,000
Metal	820	600	400	300	400	450
Nonmetal	1,520	1,700	1,700	1,600	1,850	2,050
Coal	1,900	700	500	500	350	350
Petroleum and natural-gas extraction	13,920	15,900	15,900	16,000	16,400	16,150
Products of petroleum and coal	5,120	5,200	5,400	5,000	4,900	4,900

[1] Employment Security Division, Department of Labor, State of Kansas.
[2] Revised figures.

[3] Employment Security Division, Department of Labor, State of Kansas Press release, 1956.

Injuries.—Mineral industries, excluding petroleum, reported 3 fatal accidents, 15 partial permanent injuries, and 142 temporary injuries. The nonmetal industry, with 3,259 men employed during the year, reported 2 fatal injuries, 10 partial permanent injuries, and 97 temporary injuries. Metal mining experienced 1 fatal injury, 5 partial permanent, and 38 temporary injuries. Coal mining reported the lowest injury experience, with seven temporary injuries.

Wages.—The average weekly earnings of the mining industry was $96.02, with an average of 43.2 hours worked per week, according to the Employment Security Division of the Kansas Labor Department. This represented an increase of $8.25 per week, and the average weekly hours rose 0.8 hour from the previous year. Petroleum mining increased $7.88 in average weekly earnings to $96.07, and average weekly hours rose 0.7 hour to 42.3 hours.

Production and exploration in the oil industry, road and building construction, and growing mineral economy directly reflected the higher weekly earnings. Overtime was another important factor in the higher weekly earnings and longer weekly hours.[4]

TABLE 4.—Injury experience of selected mining industries in 1956

Industry group	Number of mines	Average active days	Men employed	Man-days	Man-hours	Days disability (nonfatal) [1]	Injury experience [1]					
							Fatal	Nonfatal	Severity rate		Frequency rate	
									Fatal	Nonfatal	Fatal	Nonfatal
Metal: Lead-zinc	22	283	394	111,566	889,932	3,249	1	43	6.74	3.65	1.12	48.32
Nonmetals: [2]												
Abrasives	5	33	9	294	2,500	------	------	------	------	------	------	------
Gypsum	4	293	296	86,703	693,631	49	1	2	8.65	0.07	1.44	2.88
Salt and brine	8	309	425	131,223	1,063,401	4,526	1	22	5.64	4.26	0.94	20.69
Clays	15	244	257	62,628	517,883	2,092	------	16	------	3.95	------	30.90
Stone	93	247	2,272	562,024	4,615,584	(3)	------	67	(3)	(3)	------	14.52
Fuel: Coal	24	245	272	66,511	499,632	(3)	------	7	------	------	------	14.01

[1] 1 fatal accident and 1 permanent total accident are equivalent to 6,000 days lost.
[2] Excludes sand and gravel.
[3] Data not available.

TRANSPORTATION

The Santa Fe Trail has been replaced by a modern one, the Kansas Turnpike. This ultramodern tollroad was completed in October and was culminated in 22 months. The superhighway will aid, indirectly, the mineral industries.

Freight movement by barge on the Missouri River dropped sharply from 1955. Barge companies could not compete with the railroads because of shallowness of the river channel. Reduced freight rates and special rates for processing in transit offered by the railroads does not normally remove barge shipping from competing in freight shipments, but the shallow channel does not permit barges on the Missouri River to carry full loads. Proposed deepening of the channel to 12 feet would permit the barge companies to compete with the railroads again. The resultant stabilization, or perhaps lowered freight rates

[4] Work cited in footnote 3.

brought about by dredging the Missouri River to a depth of 12 feet, would further induce new industries to Kansas.

In 1956 the county engineers of Kansas built 6,665 miles of roads at a total cost of over $11 million and maintained 61,047 miles of roads at a cost of approximately $10 million. Road construction and maintenance have a direct impact on the nonmetallic mineral production in the State. The only counties not reporting county road construction were: Atchison, Brown, Cheyenne, Dickinson, Grant, Lincoln, Morton, Stanton, and Wallace.[5]

Two natural-gas pipelines were being constructed in 1956, according to the Oil and Gas Journal. Twenty-eight miles of 16-inch line was being laid between Leavenworth, Leavenworth County, to St. Joseph, Mo. Seven miles of 10-inch line was constructed in North Topeka.

TABLE 5.—County road construction in 1956, by types [1]

Type	County disbursements			Contractor disbursements		
	Miles	Value	Average cost per mile	Miles	Value	Average cost per mile
Standard graded and drained	2,826	$3,471,763	$1,229	174	$499,192	$2,617
One course gravel or stone	1,060	786,395	742	206	224,770	1,093
Gravel or stone on existing surface	530	390,934	738	51	33,903	662
Gravel or stone stabilization	539	761,819	1,413	32	100,771	3,160
Bituminous surface treated	659	1,179,638	1,790	125	242,486	1,942
Bituminous surface treated (including base)	311	1,056,087	3,393	108	446,217	4,139
Bituminous mix (on existing surface)	28	116,034	4,106	8	25,960	3,245
Bituminous mix (including base) and pavement	4	81,779	21,132	4	67,300	18,694
Total	5,957	7,844,449	1,317	708	1,640,599	2,319
Grand total	6,665	9,485,048	1,423			
Total all costs for construction [2]		11,079,182				

[1] State of Kansas, State Highway Commission of Kansas, Highway Planning Department, County Engineers' Annual Report: 1956, 137 pp.
[2] Includes all other costs for road construction, bridges, rights-of-way, culverts, etc.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Mineral fuels have had an important role in Kansas economy; growth and development have been associated with these commodities. The value of all mineral fuels increased over 1955. Secondary recovery of crude petroleum has become an important method for producing oil in the State.

Of 179 new fields discovered during 1956, 132 discovery wells produced oil, 36 gas, and 3 oil and gas; 8 were dry. Ellis County led in discoveries, with 19 new oilfields, followed by Barber County with 2 oil and 12 gas fields, Stafford County with 12 oilfields and 1 gas field, and Cowley County with 10 oilfields and 1 oil and gas field.

Carbon Black.—Carbon-black production in Kansas increased 9 percent from 1955. Increased quantities of natural-gas liquids were used

[5] State of Kansas, State Highway Commission of Kansas, Highway Planning Department, County Engineers' Annual Report: 1956, 137 pp.

in manufacturing carbon black, replacing natural gas as the feed stock.

Coal.—Mined output of coal increased 19 percent in quantity and 22 percent in value, despite a smaller number of operators. Production during the year was confined to larger producers, of which only 19 mines reported production over 1,000 tons. The average price for coal advanced 9 cents to $4.36 per ton and was mainly responsible for the increased tonnage.

TABLE 6.—Production of coal, 1947–51 (average) and 1952–56

Year	Number of mines			Short tons	Value	
	Underground	Strip	Total		Total	Average per ton
1947–51 (average)	22	37	59	2,279,954	$8,550,984	$3.75
1952	15	32	47	2,028,601	7,902,590	3.90
1953	28	21	49	1,715,004	7,101,386	4.14
1954	10	30	40	1,372,294	5,602,808	4.08
1955	5	19	24	742,282	3,165,868	4.27
1956	4	15	19	883,877	3,856,330	4.36

Helium.—Helium shipments from the Government plant at Otis in 1956 exceeded the previous year by 5 percent, as the Government attempted to meet the increased demands of industry and Federal agencies. The use of helium for shielded-arc welding continued to grow, as industry was provided with a new tool to fabricate aluminum, magnesium, and equipment from special alloys.

Natural Gas.—Kansas natural-gas producing area was expanded in 1956 by the discovery of gas in Wallace County. The discovery well of Skelly Oil Co. reported an initial potential of 6 million cubic feet a day; however, no production was reported because of the lack of pipeline connection. The Kansas portion of the Hugoton gas area, which produced 73 percent of the total natural gas in the State, includes 2 entire counties (Stevens and Grant) and parts of 7 other counties (Finney, Hamilton, Haskell, Kearny, Morton, Seward, and Stanton). The Hugoton gas area was first discovered in Seward County in 1922. The first well was assigned to the Liberal gas field, which was later included with the Hugoton.

Producing formations of the Hugoton gas area was limited by definition to the Chase Group of the Permian, which lies at an average depth of 2,500 feet. The Kansas Corporation Commission set well spacing in this area to 1 well per 640 acres.

Production of natural gas increased 12 percent in quantity and 14 percent in value to 526 billion cubic feet valued at $59 million from 1955. Estimated proved recoverable reserves of natural gas at the year end was 17,566 billion cubic feet—an 8-percent increase from the previous year.[6] During the year 36 new gas pools were discovered, of which important new fields were:[7]

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[6] American Petroleum Institute and American Gas Association, Proved Reserves of Crude Oil, Natural-Gas Liquids and Natural Gas: Vol. 11, Dec. 31, 1956, p. 19.

[7] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas During 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub. Bull. 128, 1957, pp. 15–22.

County:	Field name	Initial production (thousand cubic feet per day)
Barber	Driftwood	54,000
Do	Elsea	25,000
Do	Elwood	7,340
Do	McGuire	27,100
Do	Medicine Lodge West	9,000
Do	Sharon Northwest	8,800
Kingman	Goetz	24,000
Meade	Fincham	30,000
Do	Plains	7,900
Do	Sanders	9,153
Seward	Plains West	21,000
Stevens	Hanke	7,500
Do	Panoma	16,124
Wallace	Sexson	14,000

TABLE 7.—Marketed production of natural gas, 1947–51 (average) and 1952–56

Year	Million cubic feet	Value	Year	Million cubic feet	Value
1947–51 (average)	306,030	$19,318,000	1954	412,369	$43,711,000
1952	412,544	34,241,000	1955	471,041	52,286,000
1953	420,607	36,172,000	1956	526,091	59,448,000

TABLE 8.—Marketed production of natural gas from the Kansas part of Hugoton gas area, 1941–56 [1]

Year	Quantity (thousand cubic feet)	Year	Quantity (thousand cubic feet)	Year	Quantity (thousand cubic feet)	Year	Quantity (thousand cubic feet)
1941	40,759,482	1945	90,345,203	1949	247,868,876	1953	387,635,243
1942	46,365,484	1946	119,637,983	1950	320,545,480	1954	346,732,192
1943	70,921,532	1947	157,663,036	1951	371,002,475	1955	394,257,153
1944	92,922,821	1948	185,872,594	1952	375,081,748	1956	381,874,779

[1] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas During 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub., Bull. 128, 1957, p. 31.

TABLE 9.—Gas wells drilled in Hugoton gas area, cumulative to 1948 and 1949–56, by counties [1]

County	1948 cumulative	1949 drilled	1950 drilled	1951 drilled	1952 drilled	1953 drilled	1954 drilled	1955 drilled	1956	
									Drilled	Cumulative
Finney	86	76	47	19	49	73	72	49	49	520
Grant	334	89	36	68	29	6	5	3	2	572
Hamilton	4	2	1	8	8	10	4	-------	2	39
Haskell	171	42	39	33	30	27	39	40	19	440
Kearny	204	71	51	56	75	72	44	27	26	626
Morton	86	6	52	62	27	31	14	9	20	307
Seward	48	41	91	51	10	19	42	21	18	341
Stanton	125	9	17	25	7	27	24	-------	-------	234
Stevens	545	77	63	16	17	4	20	5	10	757
Total	1,603	413	397	338	252	269	264	154	146	3,836

[1] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas During 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub., Bull. 128, 1957, p. 32.

Natural-Gas Liquids.—Approximately 0.5 gallon of natural-gas condensate was obtained from each thousand cubic feet of natural gas processed from the Hugoton gas area. Nearly all of the natural gasoline and cycle plants were in this area.

Recovery of natural-gas liquids from 15 gasoline and cycle plants declined from production of the previous year to 196 million gallons; but, the value increased 9 percent to $9.8 million. The yield of natural gasoline and cycle products was smaller by 13.1 million gallons and LP-gases was 2 million gallons less than the previous year. An increase in the average price of $0.01 per gallon for both natural gasoline and LP-gases to $0.06 and $0.04 respectively was responsible for the rise in value.

TABLE 10.—Natural-gas liquids produced, 1947–51 (average) and 1952–56

Year	Natural gasoline		LP-gases		Total	
	Thousand gallons	Value	Thousand gallons	Value	Thousand gallons	Value
1947–51 (average)	89,443	$5,647,400	40,958	$1,558,000	130,401	$7,205,400
1952	115,206	7,286,000	77,406	3,116,000	192,612	10,402,000
1953–54	(1)	(1)	(1)	(1)	(1)	(1)
1955	118,599	6,318,000	92,596	2,643,000	211,195	8,961,000
1956	105,482	5,928,000	90,287	3,843,000	195,769	9,771,000

[1] Figure withheld to avoid disclosing individual company confidential data.

TABLE 11.—Natural gasoline and LP-gases processed in 1956, in barrels [1]

Company	Location		Natural gasoline	Butane	Propane	LP-gases	Total
	Nearest town	County					
Cities Service Oil Co	Burrton	Reno	59,686		15,859	55,049	130,594
Do	Wichita	Sedgwick	379,042		176,130	117,230	672,402
Colorado Interstate Gas Co.	Lakin	Kearney	95,218				95,218
Drillers Gas Co	Cheney	Sedgwick	19,997			8,686	28,683
Dunn-Mar Oil & Gas Co	Otis	Rush	29,775	3,890			33,665
Hughton Production Co	Ulysses	Grant	172,468	107,952	144,926		425,346
Kansas-Nebraska Natural Gas Co.	Deerfield	Kearney	102,194		2,302	13,624	118,120
Kansas Power & Light Co.	Medicine Lodge.	Barber	75,092				75,092
Magnolia Petroleum Co	Ulysses	Grant	171,165	73,591	90,569		335,325
Northern Natural Gas Co.	Holcomb	Finney	114,259				114,259
Do	Sublette	Haskell	308,175				308,175
Panhandle Eastern Pipeline Co.	Liberal	Seward	512,845	215,424	137,235		865,504
Skelly Oil Co	Cunningham.	Kingman	43,034			42,642	85,676
Stanolind Oil & Gas Co	Ulysses	Grant	426,802	390,975	561,598		1,379,375
The Texas Co	Atlanta	Cowley	40,934			38,879	79,813
Total			2,550,686	791,832	1,128,619	276,110	4,747,247

[1] Conservation Division, Kansas Corporation Commission.

Estimated proved recoverable reserves of natural-gas liquids declined for the second consecutive year to 7,208 million gallons, a decrease of 68 million gallons from 1955.[8]

Petroleum.—The relatively shallow oil-bearing stratum, the special inducement that nature has given oil operators to drill in Kansas, has been exploited. This exploitation maintained the Sunflower State in fifth position among oil-producing States.

Exploration for and recovery of oil was high in 1956. Nearly 124 million barrels of crude petroleum valued at $347 million was produced to set a new State record for the third consecutive year. Secondary recovery of oil increased slightly from the previous year. Exploratory drilling totaled 17 million feet.[9]

The average 1956 price of crude petroleum was $2.79 a barrel, a 1-cent reduction from 1955. Indicated demand was slightly higher than the previous year.

Shipments of oil, both in and out of the State, were larger. Crude oil, refined and used, climbed 7 percent.

Drilling and Exploration.—Wildcat drilling in Kansas was second only to Texas in the number of wells completed (1,073) in 1956, according to the Oil and Gas Journal. Most of the wildcatting took place on the Central Kansas uplift. Exploration activity became more intense in the northwestern counties late in the year. Search for new gas reserves was continued in the Hugoton gas area.[10] Exploratory drilling brought another county, Rawlins, into the list of oil-producing counties. Brumm field was discovered in June after 25 years of unsuccessful attempts.

A total of 5,028 exploration and development wells was completed during 1956, which represented an increase of 3 percent from 1955. The average depth of wells drilled in 1956 dropped 228 feet to an average of 3,543 feet per well though exploratory drilling increased 3 percent from the previous year. This decline may be explained in part by the large developmental drilling in secondary-recovery projects.

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[8] Work cited in footnote 7, p. 10.
[9] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 141.
[10] Work cited in footnote 9.

TABLE 12.—Oil- and gas-well drilling in 1956, by counties [1]

County	Proved or development wells			Exploratory wells			Total proved and exploratory wells			Grand total
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	
Barber	28	65	49	3	22	56	31	87	105	223
Barton	118	1	104	26		59	144	1	163	308
Butler	59		35	2		38	61		73	134
Chase	2					9	2		9	11
Clark	3	2	4	2	1	8	5	3	12	20
Clay						3			3	3
Cloud						4			4	4
Coffey	1		8	1		4	2		12	14
Comanche		1	1		1	7		2	8	10
Cowley	187	5	104	18	1	55	205	6	159	370
Decatur	10		12	2		9	12		21	33
Dickinson	6		5	1		13	7		18	25
Douglas						2			2	2
Edwards		1	6	5	3	21	5	4	27	36
Ellis	144		106	32		57	176		163	339
Ellsworth	28		22	2		17	30		39	69
Finney	6	34		4	1	8	10	35	8	53
Ford		1		1		5	1	1	5	7
Geary						1			1	1
Gove	1					2	1		2	3
Graham	129		71	9		73	138		144	282
Grant		2						2		2
Greeley						4			4	4
Greenwood	99		37	2		13	101		50	151
Hamilton		2	1		5	4		7	5	12
Harper	26	1	8	4		22	30	1	30	61
Harvey	11	1	11		1	20	11	2	31	44
Haskell	4	17				3	4	17	3	24
Hodgeman	2			3		5	5		5	10
Jefferson						1			1	1
Jewell						1			1	1
Kearny		26	3	1		3	1	26	6	33
Kingman	61	21	23	2	4	34	63	25	57	145
Kiowa	18	3	8	2	5	21	20	8	29	57
Lane						1			1	1
Leavenworth						2			2	2
Lincoln						2			2	2
Logan						4			4	4
Lyon	12		5			11	12		16	28
Marion	164		59	15		62	179		112	291
McPherson	76	1	35	7	1	42	83	2	77	162
Meade	12	19	5	8	8	4	20	27	9	56
Morris	25		6	2		20	27		26	53
Morton	33	50	13	1	6	3	34	56	16	106
Ness	20		11	8		30	28		41	69
Norton	2		3			17	2		20	22
Pawnee	90	4	34	6	2	45	96	6	79	181
Phillips	7		3	2		7	9		10	19
Pratt	10		11	4		20	14		31	45
Rawlins						2			2	2
Reno	2		9			33	2		42	44
Rice	76	1	45	12	1	30	88	2	75	165
Rooks	65		65	10		45	75		110	185
Rush	23	1	10	2	1	22	25	2	32	59
Russell	100		44	5		14	105		58	163
Saline	2		1	1		4	3		5	8
Scott						3			3	3
Sedgwick	50	2	25	8		37	58	2	62	122
Seward		20			2	1		22	1	23
Shawnee						1			1	1
Sheridan	4		3	2		20	6		23	29
Sherman						1			1	1
Stafford	96	1	76	23	2	68	119	3	144	266
Stanton		4	1			2		4	3	7
Stevens		10			2	2		12	2	14
Sumner	85	2	39	13		57	98	2	96	196
Thomas				1		6	1		6	7
Trego	54		24	8		53	62		77	139
Wabaunsee	1		1			4	1		5	6
Wallace			1		1	3		1	4	5
Wichita						2			2	2
Woodson	21		16	1		10	22		26	48
Total: 1956	1,973	298	1,154	261	70	1,272	2,234	368	2,426	5,028
1955	2,179	323	1,122	215	49	988	2,394	372	2,110	4,876

[1] National Oil Scouts and Landmen's Association, Oil- and Gas-Field Development in United States: 1957, vol. 27.

Average footage of new wells drilled:[11, 12]

1951	1952	1953	1954	1955	[1] 1956
3,437	3,468	3,478	3,552	3,771	3,543

[1] World Oil, vol. 144, No. 3, February 1957, p. 124.

The ratio of success in exploratory drilling in 1956 was the same as in 1955—21 percent—although 981 exploratory wells were drilled when compared with 1,252 in 1955.

Shallow drilling in the eastern part of the State resulted in the use of a larger number of cable-tool rigs; approximately 815 rigs were used compared with 385 in 1955.[13]

Production.—The production of crude petroleum—124 million barrels—in 1956 was 2.5 million barrels more than was produced in 1955 and was a gain of nearly 2 percent. Barton, Ellis, Russell, Butler, Rooks, and Greenwood Counties respectively recorded the State's largest outputs.

TABLE 13.—Production and indicated demand of crude petroleum, by months, 1956, in thousand barrels

Month	Production	Indicated demand	Month	Production	Indicated demand
January	10,585	10,681	August	10,775	11,105
February	9,865	10,325	September	9,950	10,276
March	10,838	10,410	October	10,184	9,487
April	10,396	9,257	November	9,986	10,048
May	10,416	9,791	December	10,340	10,627
June	10,345	9,521			
July	10,524	10,851	Total	124,204	122,379

TABLE 14.—Production of crude petroleum, 1947–51 (average) and 1952–56

Year	Thousand barrels	Value		Year	Thousand barrels	Value	
		Total (thousand dollars)	Average per barrel			Total (thousand dollars)	Average per barrel
1947–51 (average)	108,003	264,980	$2.45	1954	119,317	335,280	$2.81
1952	114,807	293,910	2.56	1955	121,669	340,670	2.80
1953	114,566	308,180	2.69	1956	124,204	346,529	2.79

[11] Includes oil wells, gas, and distillate wells, and dry holes only. Excludes water-input wells, gas-input wells, salt-water-disposal wells, and wells drilled deeper.
[12] American Petroleum Institute, Petroleum Facts and Figures: 12th Ed., 1956, p. 132.
[13] Work cited in footnote 9, p. 150.

TABLE 15.—Important new oilfields discovered in 1956 [1]

Field	County	Initial production (barrels per day)	Field	County	Initial production (barrels per day)
Workman North	Barton	1,696	Unger Southwest	Marion	3,000
Snake Creek East	Clark	360	Advance	Sheridan	513
Warner	Decatur	330	Hoxie	do	581
Engel	Ellis	596	Rattlesnake East	Stafford	1,393
Pleasant North (revived).	do	700	Kindig	Thomas	401
Brassfield	Graham	364	Newcomer	Trego	3,000
Banner South	Harper	1,408	Newcomer Northwest	do	1,642

[1] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas during 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub. Bull. 128, 1957, pp. 15–22.

TABLE 16.—Production of crude petroleum, 1952–56, by fields, in thousand barrels

[Oil and Gas Journal]

Field	1952	1953	1954	1955	1956
Bemis-Shutts	3,741	3,526	3,549	3,263	3,076
Bloomer	2,344	2,067	1,589	1,456	1,268
Burnett-Southwest	2,709	2,303	2,170	2,464	2,230
Burrton-Haury	909	781	809	732	695
Chase	[1] 7,152	[1] 6,007	[1] 5,339	[1] 4,897	[1] 4,689
El Dorado	3,454	3,939	3,864	4,242	4,348
Fairport	879	834	823	903	964
Geneseo-Edwards	3,304	3,061	2,869	2,941	2,734
Gladys	[2]	[2]	[2]	1,024	1,885
Gorham	1,990	1,793	1,692	1,589	1,543
Hall Gurney	3,954	4,640	4,528	4,064	3,587
Iuka-Carmi	1,244	1,314	1,421	1,464	1,486
Kraft-Prusa	5,449	4,721	4,357	3,826	3,498
Marcotte	1,964	1,831	1,681	1,712	1,621
Morel	2,092	1,798	1,654	1,470	1,461
Ray	1,624	1,393	1,280	1,312	1,225
Seeley-Wick	1,292	1,753	1,798	1,479	1,341
Silica-Raymond	[1]	[1]	[1]	[1]	[1]
Stoltenberg	1,471	1,270	1,119	1,043	951
Thrall-Aagard	1,650	1,121	1,002	775	748
Trapp	6,469	6,081	5,461	4,943	4,427
Welch-Bornholdt	740	1,259	1,361	1,254	1,108
Other fields	60,414	[3] 63,767	[3] 70,951	[3] 74,816	78,948
Total Kansas	114,845	[3] 115,259	[3] 119,317	[3] 121,669	123,833

[1] Silica included with Chase.
[2] Included with "Other fields."
[3] Bureau of Mines data.

TABLE 17.—Barrels of oil produced, shipped in, used, and shipped out, 1955–56 [1]

	1955	1956		1955	1956
Produced	121,161,234	124,467,713	Shipped out	57,527,501	58,713,375
Shipped in	29,505,340	34,320,108	Refined and used in Kansas	93,139,073	100,074,446
Total	150,666,574	158,787,821	Total	150,666,574	158,787,821

[1] Figures provided by Conservation Division, Kansas Corporation Commission.

Secondary Recovery.—The recovery of oil by secondary methods increased for the third straight year and furnished 12 percent of the oil output in the State. Recovery methods included the injection of water, gas, and air. A total of 217 projects reported 6,990 producing wells and 4,302 input wells. The Cherokee and Forest City basins were the center for most of the repressuring projects.

Both fresh and brine waters were used for waterflooding; however,

brine was preferred to fresh water. The water was treated to make the chemical properties the same as that of the brine associated with oil. This was necessary to prevent "plugging" and to assure proper flow of repressuring water through the oil stratum.

Reserves.—Proved recoverable reserves of crude petroleum decreased 5.9 million barrels to an estimated 992 million barrels. According to the American Petroleum Institute and American Gas Association, estimated reserves of petroleum hydrocarbons, including petroleum, natural-gas liquids, and natural gas equivalent in Kansas rose to 4 billion barrels during 1956. The rate of exploratory drilling footage is increasing at a greater rate than developmental drilling footage. This increased rate has resulted in a slight increase in the rate of additions to the total hydrocarbon reserves as shown in figure 2.

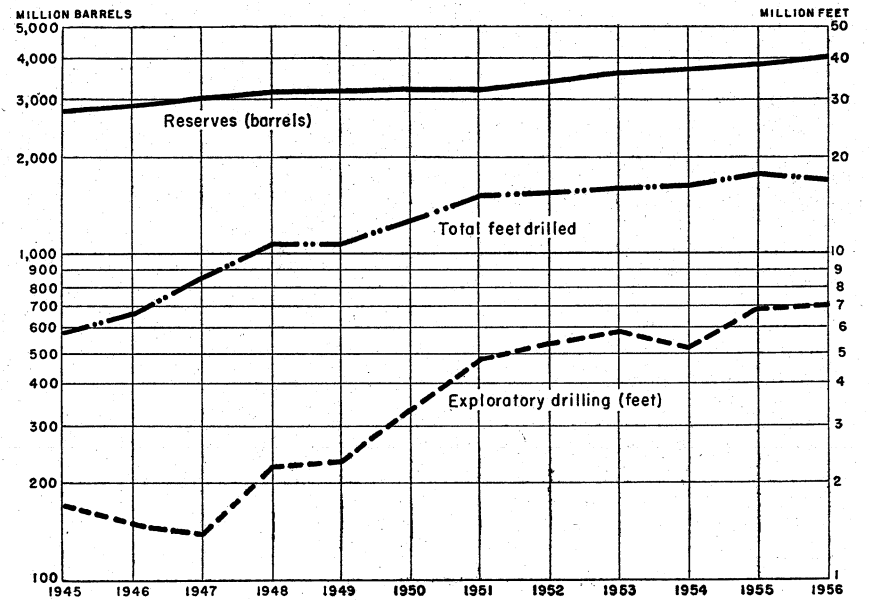

FIGURE 2.—Proved reserves of total hydrocarbons and footage drilled, 1945–56.

TABLE 18.—Secondary recovery of oil from eight counties during 1956 [1]

County	Number of projects	Total oil production (barrels)	Estimated secondary-recovery oil production (barrels)	Secondary recovery as a percentage of total production
Allen	12	844,728	557,198	66.0
Anderson	7	658,605	567,688	86.2
Butler	29	8,138,153	4,080,185	50.1
Franklin	5	347,569	290,028	83.4
Greenwood	46	6,788,601	5,365,499	79.0
Miami	10	674,580	448,771	66.5
Montgomery	16	748,019	377,502	50.5
Neosho	13	638,149	490,261	76.8
Total	138	18,838,404	12,177,132	64.6

[1] Goebel, E. D., Hornbaker, A. L., Hilpman, P. L., and Beene, D. L., Oil and Gas Developments in Kansas during 1956: State Geol. Survey of Kansas, Univ. of Kansas Pub. Bull. 128, 1957, p. 29.

TABLE 19.—Capacity of petroleum refineries and cracking plants as of January 1, 1957

(Barrels per day)

Company	Location	County	Type of plant	Crude-oil capacity		Cracked-gasoline capacity	
				Operating	Shutdown	Operating	Shutdown
Anderson-Prichard Oil Corp	Arkansas City	Cowley	Skimming, cracking, and asphalt	18,500		6,800	1,200
Century Refining Co., Inc	Shallow Water	Scott	do	2,000	2,000	1,550	950
The Chanute Refining Co	Chanute	Neosho	do	1,500		1,500	
Cooperative Refinery Assoc	Coffeyville	Montgomery	Complete	24,500		10,420	
Do	Phillipsburg	Phillips	Skimming and cracking	9,500		2,780	
Derby Refining Co	Wichita	Sedgwick	Skimming, cracking, and asphalt	20,000		9,025	
El Dorado Refining Co	El Dorado	Butler	do	18,350		6,300	2,500
Mid America Refining Co., Inc	Chanute	Neosho	Skimming and cracking	2,100		400	
National Cooperative Refinery Assoc	McPherson	McPherson	Complete	26,000		10,800	
Phillips Petroleum Co	Kansas City	Wyandotte	Skimming, cracking, lube, and asphalt	57,000		31,200	
Skelly Oil Co	El Dorado	Butler	Skimming, cracking, and asphalt	45,000		22,250	
Socony Mobil Oil Co., Inc	Augusta	do	Complete	35,000		11,000	
Standard Oil Co. (Ind.)	Neodesha	Wilson	do	22,500		4,200	2,650
Vickers Petroleum Co., Inc	Potwin	Butler	Skimming and cracking	15,000		5,700	
Total				296,950	2,000	123,925	7,300

METALS

The entire production of metallic minerals originated in the Kansas portion of the Tri-State district. The national stockpile purchase program was instrumental in maintaining firm lead-zinc prices in 1956 and was partly responsible for the increased lead-zinc production in the Tri-State district. However, mine output of recoverable lead was increased as operators were able to improve the recovery of lead. The lead assay in Kansas increased 1.4 percent to 77.53 percent and permitted larger tonnages of recoverable metal. The output of lead metal increased 39 and 46 percent in tonnage and value, respectively, to 7,635 tons of lead valued at $2.4 million.

Zinc output rose to 28,665 tons valued at $7.9 million, an increase of 4 and 16 percent in tonnage and value over 1955. Cherryvale Zinc Co., reclaimers of zinc from waste products of the copper industry, was building a pilot plant to recover tin from scrap by a new process. If the project is successful, a commercial installation will be built.[14]

TABLE 20.—Mine production of lead and zinc, 1947–51 (average), 1952–56, and total 1876–1956, in terms of concentrates and recoverable metals [1]

Year	Mines producing	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content [2]			
						Lead		Zinc	
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	74	11,554	$2,256,539	60,374	$5,794,245	8,775	$2,769,074	32,517	$9,008,836
1952	84	7,747	1,582,699	47,077	5,685,236	5,916	1,904,952	25,482	8,460,024
1953	58	4,399	665,189	28,668	2,064,783	3,347	876,914	15,515	3,568,450
1954	26	5,390	916,161	[3] 38,896	2,638,102	4,033	1,105,042	[4] 19,110	4,127,760
1955	36	7,362	1,352,876	51,252	3,980,849	5,498	1,638,404	27,611	6,792,306
1956	41	10,130	1,955,278	53,142	4,688,130	7,635	2,397,390	28,665	7,854,210
1876–1956		831,049	71,545,223	5,438,316	260,768,713	633,873	86,407,062	2,826,434	409,259,838

[1] Based on Kansas ore and old tailing treated at mills during calendar year indicated.
[2] In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal, it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of lead and zinc is calculated from the average price for all grades.
[3] Includes 360 tons from old tailing remilled.
[4] Includes 194 tons from old tailing remilled.

TABLE 21.—Mine production of lead and zinc, by months, 1956, in terms of recoverable metals

Month	Lead (short tons)	Zinc (short tons)	Month	Lead (short tons)	Zinc (short tons)
January	602	1,890	August	714	2,795
February	539	2,037	September	518	2,442
March	721	2,182	October	585	2,420
April	789	2,666	November	519	2,073
May	822	2,823	December	512	2,081
June	657	2,579			
July	657	2,677	Total	7,635	28,665

[14] Kansas Industrial Development Commission, To the Stars: Vol. 11, No. 2, March–April 1956, p. 23.

NONMETALS

Nonmetal output increased approximately 12 percent over the previous year. Cement, stone, salt, and sand and gravel, in order of value, were important commodities produced.

Tight money and increased costs that sent residential building downward was offset by the increase in commercial construction and especially by public works projects. The Kansas Turnpike, the Nation's fourth longest tollroad, was estimated to cost $160 million and to require 20 years to repay.[15] Completion of this highway was expected to relieve the short supply of materials needed for other construction.

Bureau of Reclamation dedicated Webster Dam on the Solomon River near Stockton, Rooks County. The dam was to be built at a cost of $11 million and to be completed in 3 years.

Cement.—The Kansas cement industry was highlighted with modernization and expansions in 1956. All plants operated above capacity to supply greater demands from construction, road programs, and oil-well drilling. The State's total capacity was increased 1.3 million barrels. Shipments of masonry cement reflected a slight dip as residential construction slowed. Road construction and commercial building remained firm and reflected a gain of 12 and 19 percent, respectively, in shipments and value of cement from 1955. Most of the State shipments of cement were destined for local consumption; however, important quantities were shipped to nearby States—Missouri, Oklahoma, Iowa, Nebraska, and Arkansas. Smaller amounts were shipped to more distant States, such as Michigan, Illinois, Minnesota, and others.

TABLE 23.—Production and shipments of portland cement, 1947–51 (average) and 1952–56, in 376-pound barrels

Year	Production (barrels)	Shipments		
		Barrels	Value	
			Total	Average per barrel
1947–51 (average)	8,004,240	7,940,534	$16,979,805	$2.14
1952	8,672,883	8,811,762	20,956,886	2.38
1953	8,766,206	8,546,250	21,428,536	2.51
1954	8,803,007	9,076,328	23,874,179	2.63
1955	9,219,533	9,071,747	24,520,533	2.70
1956	10,486,150	10,239,578	29,370,845	2.87

Clays.—Production and value of clays rose 14 and 8 percent, respectively, during the year as fire clay was reported for the first time since 1954. Almost all of the State production of clays was used for structural products and cement manufacture. Over 124 million unglazed brick[16] was produced during the year. A large portion of the output went to residential building.

[15] Kansas Industrial Development Commission, To the Stars: Vol. 9, No. 5, November–December 1956, pp. 10–13.

[16] Kansas Business Review, vol. 10, No. 4, April 1957.

Kansas Industries, Inc., of Kansas City, subsidiary of Texas Industries, Inc., reopened and began production in June of sintered lightweight aggregate from shale. The plant (formerly known as Mineral Products Co.) had been idle since June 1953. Kansas Industries, Inc., operated at limited production until plant modernization was completed.

Pidgeon Vitrified China Co., the only commercial dinnerware manufacturer in Kansas, shut down permanently in 1956. Water-problem and management troubles were attributed as the causes.

TABLE 24.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	638,073	$524,303	1954	[1] 697,832	[1] $777,847
1952	665,582	789,293	1955	[1] 767,662	[1] 873,016
1953	670,694	749,579	1956	977,099	1,169,048

[1] Excludes certain clays, value for which is included with table 1, "Value of items that cannot be disclosed."

Gypsum.—Although the production of crude gypsum increased slightly from the previous year, the value was below 1955. A drop of 27 cents per ton was reported for crude gypsum during 1956. Certain-Teed Products Co. sold its Blue Rapids plant to Bestwall Gypsum Co. The plant continued to produce crude and calcined gypsum and wallboard.[17]

Perlite.—A small quantity of perlite was expanded at the Kansas City plant of Pencalite Perlite Co. for lightweight aggregate. It was used in non-load-bearing lightweight concrete and insulating plasters. No crude perlite was produced in Kansas.

Pumice.—Pumice was mined and crushed for use in ceramic pottery, abrasives, and cleansing powders. Purex Corp., Ltd., closed its two mines in 1956. As a result of this shutdown, both production and value declined 69 and 75 percent, respectively. Only two counties recorded pumice production.

Salt.—Sedgwick County was added to Ellsworth, Reno, and Rice Counties as a salt producer. Frontier Chemical Co., a manufacturer of salt chemicals from brine in Sedgwick County, completed a $7 million expansion program combining another abundant Kansas raw material—natural gas—to produce salt petrochemicals (organic chlorides, acetylene, and other chlorine compounds). These products, along with other abundant raw materials—petroleum and natural gas—could induce other industries to establish plants in the State.[18]

The huge agricultural industry in Kansas consumed the largest portion of rock and evaporated salt produced in the State. Meat packers, block salt for livestock, and leather tanners were among the large users of salt.

The output of salt increased 10 and 9 percent, respectively, for tonnage and value.

[17] Mining Congress Journal, vol. 43, No. 2, February 1957, p. 146.
[18] Kansas Industrial Development Commission, To the Stars: Vol. 9, No. 3, May-June, 1956, pp. 2–6.

TABLE 25.—Salt sold or used by producers, 1947–51 (average) and 1952–56

Year	Evaporated salt		Rock salt		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	341,427	$3,711,580	521,750	$1,741,807	863,177	$5,453,387
1952	358,887	4,775,741	552,857	2,074,286	911,744	6,850,027
1953	370,569	5,285,805	534,658	2,194,751	905,227	7,480,556
1954	356,045	5,474,151	520,622	2,304,255	876,667	7,778,406
1955	361,612	5,819,536	549,254	2,612,789	910,866	8,432,325
1956	[1] 461,418	[1] 6,352,290	542,624	2,815,074	1,004,042	9,167,364

[1] Includes brine.

Sand and Gravel.—Continued high rate of construction and road building pushed mined output and value 17 and 16 percent above 1955. Completion of the Kansas Turnpike should tend to stabilize the supply of this commodity.

Kansas reported only 176 sand and gravel operations in 1956 compared with 199 in 1955. Only 50 Government-and-contractor operators produced sand and gravel during the year. Production was reported from 68 counties. Glass, molding, blast, engine, and filter sands were other uses.

TABLE 26.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Commercial		Government-and-contractor		Total sand and gravel		
	Short tons	Value	Short tons	Value	Short tons	Value	Average value per ton
1947–51 (average)	4,754,729	$3,000,290	1,861,218	$987,099	6,615,947	$3,987,389	$0.60
1952	6,797,975	4,675,216	1,582,090	348,377	8,380,065	5,023,593	.60
1953	6,678,241	4,946,934	2,050,050	721,374	8,728,291	5,668,308	.65
1954	8,340,949	6,365,665	2,080,605	828,506	10,421,554	7,194,171	.69
1955	9,000,242	6,342,242	1,664,744	567,424	10,664,986	6,909,666	.65
1956	10,656,464	7,428,877	1,858,700	593,435	12,515,164	8,022,312	.64

Stone.—Production of stone gained 8 percent while the value declined 2 percent compared with 1955. The decline in value reflected a lower reported value for limestone for cement. Average unit price of dimension limestone rose sharply from the previous year and bolstered the declining value. Crushed limestone represented 72 percent of the stone produced.

Southwest Chat Co. of Baxter Springs (Cherokee County) utilized tailing for crushed-stone uses from lead-zinc operations of the St. Louis Smelting & Refining Division of National Lead Co., which processes approximately 2,500 tons of ore a day.

Deposits of white marl are found in the Ogallala formation of the Tertiary in Wallace and Logan Counties.[19] In the northeastern corner of Wallace County, Delore Division of National Lead Co. of St. Louis mined diatomaceous marl. Pulverized marl was used as a flatting pigment in oil and water emulsion paints. Output of diatomaceous marl—11,710 short tons—approximated the production in 1955.

[19] Jewett, John M., and Schoewe, W. H., Kansas Mineral Resources for Wartime Industries: State Geol. Survey of Kansas, Bull. 41, 1942, part 3, pp. 134–137.

TABLE 27.—Stone sold or used by producers, 1952–56, by kinds

Year	Limestone		Sandstone		Miscellaneous stone		Total stone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1952	7,551,061	$11,204,877	295,246	$485,871	984,564	$360,992	8,830,871	$12,051,740
1953	7,026,871	10,045,111	591,424	800,008	1,150,857	458,831	8,769,152	11,303,950
1954	[1] 9,161,085	[1] 11,956,778	355,430	687,180	860,493	297,864	[1] 10,377,008	[1] 12,941,822
1955	[1] 10,859,729	[1] 14,340,896	746,414	1,242,626	877,237	362,668	[1] 12,483,380	[1] 15,946,190
1956	[2] 11,654,354	[2] 14,630,304	314,878	516,242	1,464,620	556,799	13,433,852	15,703,345

[1] Includes diatomaceous marl and limestone for cement.
[2] Includes limestone used for cement.

A new quarry was opened near Florence (Marion County) by Walt Keeler. The plant had a crushing capacity of 300 tons an hour. In addition to three sizes of aggregate, the plant produced agricultural limestone.[20]

Vermiculite.—Vermiculite was expanded in a plant at Wichita for insulation and as an aggregate of plaster. Production was 62 percent greater than the previous year.

Water.—Drought conditions throughout the Southwest focused attention to the supply and conservation of water. Water has become a vital factor to the expanding Kansas economy. The lack in programing long-range water needs of Kansas has hindered industrial growth.

Industrial consumption of water in Kansas reached 870 million gallons per day from privately developed sources. Foremost in this water consumption were the steam-electric generating plants. Three-fourths of the industrial water is used for cooling and heat exchange, but only 3½ percent of water used for industrial processes is actually consumed. The remainder was used for washing, movement of material and product, and for flushing wastes.[21]

Mineral industries of Kansas use water for cooling, processing, boiler feed, and sanitary and service purposes. Irrigation has greatly enhanced farm output. All but three counties (Elk, Woodson, and Brown) reported irrigation practices in 1956.[22] Despite this widespread application of irrigation, some Kansans consider this expenditure of water for the production of surplus crops of doubtful economic benefit.

Conservation and Pollution.—The major sources of industrial pollution, 65 in number, in Kansas were: Petroleum refineries (14), chemical plants (7), salt plants (4), railroads (5), major milk plants (18), meat processing (16), and miscellaneous industries. The mineral industries were responsible for approximately 25 percent of these major polluting sources.[23] Some of these industries have recognized the damages of pollution and have applied conservation measures.

The oil-producing industry, through conservation measures (salt-water disposal, etc.), made available appreciable quantities of useable water to consumers. Some pollution occurred, however, before the conservation measures were enacted. In 1955 approximately 75 percent of the brine produced in conjunction with oil was reinjected into

[20] Pit and Quarry, vol. 48, No. 11, May 1956, p. 48.
[21] Kansas State Finance Council, Water in Kansas, 1955, July 1954, p. 75.
[22] Work cited in footnote 21, p. 54.
[23] Work cited in footnote 21, pp. 108–110.

disposal wells.[24] In the recovery of oil, fresh ground-water supplies are conserved by "casing off" the well with steel pipe to prevent contamination by brine. Conservation programs by the other mineral industries would increase the availability of water in Kansas.

REVIEW BY COUNTIES[25]

Mineral production was reported in 102 of the 105 counties in Kansas in 1956, with 55 counties reporting production valued at $1 million or more. Barton County was foremost with $41.8 million in mineral production during the year. No mineral production was reported in Greeley, Lane, and Mitchell Counties. Highway construction and building strengthened the economy of some counties. Growing production of crude petroleum was responsible for considerable gains in some county mineral values.

County road construction is included in the county review for the first time and is used to aid in measuring the mineral activity of road construction materials.

TABLE 28.—Value of mineral production in Kansas, 1955–56, by counties[1]

County	1955	1956	Minerals produced in 1956 in order of value
Allen	$10,733,745	$11,425,963	Cement, crude petroleum, stone, clays, natural gas.
Anderson	2,224,905	2,043,103	Crude petroleum, stone, sand and gravel.
Atchison	384,927	287,725	Stone.
Barber	7,099,826	11,309,986	Natural gas, crude petroleum, gypsum, natural-gas liquids, sand and gravel.
Barton	40,565,367	41,774,952	Crude petroleum, sand and gravel, clays, natural gas.
Bourbon	1,124,214	1,140,544	Natural cement, stone, crude petroleum, coal.
Brown	25,059	23,083	Sand and gravel, crude petroleum.
Butler	24,056,370	23,356,706	Crude petroleum, stone, natural gas.
Chase	101,118	347,909	Stone, crude petroleum, natural gas, sand and gravel.
Chautauqua	2,700,610	2,983,774	Crude petroleum, stone, natural gas, sand and gravel.
Cherokee	11,035,808	13,148,802	Zinc, lead, coal, stone, clays.
Cheyenne	(2)	12,000	Sand and gravel.
Clark	1,227,626	1,398,307	Crude petroleum, natural gas, sand and gravel.
Clay	70,863	(2)	Stone, sand and gravel.
Cloud	341,250	238,400	Clays, sand and gravel.
Coffey	570,061	531,892	Crude petroleum, stone, coal, natural gas, sand and gravel.
Comanche	28,570	41,255	Natural gas, crude petroleum, sand and gravel.
Cowley	14,392,514	13,923,975	Crude petroleum, stone, natural-gas liquids, sand and gravel, natural gas.
Crawford	1,192,358	1,740,832	Coal, crude petroleum, clays, natural gas.
Decatur	978,386	1,097,517	Crude petroleum, sand and gravel.
Dickinson	894,956	737,343	Crude petroleum, stone, sand and gravel.
Doniphan	420,570	824,229	Stone.
Douglas	194,174	176,367	Sand and gravel, stone, crude petroleum.
Edwards	300,845	325,046	Crude petroleum, natural gas, sand and gravel.
Elk	2,506,361	1,994,613	Stone, crude petroleum, natural gas, sand and gravel.
Ellis	31,239,502	32,270,441	Crude petroleum, sand and gravel.
Ellsworth	9,399,382	9,200,574	Crude petroleum, salt, sand and gravel.
Finney	4,896,237	5,554,236	Natural gas, crude petroleum, natural-gas liquids, sand and gravel.
Ford	140,661	141,611	Sand and gravel, natural gas, crude petroleum.
Franklin	1,346,568	1,108,732	Crude petroleum, stone, clays.
Geary	363,674	345,700	Stone, sand and gravel.
Gove	90,082	76,148	Crude petroleum, sand and gravel.
Graham	13,975,460	16,991,280	Crude petroleum, stone.
Grant	12,583,273	12,889,377	Natural gas, natural-gas liquids, sand and gravel.
Gray	(2)	(2)	Sand and gravel.
Greenwood	18,168,147	18,891,267	Crude petroleum, stone.
Hamilton	633,466	499,827	Natural gas, crude petroleum, sand and gravel.

See footnotes at end of table.

[24] Work cited in footnote 21, pp. 109–110.

[25] Oil and gas data taken from State published reports: Goebel, E. D., Hornbaker, A. L., Hilpman, P. L.; and Beene, D. L., Oil and Gas Developments in Kansas During 1956; State Geol. Survey of Kansas Bull. 128, 1957.

TABLE 28.—Value of mineral production in Kansas, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Harper	$1,682,349	$2,436,329	Crude petroleum, natural gas, sand and gravel.
Harvey	720,009	724,364	Crude petroleum, sand and gravel, natural gas.
Haskell	3,862,738	4,424,706	Natural gas, natural-gas liquids, crude petroleum, sand and gravel.
Hodgeman	292,562	335,646	Crude petroleum.
Jackson	(2)	(2)	Stone.
Jefferson	(2)	362,504	Stone, crude petroleum.
Jewell	(2)	(2)	Stone, sand and gravel.
Johnson	379,095	280,689	Stone, crude petroleum, natural gas.
Kearny	7,279,019	7,558,474	Natural gas, natural-gas liquids, crude petroleum, sand and gravel.
Kingman	4,990,367	6,457,401	Crude petroleum, natural gas, natural-gas liquids, sand and gravel.
Kiowa	185,393	738,803	Crude petroleum, natural gas, sand and gravel.
Labette	582,461	371,448	Crude petroleum, stone, natural gas.
Leavenworth	560,719	931,084	Stone, sand and gravel, clays, crude petroleum, natural gas.
Lincoln	(2)	(2)	Stone, pumicite.
Linn	405,071	403,144	Crude petroleum, stone, sand and gravel, natural gas.
Logan	(2)	45,208	Sand and gravel.
Lyon	1,320,964	1,158,196	Crude petroleum, sand and gravel, stone.
Marion	2,935,554	4,062,554	Crude petroleum, stone, natural gas.
Marshall	619,766	650,740	Gypsum, sand and gravel.
McPherson	12,470,355	11,065,845	Crude petroleum, natural gas, sand and gravel.
Meade	1,660,734	2,170,662	Crude petroleum, natural gas.
Miami	2,048,120	2,049,376	Crude petroleum, stone, natural gas.
Montgomery	9,263,885	8,179,238	Cement, crude petroleum, natural gas, clays, stone.
Morris	220,733	846,601	Crude petroleum, stone, sand and gravel, natural gas.
Morton	7,101,891	9,040,467	Natural gas, crude petroleum.
Nemaha	90,298	116,696	Crude petroleum, stone.
Neosho	6,866,771	6,859,458	Cement, crude petroleum, stone, natural gas.
Ness	998,309	1,348,779	Crude petroleum.
Norton	2,910,576	2,568,484	Crude petroleum, pumicite.
Osage	(2)	356,002	Stone, coal.
Osborne	241,951	246,277	Crude petroleum, sand and gravel.
Ottawa	(2)	14,715	Sand and gravel.
Pawnee	7,261,478	10,063,216	Crude petroleum, natural gas, sand and gravel.
Phillips	5,903,815	5,115,976	Crude petroleum.
Pottawatomie	136,712	169,540	Stone, sand and gravel.
Pratt	8,232,256	7,927,276	Crude petroleum, natural gas, sand and gravel.
Rawlins		2,511	Crude petroleum.
Reno	10,075,846	9,679,369	Salt, crude petroleum, natural-gas liquids, sand and gravel, natural gas.
Republic	(2)	(2)	Sand and gravel.
Rice	20,903,506	17,068,726	Crude petroleum, salt, sand and gravel, stone, natural gas.
Riley	132,900	160,449	Sand and gravel, stone.
Rooks	19,888,555	19,409,806	Crude petroleum.
Rush	2,174,739	2,999,145	Crude petroleum, helium, natural gas, natural-gas liquids.
Russell	30,126,873	27,460,550	Crude petroleum, sand and gravel, natural gas.
Saline	3,591,176	2,565,077	Crude petroleum, sand and gravel.
Scott	282,894	205,519	Do.
Sedgwick	9,043,225	11,012,401	Crude petroleum, sand and gravel, natural-gas liquids, natural gas, salt.
Seward	5,171,118	5,171,677	Natural gas, natural-gas liquids, crude petroleum
Shawnee	1,004,964	1,078,084	Stone, sand and gravel.
Sheridan	1,066,801	1,155,456	Crude petroleum, sand and gravel.
Sherman	30,314	44,972	Sand and gravel.
Smith	(2)	1,701	Do.
Stafford	18,464,346	17,450,385	Crude petroleum, natural gas, sand and gravel..
Stanton	1,738,380	1,872,891	Natural gas, sand and gravel, crude petroleum.
Stevens	12,214,872	11,230,119	Natural gas.
Sumner	8,064,466	8,885,627	Crude petroleum, natural gas, sand and gravel.
Thomas	36,568	69,297	Sand and gravel, crude petroleum.
Trego	3,032,586	4,112,152	Crude petroleum, sand and gravel.
Wabaunsee	441,837	923,399	Do.
Wallace	(2)	40,487	Diatomaceous marl, sand and gravel.
Washington	(2)	63,950	Sand and gravel.
Wichita		30,446	Do.
Wilson	3,754,058	6,127,749	Cement, stone, crude petroleum, clays, natural gas, salt.
Woodson	2,414,934	2,795,988	Crude petroleum, natural gas.
Wyandotte	7,392,610	9,318,822	Cement, stone, sand and gravel, natural gas.
Undistributed	2,551,901	4,436,831	
Total	470,830,000	493,307,000	

[1] The following counties are not listed, because no production was reported: Greeley, Lane, and Mitchell.
[2] Value included with "Undistributed."

Allen.—Production and shipments of both masonry and portland cements, by Lehigh Portland Cement Co., at Iola, and Monarch Cement Co., at Humboldt, were the largest in Kansas during 1956. Monarch Cement Co. began a $6.5 million expansion of its facilities.[26]

Over 800,000 barrels of crude petroleum was recovered from 10 fields and 12 secondary-recovery projects accounted for 66 percent of this total. Of an estimated 333 wells drilled for primary, secondary, and natural-gas recovery, 227 were oil productive. Natural gas was produced from the Humboldt-Chanute field.

Limestone was crushed by Monarch Cement Co., Nelson Bros. Quarries, and by the Allen County Highway Department for concrete, road metal, and screening purposes. A small quantity of agricultural limestone was crushed. The United Brick & Tile Co., at Iola, and Humboldt Brick & Tile Co., near Humboldt, mined clay for the manufacture of brick and tile.

Anderson.—Secondary recovery of oil yielded over 86 percent of the total petroleum for Anderson County and was responsible for most of the drilling activity during 1956. Nearly 700,000 barrels of crude oil was produced from 21 areas in 8 fields. Production declined from previous year. An estimated total of 116 wells was drilled during the year.

At Garnett, crushed limestone was produced for concrete and road metal by the Garnett Rock Co. Paving gravel was quarried by the Anderson County Highway Department for road construction. Nelson Bros. Quarries crushed limestone near Mount Ida for concrete and road metal.

Barber.—Over 1.9 million barrels of crude petroleum was produced from 51 fields in Barber County. Most of the production was by primary methods, as only two secondary recovery projects were reported. Drilling activity increased 7 percent from the previous year with a total of 217 wells drilled in 1956. Exploration and development activities were concentrated mainly in the Rhodes and Hardtner fields. New oil and gas fields numbered 14, of which 10 were new Mississippian gas fields, the more important of which were the Driftwood and Elsea gas fields. Highway and Platt oil fields were important discoveries. Rhodes, the largest oil field in Barber County, produced 900,000 barrels; however, much of the field was shut in during early months of the year because of no market. Output of natural gas from Barber County was over 50 billion cubic feet during 1956. Natural gasoline was recovered by Kansas Power & Light Co. at its plant near Medicine Lodge.

Mined tonnage of crude gypsum was about the same as last year; however, value declined sharply. Paving gravel was quarried by Barber County Highway Department.

Barton.—The 1956 value of mineral production from Barton County, composed mostly of petroleum, was the largest in the State. Nearly 15 million barrels of crude oil was recovered from 153 fields, which was 6 percent more than the previous year. Of 273 wells drilled in 1956, 130 were oil, 3 gas, and 19 dry wildcats. The remainder of the wells drilled were dry development wells or service wells. Workman North, St. Peter East, and Klug West, each pro-

[26] Pit and Quarry, vol. 49, No. 7, January 1957, p. 153.

ducing from the Lansing-Kansas City strata, were important new oilfield discoveries.

Over 600 million cubic feet of natural gas was recovered from the Heizer Southwest, Krier, Pawnee Rock, and Unruh fields. Production of natural gas declined from the previous year.

Arkansas Sand & Gravel Co., Dubois Sand Co., Gruber Sand Plant, Moos Bros. Sand Co., and the Barton County Highway Department quarried sand and gravel for paving and construction purposes. Most all of this tonnage was reported as sand. Barton Brick & Tile Co. produced structural products from its new Hoisington plant. Great Bend Brick & Tile Co. mined fire clay for face brick and other structural clay products.

Bourbon.—Fort Scott Hydraulic Cement Co. produced natural cement, the leading commodity in the county. Shipments increased from 1955. Dimension sandstone was quarried by Bandera Stone Quarry at its plant near Fort Scott. Cullor Limestone Co., Fort Scott Hydraulic Cement Co., and the Bourbon County Highway Department quarried and crushed limestone for road construction, riprap, and agricultural purposes.

Three coal mines were operated in Bourbon County during the year; output declined 35 percent from 1955. A small quantity of crude oil was produced.

Butler.—Butler County ranked fourth in the total value of mineral production and in the value of petroleum in Kansas. The value of the 8 million barrels of crude petroleum produced from 65 fields was $23.3 million, 97 percent of the total county mineral value. Secondary-recovery operations accounted for half of the petroleum produced in the county. Wells drilled in the county during the year totaled 269 and 2 new oil fields were discovered. A small quantity of casinghead gas was recovered.

The following companies were expanding oil-refining facilities in the county:[27]

Company	*Unit*	*Capacity barrels/day*
American Oil Co	Ultraformer	6,120
Do	Hydrodesulfurization	12,000
Skelly Oil Co	H–F Alkylation	3,500
Socony Mobil Oil Co	Catalytic reformer	9,000
Vickers Petroleum Co., Inc	Ultraformer	3,500

Limestone used for road construction, building purposes, and agricultural limestone was crushed by the Amis Construction Co. of Augusta and George M. Myers, Inc., with two plants, Seglem and Duvanel.

Chautauqua.—Petroleum production in Chautauqua County increased 9 percent to over a million barrels. Production by waterflooding dropped from 75 percent of the petroleum recovered in 1955 to 54 percent in 1956. Approximately 268 wells were drilled during the year—181 less than in 1955—and most of this activity was concentrated on secondary-recovery projects. Natural gas was produced from several fields.

Sedan Limestone Co. of Sedan crushed limestone for building and paving purposes. Gravel used for paving was quarried by the Chautauqua County Highway Department.

[27] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, pp. 198-202

Cherokee.—The State's entire production of lead and zinc originated in Cherokee County. Twenty-nine mining companies operated 45 mines in the county. The 2 largest producers were The National Lead Co., St. Louis Smelting & Refining Division (7 mines), and Eagle-Picher Co. (7 mines). The Eagle-Picher Co. operated its lead smelter and pigment plant and produced sulfuric acid by the contact process at Galena.

The county remained first in coal mined in Kansas, and output increased 4 percent from 1955. Only 6 strip mines—2 less than last year—operated during the year and provided employment for 171 men. Important coal producers in the county were: Pittsburgh-Midway Coal Co. at Hallowell, and Wilkinson Coal Co. at Weir.

Three new companies joined Baxter Chat Co. and Eagle-Picher Co. in the utilization of lead-zinc tailings for stone use; C. Y. Semple, Southwest Chat Co., and Southwest Rock & Chat Co. Chats were produced by the Baxter Chat Co. and Eagle-Picher Co. for railroad ballast, concrete, and road metal. Miscellaneous clay was stripped for the manufacture of structural clay products by the United Brick & Tile Co. at Weir.

Clark.—The Harper Ranch field in Clark County was mainly responsible for over a 14-percent gain in the county's production of petroleum in 1956. Crude petroleum and natural gas were produced from eight fields in the county. Clark County Highway Department mined gravel for paving purposes.

Cloud.—Earl Beaver Sand Co. at Glasco, Ross Sand Co., Inc., and Walker Sand Co. near Concordia quarried sand and gravel for building and paving purposes. Plastic fire clays were mined at Concordia for use in face brick and other structural products by Cloud Ceramics.

Coffey.—Crude-petroleum recovery declined to 161,000 barrels from 190,000 barrels, but it remained the leading mineral produced in the county. One new field—Crandall—was discovered from 28 wells drilled during the year. Coal production declined for the second straight year and was 30 percent less than in 1955. Coal was produced by S. L. Rogers Coal Co. at Arvonia, and the Thorne Coal Co. at Lebo.

Neosho Valley Rock Co., near Burlington, and Jones Rock Co., near Emporia, crushed limestone for concrete, road metal, and agricultural uses. Paving gravel was produced by Coffey County Highway Department. Natural gas was recovered.

Cowley.—Cowley County ranked 10th in the State for value of mineral production in 1956. Crude petroleum—the leading mineral commodity—declined 100,000 barrels to 4.6 million barrels reported from 98 fields. Eleven new fields were discovered in 1956, and 202 development oil wells and 5 gas wells were found from 367 wells drilled. Secondary recovery of oil is growing in importance as an additional 260,000 barrels brought the total to 900,000 barrels. Anderson-Prichard Oil Corp. was increasing its crude capacity by 6,500 barrels per day and its straight-run asphalt capacity 250 barrels per day at the Arkansas City refinery.[28] The Texas Co. recovered natural gasoline and LP-gases at its plant near Burden. The half billion cubic feet of natural gas recovered approximated the output of the year.

[28] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 198.

Crushed limestone was produced by Anderson-Oxandale at Udall, and John V. Elam at Winfield, for riprap, concrete, and road metal. Dimension limestone was produced at Silverdale by Silverdale Cut Stone and Silverdale Limestone.

Sand and gravel was quarried for structural and paving uses by Cowley County Highway Department at Winfield; Arkansas City Sand & Gravel Co., McFarland Gravel Co., George M. Myers, Inc., and Wilson Bros., all of Arkansas City; Phillips & Son Construction, Winfield Sand & Gravel Co., both of Winfield; and Oxford Sand & Gravel Co. at Oxford. Blast, filter, railroad-ballast, and engine sands also were produced.

Crawford.—The mined tonnage of coal from Crawford County was second only to that produced in Cherokee County. Coal was mined by two methods: Shaft and open pit. Lucky Star Coal Co. (Pittsburg) and Blue Ribbon Coal Co. (Girard) operated shaft mines. Important producers among 12 strip mines in the county were the Apex-Compton Coal Co. at McCune and Clemens Coal Co. near Pittsburg. Sixty-four persons were employed by the underground coal operators and 162 men by open-pit operators.

A small quantity of crude petroleum was produced from 6 fields in Crawford County and secondary recovery represented 82 percent of the total 49,000 barrel production. Natural gas also was recovered in the county.

W. S. Dickey Clay Manufacturing Co. mined miscellaneous clay and fire clay for the manufacture of face brick, building brick, building tile, and other structural products.

Decatur.—Production of crude petroleum from 10 fields was nearly 400,000 barrels—an increase of 13 percent from 1955. Three new fields, Van Fleet, Warner, and Warner North were discovered and the Warner field recorded an initial potential of 330 barrels per day.

Sand for paving purposes was produced by the Decatur County Highway Department at Oberlin.

Dickinson.—Limestone was quarried from 3 pits by Anderson-Oxandale and from 1 pit by Riddle Quarries, Inc., for building, paving, and agricultural limestone. Sand and gravel was produced for paving and building by Shoffner Sand & Gravel Co. near Solomon, and by C. Smith Sand & Gravel Co. near Abilene.

Recovery of crude petroleum from 7 fields in Dickinson County was approximately 127,000 barrels. One new field—Bonaccord Northeast—was discovered from 23 wells drilled.

Doniphan.—Limestone was crushed by Everett Quarries, Inc., at Wathena; George W. Kerford Quarry, Inc., at Sparks, Wolf River, and Iowa Point; Wolf River Limestone, Inc., at Troy; and by the United States Corps of Engineers. The material was used mainly for riprap, concrete, roadstone, and agricultural limestone.

Edwards.—Petroleum and natural gas were recovered from 14 fields in Edwards County. Production of natural gas increased 89 percent over that of 1955 to 727 million cubic feet.

Sand and gravel was produced by Dave Showalter at Kinsley for paving and road maintenance.

Elk.—Production of stone in Elk County ranked second in the State for 1956. Limestone was quarried and crushed by Concrete Materials Construction Co. near Moline and by Elk County Highway

Department near Howard, for concrete, road metal, railroad ballast, agricultural limestone, and riprap. Gravel for paving and road maintenance was mined by the Elk County Highway Department.

Production of crude oil declined slightly from the previous year. Only 1 new oil field was discovered, and drilling activity declined to a total of 91 wells. Crude-petroleum production was recorded in Elk County as early as 1920. Natural gas was produced from some of the 30 fields in the county.

Ellis.—Ellis County ranked second in the State in value of mineral production and second among the oil-producing counties, with over $32 million for petroleum in 1956. Over 11.6 million barrels of petroleum was produced from 112 fields. Sixteen new oil fields were discovered, of which the Engel (with an initial potential of 596 barrels per day) and the North (with an initial potential of 202 barrels per day) were important. Three oil fields—Dechant, Pleasant North, and Richards—were revived. One hundred sixty-seven oil wells were productive among 332 wells drilled in 1956.

A small quantity of building sand was produced near Victoria by Lewis C. Schmidtberger.

Ellsworth.—The 1956 production of oil (3 million barrels from 18 fields) declined for the third straight year. Drilling activity, resulting in 1 oilfield discovery, also declined, as only 60 wells—9 less than in 1955—were drilled.

Rock salt was produced near Kanopolis by the Independent Salt Co. Much of the salt was consumed by the agricultural and chemical industries. Paving sand was quarried by the Ellsworth County Highway Department and Henry Millberger near Wilson.

Finney.—The Finney County portion of the Hugoton gas area produced 38 billion cubic feet of natural gas, 12 percent more than the record year of 1955. Drilling in the county resulted in 49 new gas wells and 11 new oil wells from 69 drilled wells. Discovery wells of the 2 new fields, Pleasant Prairie NW. and Sequoyah, each had an initial potential, 200 and 177 barrels of oil per day, respectively. Eight wildcat tests were attempted during 1956, and all proved dry. Oil and gas production originated from 10 fields. Northern Natural Gas Co. recovered natural gasoline at its plant near Holcomb.

Sam Alsop Construction Co., Smith Sand Co., and Finney County Highway Department, all of Garden City, produced sand and gravel for building and paving.

Franklin.—Secondary-recovery projects yielded 84 percent of the 348,000 barrels of petroleum produced in 1956. The quantity of oil recovered from the 5 fields in the county was considerably less than the 377,000 barrels of petroleum recovered in 1955.

Crushed limestone was produced by Anderson-Oxandale, Dan Fogle, and Solomon Construction Co. Lightweight aggregate was expanded by the Haydite process by Buildex, Inc. Miscellaneous clay, mined near Ottawa, was the raw material used for making lightweight aggregate.

Geary.—Crushed and dimension limestone was quarried by the Walker Cut Stone Co. near Junction City. Grosshans and Petersen quarried and crushed limestone for concrete and road aggregate. Building and paving sand was produced by Junction City Sand & Gravel Co. and by More Sand Co. near Junction City.

Graham.—Graham County ranked ninth in the State in value of mineral production; most of this value resulted from the production of crude petroleum. Forty-eight fields produced over 6 million barrels of oil. Exploration and drilling activity declined from 1955 with most of the activity concentrated in the Holley and Cooper fields. Four new oilfields were discovered and 1 (Brassfield) reported over 300 barrels per day initial production.

Government-and-contractor operators crushed sandstone for riprap.

Grant.—Grant County ranked second in the State in production of natural gas with a total of 77 billion cubic feet produced from 572 Hugoton-gas-area wells, a decline of 8 percent in production from 1955. Only two new gas wells were drilled during the year. The county was first among natural-gasoline and liquefied-petroleum producing counties, with a value of $4.4 million.

Greenwood.—Secondary-recovery projects yielded 79 percent of the 6.8 million barrels of oil produced from 50 fields in the county. Two hundred forty-six wells, including oil wells, dry holes, input wells, and salt-water-disposal wells, were drilled during the year. Nearly all drilling was for development of secondary-recovery projects. Mignot field was discovered, and four dry wildcats were drilled. Forty-nine waterflooding and other secondary-recovery operations were reported.

Greenwood County Highway Department crews crushed limestone for paving purposes.

Hamilton.—Natural gas was the leading commodity produced in Hamilton County. Production in 2 fields yielded over 4.3 billion cubic feet of natural gas and a small quantity of petroleum. Gas output decreased 17 percent to 4.3 million cubic feet, and oil recovery declined 37 percent (6,000 barrels) from 1955.

Building sand, paving sand, and paving gravel were produced near Syracuse by Smith Sand & Gravel Co., Syracuse Sand & Gravel Co., and the Hamilton County Highway Department.

Harper.—The impact of oil can easily be measured in Harper County, as the total mineral value ($1.7 million) experienced a sharp rise of 45 percent over the record year of 1955. Virtually all of this increase was attributable to the mounting crude-petroleum production in the county. Recovery of oil grew 39 percent and originated from 7 fields. Three new fields were discovered from 59 wells drilled, which were less than half of the number of wells drilled in the previous year. The discovery well of the Banner South field reported an initial potential of 1,408 barrels per day and Sunny View South recorded 35 barrels per day. Unfortunately, the Wildcat Creek field discovery yielded no oil and was abandoned. Developmental drilling resulted in 24 oil wells, 2 gas wells, and 7 oil and gas wells. Natural-gas recovery supplied the remainder of the increased mineral value. Production of natural gas (2.6 billion cubic feet valued at $285,000) more than doubled the 1955 output.

Paving sand was produced by the Harper County Highway Department.

Harvey.—Petroleum production in Harvey County increased slightly from the previous year. Natural gas output gained 19 percent over last year. Oil and natural gas were recovered from 10 fields in the county. Two new fields, Burrton East (oil) and Burrton North (gas), were discovered.

Building and paving sands were quarried near Burrton by Howard R. Thach.

Haskell.—The Haskell County section of the Hugoton gas area reported over 31.4 billion cubic feet of natural gas. Nineteen new gas wells were drilled in the development of the Hugoton area. Pleasant Prairie field—the only oilfield in Haskell County—increased its output to 121,000 barrels, a rise in production of 87 percent from 1955.

Howard Mitchell produced building sand near Hugoton.

Kearny.—Approximately 63.5 billion cubic feet of natural gas valued at approximately $7 million was reported in 1956. Twenty-six development wells were drilled, principally for natural gas, in the west-central part of the county. One new oilfield (South Side) was discovered from 33 wells drilled; this was the second oilfield in the county. Kansas-Nebraska Natural Gas Co., with its plant near Deerfield, and Colorado Interstate Gas Co., Inc., with its plant near Lakin, recovered natural gasoline and liquefied petroleum gases.

Paving sand was produced for the Kearny County Highway Department. Building and paving sand was quarried near Ulysses by Glen Popejoy.

Kingman.—Crude petroleum produced from 25 fields in Kingman County was nearly 2 million barrels and represented a 33-percent increase from the record output of 1955. Drilling activity accounted for 142 wells and 3 new field discoveries; however, the Georgia Spur field was abandoned. Natural-gas liquids were produced by the Skelly Oil Co. at its plant near Cunningham.

Recovery of natural gas more than tripled that in 1955. Two gas-field discoveries were Goetz and Settle, which logged an initial potential of 24 and 2.4 million cubic feet of natural gas per day, respectively. Natural-gas production in Kingman County was 6.9 billion cubic feet.

Building gravel was produced by Ray Wells from his quarry near Kingman.

Labette.—Limestone was produced by the Labette County Highway Department at Oswego, for concrete, road metal, and building rubble. Over 100,000 barrels of petroleum was produced from 10 fields. Waterflooding and gas repressuring represented a third of the total production. Fifty-seven wells were drilled, of which 22 were oil productive, 19 dry, and 16 were for repressuring old fields. Gas recovery of 91 million cubic feet declined approximately 10 million cubic feet from that of the previous year.

Leavenworth.—Limestone was crushed for riprap, concrete, road-metal aggregate, railroad ballast, and agricultural limestone by Wyandotte County Engineers, Loring Quarries, Inc. (near Coldspur), George W. Kerford (near Lowemont), Kansas State Penitentiary at Leavenworth, and the City of Leavenworth. Building and paving sands were produced by the Missouri Valley Sand, Inc., and Inland Construction Co. Natural gas and crude petroleum were produced during the year.

Linn.—The value of minerals produced dropped for the second straight year but was only slightly lower than in 1955. Waterflood projects in Linn County accounted for nearly all of the crude petroleum produced from the county's six fields, and the recovery was

slightly more than in the previous year. Drilling of 54 wells in 1956 was less than the estimated 43 drilled in 1955.

Concrete and road aggregate and agricultural limestone were crushed by Lee Giles near Greeley and by Murray Limestone Products Co. near Centerville. Paving gravel was stripped by the Linn County Highway Department.

Lyon.—Production of petroleum in Lyon County originated from 8 fields and amounted to 350,000 barrels. Waterflooding accounted for over 130,000 barrels of this production. Drilling activity in the county declined to 24 wells drilled, with most of the activity concencentrated in Fankhouser field, where 14 wells were drilled.

Sand and gravel was produced from quarries near Hartford by Wesley Parks and near Emporia by Harry Waterman, for building and paving purposes. A small quantity of limestone for concrete aggregate and roadstone was produced by Anderson-Oxandale near Bushong.

Marion.—Approximately 1.4 million barrels of crude petroleum was recovered from 32 fields in the county. Drilling activity was high in Marion County, as 270 wells were drilled and 7 new fields discovered. Unger Southwest was an important discovery and also accounted for the drilling of 84 wells. Natural-gas recovery increased slightly from 1955.

Riddle Quarries, Inc., operated 2 crushing plants—1 at Lost Springs and 1 at Marion—for the production of crushed limestone used for riprap, railroad ballast, concrete, roadstone, and screenings.

Marshall.—Bestwall Gypsum Co. purchased the Blue Rapids plant from Certain-Teed Products Corp. Mined output of gypsum increased slightly from 1955. Building and paving sand and gravel were produced by the Blue River Sand & Gravel Co. at Blue Rapids, by C. V. Garrett at Blue Rapids, by Hall Bros. at Marysville, by the Heinzelman Construction Co. at Marysville, and by Hugo P. Vogler at Waterville. A small quantity of filter gravel was produced.

McPherson.—Crude petroleum (valued at $11 million) was the leading mineral produced in McPherson County. Almost 4 million barrels of crude petroleum was recovered from 38 fields. The number of wells drilled in McPherson County declined from 149 in the previous year to 147. This drilling activity resulted in the discovery of two new fields—the Round Hill and the Harmac East. Cooperative Refinery Association operated its petroleum refinery near McPherson.

Paving gravel was produced by McPherson County Highway Department.

Meade.—The recovery of petroleum (490,000 barrels) exceeded that in 1955. Drilling activity rose sharply from 1955 as 62 wells were completed. Six new fields (1 oil and 5 gas) were found as a result of increased exploration. Most important of the 6 fields discovered in 1956 was the Fincham gasfield, with an initial potential of 30 million cubic feet of gas. Natural-gas recovery (over 7 billion cubic feet) rose 155 percent from the previous year and discovery of the Fincham, Sanders, Plains, Horace, and Angell fields will make Meade an important gas-producing county.

Purex Corp., Ltd., closed its pumicite mines indefinitely.

Miami.—Crude petroleum was the leading mineral commodity reported in Miami County for 1956, and all production was from

35 areas in 5 fields. Ten waterflood projects accounted for 67 percent of the 675,000 barrels recovered. Drilling of 285 wells resulted in 148 oil producers, 2 gas producers, 60 dry holes, and 75 were for repressuring. A small quantity of natural gas was reported.

Limestone for concrete, road metal, and agricultural purposes was produced by L. W. Hayes, Inc., and the Miami County Highway Department near Paola.

Montgomery.—Montgomery County was second in the State in the output of cement. The entire output of portland and masonry cements was produced at the Independence plant of Universal Atlas Cement Co. The crushing, storage, and drying equipment of the Independence plant was modernized and improved with no increase in capacity.

Production of crude petroleum declined 85,000 to 748,000 barrels and was produced from 10 fields. Half of this production originated from 16 waterflood projects. Most of the 320 wells drilled were for development of waterflood projects; however, 3 dry wildcats were drilled. Natural gas was produced in the county.

Structural clay products were manufactured from miscellaneous clay at Coffeyville by the United Brick & Tile Co.; Ludowici-Celadon Co. manufactured floor and wall tile at its Coffeyville plant. Concrete aggregate and road metal were produced by Anderson-Oxandale at the James Quarry and Severs Quarry near Sycamore.

Ozark Smelting & Mining Co. processed zinc ores into zinc pigment at its Coffeyville plant.

Morton.—Only two mineral commodities were reported in Morton County—natural gas and petroleum. The recovery of natural gas increased approximately 22 percent to over 73 billion cubic feet in 1956. Of the 114 wells drilled during the year, 65 were gas, 29 were development oil wells, and 1 was a dry wildcat. The remainder of wells drilled were dry development wells or service wells. The recovery of natural gas originated from two areas—Greenwood gas-field and Hugoton gas area. The 346,000 barrels of petroleum recovered more than doubled the 1955 output.

Neosho.—Cement was the county's leading mineral commodity in 1956. Ash Grove Portland Cement Co. completed revamping its plant. Shipments declined from the previous year.

The quantity of crude petroleum—638,000 barrels—produced from 8 fields in Neosho County was slightly less than the previous year. Secondary-recovery operations supplied nearly 77 percent of total oil recovered. An estimated 335 wells were drilled in 1956. Chanute Refining Co. and N. F. A. Oil Co. operated petroleum refineries near Chanute. Natural gas was recovered in the county.

Harry Byers and Joe O'Brien crushed limestone for concrete, road metal, and agricultural limestone. The Neosho County engineer quarried limestone for concrete and road metal near Urbana. Harry Byers quarried a small quantity of limestone rubble.

Ness.—The 486,000 barrels of crude petroleum produced from 12 fields in Ness County increased 37 percent for the second straight year. Five new fields were discovered, of which the Ryersee was an important discovery. Petroleum was the only mineral commodity reported in 1956.

Norton.—The 1956 production of crude petroleum from Norton County decreased 11 percent from over 1 million to 900,000 barrels. Exploration and development involved 21 wells and included 15 dry wildcats. This was approximately half the number of wells drilled in 1955.

Pumicite was prepared by the Wyandotte Chemical Corp. at Calvert.

Pawnee.—Approximately 3.4 million barrels of crude petroleum was produced from 39 fields in Pawnee County, representing a gain of about 43 percent over 1955. Drilling of 175 wells resulted in 5 new field discoveries. The Larned Southwest oilfield and Evers South gasfield were important discoveries. Natural-gas recovery (4.6 billion cubic feet) declined from the preceding year.

Paving gravel was produced by the Pawnee County Highway Department. Sand and gravel for building, paving, and other purposes was produced by Johnson Sand-Gravel Co. and Larned Sand & Gravel Co.

Phillips.—The value of petroleum produced in Phillips County—$5.1 million—declined approximately 13 percent from the preceding year. This was the second year in which production declined. Fourteen wells were drilled, of which 7 were oil-productive and 7 were dry. The petroleum refinery of the Cooperative Refinery Association was operated at Phillipsburg. Crude petroleum was the only mineral reported in the county.

Pratt.—Yield of crude petroleum, produced from 40 fields including 1 secondary-recovery project, was 2.8 million barrels. Two new oil fields and 1 new oil and gas field were discovered in the county by the drilling of 39 wells in 1956. Two new oil fields were Carver-Robbins and Haskins; the oil and gas field was the Cullison. Natural-gas production was over 1.3 billion cubic feet.

Near Pratt, C. D. Hogard and the Pratt County Highway Department produced paving sand; Miller Sand & Gravel Co. mined building sand.

Reno.—The value of salt—$6 million—from Reno County was the largest of the 3 counties reporting salt, and this value increased 3 percent from 1955. Salt was evaporated by Barton Salt Co., Morton Salt Co., and Carey Salt Co.; rock salt was mined by the Carey Salt Co. All salt was produced near Hutchinson.

The production of crude petroleum from 21 fields in the county was over 1 million barrels. This output declined slightly from the previous year. Drilling of 42 wells resulted in 3 oil and 39 dry holes. Natural-gas liquids were recovered near Burrton by the Cities Service Oil Co. Natural-gas yield continued to rise, and the 1956 production of 476 million cubic feet was 5 percent greater than in 1955.

J. N. Shears' Sons, Inc., produced building and paving sand from its pit near Hutchinson. Building sand was stripped by the J. E. Steele Sand & Gravel Co. near Hutchinson. Sand and gravel was produced by Fountain Sand Pit near Arlington, Haven Sand Co. near Haven, and J. A. Mummy near Nickerson for building and paving purposes and glass sand.

Rice.—Rice County yield of crude petroleum was 5.4 million barrels from 60 fields. The recovery of oil diminished 21 percent from 1955.

Drilling of 144 wells resulted in the discovery of 3 new fields—Bredfelt, Orth North, and Humphreys. Approximately 804 million cubic feet of natural gas were produced in the county.

Both evaporated and rock salt was produced near Lyons by the American Salt Corp.

Sand and gravel for structural and paving purposes was mined by Arensman Sand & Gravel Co. near Raymond; A. L. Stapleton near Alden; Rock Hill Stone & Gravel Co. and Sterling Sand & Gravel Co., both near Sterling; and A. Wright & D. Birchenough near Lyons. Riddle Quarries, Inc., crushed limestone near Little River for riprap, concrete, roadstone, and agricultural purposes.

Rooks.—Crude-petroleum production (the only mineral commodity reported in Rooks County) ranked fifth in the State. Recovery of 7 million barrels was from 79 fields. Exploratory drilling resulted in the discovery of 5 new fields, which were: Annon South, Cresson, Gra-Rook North, Trarback, and Williams North. The discovery well of the Gra-Rook North field had an initial potential of 281 barrels of oil per day. Drilling accounted for 73 new oil wells from 159 wells drilled. Important producing fields included Marcotte, Barry Southeast, Jelinek, Northampton, and Palco Southeast.

Rush.—Petroleum recovery jumped 75 percent to 703,000 barrels and was from 16 fields. Four new fields were discovered from 61 wells drilled during the year. These were Pechanec, Ryan West, and Web Southwest oilfields and Lohrey gasfield. The yield of helium, recovered from natural gas by the Federal Bureau of Mines plant at Otis, increased from the previous year. Production of natural gas, over 2.5 billion cubic feet, was slightly less than in 1955. The discovery well of the Lohrey field reported an initial potential of 6.7 million cubic feet per day. Natural-gas liquids were recovered at Otis by Flynn Oil Co.

Russell.—Mineral value in Russell County ($27.5 million) declined for the second year and was $2.7 million less than 1955; however, the county maintained its position as the third largest mineral producer in the State. Over 9.9 million barrels of crude oil was recovered from 36 fields. Two new oilfields, Kune and Worley, were discovered from 158 wells drilled; of this total, 99 were for development oil wells. A small quantity of natural gas was produced in conjunction with petroleum production.

Paving gravel was produced near Russell by the Russell County Highway Department.

Saline.—Only two mineral commodities were reported for Saline County in 1956—crude petroleum and sand and gravel. Recovery of crude oil declined 28 percent to 812,000 barrels produced from 11 active fields in the county. Only 8 wells were drilled during the year; 2 found oil, and 6 were dry.

Putnam Sand & Building Co. and Salina Sand Co., Inc., produced sand and gravel near Salina for building and paving.

Sedgwick.—The value of mineral production in Sedgwick County ($11 million) continued to rise and was 22 percent over 1955. Crude petroleum, salt, and sand and gravel were responsible for this growth.

Petroleum yield—over 2.7 million barrels—was from 43 fields in Sedgwick County. Fifty-three wells found oil from 111 wells drilled

during the year. Five new fields (Chambers Northeast, Gladys Southwest, Brumley Northwest, Latta North, and Greenwich Northeast), all producing from the Mississippian stratum, were discovered. Petroleum was refined by the Derby Oil Co. at Wichita. Cities Service Oil Co. operated its natural-gasoline plant at Wichita. Natural gas was also produced in Sedgwick County.

Seventeen sand and gravel operations were reported in 1956. Important producers were Inland Construction Co., Miles Sand Service, Dolese Bros., Walt Keeler Co., Inc., and Superior Sand Co., Inc. Much of the production was for construction in Wichita. Frontier Chemical Co. pumped brine for the manufacture of salt chemicals in Wichita.

Seward.—Production of 30 billion cubic feet of natural gas in Seward County originated from 5 fields. The Plains West gasfield was discovered and recorded an initial potential of 21 million cubic feet of natural gas per day. Gas-development projects represented nearly all of the drilling activity. Most of these wells were drilled in the Hugoton gas area. Much of the natural gas was processed by natural-gasoline plants of Panhandle-Eastern Pipeline Co. and Northern Natural Gas Co. A small quantity of crude petroleum was produced.

Shawnee.—Crushed limestone was produced by Henry C. Luttjohann, Netherland Stone Co., and Shawnee County Engineer from quarries near Topeka. Pattons Crushed Stone Co. also produced crushed limestone near Pauline. Most of the limestone was used for concrete, road metal, and screening purposes. A small quantity was produced for agricultural purposes.

Sand and gravel (principally used for building and paving) was mined near Topeka by the Kansas Sand Co., Inc., River Sand Co., Inc., Shoffner Sand, Inc., Inland Construction Co., and Victory Sand & Stone, Inc. Small quantities of blast, engine, and other sands also were produced. Road building, industrial construction, and residential construction in the City of Topeka was responsible, in part, for the increased construction materials output.

Sheridan.—The total output of crude petroleum (402,000 barrels) increased approximately 14 percent from 1955. Wells drilled numbered 31 and resulted in the discoveries of 2 new fields: Advance and Hoxie. Both fields reported over 500 barrels per day initial potentials. The Chicago field, discovered in 1955, was abandoned because no production was reported.

Paving gravel was stripped by Harry Henery, Inc., and Sheridan County Highway Department near Hoxie. Paving sand was produced by Carl Kaiser, near Grainfield.

Stafford.—Stafford County was seventh in total mineral value in Kansas for 1956. The recovery of petroleum from 158 fields was 6.2 million barrels. Of 249 wells drilled, 13 new fields were discovered. Important new fields were: Rattlesnake East (1,393 barrels per day), Dillwin (265), Liess (235), and Seevers Northwest (205). The Knoche South field was abandoned. Over 1 billion cubic feet of natural gas was produced during the year.

Structural and paving sands were produced by the Partin Sand & Gravel Co. near Stafford. Paving sand was stripped by the Stafford County engineer near Saint John.

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Stanton.—Seventeen billion cubic feet of natural gas in Stanton County was recovered from the Hugoton gas area. This quantity of natural gas represents an increase of 9 percent from the previous year. Only seven development and exploration wells were drilled.

Harry Henery, Inc., operated a quarry near Manter to produce paving sand and gravel.

Stevens.—Stevens County was the leading producer of natural gas in Kansas with over 102 billion cubic feet, all from the Hugoton gas area. Two new gasfields—Hanke and Panoma—were discovered and reported initial potentials of 7.5 million and 16 million cubic feet per day respectively. No other minerals were produced.

Sumner.—The 1956 mineral value, $8.9 million, was 10 percent greater than 1955. Over 3 million barrels of petroleum were reported from 44 fields. The number of wells drilled was 175, of which 87 were oil productive. Four new fields were discovered: Beatie, Latta Northwest, Meek, and Portland South. The yield of natural gas increased to over 2.7 billion cubic feet.

Paving gravel was produced by the Sumner County Highway Department near Wellington. Mulvane Sand Co., Inc., produced structural and paving sand near Mulvane.

Trego.—Approximately 1.5 million barrels of crude petroleum was produced from 29 fields, and output was 37 percent more than in the previous year. Six new oilfields (Adair Southwest, Kroeger, Newcomer, Newcomer Northwest, Page Creek, and Rhoden) were discovered. The Newcomer and Newcomer Northwest reported initial potential of 3,000 and 1,642 barrels per day, respectively.

Sand and gravel for paving purposes was produced by the Siebert Sand Co. at its pits near Ransom. Trego County Highway Department obtained paving gravel near Wakeeney.

Wilson.—Expanded facilities of the Consolidated Cement Co. plant at Fredonia resulted in increased production and shipments of cement. Wilson County replaced Neosho County as the third-ranking county for cement.

The recovery of crude petroleum from 12 fields decreased slightly from 1955. Drilling activity increased considerably as 126 wells were drilled, compared with 86 wells drilled in 1955. Standard Oil Co. (Indiana) was adding a 6,000-barrel-per-day ultraformer and a 6,000-barrel-per-day hydrofining unit at its Neodesha refinery.[29] Natural gas was reported in Wilson County.

Limestone was crushed by Carr Rock Products Co. at Neodesha, Benedict Rock Lime Co. at Benedict, and Anderson-Oxandale for concrete, road metal, screening, and agricultural purposes. Acme Brick Co. at Buffalo and Excelsior Brick Co. at Fredonia manufactured heavy clay products from miscellaneous clay.

Woodson.—The quantity of crude petroleum recovered from 23 fields in Woodson County was nearly 1 million barrels and included production by secondary recovery methods. Two oilfields, Annabelle and Rose East, and one gas field—Gordon—were discovered. A small quantity of natural gas was produced in the county.

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[29] Oil and Gas Journal, vol. 55, No. 12, Mar. 25, 1957, p. 211.

Wyandotte.—Continued activity in construction and road building in the Kansas City area was shown in 1956. Lone Star Cement Corp. increased production and shipments of cement from 1955. Limestone was quarried and crushed near Turner and Kansas City by American Rock Crusher Co., Peerless Quarries, Inc., and Thompson Strauss Quarries, Inc., for riprap, concrete, road metal, and asphalt filler.

Nine operators produced sand in Wyandotte County, which was used as structural, paving, filter, engine, railroad ballast, molding, and other sand uses. A small quantity of building gravel was also produced. Important producers included Stewart Sand Material Co., Peck-Woolf Sand & Material Co., Holliday Sand & Gravel Co., Builders Sand Co., and American Sand Co.

The county was one of the great centers of activity for the production of crushed limestone in Kansas, and three producers were responsible for the large output. Crushed stone was used principally in Kansas City for construction and road building.

Natural gas was produced from Roberts-Maywood field in Wyandotte and Leavenworth Counties.

The Mineral Industry of Kentucky

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Kentucky Geological Survey.

By Avery H. Reed, Jr.,[1] and A. C. McFarland [2]

EXPANSION of the coal-mining industry and record production of LP-gases, crude petroleum, cement, ball clay, miscellaneous clay, and sand and gravel highlighted Kentucky's mineral industry in 1956. Among the States, Kentucky ranked second in ball-clay production, third in bituminous-coal output, and fifth in fluorspar shipments.

The total value of mineral production in 1956 increased 13 percent over 1955 and 35 percent over 1954 but was 12 percent below 1948—the record year.

Coal mining dominated the mineral industry of the State, supplying 75 percent of the total value of the output. Other fuels, including oil and gas, furnished 18 percent. Leading producers were Nashville Coal Co., West Kentucky Coal Co., Blue Diamond Coal Co., and United States Steel Corp.

Defense Minerals Exploration Administration (DMEA) activity consisted of a project for fluorspar in Crittenden County amounting to $21,984.

TABLE 1.—Mineral production in Kentucky, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	875,699	$4,416,131	904,827	$4,079,185
Coal	69,019,910	288,665,344	74,555,028	331,357,660
Fluorspar	8,899	308,140	14,865	607,704
Lead (recoverable content of ores, etc.)			228	71,592
Natural gas—million cubic feet	73,214	17,352,000	73,687	17,022,000
Natural-gas liquids:				
Natural gasoline—thousand gallons	34,991	2,492,000	35,275	2,414,000
LP-gases—do	189,247	6,451,000	248,992	8,709,000
Petroleum (crude)—thousand 42-gallon barrels	15,518	44,850,000	17,628	51,297,000
Sand and gravel	4,898,705	5,298,102	5,684,124	5,974,292
Silver (recoverable content of ores, etc.)—troy ounces			31	28
Stone	11,933,899	15,579,312	11,552,973	15,324,278
Zinc (recoverable content of ores, etc.)			417	114,258
Value of items that cannot be disclosed: Native asphalt, cement, and iron ore (1956)		6,445,725		7,078,812
Total Kentucky [2]		391,068,000		443,168,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Total has been adjusted to eliminate duplicating the value of clays and stone.

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[2] Director, Kentucky Geological Survey, Lexington, Ky.

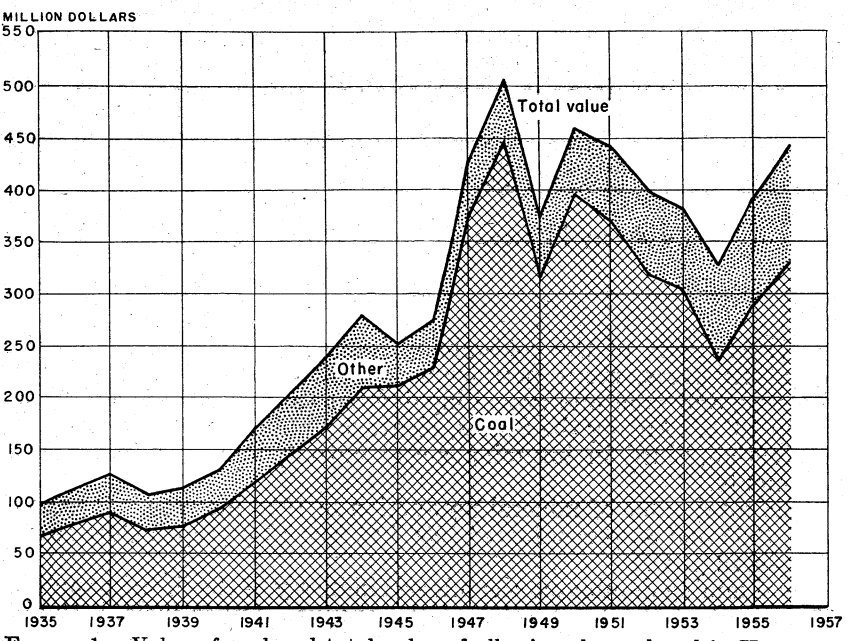

FIGURE 1.—Value of coal and total value of all minerals produced in Kentucky, 1935–56.

TABLE 2.—Average unit value of mineral commodities produced in Kentucky, 1947–51 (average), and 1952–56

Commodity	1947–51 (average)	1952	1953	1954	1955	1956
Clays:						
Ball short ton	$11.84	$12.80	$9.70	$13.10	$13.43	$13.03
Fire do	4.86	6.56	5.20	6.67	6.77	6.30
Miscellaneous do	.88	1.13	1.40	1.50	1.42	1.37
Coal do	4.95	4.80	4.66	4.16	4.18	4.44
Fluorspar do	31.83	38.57	44.46	42.15	34.63	40.88
Lead do	315.60	322.00	262.00	274.00		314.00
Natural gas thousand cubic feet	.19	.22	.22	.23	.23	.23
Natural-gas liquids:						
Natural gasoline gallon	.07	.07	.07	.06	.06	.07
LP-gases do	.03	.03	.03	.03	.03	.03
Petroleum 42-gallon barrel	2.63	2.76	2.91	2.92	2.89	2.91
Sand and gravel:						
Sand short ton	(1)	.90	.94	.91	1.08	1.06
Gravel do	(1)	.72	.95	.95	1.08	1.04
Stone:						
Limestone, crushed do	1.21	1.22	1.25	1.31	1.30	1.32
Sandstone, crushed do	(1)	1.50		2.78	2.21	2.23
Ssandstone, dimension do	(1)	(1)	7.98	16.45	13.29	12.89
Zinc do	280.80	332.00	230.00	216.00		274.00

[1] Figure withheld to avoid disclosing individual company confidential data.

EMPLOYMENT AND INJURIES

Reports submitted to the Bureau of Mines by producers indicate that employment in the mineral industries of Kentucky decreased 14 percent below 1955. Employment decreased 16 percent at coal mines, increased 9 percent at quarries and mills, decreased 9 percent at nonmetal mines, was about the same at sand and gravel mines, and decreased 2 percent at coke ovens and smelters.

The frequency rate of injuries increased 1 percent over 1955. The frequency rate declined 62 percent at coke ovens and smelters, decreased 71 percent at nonmetal mines, fell 30 percent at quarries and mills, and increased 5 percent at coal mines. There were 78 fatal injuries, compared with 65 in 1955.

TABLE 3.—Employment in the mineral industries, 1955–56 [1]

Industry	1955			1956 [2]		
	Men working daily	Average active days	Man-days worked	Men working daily	Average active days	Man-days worked
Coal mines	39,240	183	7,192,448	30,666	197	6,038,183
Quarries and mills	1,444	254	366,236	1,685	238	400,796
Nonmetal mines	487	173	84,134	475	162	76,804
Sand and gravel mines [3]	354	261	92,355	350	263	92,036
Coke ovens and smelters	304	353	107,272	288	366	105,246
Metal mines				11	34	380
Total	41,829	187	7,842,445	33,475	201	6,713,445

[1] Excluding oil and gas.
[2] Preliminary figures.
[3] Excluding Government-and-contractor operations.

TABLE 4.—Injuries in the mineral industries, 1955–56 [1]

Industry [2]	1955				1956 [3]			
	Fatal	Nonfatal	Total	Injuries per million man-days	Fatal	Nonfatal	Total	Injuries per million man-days
Metal mines								
Coke ovens and smelters		16	16	149		6	6	57
Nonmetal mines	1	29	30	357		8	8	104
Quarries and mills	5	176	181	494	2	137	139	347
Coal mines	59	1,967	2,026	355	76	2,175	2,251	373
Total	65	2,188	2,253	360	78	2,326	2,404	363

[1] Excluding oil and gas.
[2] Sand and gravel mines not canvassed.
[3] Preliminary figures.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Asphalt (Native).—Bituminous sandstone was mined in Edmonson County for roadstone.

Coal.—Coal mining continued the recovery begun in 1955, mainly owing to increased demand for power generation. Coal was produced at 2,044 mines in 39 counties, with Harlan, Hopkins, and Pike outstanding in output. Leading producing companies were Nashville Coal Co., West Kentucky Coal Co., Blue Diamond Coal Co., United States Steel Corp., and Ken Coal Co. Production increased 8 percent over 1955, to the highest figure since 1951, but was still 9 percent below the peak year 1947. In the Eastern Kentucky field coal was mined at 1,903 mines in 30 counties and in the Western Kentucky field at 141 mines in 9 counties. The Eastern field produced 45 million tons and The Western field 29.6 million tons.

TABLE 5.—Coal production, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	76,475,165	$378,456,752	1955	69,019,910	$288,665,344
1952	66,114,341	317,386,725	1956	74,555,028	331,357,660
1953	65,060,478	302,871,877			
1954	56,964,408	236,736,940	Earliest record to date	2,440,955,000	(1)

[1] Data not available.

Oil and Gas.—Oil and gas were produced from the Eastern, Central, and Western fields. Most of the oil was produced in the Western field and most of the gas in the Eastern field. An increase in drilling activity and further development of secondary-recovery projects caused an increase in total output of oil. New discoveries included 27 new pools, 37 extensions of old pools, and 20 new pays in known producing areas.

Natural Gas.—Marketed production of natural gas increased 1 percent over 1955 to the highest output since 1951 but was 24 percent below 1947—the record year.

TABLE 6.—Marketed production of natural gas, 1947–51 (average) and 1952–56

Year	Million cubic feet	Value	Year	Million cubic feet	Value
1947–51 (average)	73,564	$13,634,200	1954	72,713	$16,579,000
1952	73,427	15,934,000	1955	73,214	17,352,000
1953	71,405	15,638,000	1956	73,687	17,022,000

Natural-Gas Liquids.—*Natural gasoline.*—Production of natural gasoline increased 1 percent over 1955 and was about the same as in 1953, the peak year.

TABLE 7.—Production of natural gasoline, 1947–51 (average) and 1952–56

Year	Thousand gallons	Value (thousand dollars)	Year	Thousand gallons	Value (thousand dollars)
1947–51 (average)	9,930	739	1954	28,224	1,552
1952	30,660	2,191	1955	34,991	2,492
1953	35,406	2,394	1956	35,275	2,414

LP-Gases.—Production of liquefied-petroleum gases increased 32 percent over 1955, establishing a new annual record.

TABLE 8.—Production of LP-gases, 1947–51 (average) and 1952–56

Year	Thousand gallons	Value (thousand dollars)	Year	Thousand gallons	Value (thousands dollars)
1947–51 (average)	62,010	1,674	1954	189,966	5,066
1952	156,198	3,963	1955	189,247	6,451
1953	176,232	4,993	1956	248,992	8,709

Petroleum.—Production of crude petroleum increased 14 percent over 1955 and 28 percent over 1954, establishing an alltime record.

Table 9.—Production of crude petroleum, 1947–51 (average) and 1952–56

Year	Thousand barrels	Value (thousand dollars)	Year	Thousand barrels	Value (thousand dollars)
1947-51 (average)	9,771	25,788	1954	13,791	40,270
1952	11,918	32,890	1955	15,518	44,850
1953	11,518	33,520	1956	17,628	51,297

TABLE 10.—Production of crude petroleum by counties, 1956 [1]

County	Barrels	County	Barrels
Allen	71,010	Lee	537,505
Barren	64,356	Leslie	899
Bath	5,895	Letcher	128
Boyd	702	Logan	4,053
Breathitt	39,332	McCreary	3,637
Breckinridge	32,554	McLean	1,137,926
Butler	106,471	Magoffin	2,064,241
Christian	1,833,547	Martin	30,248
Clinton	69,396	Meade	77
Crittenden	1,071	Menifee	503
Cumberland	22,087	Metcalfe	29
Daviess	1,461,657	Monroe	1,097
Edmonson	207	Montgomery	76
Elliott	114,486	Morgan	917
Estill	157,419	Muhlenberg	927,183
Floyd	17,997	Ohio	1,243,926
Grayson	67	Owsley	1,383
Green	9,464	Pike	34,527
Greenup	1,767	Powell	59,405
Hancock	507,609	Russell	267
Hart	33,699	Simpson	12,537
Henderson	3,053,808	Todd	29,742
Hopkins	40,490	Union	1,952,599
Jackson	1,102	Warren	48,229
Johnson	274,139	Wayne	20,356
Knott	20,240	Webster	1,360,158
Knox	2,806	Wolfe	57,410
Laurel	216		
Lawrence	155,348	Total	17,628,000

[1] Data from Kentucky Geological Survey.

NONMETALS

Cement.—Kosmos Portland Cement Co. operated the Kosmosdale plant throughout 1956, producing masonry and portland cements. Shipments of masonry cement decreased 3 percent below 1955. Shipments of portland cement increased 3 percent above 1955, establishing a new annual record.

Clays.—Four companies mined ball clay in Graves County. The leading producer was Kentucky-Tennessee Clay Co. Production increased 3 percent over 1955, establishing an alltime high. The clay was used for whiteware, art pottery, enameling, floor and wall tile, firebrick and block, saggers, and other purposes.

Ten companies mined fire clay at 17 mines in Carter and Greenup Counties. Leading producers were General Refractories Co. and Harbison-Walker Refractories Co., with operations in Carter County. Production was 11 percent below 1955 and 48 percent below 1951, the peak year. The clay was used for firebrick and block, fire-clay mortar, and heavy clay products.

Seventeen companies mined miscellaneous clay in 11 counties. Leading producers were Kosmos Portland Cement Co., operating in Jefferson County, and Kentucky Light Aggregates, Inc., operating in Bullitt County. The clay was used for art pottery, floor and wall tile, heavy clay products, lightweight aggregates, and cement. Production increased 15 percent over 1955 and established a new annual record.

TABLE 11.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Ball clay		Fire clay		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	101,913	$1,208,120	479,343	$2,355,494	181,288	$159,403	762,544	$3,723,017
1952	107,211	1,372,695	526,238	3,450,046	247,425	278,525	880,874	5,101,266
1953	100,482	974,637	348,359	1,809,988	262,368	333,727	711,209	3,118,352
1954	96,483	1,263,526	197,400	1,316,364	277,598	415,036	571,481	2,994,926
1955	111,600	1,498,950	341,862	2,315,715	422,237	601,466	875,699	4,416,131
1956	115,243	1,501,550	303,275	1,912,015	486,309	665,620	904,827	4,079,185

Fluorspar.—The fluorspar industry continued to operate under depressed market conditions because the steel industry replaced domestic fluorspar with imported material. Calvert City Chemical Co. opened a new mine at Dyers Hill (Livingstone County) and produced Acid-grade fluorspar for its own use. Fifteen other companies or individuals operated shallow mines or processed mine dump and settling ponds. Eight companies processed or blended purchased fluorspar for shipment to consumers. Marketed production was 14,000 tons in 1956, compared with 9,700 tons in 1955.

TABLE 12.—Fluorspar shipped from mines, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	77,471	$2,456,849	1954	35,831	$1,510,344
1952	48,308	1,863,262	1955	8,899	308,140
1953	47,244	2,100,493	1956	14,865	607,704

Sand and Gravel.—Thirty companies mined sand and gravel in 17 counties. Leading producers were C & H Gravel Co. (Gallatin County); Standard Materials Corp. (Carroll County); and Ohio River Sand Co. (Jefferson County). Total output in 1956 increased 16 percent over 1955 and set a new annual record.

TABLE 13.—Sand and gravel sold or used by producers, 1947–51 (average), and 1952–56

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	(1)	(1)	(1)	(1)	2,416,340	$2,186,507
1952	1,461,655	$1,314,641	1,872,606	$1,341,412	3,334,261	2,656,053
1953	1,399,817	1,322,674	1,652,338	1,577,258	3,052,155	2,899,932
1954	2,653,074	2,424,407	2,076,532	1,977,386	4,729,606	4,401,793
1955	(1)	(1)	(1)	(1)	4,898,705	5,298,102
1956	2,924,180	3,091,664	2,759,944	2,882,628	5,684,124	5,974,292

[1] Figure withheld to avoid disclosing individual company confidential data.

TABLE 14.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Sand:				
Structural	1,973,564	$2,223,253	2,024,359	$2,189,029
Paving	772,974	743,042	805,850	805,079
Other	(1)	(1)	93,971	97,556
Total sand	(1)	(1)	2,924,180	3,091,664
Gravel:				
Structural	1,450,416	1,676,416	1,430,238	1,615,376
Paving	507,565	484,699	1,258,516	1,231,204
Other	(1)	(1)	71,190	36,048
Total gravel	(1)	(1)	2,759,944	2,882,628
Total sand and gravel	4,898,705	5,298,102	5,684,124	5,974,292

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Total sand and gravel."

Stone.—Sixty operators produced crushed limestone at 80 quarries in 54 counties. The leading producers were Kentucky Stone Co. (operating in Anderson, Breckinridge, Hardin, Jessamine, Lee, Logan, Madison, Rockcastle, and Todd Counties); Louisville Crushed Stone Co. (Jefferson County); Franklin Limestone Co. (Livingston County); and Kosmos Portland Cement Co. (Meade County). Total production in 1956 decreased 3 percent below 1955—the peak year.

Levi Polly and Thomas C. Mayne crushed sandstone for concrete and roads; output in 1956 was 27 percent below that in 1955. Kolar

TABLE 15.—Crushed and broken stone sold or used by producers, 1947–51 (average), and 1952–56

Year	Limestone		Sandstone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	6,532,365	$7,892,585	(1)	(1)	(1)	(1)
1952	8,687,315	10,636,291	25,645	$38,468	8,712,960	$10,674,759
1953	7,429,505	9,268,237			7,429,505	9,268,237
1954	10,120,653	13,237,726	7,400	20,560	10,128,053	13,258,286
1955	11,921,870	[2] 15,521,272	9,193	20,336	11,931,063	[2] 15,541,608
1956	11,544,414	15,285,923	6,750	15,045	11,551,164	15,300,968

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Revised figure.

TABLE 16.—Crushed limestone sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Concrete and roads	9,217,156	$12,221,629	8,959,279	$12,121,944
Agstone	1,255,305	1,584,348	967,342	1,276,722
Railroad ballast	367,404	391,637	513,556	460,652
Riprap	418,282	423,384	372,540	373,287
Asphalt filler	(1)	(1)	75,000	150,000
Fertilizer filler	(1)	(1)	4,800	6,480
Other uses	663,723	[2] 900,274	651,897	896,838
Total	11,921,870	[2] 15,521,272	11,544,414	15,285,923

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other uses."
[2] Revised figure.

Stone Quarries, Kentucky Flagstone Co., and Thomas C. Mayne quarried 1,800 tons of dimension sandstone for rough construction, rubble, and rough architectural building stone and for flagging compared with 2,800 tons in 1955.

METALS

Iron Ore.—J. Willis Crider Fluorspar Co. shipped a small quantity of brown iron ore from Crittenden County.

Lead.—Calvert City Chemical Co. recovered 228 tons of lead from fluorspar milling operations.

Pig Iron.—Armco Steel Corp. produced foundry and basic pig iron at Ashland.

Silver.—Calvert City Chemical Co. recovered 31 fine ounces of silver from lead concentrate. This was the first recorded production of silver in the State, although it has been known that lead concentrate from Kentucky contains some silver.

Zinc.—Calvert City Chemical Co. recovered 417 tons of zinc from fluorspar-milling operations.

REVIEW BY COUNTIES

Of 120 counties in the State, 94 reported mineral production, compared with 96 in 1955. Leading counties were the large coal producers, Harlan, Hopkins, Pike, Letcher, and Floyd, each yielding minerals valued at more than $25 million. County figures do not include native asphalt, natural gas, natural-gas liquids, and petroleum, or do they include an output of 600,000 tons of sand and gravel of undetermined county origin.

TABLE 17.—Value of mineral production in Kentucky, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value [2]
Adair	$153,910	$138,330	Limestone.
Allen	25,171	144,000	Do.
Anderson	(3)	(3)	Do.
Ballard	458	6,697	Sand and gravel.
Barren	191,520	150,182	Limestone.
Bell	(3)	(3)	Coal, limestone, sandstone.
Boone	(3)	(3)	Sand and gravel.
Bourbon	(3)	119,277	Limestone.
Boyd	(3)	(3)	Coal, miscellaneous clay.
Boyle	(3)	315,784	Limestone.
Breathitt	2,818,722	3,776,169	Coal.
Breckinridge	321,298	(3)	Limestone, miscellaneous clay.
Bullitt	(3)	(3)	Miscellaneous clay, limestone.
Butler	(3)	466,557	Coal.
Caldwell	(3)	148,108	Limestone, fluorspar.
Calloway	2,216	8,162	Sand and gravel.
Carlisle	788	1,500	Do.
Carroll	(3)	(3)	Do.
Carter	2,744,454	2,611,482	Fire clay, coal, limestone.
Casey	151,300	250,000	Limestone.
Christian	(3)	962,947	Do.
Clark	(3)	227,125	Do.
Clay	3,338,092	5,220,798	Coal.
Clinton	313,824	259,724	Coal, limestone.
Crittenden	489,900	492,795	Limestone, fluorspar, iron ore.
Cumberland	(3)	4,148	Limestone.
Daviess	[4] 2,278,949	3,782,787	Coal, sand and gravel.
Edmonson	(3)	108,000	Limestone.
Elliott	73,434	50,150	Coal.
Estill	(3)		
Fayette	(3)	647,714	Limestone.
Fleming	352,086	360,230	Do.

See footnotes at end of table.

TABLE 17.—Value of mineral production in Kentucky, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value [2]
Floyd	$29,445,372	(3)	Coal, sand and gravel.
Franklin	(3)	$346,295	Limestone.
Fulton	(3)	(3)	Sand and gravel.
Gallatin	109,570	875,834	Do.
Graves	1,623,457	1,501,550	Ball clay.
Grayson	(3)	(3)	Limestone.
Greenup	(3)	138,448	Sand and gravel, fire clay.
Hancock	80,855	106,120	Miscellaneous clay, coal.
Hardin	693,835	656,635	Limestone.
Harlan	47,493,157	(3)	Coal, limestone.
Harrison	(3)	(3)	Limestone.
Hart	(3)	147,500	Do.
Henderson	(3)	1,674,034	Coal, sand and gravel.
Hickman		7,095	Sand and gravel.
Hopkins	26,973,207	51,263,342	Coal, miscellaneous clay.
Jackson	995,104	606,626	Coal.
Jefferson	9,477,453	10,471,782	Cement, limestone, sand and gravel, miscellaneous clay.
Jessamine	(3)	(3)	Limestone.
Johnson	2,032,098	1,918,077	Coal.
Kenton	(3)	19,950	Limestone.
Knott	3,551,033	3,971,623	Coal.
Knox	(3)	1,355,290	Do.
Laurel	223,751	641,743	Do.
Lawrence	38,040	134,402	Do.
Lee	(3)	(3)	Coal, limestone.
Leslie	10,388,589	11,787,827	Coal.
Letcher	(3)	33,195,739	Coal, limestone.
Livingston	(3)	(3)	Limestone, fluorspar, zinc, lead, silver.
Logan	(3)	(3)	Limestone, sandstone.
Lyon	932		
Madison	(3)	(3)	Limestone, miscellaneous clay.
Magoffin	330,597	18,759	Coal.
Marion	(3)	219,000	Limestone.
Marshall	3,901	20,024	Sand and gravel.
Martin	279,498	138,168	Coal.
Mason	(3)	76,880	Sand and gravel.
McCracken	311,032	250,650	Do.
McCreary	2,913,537	2,333,665	Coal, sandstone.
Meade	(3)	(3)	Limestone.
Menifee	(3)	120,117	Do.
Mercer	(3)	114,236	Do.
Metcalfe	(3)	92,685	Do.
Monroe	(3)	(3)	Do.
Morgan	(3)	627,650	Coal, limestone.
Muhlenberg	(3)	(3)	Do.
Nelson	(3)	211,000	Limestone.
Ohio	(3)	9,177,693	Coal, limestone.
Oldham	(3)	135,000	Limestone.
Owsley		57,062	Coal.
Pendleton	(3)	349,550	Limestone.
Perry	21,757,067	27,361,638	Coal.
Pike	41,282,800	47,114,990	Do.
Powell	(3)	(3)	Limestone, miscellaneous clay.
Pulaski	(3)	(3)	Coal, limestone.
Rockcastle	(3)	(3)	Do.
Rowan	(3)	(3)	Limestone, miscellaneous clay.
Simpson	(3)	111,000	Limestone.
Todd	(3)	97,822	Do.
Trigg	(3)		
Trimble	(3)		
Union	7,251,139	8,885,814	Coal, sand and gravel, miscellaneous clay.
Warren	(3)	139,100	Limestone.
Wayne	409,637	252,195	Coal, limestone.
Webster	(3)	3,754,972	Coal.
Whitley	(3)	1,306,618	Coal, miscellaneous clay.
Wolfe	38,500	21,750	Coal.
Undistributed	[4] 170,107,790	199,107,384	
Total	391,068,000	443,168,000	

[1] County figures exclude native asphalt, natural gas, natural-gas liquids, and petroleum; included with "Undistributed." The following counties are not listed because no production was reported: Bath, Bracken, Campbell, Garrard, Grant, Green, Henry, Larue, Lewis, Lincoln, McLean, Montgomery, Nicholas, Owen, Robertson, Russell, Scott, Shelby, Spencer, Taylor, Washington, and Woodford.

[2] Other than native asphalt, natural gas, natural-gas liquids, and petroleum.

[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[4] Revised figure.

Adair.—Shamrock Stone, Inc. (Butler quarry), crushed 93,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Allen.—McLellan Stone Co. opened a new quarry and produced 77,000 tons of limestone for concrete aggregate and roadstone.

Anderson.—Kentucky Stone Co. (Tyrone mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production in 1956 increased 9 percent over 1955.

Ballard.—The Kentucky State Highway Department mined 9,000 tons of paving gravel.

Barren.—J. F. Pace Construction Co. crushed 112,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone.

Bell.—Coal production was 1,165,000 tons from 65 mines; the Crockett mine (Kentucky Ridge Coal Co.) and Amru Strip mine (Rochester and Pittsburg Coal Co.) were the leading producers. Kentucky-Virginia Stone Co. (Pineville quarry) crushed limestone for riprap, concerete aggregate, roadstone; production declined 30 percent below 1955. Levi Polly (Pine Mountain quarry) produced 6,700 tons of sandstone for concrete aggregate and roadstone.

Boone.—Belleview Gravel Co. and Kentucky Sand Co. mined sand and gravel for structural, paving, and other uses. Production rose 32 percent above 1955, owing to initial production by Kentucky Sand Co.

Bourbon.—Bourbon Limestone Co., Inc. (Snapp quarry), crushed 92,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Boyd.—Eight mines produced 244,000 tons of coal in 1956. The Coalton Strip mine (Charles E. Yates) was the leading producer. Big Run Coal & Clay Co. (Princess mine) mined miscellaneous clay for heavy clay products.

Boyle.—Boyle County Highway Department (Perryville quarry) and Caldwell Stone Co., Inc. (Danville quarry), crushed 212,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Breathitt.—Coal output totaled 671,000 tons from 21 mines; the No. 3 Elkhorn mine (Allen Creek Coal Co.) was the principal producer.

Breckinridge.—Hardinsburg Stone Co. and Kentucky Stone Co. (Webster quarry) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production increased 13 percent over 1955. Murry Tile Co., Inc. (Cloverport mine), mined miscellaneous clay for floor and wall tile.

Bullitt.—Kentucky Light Aggregates, Inc. (Shepherdsville mine), mined miscellaneous clay for lightweight aggregates; production was twice as much as in 1955. Sam Nally Co. opened a new quarry and crushed limestone for concrete aggregate and roadstone.

Butler.—Seven mines produced 129,000 tons of coal in 1956. The leading producers was the Williams South Hill mine (Williams Bros. Mining Co.).

Caldwell.—Fredonia Valley Quarries, Inc. (Fredonia quarry), produced 128,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone. Michigan & Kentucky Fluorspar Co. and P. L. Perkins mined 96 tons of fluorspar.

Calloway.—The State highway department produced 16,200 tons of paving gravel.

Carlisle.—Clarence Guhy (Williams mine) mined 1,500 tons of structural sand.

Carroll.—Carrolton Gravel-Sand Co., Inc., and Standard Materials Co. produced structural sand and structural and railroad-ballast gravel.

Carter.—Fire clay for fire brick and block, fire-clay mortar, and heavy clay products was produced by Cooper & Kiser (Kehoe mine), General Refractories Co. (Olive Hill mine), Harbison-Walker Refractories Co. (Brinegar, Riggs, and Stinson mines), Ironton Firebrick Co. (Bradmyer mine), Louisville Firebrick Works, Inc. (Aden mine), Maynard Bros. Clay Co. (Grayson mine), North American Refractories Co. (Bailey Clay, Hayward, and Lowe No. 1 mines), Star Clay Co. (Rush mine), and Vincent Mining Co. (Soldier No. 1 mine). The output totaled 287,000 tons, and the leading producer was General Refractories Co. Coal production was 128,000 tons from 5 mines; the Grayson Block mine (Fields Branch Coal Co.) was the principal producer. Standard Slag Co. crushed 78,000 tons of limestone for concrete aggregate and roadstone.

Casey.—Casey Stone Co. (Bethel Ridge mine) mined 126,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Christian.—Harry Berry, Inc. (Fort Campbell quarry), Christian Quarries, Inc., and Hopkinsville Stone Co., Inc. (Hopkinsville quarry), crushed limestone for concrete aggregate, roadstone, agstone, rock dust for coal mines, and other uses.

Clark.—Allen Co., Inc. (Boonesboro mine), produced 171,000 tons of limestone for concrete aggregate and roadstone.

Clay.—Coal production was 1,302,000 tons from 44 mines. The Thunderbird mine (Courtesy Coal Co.), No. 4 mine (Hacker Coal Co.), and No. 1 Strip mine (Black Raven Coal Co., Inc.) were the leading producers.

Clinton.—Three mines produced 34,100 tons of coal in 1956. The leading producer was the No. 2 mine (Bruce Sloan Coal Co.). Shamrock Stone, Inc. (Caldwell quarry), crushed 80,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Crittenden.—Alexander Stone Co. produced 216,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone. Numerous small producers mined 5,100 tons of fluorspar; the principal operators were Wayne Brown (Holly mine), Everett Crider, Crider & Highfil, J. Willis Crider Fluorspar Co. (Pigmy mine), Cleve Lanham (Krause mine), Marimex Fluorspar Co., and Howard Stout. J. Willis Crider Fluorspar Co. mined a small quantity of brown iron ore. Raynolds Metal Co. began a DMEA project for mining fluorspar at the Ben Belt mine, totaling $21,984, of which the Government share was 50 percent.

Cumberland.—Shamrock Stone, Inc. (Burkesville quarry), crushed 3,500 tons of limestone for concrete aggregate, roadstone, and agstone.

Daviess.—The output of coal from 10 mines totaled 1,096,000 tons. The K–9 Strip mine (Green Coal Co.) was the principal producer in 1956. Daviess County Sand & Gravel Co. and Owensboro River Sand & Gravel Co. produced 241,000 tons of structural, paving, and engine sand and 87,000 tons of structural and paving gravel.

Edmonson.—Kentucky Rock Asphalt Co. quarried bituminous sandstone for roadstone. McLellan Stone Co. produced 54,000 tons of limestone for concrete aggregate and roadstone.

Elliott.—Coal production was 14,600 tons; the only producer was T. J. Copley Coal Co. (No. 1 mine).

Fayette.—Blue Grass Stone Co. (Lexington quarry) and Central Rock Co. (Lexington mine) crushed 451,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Fleming.—Gorman Construction Co. (Carpenter quarry), produced 241,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone.

Floyd.—Floyd County ranked fifth in the State in total value of mineral production. Coal production totaled 5,142,000 tons, and 320 mines were active. The leading producers were Wheelright mine (Inland Steel Co.), Nos. 1 and 2 mines (Princess Elkhorn Coal Co.), and Stephens mine (Stephens Elkhorn Fuel Corp.). W. L. Walters Pike Sand Co. opened a new pit and mined structural and engine sand.

Franklin.—Blanton Stone Co., Inc. (Frankfort mine), and Frankfort Builders Supply Co., Inc. (Devil's Hollow mine), crushed 261,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Fulton.—Hickman Sand & Gravel Co. and the State highway department mined paving sand and gravel; production in 1956 increased 7 percent over 1955

Gallatin.—C & H Gravel Co. (Sam Hill mine) and Gallatin Sand & Gravel Co. (Warsaw mine) produced 12,000 tons of structural and paving sand and 863,000 tons of structural and paving gravel.

Graves.—Cooley Clay Co., Inc., Kentucky Clay Mining Co. (Lamkin mine), Kentucky-Tennessee Clay Co., and Old Hickory Clay Co. mined 115,000 tons of ball clay for whiteware, art pottery, high-grade tile, kiln furniture, fire brick and block, enameling, and other uses.

Grayson.—Ragland Bros. (Letchfield quarry) and Rogers & Brunnhoeffer crushed limestone for riprap, concrete aggregate, roadstone, and agstone; production increased 32 percent over 1955.

Greenup.—Worthington Sand & Gravel Co., Inc., produced 51,000 tons of structural and paving sand and 9,000 tons of structural gravel. M. A. McCoy mined 16,600 tons of fire clay for fire brick and block.

Hancock.—Booneville Brick & Tile Co., Murray Tile Co., Inc., Owensboro Brick & Tile Co., and Owensboro Sewer Pipe Co. produced 72,000 tons of miscellaneous clay for heavy clay products. Coal output was 2,000 tons; Chester Powers Coal Co. (Powers Strip mine) was the only producer.

Hardin.—Kentucky Stone Co. (Lilmay mine and Upton quarry), Osborne Bros., and Waters Construction Co. crushed 507,000 tons of limestone for riprap, concrete aggregate, roadstone, and agstone.

Harlan.—Harlan County ranked first in the State in total value of mineral production. Coal production from 147 mines was 8,643,000 tons. The No. 32 mine (United States Steel Corp.), No. 2 mine (International Harvester Co.), and Harlan mine (Black Star Coal Corp.) were the principal producers. Sam Nally Co. opened a new quarry and crushed limestone for concrete aggregate and roadstone.

Harrison.—Genet Stone Co., Inc. (Cynthiana quarry), produced limestone for concrete aggregate, roadstone and agstone.

Hart.—McLellan Stone Co. (Horse Cave quarry) crushed 118,000 tons of limestone for concrete aggregate and roadstone.

Henderson.—Coal output in 1956 was 282,000 tons from 9 mines. The leading producers were the Mike & Pat mine (Dolph Hazelwood Coal Co.) and Henderson No. 1 mine (Henderson Mining Co., Inc.). Bedford-Nugent Co., Inc., mined 341,000 tons of structural, paving, railroad-ballast, and other sand and 220,000 tons of structural, paving and railroad-ballast gravel.

Hickman.—The State highway department produced 15,000 tons of paving gravel.

Hopkins.—Hopkins County ranked second in the State in total value of mineral production. Coal production totaled 14,827,000 tons from 54 mines. The principal producers were the Homestead Strip mine (Charbon Stripping Co.), Pleasant View and East Diamond mines (West Kentucky Coal Co.), and Fies mine (Nashville Coal Co.). Clarkes Clay Products Co. (Ashbyburg mine) mined 1,600 tons of miscellaneous clay for heavy clay products.

Jackson.—Seventeen mines produced 138,000 tons of coal in 1956. The Travis Creek mine (Travis Creek Fuel Co.) was the outstanding producer.

Jefferson.—Kosmos Portland Cement Co. produced masonry and portland cements at Kosmosdale; shipments of masonry cement were 3 percent below those in 1955, and shipments of portland cement increased 3 percent above 1955. Falls City Stone Co. (Fern Creek quarry), Jefferson County Stone Co. (Avoca quarry), Louisville Crushed Stone Co. (Louisville mine), Louisville & Nashville Railroad Co., and Okolona Stone Quarry crushed 1,432,000 tons of limestone for concrete and roadstone, railroad ballast, and agstone. R. W. Greene Sand & Gravel Co., Nugent Sand Co., Ohio River Sand Co., Inc., and E. T. Slider Co., Inc., produced 1,142,000 tons of structural, paving, and other sand and 564,000 tons of structural, paving, and railroad-ballast gravel. General Shale Products Corp. (Coral Ridge mine), Kosmos Portland Cement Co., and Louisville Pottery Co. mined miscellaneous clay for art pottery, cement, and heavy clay products; production in 1956 was 4 percent higher than in 1955.

Jessamine.—Kentucky Stone Co. (High Bridge mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone.

Johnson.—Coal production from 106 mines was 509,000 tons; the No. 1 mine (Sadler & Kennard Coal Co.) was the leading producer.

Kenton.—Franxman Bros. (Covington quarry) crushed 11,400 tons of limestone for concrete aggregate and roadstone.

Knott.—Coal output totaled 1,039,000 tons from 126 mines in 1956. The Knott mine (Knott Coal Corp.) produced the largest quantity.

Knox.—Coal production was 349,000 tons, and 48 mines were active. The outstanding producers were the No. 1 strip mine (Callihan & Callihan Coal Co.) and Osborne No. 2 strip mine (Osborne Mining Co., Inc.).

Laurel.—Output of coal from 16 mines was 180,000 tons. The leading producer was the No. 1 strip mine (Laurel Mountain Coal Co.).

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Lawrence.—Big Block Coal Co. (No. 1 mine) and Milt Robinet Coal Co. (No. 1 mine) produced 25,000 tons of coal—the only output in 1956.

Lee.—Four mines produced 85,000 tons of coal; the output of the Pacemaker mine (Congleton Bros., Inc.,) was outstanding. Kentucky Stone Co. (Yellow Rock mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production increased 6 percent over 1955.

Leslie.—Coal production from 60 mines totaled 2,780,000 tons; the No. 1 mine (Liberty Coal Co.), No. 6 mine (Kentucky Maid Coal Co.), and No. 3 mine (Kentucky Mountain Coal Co.) were the leading producers.

Letcher.—Letcher County ranked fourth in the State in total value of mineral production. Coal production was 6,134,000 tons, and 275 mines were active. The principal producers were the Nos. 21 and 22 mines (Bethlehem Mines Corp.), Big Chief mine (South East Coal Co.), and Lynch No. 31 mine (United States Steel Corp.). Hurricane Gap Quarries, Inc., and Levisa Stone Corp. (Jenkins quarry) crushed 190,000 tons of limestone for concrete aggregate, roadstone, and asphalt filler.

Livingston.—Franklin Limestone Co. (Barrett's quarry) and Reed Crushed Stone Co., Inc. (Grand Rivers quarry), produced limestone for riprap, concrete aggregate, roadstone, railroad ballast, and agstone; production dropped 8 percent below 1955. Fluorspar was produced by Black Mining Co., Calvert City Chemical Co. (Dyer's Hill mine), Marimex Fluorspar Co. (Mineral Ridge mine), Boyce Moody (Klondyke mine), Roberts & Frazer, and Tinsley & Loyd (Nancy Hanks mine); the output totaled 9,650 tons. Calvert City Chemical Co. opened a new mine in 1956 and recovered 417 tons of zinc, 228 tons of lead, and 31 fine ounces of silver from fluorspar milled at its Mexico mill.[3]

Logan.—Kentucky Stone Co. (Russellville mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production decreased 11 percent below 1955. Kentucky Flagstone Co. (Lewisburg quarry), and Kentucky Kolor Stone Corp. (Russellville quarry) produced 1,800 tons of dimension sandstone for rubble and rough architectural building stone and for flagging.

Madison.—Kentucky Stone Co. (Boonesboro mine) crushed limestone for concrete aggregate, roadstone, and agricultural stone; production increased 10 percent over 1955. Cornelison Pottery Co. and Etta Grinstead mined 115 tons of miscellaneous clay for art pottery.

Magoffin.—Coal output was 3,900 tons; the only producers were J. L. & Calloway Adams (Adams No. 1 mine) and Tip Top Coal Co. (No. 1 mine).

Marion.—Lebanon Stone Co. and Ward & Montgomery crushed 146,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Marshall.—The State highway department mined 48,000 tons of paving gravel.

Martin.—Five mines produced 45,000 tons of coal in 1956. The output of No. 2 mine (Webbs Coal & Mining Co.) was largest.

[3] Pit and Quarry, Fluorspar Demands of Pennsalt Plant Met by New Mine, Expanded Mill: Vol. 49, No. 4, October 1956, pp. 71–74.

Mason.—J. F. Hardymon Co. mined 33,000 tons of structural and paving sand and 15,000 tons of structural gravel.

McCracken.—Federal Materials Co., Inc., Floyd Keeling, McCracken County Highway Department, and Smiley Sand & Gravel Co. produced 262,000 tons of structural, paving, and engine sands and structural and paving gravels.

McCreary.—Coal output totaled 613,000 tons from 17 mines in 1956. The No. 18 mine (Stearns Coal & Lumber Co.) and Holly Hill & Hayes Creek strip mines (R. B. Campbell & Son Coal Co., Inc.) were the principal producers. Thomas C. Mayne (Day Ridge quarry) quarried 50 tons of dimension sandstone for rough construction building stone and crushed 60 tons of sandstone for concrete aggregate and roadstone.

Meade.—Kosmos Portland Cement Co. and Owensboro River Sand & Gravel Co. produced limestone for cement, concrete, aggregate, roadstone, and agstone; output increased 45 percent over 1955, owing to initial production by Owensboro River Sand & Gravel Co.

Menifee.—A. W. Walker & Son (Frenchburg quarry) crushed 76,000 tons of limestone for concrete aggregate, roadstone and agstone.

Mercer.—Mercer County Highway Department and Mercer Stone Co. crushed 82,000 tons of limestone for concrete aggregate, roadstone, and fertilizer filler.

Metcalf.—Montgomery & Co. (Chapman quarry) crushed 59,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Monroe.—Trico Stone, Inc., crushed limestone for concrete aggregate, roadstone, and agstone; production rose 33 percent over 1955.

Morgan.—Seven mines in Morgan County produced 93,000 tons of coal; the No. 1 strip mine (Andrew Reed Coal Co.) had the largest output. Kentucky Road Oiling Co. (Wrigley quarry) and Licking River Limestone Co. (Zag quarry) crushed 166,000 tons of limestone for concrete aggregate, roadstone, agstone, and other uses.

Muhlenburg.—Coal production was 6,935,000 tons, and 27 mines were active. The leading producers were Paradise strip mine (Pittsburgh & Midway Coal Mining Co.), Crescent mine (Nashville Coal Co., Inc.), Gibraltar strip mine (Gibraltar Coal Corp.), and Skibo strip mine (W. G. Duncan Coal Co.). Greenville Quarries, Inc., and Luzerne Limestone Quarry, Inc., crushed limestone for concrete aggregate, roadstone and agstone; production more than doubled that in 1955.

Nelson.—Geoghegan & Mathis produced 159,000 tons of limestone for concrete aggregate and roadstone.

Ohio.—Output of coal was 2,811,000 tons from 14 mines. The Ken strip mine (Peabody Coal Co.), and No. 1 strip mine (Riverview Coal Co.) were the outstanding producers. Fort Hartford Stone Quarry crushed 209,000 tons of limestone for riprap, concrete aggregate, roadstone, railroad ballast, and agstone.

Oldham.—W. T. Liter opened the Crestwood mine and produced 100,000 tons of limestone for concrete aggregate and roadstone.

Owsley.—The only producers—Joe Reynolds Coal Co. (No. 1 mine) and Corbet Sizemore Coal Co. (No. 2 mine)—mined 13,900 tons of coal in 1956.

Pendleton.—Geoghegan & Mathis (Butler and Falmouth quarries) crushed 263,000 tons of limestone for concrete aggregate roadstone.

Perry.—Coal production totaled 5,713,000 tons and 136 mines were active. The Leatherwood Nos. 1 and 2 mines and the Blue Diamond mine (Blue Diamond Coal Co.) and the Blair Fork mine (Jewell Ridge Coal Corp.) were the leading producers.

Pike.—Pike County ranked third in the State in total value of mineral output. Coal production totaled 9,046,000 tons from 391 mines. The principal producers were Stone mine (Eastern Coal Corp.), Kentland No. 1 mine (Kentland-Elkhorn Coal Co.), Republic mine (Republic Steel Corp.) and Feds Creek mine (Feds Creek Coal Co. Inc.).

Powell.—A. W. Walker & Son (Whiterock quarry) crushed 112,000 tons of limestone for concrete aggregate, roadstone, and agstone. H. B. Sipple Brick Co. (Faulkner No. 1 mine) mined miscellaneous clay for heavy clay products.

Pulaski.—Eighteen mines produced 349,000 tons of coal in 1956. The No. 1 mine (E. L. Norton Coal Co.) and Wildcat No. 1 mine (Foster Stokes Coal Co.) were the leading producers. Somerset Stone Co., Inc., and Strunk Construction Co. crushed limestone for concrete aggregate, roadstone, and agstone; production in 1956 was 19 percent below that in 1955.

Rockcastle.—Coal output was 147,000 tons; and 10 mines were active; of these, No. 1 Strip mine (H & W Lumber Co., Inc.) was the outstanding producer. Kentucky Stone Co. (Mt. Vernon quarry and Mullins mine) crushed limestone for concrete aggregate, roadstone, railroad ballast, and agstone; production was 11 percent below that in 1955.

Rowan.—Kentucky Road Oiling Co. (Christy quarry) and Morehead Limestone Co. crushed 177,000 tons of limestone for fluxing stone, concrete aggregate, roadstone, and agstone. Lee Clay Products Co. Inc. (Lee Clay mine), mined miscellaneous clay for heavy clay products; production increased 9 percent over 1955.

Simpson.—Southern Stone Co. Inc. (Franklin quarry), produced 74,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Todd.—D. W. Dickinson (Gallatin quarry) and Kentucky Stone Co. (Todd quarry) crushed 75,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Union.—Coal production totaled 2,267,000 tons from 5 mines; of these, the Uniontown mine (Nashville Coal Co., Inc.) and Poplar Ridge mine (Seneca Coal Co.) were the leading producers. The State highway department and Union Sand & Gravel Co. (Morganfield mine) mined 11,100 tons of structural sand and 34,300 tons of structural gravel. Clarks Clay Products Co.(Uniontown mine) produced 3,500 tons of miscellaneous clay for heavy clay products.

Warren.—McLellan Stone Co. crushed 98,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Wayne.—Four mines produced 33,900 tons of coal in 1956. The No. 1 strip mine (Porter Koontz Coal Co.) had the largest output. Bassett Products Co. produced 75,000 tons of limestone for concrete aggregate, roadstone, and agstone.

Webster.—Coal production totaled 1,217,000 tons from 14 mines. The Precision Washed strip mine (Hart & Hart Coal Co.) was the principal producer.

Whitley.—Output of coal from 41 mines was 344,000 tons. The Whitley strip mine (Whitley Strip Mining Co., Inc.) and No. 3 mine (Reaves Dixie Gem Coal Co.) were the leading producers. Corbin Brick Co. mined 13,000 tons of miscellaneous clay for heavy clay products.

Wolfe.—David Day Coal Co. (No. 1 mine) and C. L. Thompson Coal Co. (Miller mine) produced 7,250 tons of coal, the only output in 1956.

The Mineral Industry of Louisiana

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Louisiana Geological Survey.

By Howard E. Rollman [1] and Leo Hough [2]

AN INFLUX of industry began converting the old plantations along the Mississippi River between Baton Rouge and New Orleans into new industrial sites. The river, as a source of fresh water and a means of low-cost transportation, combined with abundant industrial mineral raw materials to create a favorable economic environment for this development.

Chemical and metals industries were most active in the new expansion. Ample industrial processing and cooling water and cheap water transportation were economically important to these industries. Present and planned alumina and nickel-cobalt plants along the river channel were to use ores from the Caribbean area. Shipping facilities provided efficient handling of ores, alumina, and finished metal. The chemical industry, producing bulk intermediate products requiring further distribution, also was located with transportation costs and access in mind. Chemical plants were also attracted by the available chemical raw materials and fuels. The location of the Mississippi River, in relation to access to the northern industrial areas and to foreign imported materials, gives a flexibility to the new evolving economic pattern in the State.

In 1956 intensive activity in offshore oil and gas exploration and development continued; a new cement plant, gypsum-processing plant, and barite-grinding plant, were being constructed; large sulfur deposits, were being developed and opening of 2 new salt domes was planned.

Except for gypsum, the output of minerals in Louisiana during 1956 was greater than in the previous year. The total value of all minerals increased 10 percent. Greater total values of natural gas, petroleum, and natural-gas liquids largely explained the growth.

The Suez crisis had its first impact on the petroleum industry of Louisiana during the last few months of 1956. Marketed production of natural gas—the second largest of any State—was 12 percent higher than 1955. Mineral fuels comprised 91 percent of the total value of all minerals produced. Recovery of other minerals, however,

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was sizable. In 1956 Louisiana produced nearly 40 percent of the Nation's sulfur shipments; was the fourth largest in salt recovery; and produced 4 million tons of shell, 9.8 million tons of sand and gravel, as well as large tonnages of clays, cement, and lime.

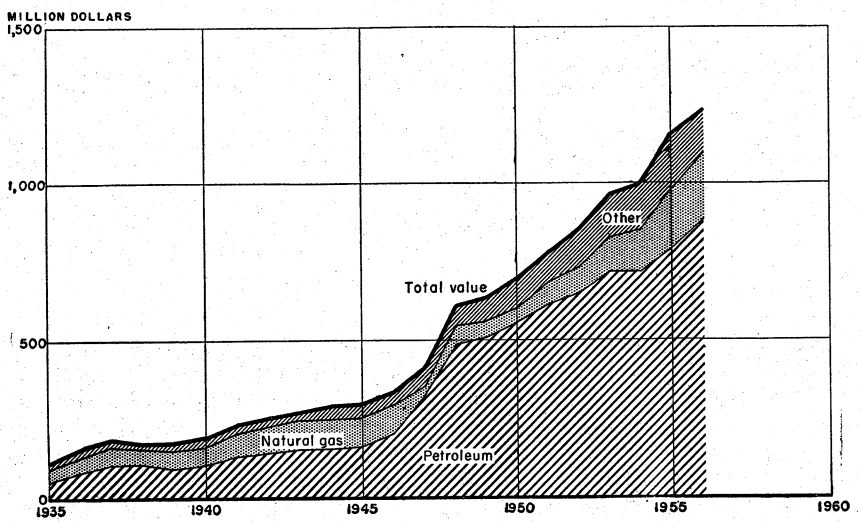

FIGURE 1.—Value of crude petroleum, natural gas, and total value of mineral production in Louisiana, 1935–56.

TABLE 1.—Mineral production in Louisiana, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays [2]	651,268	$659,099	785,283	$785,283
Gypsum	335,371	586,900	275,984	598,000
Natural gas ..... million cubic feet	1,680,032	189,844,000	1,886,302	215,038,000
Natural-gas liquids:				
Natural gasoline and cycle products ..... thousand gallons	782,328	59,158,000	773,949	62,394,000
LP-gases ..... do	291,138	10,323,000	305,222	14,727,000
Petroleum (crude) ..... thousand 42-gallon barrels	271,010	793,280,000	299,421	877,951,000
Salt (common)	3,562,636	15,406,993	3,703,500	17,695,270
Sand and gravel	8,574,020	10,941,860	9,832,443	12,158,428
Stone [3]	3,252,585	4,961,657	4,405,000	6,674,000
Sulfur (Frasch process) ..... long tons	2,072,418	58,027,704	2,238,852	59,329,579
Value of items that cannot be disclosed: Bentonite, cement, lime, recovered elemental sulfur	----------	15,308,896	----------	16,562,656
Total Louisiana [4]	----------	1,156,637,000	----------	1,281,849,000

[1] Production is measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes bentonite; value included with items that cannot be disclosed.
[3] Includes 3,220,928 short tons of oystershell valued at $4,930,000 in 1955 and 4,364,067 short tons of oystershell valued at $6,633,385 in 1956.
[4] Total value has been adjusted to avoid duplicating value of clays used for cement and oystershell used in producing lime and cement.

Employment.—Employment in oil and gas fields and in quarries, pits, and mines and on dredges increased 10 percent in 1956 compared with 1955. Nine-tenths of the labor force in the mineral industry

was engaged in producing petroleum, natural gas, and natural-gas liquids. The number of workers in this activity increased 10 percent; the number in nonmetallic production increased 8 percent. In the 3-year period 1954–56, the increased mining activity resulted in an economic gain to the State of $62 million and a total payroll of $233 million in 1956.

The average annual wage for oil and gas labor advanced 6 percent, to $5,342; for nonmetals the increase was 6 percent, to an average of $4,389.

In all phases of petroleum production, refining, and all the related industries employment increased 6,650 over 1955.

In all nonmetal-mining operations in Louisiana during 1956 there were 4 fatal and 73 nonfatal injuries. The injury rate was 1 fatal injury for every 1,185,000 man-hours and 1 nonfatal injury for every 65,000 man-hours.

TABLE 2.—Employment and wages in the mineral industries, 1955–56 [1]

Activity	Average number of workers		Total wages and salaries	
	1955	1956	1955	1956 [2]
Crude-petroleum production (including associated natural-gas production)	18,694	19,660	$101,831,895	$113,334,000
Natural gas and natural-gas liquids	1,352	1,333	6,475,229	6,537,000
Oil- and gas-field contract services	16,199	18,993	74,093,801	93,742,000
Sand and gravel quarries, pits, and dredges	1,319	1,491	4,101,402	4,777,000
Salt mines	1,014	980	3,710,595	3,806,000
Nonmetallic minerals [3]	1,710	1,911	8,958,155	10,650,000
Total	40,288	44,368	199,171,077	232,846,000

[1] Louisiana Department of Labor.
[2] Preliminary.
[3] Mainly sulfur- and shell-production workers.

TABLE 3.—Total wage and salaried workers in petroleum production, refining, and related industries, 1947–51 (average) and 1952–56 [1]

Year	Crude petroleum and natural-gas production	Petroleum refining	Pipeline transportation (except natural gas)	Gas utilities	Petroleum bulk tank stations	Retail filling stations	Chemicals manufactured as byproducts of petroleum or used in refining petroleum	Total
1947–51 (average)	22,362	15,271	1,430	3,878	3,059	4,666	8,382	59,048
1952	26,442	16,039	1,544	4,660	3,157	5,572	9,688	67,102
1953	28,450	15,900	1,500	4,900	3,500	6,250	10,350	70,850
1954	31,900	15,850	1,450	4,950	3,650	6,600	10,600	75,000
1955	35,900	15,800	1,450	5,100	3,900	7,400	11,350	80,900
1956 [2]	40,200	15,500	1,400	5,600	4,400	8,400	12,050	87,550

[1] Louisiana State Department of Labor.
[2] Preliminary figures.

REVIEW OF MINERAL COMMODITIES

MINERAL FUELS

Recovery of mineral fuels continued its steady increase to meet the ever-growing energy requirements of the Nation. In 1956 the quantity of energy fuels produced in Louisiana was equal to energy consumption in the United States in 1900. In addition to the impetus of the oil-rich offshore provinces, curtailment of Middle East oil by the Suez crisis began to show effect in Louisiana. In the latter part of the year production allowables for the State were raised by the Department of Conservation to help fill the world need for oil. These increased allowables enabled Louisiana to press California for the position of second-ranking producing State during December.

According to the Louisiana Department of Conservation, at the end of 1956 there were 756 oil and/or gas fields with over 24,000 wells capable of producing oil or gas. Exploratory drilling resulted in discovery of 79 new fields.

TABLE 4.—Production of crude petroleum and natural gas in the Louisiana offshore area, 1956 and cumulative total [1]

Area	1956		Cumulative total	
	Crude petroleum (barrels)	Natural gas (million cubic feet)	Crude petroleum (barrels)	Natural gas (million cubic feet)
Bay Marchand	3,431,414	2,345	17,193,525	11,855
Brenton Sound	489,413	8,213	1,765,498	18,032
Chandeleur Sound	53,371	59	164,612	110
Eugene Island	4,656,755	54,742	12,998,660	201,055
Grand Isle	1,983,526	1,256	5,922,187	3,540
Main Pass	8,560,954	12,079	30,306,003	33,936
Ship Shoal	627,391	518	2,336,385	2,106
South Pass	18,261,055	19,036	35,390,539	33,558
South Pelto	105,358	159	152,933	206
South Timbalier	52,436	31	261,644	163
Vermilion	183,105	35,775	610,137	121,369
West Cameron	282,074	390	872,250	1,816
West Delta	2,219,116	1,924	3,660,461	3,060
Total	40,906,000	136,527	111,635,000	430,806

[1] Louisiana Department of Conservation, Annual Oil and Gas Report: 1956, pp. 64–68.

TABLE 5.—Revenue from oil and gas mineral leases on Louisiana submerged lands, 1947–56 [1]

Year	Rentals	Bonuses	Royalty	Year	Rentals	Bonuses	Royalty
1947	$2,275,599	$8,676,522		1952	$1,026,869	$8,933,573	$136,890
1948	5,573,631	11,866,375	$32,524	1953	1,300,176	3,766,110	3,576,812
1949	7,663,728		273,814	1954	2,091,481	36,302,875	3,983,146
1950	3,941,764	1,340,590	941,800	1955	1,553,069	44,212,535	5,839,623
1951	867,455	4,087,286	319,959	1956	1,260,145	15,951,512	6,342,202

[1] Louisiana State Land Office.

Exploration and Reserves.—In 1956 South Louisiana was one of the most successful areas in the Nation for oil and gas exploration. Favorable achievements in the offshore areas continued to encourage operators. Success in the deep-drilling programs in the inland areas

offered unforeseen potentials in the areas previously neglected by shallower drilling programs. As a result of exploratory activity, there was a net gain in reserves of 420 million barrels of crude petroleum, 79 million barrels of natural-gas liquids, and 2,618 million cubic feet of natural gas by the end of 1956. Total reserves were 3,675 million barrels of oil, 45,054 billion cubic feet of gas, and 1,015 million barrels of natural-gas liquids.

The 420-million-barrel net increase in crude-petroleum reserves developed in Louisiana represented 99 percent of the net increase for the Nation. About 20 percent of Louisiana's crude-petroleum reserve was developed in the offshore area. At the end of 1956 the ratio of reserves to production was 13.61:1.00—the second best of the major oil-producing States in the Nation. The decreasing ratio of the gas reserves to production was stemmed in 1956 by the large, new gas-reserve development. The likely impact of new gas reservoir discoveries in the Gulf areas was not yet fully evaluated. Newly discovered offshore gas wells were shut in because of the inability to market the gas from these wells in inland pipelines. The ratio of gas reserve to production in 1956 was 24.24:1. An estimate based on comparable inland occurrences placed Louisiana's undeveloped offshore reserves at 21.5 trillion cubic feet.[3]

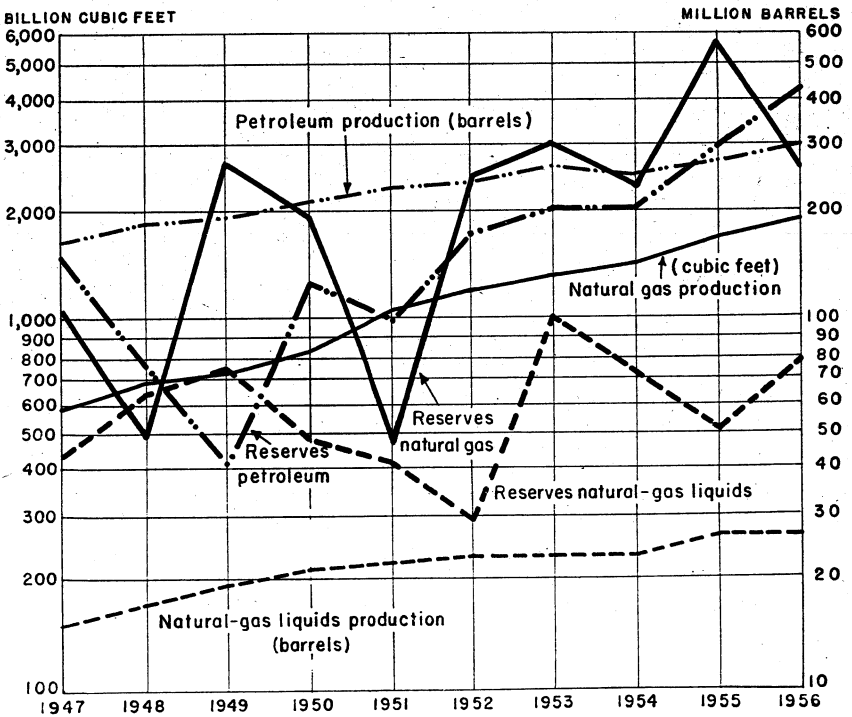

FIGURE 2.—Relationship of production and additions to reserves of crude petroleum, natural gas, and natural-gas liquids, in Louisiana, 1947–56.

[3] Atwater, Gordon, Future of Offshore Province, Bulletin of American Association of Petroleum Geologists, vol. 40, No. 11, November, 1956, pp. 2624–2635.

TABLE 6.—Reserves of crude petroleum, natural gas, and natural-gas liquids, 1955–56 [1]

Fuel	Proved reserves as of Dec. 31			Increase, percent
	1955	1956	Change in reserves	
Crude petroleum [2]	3,255	3,675	420	13
Natural-gas liquids [2]	936	1,015	79	8
Natural gas [3]	42,436	45,054	2,618	6

[1] American Gas Association and American Petroleum Institute, Proved Reserves of Crude Oil, Natural-Gas Liquids, and Natural Gas: Vol. 11, Dec. 31, 1956, pp. 9, 10, and 19.
[2] Million barrels.
[3] Billion cubic feet.

TABLE 7.—Estimated reserves in the offshore area [1]

Field	Estimated reserves (thousand barrels)	Number wells	Acres [2]
Bay Marchand [3]	67,811	87	3,480
Belle Isle [3]	17,958	21	840
Breton Sound: Block 20	8,651	10	400
Eugene Island:			
Block 18 and 32	19,993	25	1,000
Block 126	49,618	52	2,080
Block 128	8,534	9	360
Grande Isle: Block 18	20,591	26	1,040
Main Pass:			
Block 35	76,704	74	2,960
Block 69 [4]	102,334	93	3,720
Ship Shoal: Block 154	14,540	15	600
South Pass:			
Block 24 [3 4]	278,511	312	4,160
Block 27	25,708	28	1,120
West Delta:			
Block 30	33,360	35	1,400
Block 53	9,241	11	440

[1] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 161.
[2] Figures under "Acres" apply to largest reservoir only.
[3] Includes onshore production.
[4] Estimated ultimate recovery of 100 million barrels or more.

Of the approximate 36,000 wells drilled for oil and gas in Louisiana from 1937 to 1955, about 14 percent were wildcat wells. Of these wildcats, 7.7 percent were productive in North Louisiana and 20.5 percent in South Louisiana. In 1956, 13.9 percent of the wells drilled for oil and gas in North Louisiana and 20.8 percent in South Louisiana were wildcats. The percentage of wildcats in South Louisiana was one of the highest in the Nation. In South Louisiana in 1956, 18.5 percent of the wildcats were productive, in North Louisiana 7.8 percent were productive. The increasing success ratio in South Louisiana explains in part the extensive exploratory activity in the area.[4] At the end of 1956, 424 rotary-drilling rigs were operating in the State as compared with 406 in 1955, a 4-percent increase. Of these, 69 operated in North Louisiana and 355 in South Louisiana.[5] Although the total number of wells drilled for development and exploration was about the same as in the previous year, the number of wildcats in 1956 was about one-third more than in 1955.

[4] World Oil, vol. 144, No. 3, Feb. 15, 1957, p. 124.
[5] Work cited footnote 4, p. 162.

TABLE 8.—Oil and gas well drilling in 1956, by parishes [1]

Parish	Proved field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Acadia	16	21	14	5	9	25	21	30	39
Allen	6	12	8	1	2	19	7	14	27
Ascension	3	----	2	1	1	3	4	1	5
Assumption	1	4	2	2	2	10	3	6	12
Avoyelles	----	----	1	1	----	3	1	----	4
Beauregard	36	3	11	6	1	32	42	4	43
Bienville	6	7	4	1	----	4	7	7	8
Bossier	31	9	15	4	----	18	35	9	33
Caddo	555	23	35	1	1	9	556	24	44
Calcasieu	31	11	18	3	9	25	34	20	43
Caldwell	----	----	----	----	----	3	----	----	3
Cameron	50	21	16	3	7	33	53	28	49
Catahoula	18	----	15	4	----	18	22	----	33
Claiborne	25	2	12	8	1	3	33	3	15
Concordia	12	----	18	1	----	32	13	----	50
De Soto	26	25	34	2	1	9	28	26	43
East Baton Rouge	1	----	1	----	----	2	1	----	3
Evangeline	5	----	1	----	----	7	5	----	8
Franklin	12	1	15	3	----	9	15	1	24
Grant	8	----	2	----	----	----	8	----	2
Iberia	30	6	12	7	3	14	37	9	26
Iberville	29	2	10	2	3	17	31	5	27
Jackson	----	----	----	----	----	1	----	----	1
Jefferson	17	----	4	9	3	14	26	3	18
Jefferson Davis	5	9	7	2	6	14	7	15	21
Lafayette	1	4	1	1	3	2	2	7	3
Lafourche	68	24	19	8	15	47	76	39	66
La Salle	38	----	17	2	----	8	40	----	25
Lincoln	----	4	1	----	----	1	----	4	2
Madison	----	----	----	----	----	3	----	----	3
Morehouse	----	5	----	----	----	3	----	5	3
Natchitoches	1	----	1	----	----	4	1	----	5
Orleans	----	----	----	----	----	1	----	----	1
Ouachita	----	1	1	----	----	1	----	1	2
Plaquemines	101	3	17	11	5	35	112	8	52
Pointe Coupee	2	----	----	1	----	4	3	----	4
Rapides	----	----	5	----	----	4	----	----	9
Red River	1	----	5	----	----	10	1	----	15
Richland	6	3	6	----	----	3	6	3	9
Sabine	4	1	15	2	----	14	6	1	29
St. Charles	7	1	4	1	5	17	8	6	21
St. James	2	1	----	----	----	7	2	1	7
St. Landry	21	8	14	1	6	13	22	14	27
St. Martin	38	7	26	4	11	15	42	18	41
St. Mary	43	13	13	5	1	16	48	14	29
St. Tammany	----	----	----	----	1	1	----	1	1
Tangipahoa	----	----	----	----	----	1	----	----	1
Tensas	23	2	9	2	1	21	25	3	30
Terrebonne	61	15	13	12	9	43	73	24	56
Union	1	57	1	----	1	9	1	58	10
Vermilion	12	16	7	1	10	12	13	26	19
Vernon	----	----	----	----	----	1	----	----	1
Webster	58	4	15	3	2	4	61	6	19
West Baton Rouge	----	----	----	----	----	6	----	----	6
West Carroll	----	2	3	----	----	----	----	2	3
West Feliciana	----	----	----	----	----	1	----	----	1
Winn	11	----	9	----	----	4	11	----	13
Gulf of Mexico:									
Bay Marchand	21	1	7	----	3	3	21	4	10
Breton Sound	3	----	2	----	----	3	3	----	5
Chandeleur Sound	----	----	----	----	----	1	----	----	1
East Cameron	----	2	----	----	2	----	----	4	----
Eugene Island	25	----	6	7	3	1	32	3	7
Grand Isle	12	----	14	3	1	1	15	1	15
Main Pass	39	4	5	----	5	2	39	9	7
Ship Shoal	9	5	21	3	2	5	12	7	26
South Pass	88	11	18	----	5	12	88	16	30
South Pelto	----	----	1	----	----	----	----	----	1
South Timbalier	1	1	1	2	----	2	3	1	3
Vermilion	----	7	2	----	4	5	----	11	7
West Cameron	3	12	6	----	2	2	3	14	8
West Delta	31	6	13	6	----	2	37	6	15
Total, Gulf of Mexico	232	49	96	21	27	39	253	76	135
Total: 1956	1,654	376	555	141	146	674	1,795	522	1,229
1955	2,317	406	692	104	74	534	2,421	480	1,226

[1] National Oil Scouts and Landmen's Association, Oil- and Gas-Field Development in United States: Austin, Tex., vol. 27, 1957.

TABLE 9.—New oil and gas discoveries, 1956, by parishes [1]

Parish	Field	Section	Township	Range	Date of discovery	Product
NORTH LOUISIANA						
Bossier	Alden Bridge	9	20 N.	13 W.	June 21	Oil.
Do.	Bolinger	34	23 N.	13 W.	Nov. 18	Do.
Do.	Crossway Bayou	27	21 N.	12 W.	July 22	Do.
Caddo	Metcalf	21	16 N.	16 W.	June 15	Gas.
Catahoula	Patten Church	24	8 N.	6 E.	Nov. 18	Oil.
Do.	Tew Lake	11	8 N.	6 E.	June 6	Do.
Claibourne	Northwest Colquitt	21	23 N.	6 W.	Oct. 15	Do.
Franklin	Baskinton	28	16 N.	8 E.	July 16	Do.
Do.	Turkey Creek	16	15 N.	8 E.	Aug. 25	Do.
Do.	West Baskinton	36	16 N.	7 E.	Oct. 24	Do.
LaSalle	Sandy Bayou	13	5 N.	3 E.	July 26	Do.
Sabine	Kilgore Slough	20	9 N.	14 W.	June 19	Do.
Tensas	Justine	24	12 N.	10 E.	Dec. 9	Gas.
Do.	Lake Formosa	22	12 N.	10 E.	Oct. 18	Oil.
Union	Bull Creek	20	21 N.	3 W.	Oct. 9	Gas.
SOUTH LOUISIANA						
Acadia	South Mermentau	69	10 S.	2 W.	Dec. 28	Gas.
Do.	South Rayne	17	10 S.	2 E.	May 18	Do.
Allen	Cane Brake	32	5 S.	6 W.	July 10	Oil.
Beauregard	Fulton	34	6 S.	8 W.	Sept. 21	Do.
Do.	Shoats Creek	10	7 S.	12 W.	Feb. 25	Gas.
Calcasieu	Coulee Hippolyte	33	10 S.	8 W.	Feb. 19	Oil.
Do.	North Chalkley	29	11 S.	6 W.	July 3	Gas.
Do.	West Holmwood	29	10 S.	7 W.	May 29	Do.
Cameron	Calcasieu Pass	29	15 S.	10 W.	Oct. 28	Do.
Do.	East Cameron Block 62	Offshore			Jan. 22	Do.
Do.	East Cameron Block 160	do			Sept. 21	Do.
Do.	Grosse Savanne	33	12 S.	8 W.	Jan. 27	Oil.
Do.	Kings Bayou	3	15 S.	7 W.	Mar. 26	Gas.
Do.	West Cheniere Perdue	16	14 S.	7 W.	Sept. 9	Do.
Iberia	Bayou Postillion	35	12 S.	11 E.	Jan. 3	Oil.
Do.	Big Bayou Pigeon	30	12 S.	11 E.	Jan. 17	Do.
Do.	East Bayou Pigeon	15	12 S.	11 E.	Dec. 5	Gas.
Do.	Eugene Island Block 47	Offshore			Mar. 4	Do.
Jefferson	Grand Isle Block 43	do			Oct. 28	Do.
Do.	Marrero	44	14 S.	24 E.	Aug. 2	Do.
Do.	McCall's Island	14	18 S.	23 E.	Dec. 16	Oil.
Do.	South Little Lake		18 S.	23 E.	Apr. 5	Do.
Do.	Three Bayou Bay	7	18 S.	24 E.	July 9	Gas.
Do.	West Pontchartrain				July 26	Do.
Jefferson Davis	Fontenot	27	7 S.	5 W.	Apr. 16	Do.
Lafayette	Ossum	13	9 S.	3 E.	Nov. 15	Oil.
Do.	Southeast Rayne	11	10 S.	2 E.	June 1	Gas.
Lafourche	Bayou Raphael	39	19 S.	22 E.	Oct. 4	Oil.
Do.	Lake Boeuf	116	15 S.	18 E.	Oct. 20	Do.
Do.	Lake Fields		17 S.	19 E.	July 7	Gas.
Do.	South Timbalier Block 86	Offshore			Dec. 30	Oil.
Do.	South Timbalier Block 135	do			Dec. 25	Do.
Plaquemines	Bayou Gentilly	16	15 S.	14 E.	Sept. 13	Gas.
Do.	Dalcour	44	14 S.	13 E.	June 20	Oil.
Do.	Main Pass Block 46	Offshore			Sept. 18	Gas.
Do.	South Pass Block 20	do			Feb. 28	Do.
Do.	South Pass Block 21	do			May 28	Do.
Do.	South Pass Block 42	do			Apr. 13	Do.
Do.	Tiger's Ridge	41	15 S.	12 E.	Nov. 8	Do.
Do.	West Delta Block 25	Offshore			Nov. 3	Oil.
Do.	West Delta Block 83	do			Nov. 14	Do.
Pointe Coupee	Frisco	8	6 S.	9 E.	July 5	Oil.
St. Charles	Kenner	39	12 S.	9 E.	Feb. 12	Gas.
Do.	West Pontchartrain		11 S.	9 E.	May 15	Do.
St. Landry	Lawtell	23	6 S.	3 E.	Nov. 5	Do.
St. Martin	Bayou Crook Chene	3	11 S.	9 E.	June 6	Oil.
Do.	Cade	11	11 S.	5 E.	Aug. 23	Gas.
Do.	Cecelia	63	8 S.	6 E.	Oct. 18	Oil.
Do.	Simon Pass	22	15 S.	13 E.	June 6	Gas.

See footnote at end of table.

TABLE 9.—New oil and gas discoveries, 1956, by parishes [1]—Continued

Parish	Field	Section	Township	Range	Date of discovery	Product
	SOUTH LOUISIANA—Continued					
St. Mary	Eugene Island Block 77	Offshore			May 1	Gas.
Do	Eugene Island Block 175	do			July 2	Oil.
Do	Eugene Island Block 184	do			Mar. 16	Gas.
Do	Eugene Island Block 188	do			Oct. 16	Oil.
Do	Garden City	61	15 S.	10 E.	Dec. 24	Gas.
Terrebonne	Bayou Rambio	12	20 S.	16 E.	Dec. 15	Do.
Do	Humphreys	93	17 S.	16 E.	Aug. 10	Do.
Do	Ship Shoal Block 176	Offshore			Nov. 28	Do.
Do	South Humphreys	50	17 S.	15 E.	Dec. 22	Do.
Vermilion	Boston Bayou	22	14 S.	4 E.	Nov. 10	Do.
Do	Maurice	41	11 S.	4 E.	Mar. 28	Do.
Do	Theall	2	14 S.	2 E.	Jan. 29	Do.
Do	Vermilion Block 14	Offshore			July 24	Do.
Do	Vermilion Block 46	do			Dec. 10	Do.
Do	Vermilion Block 66	do			July 3	Do.

[1] Louisiana Department of Conservation, Annual Oil and Gas Report, 1956: Pp. 8-9.

TABLE 10.—Crew-weeks spent in geophysical and core-drill oil and gas prospecting, by methods [1]

Parish	Method		Parish	Method	
	Reflection seismograph	Gravity meter		Reflection seismograph	Gravity meter
North Louisiana:			South Louisiana (Con.):		
Bienville [2]	14	8	Jefferson Davis	163	9
Bossier	80		Lafayette	180	3
Caddo	28		Lafourche	305	
Caldwell	28		Livingston	23	
Catahoula	20	4	Orleans	27	
Claiborne	91		Plaquemines	340	
DeSoto	2		Pointe Coupee	56	
East Carroll	8		St. Bernard	52	
Franklin	18	3	St. Charles	61	
Jackson	7		St. Helena	5	
LaSalle	10		St. James	40	
Lincoln	21	1	St. John the Baptist	81	
Madison	23	11	St. Landry	179	4
Morehouse	85		St. Martin	242	47
Natchitoches	3	47	St. Mary	462	17
Ouachita	33		Tangipahoa	14	
Red River	10		Terrebonne	651	
Richland	17		Vermilion	477	22
Sabine	9		Vernon	11	
Tensas	47	7	West Baton Rouge	14	
Union	165		Total	5,175	246
Webster	99	8			
West Carroll	13		Offshore area:		
Winn	25	7	Bay Marchand	1	
Total	856	96	Breton Sound	36	
South Louisiana:			Chandeleur Sound	14	
Acadia	278	12	East Cameron	95	12
Allen	123	5	Eugene Island [3]	140	17
Ascension	27		Grand Isle	18	9
Assumption	159		Main Pass	54	
Avoyelles	19		Ship Shoal	95	14
Beauregard	170	7	South Marsh Island	70	11
Calcasieu	198		South Pass	17	
Cameron	182	24	South Pelto	4	
East Baton Rouge	30		South Timbalier	93	28
Evangeline	114		Vermilion	117	38
Iberia	210	90	West Cameron	145	118
Iberville	131	3	West Delta	19	12
Jefferson	151	3	Total	918	259

[1] National Oil Scouts and Landmen's Association, Oil- and Gas-Field Development in United States and Canada, Austin, Tex., vol. 27, 1957, pp. 382, 403, 432, 450.
[2] Plus 4 crew weeks with seismograph method.
[3] Plus 3 crew weeks with refraction seismograph method.

Seventy-nine new oil and gas fields were discovered from oil exploratory activity. The exploratory wells drilled during the year included 141 oil wells, 146 gas wells, and 674 dry holes.

Carbon Black.—Daily plant carbon-black capacity increased 72,000 pounds to a total of 1.6 million pounds per day. During the year 8 furnace-black plants and 1 contact-type plant were operating. Production rose 7 percent. Virtually all of the carbon black manufactured in the State was produced by the furnace-black process, which utilized natural gas and liquid hydrocarbons as raw materials. Of the total carbon black, about half was produced from natural gas and half from liquid hydrocarbons. In 1956, 565,000 pounds of contact black was produced with an average value of 2.11 cents per pound; 537 million pounds of furnace black was produced with an average value of 5.84 cents per pound. In the production of carbon black, 29 billion cubic feet of natural gas and 74 million gallons of liquid hydrocarbons were consumed. The average yield was 8.52 pounds of carbon black per thousand cubic feet of natural gas and 3.98 pounds per gallon of liquid hydrocarbons. The following table shows production for the period, 1952–56:

Year:	*Production, million pounds*
1952	256
1953	377
1954	368
1955	503
1956	538

Natural Gas.—The offshore area began to manifest itself as a large, undeveloped natural-gas source. In 1956 the lack of pipelines to shore still was hindering offshore production. Gas-discovery wells were capped until pipelines could be constructed. During 1954–56, 48 exploratory gas wells were successfully completed offshore.

In 1956 the quantities of natural gas originating in Louisiana, supplying many of the Nation's industrial and urban areas, continued upward. Compared with 1955, production was 12 percent greater. In 1947–56 recovery more than trebled. In 1952–56 production increased 50 percent, double the rate of increase for the Nation.

Louisiana was one of the leading natural-gas-consuming States because many industries were attracted there by the cheap, abundant supply of this quality fuel. The capacity to negotiate favorable long-term contracts for purchase of the fuel should continue to be an incentive for the continued high rate of local consumption.

TABLE 11.—Marketed production of Natural gas, 1947–51 (average) and 1952–56 [1]

Year	Million cubic feet	Value at wells (thousand dollars)	Cents per thousand cubic feet	Year	Million cubic feet	Value at wells (thousand dollars)	Cents per thousand cubic feet
1947–51 (average)	777,255	36,991	4.8	1954	1,399,222	124,531	8.9
1952	1,237,143	82,889	6.7	1955	1,680,032	189,844	11.3
1953	1,293,644	106,079	8.2	1956	1,886,302	215,038	11.4

[1] Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

Offshore Developments.—At the end of 1956 an estimated $1.5 billion had been invested offshore by all oil operators. The cost of finding and developing 1 barrel of oil was estimated to be $14. Accumulated production income was estimated to be less than $250 million. Nearly 5 million acres of underwater lands had been leased and about 11 million feet of wells drilled. Approximately 87 percent of all offshore wells up through 1956 has been drilled in Louisiana.[6]

To some extent the extensive drilling program was to validate leases before their expiration dates. Also the supply of specialized offshore rigs improved, and over 100 mobile platforms, self-contained platforms and drilling tenders were operated offshore. A preference for mobile platforms for exploratory drilling developed. Self-contained platforms were expected to become more desirable for development drilling.[7] Water depth was an important consideration in selecting rigs.

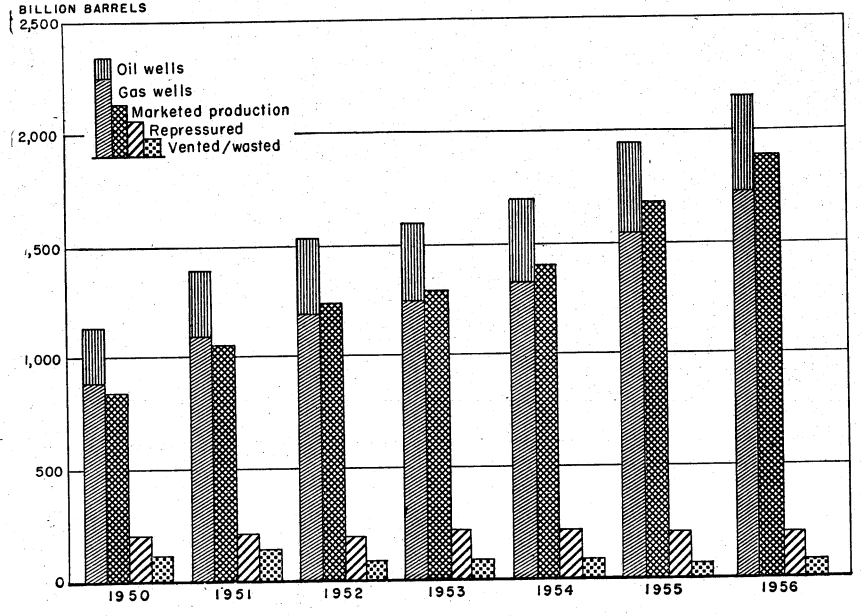

FIGURE 3.—Gross withdrawals and disposition of natural gas in Louisiana, 1950–56.

Among the operating problems were transportation of personnel and supplies to the rigs and costly servicing. The need for sizable production allowables to compensate for heavy investments created a financial problem.

Cumulative production in the offshore areas reached nearly 112 million barrels of crude petroleum and 431 billion cubic feet of natural gas by the end of 1956. For the year, 41 million barrels of oil and 137 billion cubic feet of natural gas were recovered.

[6] Petroleum Week, vol. 4, No. 8, Feb. 22, 1957, pp. 42-70 (special report on offshore activity).
[7] Work cited in footnote 6.

Offshore drilling, which had been halted several months during 1956 by court order, was resumed after an interim agreement was reached between the State of Louisiana and the Federal Government. The dispute involved the ownership of the rich tidelands in the Gulf of Mexico. Until a final decision by the Supreme Court, Louisiana is to control lands to 3½ miles out from its coast; the United States, lands over 30 miles from the coast. Both Louisiana and the Federal Government would approve permits for drilling in the area between 3½ and 30 miles from the coast. Royalties from drilling on existing leases would be held, pending the Court decision.

TABLE 12.—Consumption of natural gas, 1956, by uses

Use	Volume (million cubic feet)	Percent of total consumption	Average Louisiana value [1]	Average United States value [1]
Residential	39,634	4.7	64.5	91.3
Commercial	16,320	2.0	45.4	64.9
Field (drilling, pumping, etc.)	166,349	19.8	9.5	10.5
Carbon black	28,706	3.4	8.0	7.9
All other industrial (including electric utility plants)	588,384		15.4	25.3
Refinery fuel	104,915	12.5		
All other	483,469	57.6		
Total	839,393	100.0		

[1] Cents per thousand cubic feet at point of consumption.

TABLE 13.—Miles of utility gas mains for Louisiana by type of main, 1955–56

Type	1955	1956
Field and gathering	1,960	2,030
Transmission	8,850	9,740
Distribution	7,010	7,580
Total	17,820	19,350

[1] American Gas Association, Gas Facts: 1956, p. 59; 1957, p. 60.

Natural-Gas Liquids.—Following national trends, recovery of natural gasoline and cycle products declined during 1956, and production of liquefied petroleum gases increased. The total of all natural-gas liquids recovered in 24 parishes was 5.7 million gallons higher than in 1955. Because of a sharp increase in stocks during the year, the price of natural gasoline was depressed. Continued strong demand strengthened the market position of liquefied petroleum gases.

A $3 million natural-gasoline plant with a daily gas capacity of 20 million cubic feet was dedicated by Gulf Natural Gas Corp. near Oil City. Casinghead gas for processing was to be delivered from 1,700 wells in the Pine Island field in Caddo Parish.

Jefferson Lake Sulphur Co. completed a test run on its new Rotosorber process for separating liquid hydrocarbons from natural gas at its plant in St. Mary Parish. The plant had a daily rated capacity to process 40 million cubic feet of gas, with an expected daily yield of 5,000 gallons of natural gasoline and 5,000 gallons of butane and propane. Sunray Mid-Continent Oil Corp. placed its new cycling

plant on stream during the year at Northwest Branch, La. Plant capacity was 690 million cubic feet of natural gas a month, with expected production of 65,000 barrels of natural-gas liquids.

TABLE 14.—Natural-gas liquids produced, 1947–51 (average) and 1952–56

Year	Natural gasoline and cycle products		LP-gases		Total	
	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)
1947–51 (average)	573,005	42,468	219,768	10,275	792,773	52,743
1952	672,042	48,579	297,444	14,890	969,486	63,469
1953	665,532	55,421	287,280	12,654	952,812	68,075
1954	665,070	54,330	292,226	11,620	957,296	65,950
1955	782,328	59,158	291,138	10,323	1,073,466	69,481
1956	773,949	62,394	305,222	14,727	1,079,171	77,121

TABLE 15.—Sales of LP-gases, 1955–56, by uses

(Thousand gallons)

Use	Butane		Propane		Mixture		Total	
	1955	1956	1955	1956	1955	1956	1955	1956
Domestic	3,964	7,886	17,504	20,332	52,145	47,879	73,613	76,097
Gas manufacturing					110		110	
Industrial	500	3,830	5,336	8,897	5,059	3,787	10,895	16,514
Synthetic rubber	12,677	22,037			[1] 14,233	[1] 14,314	26,910	36,351
Chemical plants	10,715	5,137	45,934	1,919	131,434	177,018	188,083	184,074
Internal combustion	513	2,128	5,682	6,396	20,313	18,337	26,508	26,861
All other			5	9	69	192	74	201
Total	28,369	41,018	74,461	37,553	223,363	261,527	326,193	[2] 340,098

[1] Isobutane.
[2] Consumption of LP-gases as refinery fuel not included.

Petroleum.—Curtailment of crude-oil shipments from the Middle East, following closing of the Suez Canal, made it necessary for United States producers to increase exports to supply European and other consuming areas. In addition, a sizable increase in domestic demand added to the total requirements. Runs to refineries set new records. As a consequence, Louisiana production was the highest in history. The Louisiana Department of Conservation increased monthly allowables by the end of the year to over 29 million barrels. The 299-million-barrel recovery from 56 parishes was a record. By the end of 1956 offshore recovery was becoming substantial. According to the Louisiana Department of Conservation, about 13.5 percent of the State's total crude-oil production in 1956 was from the tidelands.

Richardson & Bass et al. set a new producing depth record at the wells drilled the previous year in Plaquemines Parish. The well, 1–L, Humble—L. L. & E., flowed 206 barrels of oil a day from the Miocene sands at depths of 21,443–21,465 and 21,419–21,435 feet, making it the deepest producer in the world.[8]

[8] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 147.

TABLE 16.—Production of crude petroleum, 1947–51 (average) and 1952–56

Year	Thousand barrels	Value		Year	Thousand barrels	Value	
		Total (thousand dollars)	Average per barrel			Total (thousand dollars)	Average per barrel
1947–51 (average)	194,732	496,802	$2.55	1954	246,558	722,370	$2.93
1952	243,929	645,090	2.64	1955	271,010	793,280	2.93
1953	256,632	721,150	2.81	1956	299,421	877,951	2.93

TABLE 17.—Indicated demand, production, and stocks of crude petroleum by months, 1955–56

(Thousand barrels)

Month	1955			1956		
	Indicated demand	Production	Stocks [1]	Indicated demand	Production	Stocks [1]
January	21,534	21,909	15,444	24,819	24,636	16,290
February	20,923	20,182	14,703	23,684	23,346	15,952
March	21,469	22,626	15,860	25,426	25,463	15,969
April	21,908	22,169	16,121	23,657	24,842	16,993
May	22,126	23,121	17,116	26,049	24,757	15,595
June	22,935	21,267	15,448	24,496	24,044	15,223
July	21,840	22,474	16,082	23,122	24,297	16,282
August	23,791	22,792	15,083	23,780	24,619	16,898
September	21,425	22,677	16,335	23,684	23,563	16,981
October	24,172	23,651	15,814	24,102	24,667	17,164
November	23,018	23,516	16,312	24,737	25,543	17,533
December	24,472	24,626	16,466	28,162	29,644	18,697
Total	269,613	271,010	----------	295,718	299,421	----------

[1] End-of-month figures.

TABLE 18.—Number of producing oil wells and average production per well, 1947–56

Year	Number of producing wells, as of Dec. 31	Average production per well per day (barrels)	Year	Number of producing wells, as of Dec. 31	Average production per well per day (barrels)
1947	8,700	52.4	1952	13,290	51.7
1948	9,770	53.7	1953	14,220	49.4
1949	10,890	50.6	1954	15,980	44.6
1950	11,860	50.4	1955	18,800	42.7
1951	12,490	52.3	1956	20,905	41.0

TABLE 19.—Production of crude petroleum, 1952–56, by districts and fields

(Thousand barrels)

District and field	1952	1953	1954	1955	1956 [1]
Gulf Coast:					
Anse la Butte	2,373	2,165	1,699	1,719	1,890
Avery Island	3,090	3,111	2,724	3,499	3,303
Bateman Lake					1,718
Barataria	2,876	2,351	1,628	1,358	1,103
Bay de Chene	1,288	1,302	1,208	1,456	1,609
Bay Marchand	2,004	1,560	2,430	2,933	3,539
Bay St. Elaine	2,733	3,194	3,130	3,315	3,188
Bayou Blue	1,156	1,158	1,060	955	931
Bayou Choctaw	600	893	1,171	1,293	1,176
Bayou Mallett	1,604	1,796	1,413	1,140	1,043
Bayou Sale	5,199	4,710	3,589	3,090	2,825
Bully Camp	1,250	1,640	1,353	1,767	1,623
Caillou Island	7,136	8,540	8,398	9,017	9,626
Charenton	1,176	1,278	1,223	1,234	1,426
Cox Bay	2,102	2,700	3,413	3,113	2,762
Delta Farms	6,751	6,480	5,456	4,810	4,493
Dog Lake	1,276	1,530	1,270	1,072	947
Duck Lake	2,269	2,935	3,199	3,329	2,916
East White Lake	1,427	1,479	1,179	1,390	1,390
Egan	2,041	2,017	2,117	2,225	2,529
Erath	1,179	1,370	1,152	964	919
Garden Island Bay	1,590	1,590	1,419	1,343	1,340
Gibson	1,498	1,410	1,140	1,020	919
Golden Meadows	4,546	3,918	3,974	3,784	3,452
Good Hope	2,288	2,045	1,446	1,208	1,087
Grand Bay	3,638	3,768	3,519	3,403	4,030
Gueydan	1,970	1,570	1,298	1,076	963
Hackberry	3,780	4,512	4,215	4,451	5,927
Horseshoe Bayou	1,303	1,394	1,097	871	836
Iberia					800
Iowa	2,513	2,842	2,701	2,465	2,214
Jeanerette	1,084	1,137	1,228	1,193	1,148
Jennings					1,024
Lafitte	4,467	4,650	3,686	3,323	2,935
Lake Arthur South					1,097
Lake Barre	417	599	1,056	1,363	1,723
Lake Chicot	1,104	1,072	1,021	1,031	1,009
Lake Fausse Point	468	576	823	1,344	1,499
Lake Pelto	2,456	2,697	2,324	2,421	2,652
Lake Salvador	1,843	1,831	1,415	1,370	1,391
Lake Washington	380	951	1,947	4,697	7,849
La Rose					1,095
Leeville	2,417	3,251	3,556	4,088	4,094
Little Lake	192	823	1,582	2,147	2,353
Lockport					908
Main Pass Block 69	2,445	4,287	4,981	6,354	8,417
North Crowley	1,390	1,504	1,273	1,299	1,168
Paradis	3,411	3,445	3,379	3,172	2,843
Phoenix Lake	1,507	1,781	1,778	1,533	1,367
Pine Prairie	984	955	864	885	927
Point-a-La Hache	2,746	2,689	2,451	2,168	1,999
Port Barre	1,285	1,327	1,056	925	852
Quarentine Bay	3,480	3,151	2,649	3,151	3,964
Romere Pass	3,641	4,570	4,719	3,913	3,485
St. Gabriel	2,095	1,778	1,278	1,047	825
Section 28	1,343	1,244	1,335	1,359	1,396
Shuteston					1,025
South Pass Block 24					8,208
Tepetate	2,647	2,149	1,722	1,692	1,706
Timbalier Bay	1,731	2,514	2,289	3,935	6,120
University	1,811	1,534	1,391	1,073	934
Valentine	902	1,252	1,379	1,684	1,802
Venice	5,965	5,728	5,364	4,903	5,117
Ville Platte	1,424	1,333	1,402	1,249	1,150
Vinton	3,786	3,618	2,712	2,352	2,203
Weeks Island	10,680	11,258	9,029	8,210	8,668
West Bay	3,123	3,132	2,525	2,423	3,326
West Cote Blanche Bay	2,830	2,865	2,380	2,016	1,891
West Lake Verrett	1,966	1,757	1,517	1,332	1,361
White Castle	1,563	1,343	941	763	786
Other Gulf Coast [2]	49,780	56,071	58,048	77,694	76,607
Total Gulf Coast	200,019	214,130	204,721	227,409	251,448

See footnotes at end of table.

TABLE 19.—Production of crude petroleum 1952–56, by districts and fields—Con.

(Thousand barrels)

District and field	1952	1953	1954	1955	1956 [1]
Northern:					
Big Creek	1,432	1,279	900	750	679
Caddo	5,111	5,438	8,251	9,111	8,417
Cotton Valley					1,407
Delhi	6,436	5,916	4,880	5,377	6,301
Esperance Point					1,684
Haynesville	5,008	4,445	3,694	3,234	2,859
Lake St. John	4,870	4,015	3,162	2,788	2,430
Nebo [3]	2,272	2,268	2,270	2,193	1,905
Olla [4]	2,203	2,106	1,934	1,709	1,626
Rodessa	934	868	784	793	751
Sligo	859	879	966	1,030	1,043
Urania					786
Other Northern [2]	14,785	15,288	14,996	16,616	16,613
Total Northern	43,910	42,502	41,837	43,601	46,501
Total Louisiana	243,929	256,632	246,558	271,010	297,949

[1] Preliminary figures.
[2] Includes crude oil consumed on leases and net change in stocks held on leases for entire district.
[3] Includes Hemphill, Trout Creek, and Jena.
[4] Includes Little Creek and Summerville.

Refineries.—Crude-oil capacity of Louisiana refineries at the end of the year was 730,650 barrels per day. Cracked-gasoline capacity was 202,910 barrels per day. The expansion and modernization of Louisiana refineries continued. As a part of a multi-million-dollar expansion program at its Meraux refinery, Ingram Products Co. placed a 3,000-barrel platformer on stream for production of high-octane gasoline. Bay Petroleum Corp. completed installing a 5,000, barrel-per-day platformer unit and made additions and alterations to its New Orleans refinery's crude and catalytic cracking units. Construction began on a $6,250,000 coking unit by Continental Oil Co. adjacent to its Lake Charles refinery. The plant was designed to produce 85,000 tons of coke annually.

TABLE 20.—Production at Louisiana Gulf Coast refineries, 1956

Product	Thousand barrels	Product	Thousand barrels
Gasoline	128,253	Coke	2,853
Kerosine	20,081	Asphalt	5,316
Distillate fuel oil	66,197	Road oil	1
Residual fuel oil	19,089	Still gas	9,105
Jet fuel	6,867	Liquefied gases	11,509
Lubricants	6,295	Miscellaneous	1,600
Wax	672		

TABLE 21.—Capacity of petroleum refineries and cracking plants at end of 1956

(Barrels per day)

Company	Location	Crude-oil capacity, operating	Cracked-gasoline capacity, operating
Inland:			
Bayou State Oil Corp	Hosston	1,000	
Calumet Refining Co	Princeton	950	
Cotton Valley Solvents, Inc	Cotton Valley	5,000	
Great National Refining Corp	Ida	800	
Gulf:			
American Oil Co	Destrehan	35,500	9,000
Bay Petroleum Corp	Chalmette	22,000	8,500
Breaux Bridge Oil Refining Co	Anse La Butte	[1]	[2]
Canal Refining Co	Church Point	[3] 900	700
Cities Service Refining Corp	Lake Charles	185,000	54,400
Clark Oil & Refining Corp	Marrero	7,500	975
Continental Oil Co	West Lake (Lake Chas.)	52,000	16,085
Esso Standard Oil Co	Baton Rouge	[4] 308,000	[5] 81,700
Evangeline Refining Co., Inc	Jennings	2,000	
Ingram Products Co	Meraux	15,000	5,550
Shell Oil Co	Norco	95,000	26,000
Total		730,650	202,910

[1] In addition 1,000 barrels per day, shut down.
[2] In addition 780 barrels per day, shut down.
[3] In addition 200 barrels per day, building.
[4] In addition 2,000 barrels per day, shut down.
[5] In addition 1,700 barrels per day, shut down.

TABLE 22.—Sales of petroleum products, 1952–56

(Thousand barrels)

Product	1952	1953	1954	1955	1956
Gasoline [1]	15,510	16,742	17,572	19,961	20,872
Kerosine	1,572	1,425	1,348	1,228	1,207
Range oil	764	664	675	648	742
Distillate fuel oil	5,840	6,212	6,242	7,385	7,653
Residual fuel oil	10,422	9,929	9,710	10,601	10,804

[1] Gasoline consumption from American Petroleum Institute.

TABLE 23.—Sales of distillate and residual fuel oils, 1955–56, by uses

(Thousand barrels)

Use	Distillate fuels		Residual fuels	
	1955	1956	1955	1956
To railroads	1,223,000	1,270,000	57,000	11,000
To vessels (including tankers)	2,088,000	2,181,000	8,592,000	8,834,000
To gas and electric power plants	63,000	54,000	32,000	23,000
Industrial (excluding oil company use)	656,000	640,000	647,000	671,000
Oil-company fuel	195,000	240,000	470,000	391,000
Light heating oils	659,000	689,000		
Heavy heating oils			571,000	625,000
To military	465,000	494,000	140,000	142,000
Miscellaneous uses	1,959,000	1,986,000	92,000	107,000
Range oil No. 1	77,000	99,000		
Total	7,385,000	7,653,000	10,601,000	10,804,000

Petrochemicals.—The industrial picture in Louisiana during 1956 was dominated by the unabated growth of the chemical industry. The Gulf Coast region of Texas and Louisana was rapidly becoming one of the most important chemical-producing areas in the world and was the source of an estimated four-fifths of all petrochemicals being produced in the Nation. Because of abundant raw-material supplies, Louisana was expected to hold a leading position in the future growth of the industry.

Several petrochemical complexes had begun to appear in the State; these were groups attracted together by supplies of natural gas and refinery-waste gases. The evolving cluster at Lake Charles, where Cities Service Refining Corp. and Continental Oil Co. refineries supplied raw materials was illustrative of the trend. Butadiene made from refinery gases by Petroleum Chemical, Inc., was being used at the adjacent Firestone Tire & Rubber Co. plant for manufacturing synthetic rubber. Expansion programs at both plants raised butadiene capacity 15,000 tons and synthetic rubber by 40,000 tons. Petroleum Chemical, Inc. (owned jointly by Cities Service Refining Corp. and Continental Oil Co.) began constructing two new plants for further use of refinery gases. Hydrogen developed by the refinery re-forming units would be used at 1 plant for manufacturing 100,000 tons of anhydrous ammonia a year. At another plant ethylene would be produced from refinery gases for conversion to ethylene glycol and other chemical products.

Most chemical activity was centered along the Mississippi River from Baton Rouge to New Orleans. Attracted by abundant supplies of ethylene from the huge refinery of Esso Standard Oil Co. at Baton Rouge, Wyandotte Chemicals Corp. began constructing an $8-million ethylene oxide plant with an annual capacity of 60,000 pounds a year for production of ethylene glycol. W. R. Grace broke ground for a plant to use Esso ethylene for low-pressure production of polyethylene, which will be used in a variety of plastic products.

Monsanto Chemical Co. started to build an adipic acid plant at the Barton ammonia plant at Luling. Ethyl Corp. announced plans for a plant at Baton Rouge for producing vinyl chloride monomer to be used in the manufacture of plastics. Operations were begun at American Cyanamid Co.'s new monomethyl styrene plant at its facilities near Avondale. A series of further expansions was anticipated for this petrochemical operation. At Norco, Shell Chemical Co. planned a 40-million-pound-a-year methyl-ethyl ketone plant.

Synthetic sodium nitrate continued to be produced at Lake Charles by Olin-Mathieson Chemical Corp. This plant was 1 of only 2 such plants in the country. In addition to the anhydrous ammonia plant under construction at Lake Charles, there were similar plants at Avondale, Sterlington, and Luling, as well as the existing plant at Lake Charles.

NONMETALS

The nonmetals produced in Louisana are classified into two types—chemical and construction materials. The chemical materials (sulfur, lime, and salt) follow the trends in the chemical and chemical-using industries. The volume of construction materials (clays, gypsum,

cement, sand and gravel, stone, and shell) depends on residential, commercial, and industrial construction.

In the 10-year period 1947–56 the trends in value of new construction and value of mineral construction materials produced in the State paralleled each other, both nearly tripling. In 1956 the total value of construction minerals in Louisana was approximately $34 million. Highway construction used large quantities of cement, sand and gravel, stone, and shell. The overall effect was an increase in raw material requirements for highways. Although maintenance expenditures remained about the same as in 1955, highway-construction expenditures for contracted work increased 47 percent to a total of over $71 million.

Because of the stimulus of new construction in the State in 1956, production of construction materials was one-sixth greater than in 1955. High activity in industrial building, particularly in the Baton Rouge-New Orleans area, were expected to maintain a strong market demand for construction materials.

Expenditures for industrial, commercial, and public works were the largest part of total construction in 1956. Tonnagewise, this type of construction consumes the greatest quantity of the bulk mineral construction materials. Total contracts awarded for construction in 1956 were 2.4 percent greater than in 1955. This increase would have been much more pronounced, had it not been for a rather sharp decline in contracts for residential construction. Figures for construction awards by types follow:[9]

Type	Value of construction contracts awarded		Change, percent
	1955	1956	
Residential	$191,682,000	$167,653,000	−12.5
Nonresidential	181,769,000	206,844,000	13.8
Public works and utilities	238,724,000	252,176,000	5.6
Total	612,175,000	626,673,000	2.4

National trends for the consumption of chemical raw materials in 1956 generally continued upward in both the inorganic and organic chemical industries. Of the inorganic raw materials, salt and sulfur were in the greatest demand in the State. Louisiana sulfur shipments, although greater than in 1955, were limited because consumption of sulfuric acid remained virtually unchanged in the 2 years, and Mexican sulfur began competing.

Two new electrolytic caustic-chlorine plants were established in Louisiana to use salt as a raw material. The caustic soda was expected to be used mainly by the growing alumina industry of the State. In recent years the electrolytic process coproduct, chlorine, has grown in demand. A large user of chlorine is the pulp and paper industry. The rapid growth of the pulp and paper industry in the Midsouth, particularly in northern Louisiana, also represented a ready market for the gas as the plants were completed.

[9] Dodge Statistical Research Service in Louisana Business Review, vol. 21, No. 2, February 1957, p. 15.

A number of mineral-processing plants operating in Louisiana were supplying local markets and using raw materials imported from other States. These included 2 barite-grinding plants, 2 perlite-expanding plants, and 1 plant for exfoliating vermiculite.

Barite.—The vast drilling program of the petroleum industry in South Louisiana so augmented the demand for barite for drilling muds that Magnet Cove Barium Corp. constructed a new barite-grinding mill at Lake Charles. The mill used both domestic and imported ores in 1956. The same company had operated a grinding mill at New Orleans several years.

Cement.—Consumption of cement in Louisiana during 1956 followed the trend of the previous 2 years, increasing at double the rate of the Nation as a whole. Production at the State's two cement plants increased to help meet this demand. The addition of a fifth kiln and related mills, slurry tanks, etc., and increased storage capacity was completed by midyear at the Baton Rouge plant of Ideal's Cement Co. The plant, originally designed for sintering bauxite, would be economically more efficient after a few additional modifications were completed. Work continued on construction of a new cement plant on the Calcasieu River channel near Lake Charles by the Lone Star Cement Co. Proposed cement capacity of this plant was 2 million barrels a year, based on oyster-shell as raw material.

TABLE 24.—Shipments of finished portland cement into Louisiana from mills, 1947–51 (average) and 1952–56

Year	Louisiana, thousand barrels	Change in Louisiana, percent	Change in United States, percent	Year	Louisiana, thousand barrels	Change in Louisiana, percent	Change in United States, percent
1947–51 (average)	4,155	+15.7	+7.7	1954	6,292	+9.2	+5.7
1952	5,869	+11.1	+4.3	1955	7,340	+16.7	+6.4
1953	5,759	−1.9	+4.1	1956	8,507	+16.0	+6.0

Clays.—The use of clays in Louisiana was divided equally between lightweight aggregate, structural clay products, and portland cement. During 1956 there were 12 brick plants in 11 parishes. The output of clay recovered strongly from the decline of the previous year to an all-time high of 785,000 tons. Production of clay for structural-clay products declined with residential construction, but a substantial increase of lightweight aggregate at plants at Erwinville and Alexandria caused the overall increase over 1955.

A modernization program at the Dixie Brick, Inc., plant at Natchitoches was expected to boost the daily capacity to 40,000 brick as compared with the existing output of 30,000 brick. The modernization program included installation of an electrically operated production-equipment system, replacing a gasoline-power system that had been in use for the past quarter century. The plant produced building brick.

Gypsum.—In April 1956 National Gypsum Co. began operating its new gypsum-products plant at Westwego on a 20-acre tract in Jefferson Parish 15 miles northeast of New Orleans. Gypsum was imported from Jamaica for manufacture of gypsum lathing, wallboard, base-coat plasters, and other construction products.

TABLE 25.—Miscellaneous clay sold or used by producers 1947–51 (average), and 1952–56 [1]

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	269,518	$224,270	1954	713,940	$940,940
1952	390,136	433,808	1955	651,268	659,099
1953	614,427	901,612	1956	785,283	785,283

[1] Excludes bentonite.

At Winnfield, Anderson & Dunham, Inc., mined crude gypsum for use as a cement retarder and for road construction and maintenance. The quantity produced declined 18 percent.

Lime.—Olin Mathieson Chemical Corp. produced lime from oystershell for use in industrial chemicals at its chemical plant at Lake Charles.

Perlite.—Lightweight plaster and concrete aggregate were manufactured at Bossier City and New Orleans from crude perlite shipped into the State.

Salt.—Recovery of salt in Louisiana in 1956 increased for the fifth consecutive year to 3.7 million tons—4 percent higher than 1955. The State ranked fourth in the Nation in recovery of salt. A larger output of rock salt largely accounted for the additional production. About three-fourths of Louisiana salt was used for manufacturing chlorine, soda ash, and other industrial chemicals. Of all salt produced, 70 percent was consumed in Louisiana for industrial and other purposes.

Sixty-two percent of the total salt was recovered from wells as liquid brines. These brines were used at Lake Charles by Olin Mathieson Chemical Corp. for manufacturing soda ash and Columbia-Southern Chemical Corp. for producing chlorine. At North Baton Rouge the Solvay Process Division of Allied Chemical & Dye Corp. made soda ash, chlorine, and other chemicals from brines from wells near Plaquemine. Most Louisiana rock salt was shipped to States in Southern and Southwestern United States.

Production was concentrated in the vicinity of Weeks, Avery, and Jefferson Island on the coastal waterway and at Winnfield in Winn Parish.

Wyandotte Chemicals Corp. decided to erect a large electrolytic chlorine-caustic soda plant at Geismar in Ascension Parish. Selection of the site was based on enormous supplies of salt from several nearby domes, abundant natural gas and electric power, and the Mississippi River as a natural means of access up and down the central region and to the sea. The plant was to be built adjacent to the new company ethylene oxide plant. Part of the caustic was committed to Olin Revere Metals Corp. alumina plant to be erected at Burnside.

At Gramercy Kaiser Aluminum & Chemical Corp. planned to construct a caustic-chlorine plant to supply caustic soda for its new alumina plant at that site. The plant was of the diaphragm-cells type, for electrolytic reduction of salt into soda ash and chlorine. The coproduct—chlorine—would be marketed.

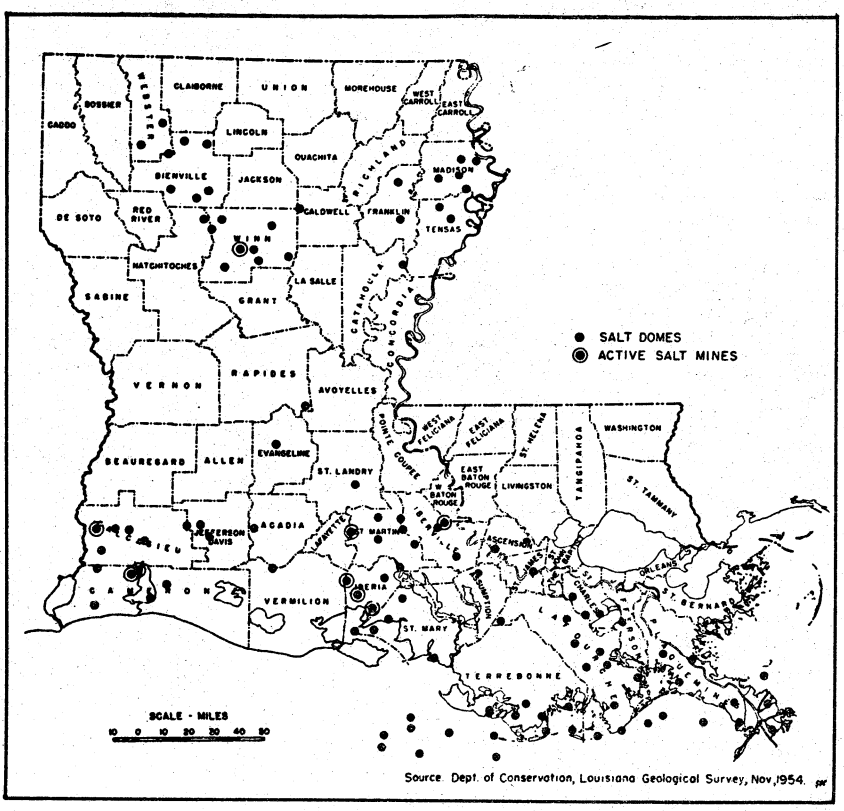

FIGURE 4.—Location of salt domes in Louisiana.

TABLE 26.—Salt sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	2, 244, 933	$6, 549, 195	1954	3, 088, 686	$11, 101, 456
1952	2, 553, 448	7, 807, 693	1955	3, 562, 636	15, 406, 993
1953	3, 061, 234	9, 189, 526	1956	3, 703, 500	17, 695, 270

TABLE 27.—Production of salt, 1955–56, by types

Type	1955		1956	
	Short tons	Value	Short tons	Value
Evaporated salt	110, 218	$1, 743, 445	121, 900	$1, 995, 188
Rock salt	1, 198, 299	7, 602, 698	1, 293, 784	8, 515, 502
Brine	2, 254, 119	6, 060, 850	2, 287, 816	7, 184, 580

With the probable influx of chemical industries into Louisiana, the economically situated salt domes will become more promising mineral resources. There were 110 known salt domes in Louisiana, as reported by the Department of Conservation of Louisiana, in November 1954.

Sand and Gravel.—The 15-percent increase in sand and gravel production during 1956 reflected the rapid growth of construction in the area. Of the more than 3 million tons of sand recovered, 38 percent was consumed in Louisiana as structural sand, 56 percent was used as paving sand, and the remaining 6 percent was used as molding, blast, and filter sand and for railroad ballast. Over 6 million tons of gravel was produced; 37 percent went into concrete, 60 percent was used as paving gravel, and the remaining 3 percent was employed for railroad ballast and other purposes. In all, there were 53 commercial sand and gravel operations in 23 parishes. Most of the sand and gravel production lies north of an east-west line across the State from Baton Rouge.

TABLE 28.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Commercial		Government-and-contractor		Total		
	Short tons	Value	Short tons	Value	Short tons	Value	
						Total	Average per ton
1947–51 (average)	4,954,003	$5,807,734	255,525	$96,341	5,209,528	$5,904,075	$1.13
1952	5,788,098	6,660,994	217,021	75,530	6,005,119	6,736,524	1.12
1953	4,305,597	5,090,598	232,790	71,650	4,538,387	5,162,248	1.14
1954	7,641,229	9,592,566	268,923	94,069	7,910,152	9,686,635	1.22
1955	8,338,015	10,758,658	236,005	183,202	8,574,020	10,941,860	1.28
1956	9,578,520	12,073,156	253,923	85,272	9,832,443	12,158,428	1.24

Stone.—The relative scarcity of good-quality or economically located stone has forced Louisiana to rely on abundant supplies of clam- and oyster-shell from lakebeds and coastal reefs. More than half of all shell produced in 1956 was clamshell. Oystershell was considered preferable to clamshell for many chemical uses and for making cement because of its grinding characteristics. Basically, clamshell was used for aggregate and paving. It also was used for neutralizing industrial waste solutions. Over one-fourth of all shell produced was used in Louisiana for manufacturing cement and lime. Large quantities of shell also were used for concrete aggregate and road material.

At New Orleans artificially colored roofing granules were produced by the Flintkote Co.

Sulfur.—Notable events in the Louisiana sulfur industry in 1956 included preliminary development of Freeport Sulphur Co. Lake Pelto deposit and the announcement of plans by Freeport to operate the newly discovered Grand Isle deposit. The Lake Pelto property lies in shallow waters in the tideland, 60 miles southwest of New Orleans. Grand Isle, discovered by Humble Oil Co. during exploratory drilling for oil, was considered one of the largest sulfur discoveries

of recent years. Located in 45 feet of water 6 miles from the nearest land, the deposit would be the first completely offshore sulfur operation in history. Freeport Sulphur Co. entered into an agreement to operate the property under a profit-sharing plan with Humble. Other mines recovering sulfur during the year were Grand Ecaille, Bay Ste. Elaine, Garden Island Bay, Chacahoula, and Starks Dome.

Consumption and production of sulfur reached new highs. Recovery of Frasch sulfur in Louisiana was 17 percent greater than in 1955. The increased shipments of sulfur from Louisiana, although not as large as the increased production, were good in view of a decline in Texas shipments and in the face of new Mexican competition.

Freeport Sulphur Co. installed new docking facilities at Port Sulphur. At this port liquid sulfur from Grand Ecaille, Bay Ste. Elaine, and Garden Island Bay was either to be solidified in storage bins or kept liquid in heated tanks. At the shipping point a new loading machine enabled the operator to load a ship or barge in half the time normally required. Facilities were installed in 1955 for loading molten sulfur to meet the increasing demand for liquid sulfur.

TABLE 29.—Sulfur produced and shipped from Frasch mines, 1947–51 (average) and 1952–56

Year	Production (long tons)	Shipments		
		Long tons	Value	
			Total	Average per ton
1947–51 (average)	1,114,033	1,077,590	$20,374,000	$18.91
1952	1,508,550	1,449,668	32,015,000	22.08
1953	1,640,571	1,609,364	43,453,000	27.00
1954	2,009,553	1,853,563	49,222,394	26.56
1955	2,081,261	2,072,418	58,027,704	28.00
1956	2,429,490	2,238,852	59,329,579	26.50

Vermiculite.—Zonolite Co. exfoliated vermiculite in New Orleans from crude material shipped to Louisiana from other States. This mineral was used as a lightweight construction material.

Water.—Louisiana ranked 10th in the Nation in the use of industrial waters. Industrial water use rose from 1,940 million gallons daily in 1950 to 3,750 million in 1955. Forty percent of the industrial water was used for the generation of power. New Orleans used 1,370 million gallons daily; Baton Rouge 813 million gallons daily; and Lake Charles 567 million gallons daily. One industrial plant in New Orleans used five times as much water as was delivered by the New Orleans' municipal water-supply system. The aluminum, oil-refining, and chemical industries were responsible for the large consumption of water in the State, and further increases in water consumption were expected as industry growth occurs. The State, however, is blessed with an abundant supply of suitable waters for industrial use. At Baton Rouge, for example, the average flow of the Mississippi River is 312 billion gallons daily. Louisiana also has abundant supplies of under-

ground water. The following table shows the major consumption of industrial water in 1955.[10]

Purpose	Total used, million gallons daily
Steam power	1,574
Alumina reduction	515
Oil refining	426
Chemical manufacturing	423
Sugar refining	383
Papermaking	122
Other	304
Total	3,747

METALS

Aluminum.—Two major developments during 1956 were noteworthy. Kaiser Aluminum & Chemical Corp. began constructing a 500,000-ton alumina plant at Gramercy, midway between New Orleans and Baton Rouge, at an estimated cost of $60 million. A deep-water dock was to be constructed to accommodate specially built ore carriers bearing Jamaica ores. Kaiser was erecting another plant at Gramercy for producing soda ash from nearby salt deposits (soda ash is used in producing alumina). After completion of the project, Kaiser then would have alumina plants at Baton Rouge and Gramercy and, in addition to two reduction plants in Washington, a reduction plant at Chalmette near New Orleans. The added alumina will be used to supply the new Kaiser plant at Ravenswood, W. Va. At Chalmette construction was begun on a ninth potline, which would raise capacity of aluminum metal 27,500 tons to 247,500 tons per year.

At Burnside, just north of Gramercy, Olin Revere Metals Corp. prepared to erect a 345,000-ton alumina plant. The alumina from this plant will be shipped up the Mississippi River to Clarington, Ohio. The plant will have an initial annual capacity to process 700,000 tons of bauxite into 345,000 tons of alumina. Plans also were made to build three large bauxite ore carriers to haul raw ore from Dutch Guiana to a projected plant-site dock.

Louisiana has become a leader in the production of alumina and in the aluminum industry because of the availability of the waterway to import ores and ship finished alumina, abundant fuel, and local economically available salt to produce soda ash. The increasing importance of Jamaican bauxite for alumina production in this country augments this leading position.

Nickel and Cobalt.—Promising results from pilot-plant reduction of nickel and cobalt ores received from Moa Bay, Cuba, by Freeport Sulphur Co. led to a company decision to build a commercial plant at Braithwaite, La. Orignial estimates of annual capacity were 30 million pounds of nickel and 3 million pounds of cobalt. These capacity figures were subject to upward revision, pending negotiation of a Government purchasing contract.

[10] Louisiana Department of Public Works, Water: Baton Rouge, La., 1956, pp. 5, 8–10, 16.

REVIEW BY PARISHES

Geographically, mineral production was well distributed among the parishes. Of the 64 parishes in the State, 62 produced 1 or more of the minerals recovered. Gaseous and liquid hydrocarbons were produced in 58 parishes and other minerals in 40. In value of production, however, mineral production was concentrated. Over one-third of the value of all minerals produced in Louisiana during 1956 was from Plaquemines, Lafourche, and Terrebonne Parishes. Sixty-three percent of the value was produced in the top 10 parishes.

TABLE 30.—Value of mineral production in Louisiana, 1955–56, by parishes[1 2]

Parish	1955	1956	Change, percent	Minerals produced in 1956 in order of value
Acadia	$42,725,285	$48,815,704	14	Petroleum, natural gas, natural-gas liquids.
Allen	4,937,427	6,425,890	30	Petroleum, natural gas.
Ascension	695,274	620,419	−11	Do.
Assumption	4,066,515	4,788,213	18	Do.
Avoyelles	3,521,279	3,302,576	−6	Petroleum, natural-gas liquids, natural gas.
Beauregard	11,724,869	12,967,393	11	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Bienville	4,188,064	4,794,971	14	Natural gas, petroleum, natural-gas liquids, clays.
Bossier	23,403,541	25,913,404	11	Natural gas, petroleum, natural-gas liquids, sand and gravel.
Caddo	46,138,322	38,511,466	−17	Petroleum, natural gas, natural-gas liquids, sand and gravel, clays.
Calcasieu	41,770,020	42,251,350	1	Petroleum, natural gas, salt, sulfur, natural-gas liquids, lime.
Caldwell	289,971	311,954	8	Natural gas, petroleum.
Cameron	43,325,279	53,504,104	23	Petroleum, natural gas, salt, oystershell.
Catahoula	2,541,187	3,389,504	33	Petroleum, sand and gravel, natural gas.
Claiborne	26,117,086	25,913,705	−1	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Concordia	14,827,095	15,490,115	4	Petroleum, natural gas.
De Soto	4,424,050	7,561,434	71	Natural gas, petroleum.
East Baton Rouge	12,855,612	12,828,342	----------	Cement, petroleum, natural gas, clays, sand and gravel, sulfur, stone.
East Carroll	1,359	----------	----------	
East Feliciana	(3)	(3)	----------	Sand and gravel.
Evangeline	13,286,533	13,257,838	----------	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Franklin	2,245,409	2,823,163	26	Petroleum, natural gas.
Grant	457,354	952,554	108	Sand and gravel, petroleum, natural gas.
Iberia	56,449,768	59,750,389	6	Petroleum, salt, natural gas, clays, sand and gravel.
Iberville	20,339,756	21,223,185	4	Petroleum, salt, natural gas, natural-gas liquids.
Jackson	71,531	54,652	−24	Natural gas.
Jefferson	34,925,550	35,437,118	1	Petroleum, natural gas, oystershell, natural-gas liquids.
Jefferson Davis	23,635,089	27,355,476	16	Petroleum, natural gas, sand and gravel, natural-gas liquids.
Lafayette	1,259,649	2,525,973	101	Petroleum, natural gas, clays.
Lafourche	94,244,360	100,513,925	7	Petroleum, natural gas, sulfur, oystershell.
La Salle	17,529,383	16,081,583	−8	Petroleum, natural gas, sand and gravel.
Lincoln	15,539,861	18,233,772	17	Natural-gas liquids, natural gas, petroleum, clays.
Livingston	418,006	400,367	−4	Petroleum, sand and gravel, natural gas.
Madison	1,473,650	1,449,896	−2	Petroleum, natural gas.
Morehouse	1,787,405	1,815,936	2	Natural gas, petroleum, sand and gravel.
Natchitoches	334,305	273,702	−18	Petroleum, natural gas, clays.
Orleans	7,689,058	7,554,511	−2	Cement, oystershell, clays, sand and gravel, petroleum, natural gas.
Ouachita	3,129,725	3,325,549	6	Natural gas, sand and gravel, petroleum, natural-gas liquids, clays.
Plaquemines	214,536,374	260,398,432	21	Petroleum, sulfur, natural gas.
Pointe Coupee	7,390,674	6,864,429	−7	Petroleum, natural gas, clays.
Rapides	2,866,086	2,815,667	−2	Petroleum, sand and gravel, natural-gas liquids, clays, natural gas.
Red River	764,814	529,034	−31	Petroleum, natural gas.
Richland	16,296,225	18,506,549	14	Petroleum, natural-gas liquids, natural gas.
Sabine	386,505	388,823	1	Petroleum.
St. Bernard	202,906	438,584	116	Oystershell, petroleum, natural gas.

See footnotes at end of table.

TABLE 30.—Value of mineral production in Louisiana, 1955–56, by parishes[1 2]—Continued

Parish	1955	1956	Change, percent	Minerals produced in 1956 in order of value
St. Charles	$23,923,298	$23,560,585	−2	Petroleum, natural gas, natural-gas liquids, oystershell.
St. Helena		[3]		Sand and gravel.
St. James	5,030,377	4,807,564	−4	Petroleum, natural gas, oystershell.
St. John the Baptist	332,909	264,427	−21	Natural gas, petroleum.
St. Landry	32,442,141	36,372,640	12	Petroleum, natural-gas liquids, natural gas.
St. Martin	40,039,812	40,394,993	1	Petroleum, natural gas, salt, natural-gas liquids, oystershell.
St. Mary	56,113,795	65,302,139	16	Petroleum, natural gas, natural-gas liquids, oystershell.
St. Tammany	1,707,409	1,820,551	7	Oystershell, sand and gravel, natural gas, petroleum clays.
Tangipahoa	1,303,081	782,385	−40	Sand and gravel, clays.
Tensas	6,283,039	8,020,206	28	Petroleum, natural gas.
Terrebonne [4]	86,461,459	94,780,432	10	Petroleum, natural gas, natural-gas liquids, sulfur.
Union	9,067,183	9,572,932	6	Natural gas, natural-gas liquids, petroleum.
Vermilion	36,872,230	42,311,729	15	Petroleum, natural gas, natural-gas liquids.
Washington	830,805	1,041,305	25	Sand and gravel, natural gas, petroleum.
Webster	27,894,266	29,666,620	6	Petroleum, natural-gas liquids, natural gas, sand and gravel.
West Baton Rouge	1,064,553	930,986	−13	Petroleum, natural gas.
West Carroll	334,981	473,796	41	Natural gas.
West Feliciana		907,028		Sand and gravel.
Winn	2,235,447	2,291,546	3	Salt, gypsum, petroleum, natural gas.
Undistributed	1,749,113	8,185,908		
Total [5]	1,156,637,000	1,281,849,000		

[1] Vernon Parish not listed because no production was reported.
[2] Value of petroleum, natural gas, and natural-gas liquids by parishes based on data from Louisiana Department of Conservation, Annual Oil and Gas Report, 1956.
[3] Figure withheld to avoid disclosing individual-company confidential data; value included with "Undistributed."
[4] Sulfur value not included.
[5] Total has been adjusted to eliminate duplicating value of clays, stone, and shell.

Acadia.—Petroleum recovery in Acadia Parish, was 11 percent higher than in 1955; natural gas was 18 percent greater. At two natural-gasoline and cycle plants at Church Point and the cycling plant at Egan, over $3 million of natural-gas liquids was extracted from natural gas. The Canal Refining Co. skimming and cracking plant at Church Point had a daily crude-oil capacity of 900 barrels and a cracking capacity of 700 barrels of gasoline. The expansion program was expected to add 200 barrels of crude-oil capacity. South Mermentau and South Rayne gasfields were discovered during 1956 in Acadia Parish.

Beauregard.—Crude petroleum, natural-gas liquids, natural gas, and sand and gravel, in order of value, were produced during the year. Two natural-gasoline and cycle plants recovered natural-gasoline and liquefied-petroleum products in Beauregard Parish—1 at Merryville using the absorption process and 1 at Longville using the compression process. The 10.6 billion cubic feet of natural gas and 3.5 million barrels of crude petroleum recovered represented gains of 6 and 9 percent, respectively.

Building sand and paving gravel were recovered by the C. A. Arnold Sand and Gravel Co. portable plant at Merryville. H. W. Holeman Sand and Clay Co. also produced paving gravel.

Bossier.—The Bossier Parish Police Jury produced gravel for public-highway construction during 1956. Expanded perlite was manufactured at Bossier City by Southwestern Perlite Co. for plaster and other

lightweight structural uses. Natural-gasoline and cycle products produced at 2 plants in Haughton and 1 at Benton were valued at $3.8 million. Crude-petroleum recovery increased 6 percent to 3.4 million barrels. Alden Bridge, Bolinger, and Crossway Bayou oilfields were discovered during the year. Natural-gas output (101 billion cubic feet) was 2 percent higher than in the preceding year. Calumet Refining Co. operated a lube-asphalt refinery at Princeton that had a capacity of 950 barrels of crude oil daily.

Caddo.—Building brick was manufactured by the Arklatex Face Brick Co. near Mooringsport from clays produced locally. The plant was shut down temporarily in December 1956. In the vicinity of Shreveport the Meriwether Sand Co., Inc., operated a dredge for producing washed and screened sand and gravel, which was used in building and highway construction. The 10.5 million barrels of crude petroleum recovered in 1956 constituted about four-fifths of the total value of minerals produced in the parish. Output of natural-gasoline and cycle products from the nine plants in the parish was valued at $3 million. Natural-gas recovery of 41 billion cubic feet in 1956 represented an increase of 46 percent. A new gas field (Metcalf) was discovered in June. The Hosston and Ida refineries operated during the year with a daily combined capacity of 1,800 barrels of crude oil.

Calcasieu.—Quicklime for manufacturing alkalies was produced from oystershell in the rotary kilns of the Olin Mathieson Chemical Corp. at its plant near Lake Charles. Brines were used at this plant for the manufacture of soda ash.

Frasch sulfur was produced by Jefferson Lake Sulphur Co. from its mine at Starks Dome, 6 miles south of Starks. Sulfur also was recovered by the contact method by Cities Service Refining Corp., both as sludge sulfur from refining and from hydrogen sulfide in the liquid purification of gas.

Salt brines for manufacturing chlorine were produced from wells in salt domes in the parish by Columbia-Southern Chemical Corp.

The 1956 value of natural-gasoline and cycle products, recovered at absorption plants in Lake Charles and Iowa, was $2.3 million. Natural-gas value increased 6 percent, but the value of crude petroleum declined 4 percent. Carbon black was produced at a furnace-black plant at West Lake. Cities Service Refining Corp. and Continental Oil Co. operated refineries in Lake Charles, which had a combined capacity of 237,000 barrels of crude oil daily and a cracking capacity of 70,485 barrels of gasoline daily. Two new gasfields were discovered in the parish during 1956.

At a newly constructed plant at Lake Charles, Magnet Cove Barium Corp., ground barite for use as a weighting material in oil-well drilling muds. Work continued on the Lone Star Cement Co. new cement plant near Lake Charles. Construction of a new anhydrous ammonia plant and an ethylene plant was planned near Lake Charles.

Cameron.—Natural gas from Cameron Parish increased 27.5 percent to 153 billion cubic feet. Crude-petroleum recovery was 19 percent higher. Three new gasfields and the Grosse Savanne oilfield were discovered in 1956.

At Hackberry Olin Mathieson Chemical Corp. produced salt from wells for making soda ash. Reef shell from coastal waters was recovered in the parish.

Claiborne.—Petroleum, natural gas, natural-gas liquids, and sand and gravel were produced in Claiborne Parish in 1956. Five plants recovered $4 million worth of natural-gasoline and cycle products. The value of crude petroleum declined 2 percent for a production of 5.7 million barrels; natural-gas decreased 18 percent for a production of 45 billion cubic feet. Gravel used for road construction was produced by George H. Owens at his plant in Arcadia. A new oilfield, Northwest Colquitt, was discovered in mid-October.

Condordia.—Nearly 5.2 million barrels of crude petroleum and 3.7 billion cubic feet of natural gas were obtained in 1956. Quantitatively, this was an increase of 6 percent and a decrease of 8 percent, respectively.

East Baton Rouge.—Miscellaneous clay for manufacturing brick was mined by the Acme Brick Co. at Baton Rouge. Ideal Cement Co. produced clay as a raw material for manufacturing cement at its Baton Rouge plant. Oystershell was used as the basic material for producing general-use, high-early-strength, and masonry cements at the Ideal Cement plant. A new kiln, raw mill, and finish mill were installed in May 1956.

Consolidated Chemical Industries, Inc., recovered sulfur as a byproduct in the liquid purification of gas by the Claus process at its Baton Rouge plant.

Sand and gravel was produced by two operators near Baton Rouge for construction paving and as railroad ballast. The State of Louisiana Highway Department produced miscellaneous stone for road construction.

During the year, 1.8 million barrels of crude petroleum and 3.3 billion cubic feet of natural gas were produced. The largest refinery in the United States was operated at Baton Rouge by Esso Standard Oil Co. The crude-oil capacity was 308,000 barrels a day and the cracked-gasoline capacity totaled 81,700 barrels a day. Two new plastic plants were planned for the parish, using available refinery waste gases.

Salt was used by Allied Chemical & Dye Corp. for producing industrial chemicals.

Imported Jamaica bauxite ore was processed into alumina at the Kaiser Aluminum & Chemical Corp. plant at North Baton Rouge.

Evangeline.—In order of value, crude petroleum, natural-gas liquids, natural gas, and sand and gravel were produced in Evangeline Parish in 1956. The total value of mineral output remained about the same as in 1955. Recovery of natural-gas liquids by plants at Easton, Basile, Ville Platte, and Mamou amounted to 40 million gallons in 1956. The 2.4 million barrels of crude petroleum and 21 billion cubic feet of natural gas recovered during the year represented 8- and 12-percent decreases, respectively. At Ville Platte a furnace-type plant produced carbon black. Gifford-Hill & Co., Inc., at Turkey Creek, dredged and washed sand and gravel for structural uses, paving, road construction, and railroad ballast.

Iberia.—In total value of mineral production, Iberia ranked fifth in the State. One-third of the salt yield in Louisiana came from three operations in this parish. Evaporated salt, rock salt, and pressed salt blocks were produced at the underground mine and refinery of International Salt Co., Inc., near Avery Island. Evaporated salt was

produced by the vacuum-pan method. Similar operations were conducted by the Morton Salt Co. at Weeks Island and by Jefferson Island Salt Co., Inc., at New Iberia.

At Jefferson Island Iberia Sand & Gravel Co. dredged sand for building purposes. Clay used for building brick was mined by Mike Baker Brick Co.

Sixteen million barrels of crude petroleum and 49 billion cubic feet of natural gas were recovered in 1956. Bayou Postillion and Big Bayou Pigeon oilfields and East Bayou Pigeon gasfield were discovered in 1956.

Iberville.—Solvay Process Division of Allied Chemical & Dye Corp. produced salt brines from wells near Plaquemines' for use mainly in manufacturing soda ash. Amerada Petroleum Corp. recovered natural gasoline from natural gas at its absorption plant at Plaquemines'. Petroleum and natural-gas output in 1956 amounted to 5.8 million barrels and 16 billion cubic feet, respectively.

Jefferson.—Crude petroleum, natural gas, shell, and natural-gas liquids were produced during 1956. Recovery of natural-gas liquids at the absorption plant at Lafitte totaled 3 million gallons. Crude-petroleum production gained 2 percent to 11.1 million barrels, and natural-gas production gained 6 percent to 21.1 billion cubic feet in 1956. The Clark Oil & Refining Corp. operated a petroleum refinery at Marrero. The crude-oil capacity of this plant was 7,500 barrels daily; cracked-gasoline capacity was 975 barrels daily. Three new gasfields and 2 oilfields were discovered in 1956.

National Gypsum Co. began operating its new gypsum-products plant at Westwego. Gypsum was shipped in from Jamaica. Southern Shell Fish Co. of Harvey sold shell for use in concrete. At Avondale, American Cyanamid Co. expanded operations to include production of monomethyl styrene.

Jefferson Davis.—Gifford-Hill & Co., Inc., and Witte Gravel Co., operating near Kinder, produced sand and gravel for road paving, construction, and other purposes. The estimated value of the output of natural gasoline and other liquefied-petroleum gases from four plants situated at Jennings, Welsh, and Elton was $2 million. The value of natural gas produced was $11 million—34 percent more than in 1955; the 4.2 million barrels of crude petroleum recovered was 5 percent higher. Evangeline Refining Co., Inc., operated a small skimming refinery at Jennings with a daily crude-oil capacity of 2,000 barrels. The Fontenot gasfield was discovered in April 1956.

Lafourche.—Lafourche Parish was the second-ranking producer of petroleum. Natural gas, sulfur, and shell were other commodities produced. The total value of these minerals was 7 percent higher than in 1955. Near Thibodaux, Freeport Sulfur Co. produced sulfur at its Chacahoula mine. Petroleum production (which gained 7 perent) totaled 29.9 million barrels in 1956; the natural-gas value was up 1 percent. Lake Boeuf and Bayou Raphael oilfields and the Lake Fields gasfield were discovered in 1956. The number of exploratory wells drilled in Lafourche was the largest in the State. The parish ranked fifth in geophysical and core-drill prospecting.

La Salle.—Near Jena, Quality Gravel Co. produced paving sand and gravel. Petroleum recovery in 1956 was 5.4 million barrels; the natural-gas yield was 3.1 billion cubic feet.

Lincoln.—Lincoln Parish ranked third in the State as a producer of natural-gas liquids. The value of natural-gas liquids recovered by plants in Ruston, Hilly, and Dubach amounted to $10 million. The 62 billion cubic feet of natural gas produced during the year was 3 percent lower than in 1955. Building and face brick were manufactured by Ruston Brick Works from clays produced from a pit near Ruston. Bentonite also was mined at Ruston by the Filtrol Corp. The clay was used for filtering and bleaching and as drilling mud.

Orleans.—Barite was crushed and ground by the Magnet Cove Barium Corp. at the New Orleans mill and grinding plant for weighting material in oil-well drilling mud and for other uses. Limestone shipped into the State was used at the New Orleans plant of the Lone Star Cement Corp. for producing cement. Expanded perlite was manufactured by the Alatex Construction Service, Inc., plant at New Orleans from crude perlite from Western States. The finished material was used in plasters and concrete aggregate. The Flintkote Co. produced artificially colored roofing granules at New Orleans. Vermiculite was exfoliated by the Zonolite Co. at its Burgundy plant, using crude vermiculite imported from other States. Jahncke Service Co., Inc., dredged shell and sand and gravel for concrete and other construction. Sand & Shell, Inc., also dredged shell for use in concrete.

Plaquemines.—Over one-fifth of the value of all minerals produced in Louisiana in 1956 was recovered in Plaquemines Parish. Petroleum production for the year was 66.9 million barrels—an increase of 29 percent over 1955. Production of 101 billion cubic feet of natural gas was reported for the parish. Bayou Gentilly and Tiger's Ridge gasfields and the Dalcour oilfield were discovered during the year. Most sulfur recovered in the State originated in the Parish. Grande Ecaille and Garden Island Bay mines, made the parish one of the most important sulfur-producing areas in the Nation. New docking facilities were installed at the Port Sulphur facilities of the Freeport Sulfur Co. A new nickel-colbalt recovery plant was built at Braithwaite.

Rapides.—During 1956 the parish had 4 commercial sand and gravel operations: 2 dredges operated near Woodworth; another dredge operated at Alexandria; and a stationary plant produced paving gravel at Glenmore. The United States Forest Service also produced sand and gravel for paving uses.

At Alexandria, Acme Brick Co. produced clay for manufacturing structural clay products. Also at Alexandria, the Louisiana Lightweight Aggregate Co. obtained miscellaneous clay from a canal soilbank for production of lightweight aggregate.

Natural-gas liquids were recovered at Cheneyville by a plant using the absorption process. Over a half million barrels of crude petroleum and small quantities of natural gas also were produced.

Richland.—In 1956 the estimated value of natural-gas liquids from the absorption-type plant at Delhi was over $1 million. Gains of 12 percent for petroleum and 33 percent for natural-gas output resulted in an overall gain of 14 percent for the value of the parish mineral production. A contact-type carbon-black plant operated at Rayville.

St. Charles.—Crude petroleum, natural gas, natural-gas liquids, and shell were produced in St. Charles Parish in 1956. The total value of this output was 2 percent less than in 1955. This total decrease was attributed mainly to declines in the values of petroleum and shell output. The 2 refineries at Norco and Destrehan had a combined daily straight-run capacity of 130,500 barrels of crude oil and a cracking capacity of 35,000 barrels of gasoline. A 40-million-pound-per-year methyl-ethyl ketone plant was planned for Norco.

An adipic acid plant was being constructed at the Barton ammonia plant at Luling. Olin Revere Metals Corp. bought land at Burnside for erecting a 345,000-ton alumina plant to process bauxite into alumina. At Geismar, Wyandotte Chemicals Corp. began constructing an $8-million plant to produce ethylene oxide. Wyandotte was planning to locate an electrolytic chlorine-caustic soda plant at the same location.

Two new gasfields (Kenner and West Pontchartrain Block 41) were found in the parish in 1956.

St. James.—Kaiser Aluminum & Chemical Corp. began constructing its Gramercy alumina plant at an estimated cost of $70 million. At the same location, Kaiser was building another plant to convert salt into caustic soda for use in producing alumina. The parish, located in a strategic region between Baton Rouge and New Orleans, seemed destined for rapid and large-scale industrialization. Petroleum and natural gas and a small quantity of shell also were produced in the parish.

St. Landry.—The values of recovered crude petroleum and natural gas increased 5 and 7 percent, respectively. About 6.2 million barrels of petroleum and 48 billion cubic feet of natural gas were recovered. St. Landry Parish is the leading producer of natural-gas liquids in the State. The natural-gas liquids were recovered by natural-gasoline plants at Eunice, Krotz Springs, and Opelousas. The Lawtell gasfield was discovered in November 1956.

St. Martin.—Petroleum, natural gas, salt, natural-gas liquids, and shell were produced in St. Martin Parish in 1956. The Gordy Salt Co. produced evaporated salt for many chemical and industrial uses from wells and a mill at Breaux Bridge. Shell was dredged from coastal waters for use in construction and industrial activities. Ninety billion cubic feet of natural gas and 10 million barrels of petroleum were produced in the parish during 1956. Natural gasoline and cycle products were recovered from gas at a plant using the absorption method at Breaux Bridge. Two oilfields and two gasfields were discovered during the year. Breaux Bridge Oil Refining Co. plant at Anse La Butte was shut down at the end of 1956.

St. Mary.—In order of value, crude petroleum, natural gas, natural-gas liquids, and shell were produced in 1956. Over 16.9 million barrels of petroleum and 101 billion cubic feet of natural gas were produced. Natural gasoline and cycle products were recovered from natural gas at The Texas Co. cycle plant at Berwick. Shell was dredged near Morgan City by the Leftwich Co., Inc. Three furnace-type carbon-black plants operated at Franklin in St. Mary Parish. The Garden City gasfield was discovered in December.

Terrebonne.—Large quantities of petroleum, natural gas, and natural-gas liquids were recovered in Terrebonne Parish during 1956. The total value of minerals produced was 10 percent higher than in 1955. Petroleum production gained 6 percent, and natural-gas yields were up 13 percent. Natural-gas liquids were recovered at Waterproof by The California Co., using the cycling process. Terrebonne Parish was the leading natural-gas producer. Bayou Rambio, Humphreys, and South Humphreys gasfields were discovered by exploratory drilling in the parish during the year.

Sulfur was recovered from wells in the Bay Ste. Elaine dome near Houma. The new Lake Pelto sulfur property, under development in 1956, is in shallow waters in Terrebonne Parish.

Vermilion.—In 1956, 125 billion cubic feet of natural gas and 5.8 million barrels of crude petroleum were produced. The cycle plant at Erath had the largest capacity of natural-gas liquids of any plant in the State. An estimated $10.6 million of natural-gas liquids was recovered. Three gasfields were discovered in the parish in 1956.

Webster.—About 1 million short tons of sand and gravel was produced in Webster Parish in 1956; these were plants at Minden, Springhill, and Heflin.

The estimated value of natural-gas liquids recovered by an absorption plant at Heflin and by cycling plants at Cotton Valley and Sarepta totaled $10 million. The value of petroleum production declined 12 percent; natural gas gained 20 percent. A yearly total of 3.8 million barrels of petroleum and 57 billion cubic feet of natural gas were obtained. At Cotton Valley, Cotton Valley Solvents, Inc., operated a skimming plant that had a daily crude-oil capacity of 5,000 barrels.

Winn.—In order of value, salt, gypsum, petroleum, and natural gas were produced in Winn Parish during 1956. Anderson & Dunham, Inc., produced gypsum from an open pit at Winnfield for use as a portland-cement retarder and for road-construction maintenance. The Carey Salt Co. produced rock salt and pressed blocks from an underground mine also at Winnfield. During the year, 125,000 barrels of crude petroleum was produced.

The Mineral Industry of Maine

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Maine.

By Robert W. Metcalf [1]

MAINE mineral production in 1956 decreased 6 percent in value from the $13 million for 1955 but still was considerably higher than any other recent year. Output decreased chiefly in portland cement, stone, sand and gravel, and feldspar; the value of sand and gravel rose slightly. The production of masonry cement, lime, sheet mica, and slate increased moderately in value.

The chief mineral commodities produced in Maine in 1956 were cement, sand and gravel, and stone. Their total output comprised by far the bulk of Maine mineral production, both in tonnage and aggregate value. The leading counties in terms of value were Knox, Cumberland, Piscataquis, York, and Androscoggin. Of these, Knox County alone had 57 percent and Cumberland County another 7 percent of the total Maine value.

TABLE 1.—Mineral production in Maine, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate	22	$12,671	12	$6,696
Cement:				
Portland, 376-pound barrels	2,264,678	6,570,449	(2)	(2)
Masonry, do	83,839	304,996	(2)	(2)
Clays	32,598	32,598	26,162	23,045
Feldspar, long tons	26,282	188,961	22,219	143,495
Gem stones	(3)	5,000	(3)	500
Lime	(2)	(2)	11,997	179,162
Mica:				
Scrap	71	1,922	114	3,213
Sheet, pounds	21,121	128,721	19,913	146,437
Peat	4,670	179,544	(2)	(2)
Sand and gravel	7,528,903	2,855,585	7,196,019	3,085,417
Stone	1,192,361	2,542,228	942,478	2,238,011
Value of items that cannot be disclosed: Cement (1956), columbium-tantalum concentrate, slate, lithium mineral (spodumene),[4] and value indicated by footnote 2		677,809		6,912,327
Total Maine [5]		12,991,000		12,179,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Weight not recorded.
[4] Data not available.
[5] Total has been adjusted to eliminate duplicating the value of stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

METALS

Beryllium.—Recovery of beryl concentrate was nearly half that reported for 1955; the entire output came from Oxford County. Of 5 producers, the 2 leading were Whitehall Co., Inc., at its Newry mine at Newry and William Pechnik at the Dunn mine at North Norway. Most of the beryl was purchased under the strategic materials stockpiling program by General Services Administration Materials Purchase Depot at Franklin, N. H.

Columbium-Tantalum.—Production of columbium-tantalum concentrate in Maine increased compared with 1955; in 1956 it was recovered from the Newry mine of the Whitehall Co., Inc., as a byproduct of mica and feldspar mining. The Federal Government purchased the entire output at the GSA depot in Franklin, N.H., for the strategic materials stockpile.

Manganese.—Experimental work on recovery of manganese from potential low-grade manganese ores in Maine continued unabated. A progress report on a chloride-volatilization process on Maple Mountain-Hovey Mountain ore indicated that this method was feasible and might also be adapted for use on open-hearth slags and oxide-type ores.[2] Small-scale batch-fluidization tests on ore from the same area indicated that temperatures of 950° C. were necessary to obtain a practicable rate of volatilization of manganese chloride. Fluidization gave results superior to fixed-bed chloridization.[3]

NONMETALS

Cement.—Cement again was Maine's most important mineral product, measured by value, although shipments in 1956 were somewhat less than in 1955. Production came entirely from the Dragon Cement Co. (a division of American-Marietta Co.) at its Thomaston, Knox County, plant. This wet-process plant (its annual capacity was over 2 million barrels) produced largely general-use and moderate-heat cements and some high-early-strength cement. The output of masonry cement prepared by the same firm was higher in 1956 than in 1955. The acquisition of Dragon Cement Co., Inc., by American-Marietta Co., Chicago, Ill., was effective in October in a $30 million exchange of stock. Dragon Cement Co., Inc., also operated a plant at Northampton, Pa.; American-Marietta Co. also produced large quantities of concrete pipe at its cement plants in Alabama and West Virginia. Following the merger and completion of a Marietta expansion program, total annual cement-manufacturing capacity of the new company will exceed 10 million barrels. The Dragon Cement Co. operated one of the oldest cement-making plants in the United States and in 1956 was the only cement manufacturer in the New England States.[4] New deposits northeast of the old quarry area include ade-

[2] MacMillan, R. T., and Turner, T. L., Development of a Chloride-Volatilization Process for Manganese Ores From Aroostook County, Maine; Progress Report: Bureau of Mines Rept. of Investigations 5281, 1956, 31 pp.

[3] Skow, M. L., Kirby, R. C., and Conley, J. E., Chloridization of Maine Manganese Ore; Preliminary Batch-Fluidization Tests on Maple Mountain-Hovey Mountain Samples: Bureau of Mines Rept. of Investigations 5271, 1956, 29 pp.

[4] Wall Street Journal, vol. 148, No. 47, Sept. 6, 1956, p. 5; Pit and Quarry, vol. 49, No. 4, October 1956 p. 23.

quate reserves for operating the plant at least 85 years and were being opened by means of a 400-foot access tunnel passing about 100 feet below United States Highway No. 1. Haulage will be by truck through this 33- by 33-foot tunnel to the kilns. Operation of the old quarry will be terminated when the new tunnel is completed.

Clays.—Production of clays in Maine in 1956 declined 20 percent in tonnage and 29 percent in value, because, in Cumberland County, 1 firm became inactive and another company decreased its production. Output was the lowest since 1952 and consisted only of miscellaneous or common clay for use in making heavy clay products, mostly building brick. In 1956, 7 open-pit mines were in operation—2 in Androscoggin County, 3 in Cumberland County, 1 in Franklin County, and 1 in Penobscot County. Androscoggin County led as a clay-producing county in 1956, followed in order by Cumberland, Penobscot, and Franklin Counties. The leading producers of clay in the State were again Morin Brick Co., Androscoggin County; and Lachance Bros. Brick Co., Cumberland County.

TABLE 2.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1947–51 (average)	25,898	$23,286	$0.90	1954	26,872	$26,872	$1.00
1952	26,050	26,050	1.00	1955	32,598	32,598	1.00
1953	29,661	27,476	.93	1956	26,162	23,045	.88

Feldspar.—Although feldspar production declined 15 percent from the high tonnage of 1955, the 1956 production was considerably higher than in any other recent year. The average value per ton in 1956 declined 10 percent to $6.46 from $7.19 in 1955. Active mines included 2 in Androscoggin County, 1 in Cumberland County, 8 in Oxford County, and 13 in Sagadahoc County. Several other mines produced small tonnages of feldspar in Oxford and Sagadahoc Counties. Mines in Maine produced predominantly potash feldspar. The principal mines in the State were the Bell Minerals Co. LaFlamme and Perham mines in Androscoggin and Oxford Counties, respectively, followed by the Bell Minerals Co. Tamminen mine in Oxford County and the Alex Cunningham Brown mine in Sagadahoc County. Two feldspar-grinding mills were active in the State; one mill at West Paris (Oxford County) ground both purchased and company-mined feldspar, and the other at Topsham (Sagadahoc County) processed only purchased feldspar. The most important market for Maine ground feldspar was pottery manufacture, including tile, sanitary ware, and electrical porcelain. Sizable quantities also were used in soaps and abrasive products.

Gem Stones.—Gem stones produced in Maine in 1956 had about one-tenth the value of those reported for 1955. Although the county of origin of most of this gem material is not known, the discoveries undoubtedly were largely from Oxford and Sagadahoc Counties, where occur numerous pegmatites rich in feldspar, mica, and other associ-

ated minerals. Included in the gem stones total were small quantities of amethyst and rose quartz from Oxford County.

Gypsum.—The United States Gypsum Co. (Chicago, Ill.) used crude gypsum from its quarries in Nova Scotia, Canada, at its Lisbon Falls (Androscoggin County) plant. The company announced plans in 1956 to increase the output of this plant about 40 percent. Products manufactured at the mill include insulation board, tile, planks, building board, and sheathing.[5]

Lime.—The Rockland-Rockport Lime Co., Rockland, Knox County, produced largely quicklime used for chemical purposes in paper manufacture. Some hydrated lime for agricultural use also was sold.

Lithium Mineral (Spodumene).—One firm in Oxford County recovered spodumene occurring as a byproduct of feldspar and mica mining.

Mica.—Output of sheet mica was 6 percent less than in 1955, although the value increased 14 percent. In referring to sheet mica, hand-cobbed material has been converted to full-trim. Nearly all sales of sheet mica were made through the GSA Franklin (N. H.) Materials Purchase Depot for the national strategic stockpile. Average realization per pound in 1956 was $7.35 compared with $6.09 in 1955. Production and value of scrap mica in 1956 rose over 60 percent in both quantity and value compared with 1955; average value per ton also increased from $27.07 per short ton in 1955 to $28.18 in 1956. In 1956, 12 operators produced mica at 13 mines in Oxford County; some output also came from small mines in that county. A small quantity of punch and circle mica and some scrap mica were produced, but neither mine nor county was identified. Some of the mica mined in Maine was shipped to the GSA Spruce Pine (N. C.) Purchase Depot; a small quantity went to the Custer (S. Dak.) Purchase Depot. No output was specifically reported from Sagadahoc County in 1956.

Nitrogen Compounds.—Contributing to an increased output of anhydrous ammonia in the United States in 1956 was a newly built 125-ton-per-day plant at Searsport in Waldo County.

Sand and Gravel.—Production of sand and gravel in Maine decreased 4 percent compared with 1955. Value of output rose 8 percent to more than $3 million. Commercial shipments in 1956 increased more than 40 percent compared with 1955, and the value of commercial shipments by more than 25 percent, owing to accelerated road- and industrial-construction activity. Government-and-contractor production totaled only 76 percent of the total tonnage compared with 84 percent in 1955. Building or structural sand and gravel comprised 9 percent of the total; most of the remainder (89 percent) was paving gravel. The leading producer, the Maine State Highway Commission, either mined or produced material under contract in every county. The principal counties producing in 1956 were Cumberland, Penobscot, Aroostook, Androscoggin, and York.

[5] Rock Products, vol. 59, No. 6, June 1956, p. 49.

TABLE 3.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956		
	Short tons	Value	Average per ton	Short tons	Value	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Structural	193,093	$178,663	$0.93	220,749	$165,900	$0.75
Paving	(1)	(1)	(1)	326,907	143,529	.44
Railroad ballast				383	273	.71
Gravel:						
Structural	215,153	200,024	.93	406,825	438,108	1.08
Paving	489,476	340,763	.70	601,938	345,380	.57
Railroad ballast	52,485	24,575	.47	32,067	8,939	.28
Other	113,586	72,975	.64	84,208	35,167	.42
Undistributed [2]	129,753	86,476	.67	18,398	9,379	.51
Total	1,193,546	903,476	.76	1,691,475	1,146,675	.68
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Structural	270	27	.10			
Paving	367,828	110,261	.30	331,436	189,500	.57
Gravel:						
Structural	20,148	1,864	.09	16,835	5,892	.35
Paving	5,947,111	1,839,957	.31	5,156,273	1,743,350	.34
Total	6,335,357	1,952,109	.31	5,504,544	1,938,742	.35
Grand total	7,528,903	2,855,585	.38	7,196,019	3,085,417	.43

[1] Included with "Undistributed."
[2] Includes paving-sand (1955); engine and other sands (1956).

Slate.—Slate was produced in Maine at an underground mine and adjacent mill at Monson, Piscataquis County. Electrical slate, especially switchboard panels, and flagging were the principal products marketed.

Stone.—Output of stone in Maine in 1956 decreased 21 percent in tonnage and 12 percent in value compared with 1955. This decline was shared by both dimension stone (all granite) and crushed and broken stone (mostly limestone and sandstone). In addition to granite, sandstone, and limestone, a small tonnage of miscellaneous stone (gneiss) was quarried in 1956. Twelve commercial quarries were active—7 in granite, 3 in limestone, and 2 in sandstone. Six granite quarries produced dimension stone and the other yielded crushed or broken stone only. Two dimension-stone quarries also yielded crushed or broken granite. Dimension stone produced included dressed architectural stone and curbing and flagging. Crushed or broken sandstone and granite were used principally for road construction and riprap; crushed or broken limestone was used in agriculture, cement and lime, and riprap. In order of tonnage, the leading counties were Knox, Cumberland, and Penobscot and in order of value Knox, York, and Cumberland.

MINERAL FUELS

Peat.—Peat was recovered from bogs in Hancock and Washington Counties in 1956 and sold for agricultural purposes.

REVIEW BY COUNTIES

Androscoggin.—Dennis Brick Co., Inc. (Auburn), formerly Joseph F. Dennis & Sons, and Morin Brick Co. (Danville), both with claybanks near Auburn, mined miscellaneous or common clay for use in manufacturing building brick. The LaFlamme and Giddinge open-pit feldspar mines were operated by Bell Minerals Co. near Center Minot. The Sturtevant feldspar pit was not worked in 1956. The Maine State Highway Commission quarried gneiss for use in highway and road construction.

In Androscoggin County commercial production of sand and gravel accompanied by higher material costs and slightly advanced prices increased 15 percent compared with 1955. Ten commercial producers and 6 Government-and-contractor agencies mined sand and gravel for building and paving, engine-sand use, and other purposes. Over two-thirds of the commercial output was washed or prepared before sale. Commercial producers were: Leon Bard, Lisbon Falls; W. E. Cloutier Co., Inc., Lewiston; R. F. Dobbins, Webster; Philip E. Dunn, Poland; Conrad J. Jean, Lewiston; Kramarz & Dingley, Lisbon; Leeds Sand & Gravel Co., Winthrop; Lewiston Crushed Stone Co., Inc., Lisbon; G. A. Peterson Co., Auburn; and Jackson Tupper, Lisbon Falls. The city of Lewiston, and the towns of Livermore, Mechanics Falls, Turner, and Wales produced sand and gravel for their own use. The Maine State Highway Commission produced sand and gravel for highway construction. Sizable quantities of paving gravel also were mined under contract for the commission.

TABLE 4.—Value of mineral production in Maine, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Androscoggin	$511,612	$538,454	Sand and gravel, feldspar, stone, clays.
Aroostook	294,554	466,408	Sand and gravel, stone.
Cumberland	721,554	830,689	Sand and gravel, stone, clays, feldspar.
Franklin	(1)	(1)	Sand and gravel, clays.
Hancock	(1)	(1)	Sand and gravel, peat, stone.
Kennebec	(1)	214,446	Sand and gravel, stone.
Knox	7,568,453	6,927,121	Cement, stone, lime, sand and gravel.
Lincoln	72,903	68,716	Sand and gravel.
Oxford	384,195	383,475	Sand and gravel, mica, feldspar, beryllium concentrate, columbium—tantalum concentrate.
Penobscot	475,192	498,869	Sand and gravel, stone, clays.
Piscataquis	(1)	(1)	Slate, sand and gravel, stone.
Sagadahoc	91,144	(1)	Sand and gravel, feldspar.
Somerset	172,457	155,494	Sand and gravel.
Waldo	(1)	118,208	Sand and gravel, stone.
Washington	(1)	(1)	Peat, sand and gravel, stone.
York	(1)	(1)	Stone, sand and gravel.
Undistributed [2]	2,699,320	1,977,512	
Total	12,991,000	12,179,000	

[1] Included with "Undistributed."
[2] Includes some mica and gem stones for which no breakdown by counties is available.

Aroostook.—Sand and gravel was produced in Aroostook County by Bull Bros., Washburn; Lawrence E. Burleigh, Quint Bros., both of Houlton; and the Bangor & Aroostook Railroad, Wallagrass. The latter mined gravel for railroad ballast and other uses; the others produced building and paving sand and gravel. The Maine State Highway Commission produced paving sand and gravel for its own use.

The United States Army Engineers also contracted for sizable quantities of paving sand and gravel. The Maine State Highway Commission quarried quartzite for roadbuilding purposes.

Cumberland.—Lachance Bros. Brick Co. (Gorham), Fred S. Liberty & Son (North Yarmouth), and Royal River Brick Co. (Cumberland Center), mined miscellaneous clay for use in making brick. Joseph A. Blais, Jr. (Portland), did not operate in 1956. Structural and paving sand and gravel were produced from open pits by Cumberland Sand & Gravel Co., Inc., Cumberland Center; H. E. Hackett, Topsham; P. E. Hamlin, Falmouth; Carl F. Hartley (Hartley Gravel Co.), Brunswick; Fred H. Jordan, South Portland; Leroy S. Prout, Scarboro; Charles W. Qualey, Gray; and Maynard W. Robinson, Cumberland Center. Paving sand and gravel also was produced with its own crews by Maine State Highway Commission in Cumberland County for road construction. Quartzite for use as concrete aggregate, roadstone, railroad ballast, and riprap was quarried by Blue Rock Quarry, Westbrook. The Maine State Highway Commission produced quartzite for use in roadway maintenance and construction. Feldspar was produced from the Tryon Mountain mine in Pownal by Joseph Poulin (Brunswick).

Franklin.—Farmington Brick Co. (Temple) produced a small quantity of miscellaneous clay for use in making common brick. Structural and paving sand and gravel were produced in Franklin County by four individuals: Donald C. Ames, New Sharon; E. N. Barry, Farmington; Omer Beisaw, Jay; and Thomas A. Skolfield, Weld. Paving sand and gravel also was mined by Maine State Highway Commission crews for road construction.

Hancock.—Dressed dimension granite for construction use, paving blocks, and curbing was produced by Joseph Musetti at Joe's quarry (Hall Quarry). Exterior architectural stone was produced by Grenci & Sons, Inc., at its Hall Quarry operation. This stone was used in the New York and New Jersey approaches to the third tube of the Lincoln Tunnel and in construction work at Maryknoll Seminary, Glen Ellyn, Ill. Both the Musetti and the Grenci product is marketed under the name of Somes Sound pink granite.

T. W. Carlisle, Blue Hill, and Alvin R. Whitten (Winter Harbor) produced bank-run paving sand and gravel and gravel for which no specific use was reported. The town of Blue Hill produced paving sand. The Maine State Highway Commission mined paving sand and gravel for its own use. Peat was produced by the Richland Peat Mines, Inc., near Penobscot.

Kennebec.—Sand and gravel was produced in Kennebec County by V. Dunn (V. E. Dunn & Sons), Augusta; and Rundstrom Bros. and William S. Williams, Gardiner. Structural sand and gravel, paving gravel, and railroad ballast sand and gravel were produced. The Maine State Highway Commission also mined sizable tonnages of paving sand and gravel for its own use. H. E. Sargent, Inc. (near Farmingdale), and the city of Augusta crushed granite for road construction and maintenance.

Knox.—Charles R. Wallace & Son (Warren) produced building and paving sand and gravel, and the Maine State Highway Commission mined paving sand and gravel for its own use. Higher prices for repairs, parts, and labor have affected income of commercial producers

in this area. Rockland-Rockport Lime Co., Inc., produced quick and hydrated lime from limestone quarried near Rockland. This material was marketed for chemical use in papermaking (quicklime) and for agricultural purposes (hydrated lime).

Dragon Cement Co., a division of American-Marietta Co., produced cement at its plant at Thomaston. Two kilns produced general-use and moderate-heat cements and a smaller quantity of high-early-strength cement. All components of the finished cement were purchased except the cement rock, which was quarried by the company near the plant. Both portland and masonry cements were manufactured. Shipments were distributed to New England States. In spite of a 12-percent wage increase on May 1 and price increases of 15 cents per barrel effective January 1 and October 1, production was balanced by demand. Hocking Granite Industries, Inc. (Clark Island), quarried granite for riprap, construction, architectural work, paving blocks, and curbing. Crushed limestone for use in manufacturing paper was quarried by Knox Lime Co., Union. The Rockland-Rockport Lime Co. quarried limestone and crushed it for use as riprap, agricultural stone, chemical stone for use in making paper, and raw material for lime manufacture.

Lincoln.—Structural gravel was produced by Howard E. Wright & Son near Newcastle and railroad ballast sand and gravel by Arthur D. Henry (Thomaston). The Maine State Highway Commission mined paving sand and gravel for its own use in roadbuilding.

Oxford.—Commercial sand and gravel for paving, building, railroad ballast, and unspecified uses was produced in Oxford County by Merton Charles, Fryeburg; Leo Mallett, Mexico; Homer A. Roberts, Mexico; S. Evelyn Swett, Ridlonville; and Donald E. Wood, Norway. The Maine State Highway Commission produced sand and gravel for use in road construction and maintenance.

Crude feldspar was produced from open-pit operations by Buck & Baker (Tiger Bill mine, West Paris); Bell Minerals Co. (Perham and Tamminen mines, near West Paris, the latter subleased to R. C. Benson, and the Glover-Wilbur mine, South Paris); Pechnik Bros. (Dunn mine at Norway); The Whitehall Co., Inc. (Newry mine, Newry); and Maine Mica Co., location of mine not reported. In addition, a small quantity of feldspar was mined; the output was sold to Bell Minerals Co. The Bell Minerals Co., feldspar mill at West Paris ground both purchased and company-mined material. The ground feldspar was sold principally for ceramic tile, sanitary ware, electrical porcelain, and as an ingredient in soaps, scouring compounds, and abrasives. Distribution of ground feldspar was largely to Ohio, New York, New Jersey, and Wisconsin. The Whitehall Co., Inc., Newry mine yielded, in addition to feldspar and mica, a columbium-tantalum concentrate and a lithium concentrate (spodumene).

Producers of beryl concentrate in 1956 were: Howard I. Baker, from the Tiger Bill No. 2 mine near Greenwood; Mrs. Howard M. Irish, from the Mount Mica mine near South Paris; William Pechnik from the Dunn mine at North Norway; Whitehall Co., Inc., from the Newry mine at Newry; and Alden Wilson, from the Wilson mine at Bethel. Most of the material was sold to the GSA Franklin (N. H.) Material Purchase Depot for the strategic stockpile. A small quantity

of amethyst and rose quartz was produced near Stow and Albany, respectively, by Orman McAllister of Lovell.

Twelve operators produced mica at 13 mines in Oxford County in 1956; the source of some production was not identified. Several producers worked the same mine at various times during the year. The more important of these producers were: Lewie Aldridge, Pechnik mine at Norway; Lawrence Anderson, B. B. No. 1 and Dunn mines near Norway, Big Deer mine at Stow, Brown mine at Mason, Wassaman mine at Greenwood, and Wheeler mine at Gilead; Paul Carpenter, Pechnik mine at Norway and Wheeler mine at Gilead; W. Phillips Cole, Deer Hill mine at Stow; Homer Hise, B. B. No. 1 mine at Norway; Maine Mining Co., Hibbs mine at Hebron; Maine Mica Co., Wardwell Mine at Norway; Marjorie Milonich, B. B. No. 1 mine at Norway; Pechnik Bros., Pechnik mine at Norway; Wheeler Bros., Wheeler mine at Gilead; and Whitehall Co., Inc., Newry mine at Newry. Two of these producers—Pechnik Bros., and Whitehall Co., Inc.—reported output of scrap mica. Hand-cobbed and half- and full-trimmed sheet were produced. Most of the hand-cobbed material and all of the half- and full-trim mica was sold to the GSA largely to its Franklin (N. H.) Materials Purchase Depot; and smaller quantities went to the Spruce Pine (N. C.) Purchase Depot.

Penobscot.—Sand and gravel produced in Penobscot County in 1956 was used for paving, building, railroad ballast, and various unspecified purposes. Commercial producers were: Bridge Construction Corp., location of deposit not reported; Owen R. Folsom, Stillwater; G. E. Goding & Son, Lincoln; Lane Construction Corp., Bangor; Harl L. McKusick, Dexter; Arthur I. Miles, Old Town; C. M. Page Co., Inc., Orono; and H. E. Sargent, Inc., Stillwater. Sand and gravel for road construction was produced both by their own crews and under contract by the city of Brewer and the Maine State Highway Commission. Quartzite was quarried and crushed by Bridge Construction Corp. at its Read quarry near Orono for highway and road building maintenance. The Maine State Highway Commission also produced quartzite for road construction. Miscellaneous clay was produced by Brooks Brick Co. (Brewer) for use in manufacturing heavy clay products.

Piscataquis.—The Portland-Monson Slate Co. produced slate at an underground mine at Monson. This material was processed at the company mill at Monson and sold as electrical and flagging slate. Good demand was experienced throughout the year, and prices were increased in December. Sand and gravel was produced by the Maine State Highway Commission for road construction both by its own crews and under contract. The commission also quarried quartzite for its own use in building roads.

Sagadahoc.—Sand and gravel was produced in Sagadahoc in 1956 by Andrew R. Maynard, Topsham; Almon R. Mitchell, Bath; Mrs. Helen G. Morton, Brunswick; and the Maine State Highway Commission, which mined material both with its own crews and under contract. Output was used for structural and paving purposes.

The larger producers of crude feldspar in Sagadahoc County in 1956 were: Augustin Carter, Henry Haskell, and Frank DeBiasio (Aldred mine), near Topsham; Alex Cunningham (Brown mine),

Georgetown; Ray C. Leavitt (Diamond Match mine), John H. Palozzi (Fisher mine), Victor Ponziani (Tedford mine), James Russo (Russo mine), and White's Service (Additon mine), all near Topsham; and Cesare Trusiani (Georgetown mine), Georgetown. These producers and several others sold their output to the Consolidated Feldspar Division, International Minerals and Chemical Corp., which ground feldspar at a mill at Topsham. The ground feldspar was sold mostly for pottery, soaps, and abrasives. Shipments largely were to New England States, Ohio, Pennsylvania and neighboring States. The Topsham Feldspar Co. ground no feldspar in 1956.

Somerset.—Sand and gravel for building and paving was produced in Somerset County by Donald J. Gurney, Smithfield, from pits at Fairfield and Smithfield. Gurney's preparation plant was at Smithfield. Sand and gravel for road construction and maintenance also was produced by the Maine State Highway Commission.

Waldo.—Clements & Foley (Winterport), A. P. Wyman, Inc. (Waterville), The Bangor and Aroostook Railroad, and the Maine State Highway Commission produced sand and gravel in Waldo County in 1956. Uses included paving and railroad ballast. Architectural granite was produced from the Mount Waldo quarry near Frankfort by Grenci & Ellis, Inc. Stone from this quarry, marketed as Mount Waldo Grey Granite, was used in the Supreme Court Building, Brooklyn, N. Y., and other structures. Northern Chemical Industries began production of anhydrous ammonia from atmospheric nitrogen at its new plant at Searsport and used fuel oil as a source of hydrogen.

Washington.—Sand and gravel was mined by Carl Look, Jonesboro; Hill & Sennett, and D. T. Moffett, both of Machias; the Maine Central Railroad; and the Maine State Highway Commission. Grenci & Sons, Inc., produced red granite for exterior architectural use from its Jonesboro quarry. Buildings in which this stone was placed included two State office buildings at Albany, N. Y.; The State Mutual Life Assurance Co. Building, Worcester, Mass.; and the Supreme Court Building, Brooklyn, N. Y. Peat moss was obtained from bogs near Jonesport by Maine Peat Moss, Inc. This material was sold locally for agricultural use for distribution in New England, New York, Pennsylvania, and Ohio.

York.—The John Swenson Granite Co. quarried pink granite from its High Pine quarry for use as rubble, architectural stone, riprap, concrete aggregate, and roadstone. The architectural stone was used in exterior construction of the Standard Vacuum Oil Co. Building, Harrison, N. Y.; in the State Mutual Life Assurance Building, Worcester, Mass.; the Cuyahoga County Administration Building, Cleveland, Ohio; and other structures. The Maine State Highway Commission produced sand and gravel and quartzite for road construction and maintenance.

The Mineral Industry of Maryland

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Maryland Department of Geology, Mines and Water Resources.

By James R. Kerr [1] and Jean A. Pendleton [2]

MINERAL PRODUCTION in Maryland in 1956 rose 14 percent in value as compared with the preceding year. Biggest factor in the upswing of State value was the large increase in stone production, particularly crushed limestone which comprised 85 percent of the stone total. The increased value of portland-cement shipments (13 percent), the 34-percent increase in value of coal production, and the 87-percent increase in value of natural-gas shipments also played leading roles in Maryland's increased mineral value. Commodities showing little variation from the previous year's production were clay, sand and gravel, greensand marl, and potassium salts. Production decreased significantly in the lime (29 percent), masonry-cement (13 percent), and talc and soapstone (32 percent) industries. There was no output of slate during the year, as the only slate quarry in the State ceased operation.

TABLE 1.—Mineral production in Maryland, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	698,257	$1,264,948	[2] 635,550	[2] $1,046,520
Coal	512,469	2,001,743	668,875	2,684,720
Gem stones			[3]	150
Lime	74,497	669,228	52,604	580,928
Natural gas—million cubic feet	3,116	626,000	4,619	1,169,000
Sand and gravel	9,694,928	12,210,658	[4] 10,146,905	[4] 12,395,221
Stone	5,342,968	8,800,044	6,228,849	13,304,730
Value of items that cannot be disclosed: Ball clay (1956), portland cement, masonry cement, greensand marl, shell (1955), potassium salts, slate (1955), and talc and soapstone		11,027,986		10,727,012
Total Maryland [5]		35,491,000		40,532,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Incomplete total. Figure for ball clay withheld to avoid disclosing individual company confidential data.
[3] Weight not recorded.
[4] Supersedes figure in commodity chapter.
[5] The total has been adjusted to eliminate duplicating the value of clays and stone.

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REVIEW BY MINERAL COMMODITIES

METALS

Iron and Steel.—Bethlehem Steel Corp. announced plans to make Sparrows Point, Md., the site of the world's largest steelmaking plant. The capacity of the plant will be increased 2 million tons to a total of 8.2 million. The development will include a blast furnace, 7 additional 350-ton open-hearth furnaces, a roughing mill, a 45- by 90-inch slabbing mill, a battery of coke ovens, additional soaking pits, and steam and electric generating facilities. New ingot capacity should be completed by August 1957. Expansion in finishing capacity includes increased tinplate facilities and a sheared-plate mill. Tinplate additions were put into operation at the end of 1956, and the new plate mill is expected to begin operating during the summer of 1957.

NONMETALS

Cement.—Portland-cement shipments in Maryland in 1956 increased 6 percent over those in 1955. Value went up 13 percent, owing primarily to an increased average value per barrel. Masonry-cement shipments dropped 13 percent below 1955. The bulk of portland and masonry cements produced by two companies were consumed in Maryland, Virginia, District of Columbia, and Pennsylvania. Eleven kilns were active during the year. The North American Cement Corp. reported early in the year addition of a Humboldt four-stage suspension-type preheater to their Hagerstown plant. Both producing companies mined limestone from adjacent properties for cement production. The Lehigh Portland Cement Co. also mined all the shale and sand for use in manufacturing cement.

Clays.—The bulk of the clay produced in Maryland in 1956 was miscellaneous clay mined entirely from open-pit mines. Fire clay was mined from 5 open-pit mines and from the only 2 underground clay mines active in the State in 1956. Ball clay was mined from an open pit for use in manufacturing refractories, pottery, stoneware, and floor and wall tile. Most fire clay produced was used for refractories. The chief uses of miscellaneous clay were for manufacturing heavy clay products and in manufacturing cement. Baltimore and Prince Georges were the leading clay-producing counties.

Gem Stones.—The Mineralogical Society of Pennsylvania, Lapidary Section, collected williamsite, an impure apple-green variety of serpentine, at the limestone quarries near Conowingo, Md. The gem was used principally for ornamental purposes.

Gypsum.—Crude imported gypsum was calcined at the Baltimore plant of the National Gypsum Co. Four kettle kilns fired by oil and having a capacity of 670 tons per day produced a considerable tonnage of calcined gypsum for the manufacture of plasters, lath, and wallboard.

Iron Oxide Pigments.—Sales of finished natural and manufactured iron oxide pigments were reported by Mineral Pigments Corp., Laurel. The largest selling type of pigment was natural red iron oxide.

Lime.—Since 95 percent of the lime production in Maryland was utilized for agricultural purposes, the adverse weather conditions

during early spring and late fall caused a 29-percent drop in total output in 1956. The demand for building lime was also less. A price increase averaging 11 percent was put into effect during the year. Five producers, operating a total of 45 pot kilns using primarily coke as a fuel, had an annual capacity of approximately 80,000 tons of lime.

Marl, Greensand.—The Kaylorite Corp. operated an open pit near Dunkirk and processed greensand marl for use as agricultural material.

Perlite.—Perlite from crude-ore producers in the west, primarily in Antonito, Colo., and Socorro, N. Mex., was processed at two plants in Maryland. The expanded product was used as plaster and concrete aggregate, soil conditioner, and as a filtering agent. A reduced margin of profit was reported to be due to increased ore prices and increased freight rates, coupled with the inability to raise prices of the finished product and still compete in a highly competitive market.

Potassium Salts.—Potassium sulfate was prepared from cement clinkers of the North American Cement Corp. Security plant in Washington County as a byproduct of the cement-mill operations.

Sand and Gravel.—Output of sand and gravel in Maryland increased 5 percent compared with that in the preceding year. Value of production increased slightly. Structural and paving again dominated as chief uses for sand and gravel; 98 percent of the State output was used for these purposes. A total of 67 commercial operations, mostly fixed plants, and 13 Government-and-contractor operations reported production in 1956. The average number of days commercial pits were active during the year exceeded 240. Prince Georges County was the largest producing county, followed by Baltimore, Anne Arundel, Harford, and Cecil.

Slackened demand was noted by most sand and gravel producers in 1956. Reasons given included: (1) Adverse weather conditions during early spring and late fall months curtailed building and paving, (2) tight money policy limited the number of private homes constructed, and (3) the steel strike caused a delay in some construction

TABLE 2.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
Sand:						
Structural	2,221,341	$2,399,638	$1.08	2,564,383	$2,869,436	$1.12
Paving	2,817,906	3,642,952	1.29	2,869,200	3,215,498	1.12
Gravel:						
Structural	1,919,447	3,349,848	1.75	2,013,973	3,532,198	1.75
Paving	2,612,575	2,517,507	.96	2,454,693	2,448,635	1.00
Undistributed [1]	123,659	300,713	2.43	244,656	329,454	1.35
Total	9,694,928	12,210,658	1.26	[2] 10,146,905	[2] 12,395,221	1.22

[1] Includes glass sand, grinding and polishing sands (1955), fire or furnace sand, engine sand, filter sand, and other sands, railroad ballast gravel (1955), and other gravel which cannot be shown separately.
[2] Supersedes figure given in commodity chapter.

projects. Competition was keen, and the increased cost of wages, equipment, and parts cut the margin of profit as prices remained the same or dropped slightly from the preceding year.

Stone.—The output of stone in Maryland in 1956 increased 17 percent in production and 51 percent in value compared with 1955. The increased output of crushed limestone (which comprised 85 percent of the total stone production) accounted for the major portion of the increase in total stone value. A portion of the increased output, particularly the value, can be explained by the fact that 1956 marked the first year for including data on oystershell, which has a high unit value, in the stone total. The bulk of crushed limestone produced was used in manufacturing cement and lime. Baltimore County led in crushed-limestone production, increasing 20 percent over that of the preceding year.

Basalt, marble, granite, and miscellaneous stone (mostly mica schist) also were produced during the year. No dimension sandstone was produced as the Hernwood Quarries reported their quarry idle during the year. However, crushed sandstone (quartzite) for manufacturing silica brick was produced by Harbison-Walker Refractories Co. from a quarry in Cecil County near North East.

Oystershell crushed for use primarily as poultry grit was produced in Baltimore and Dorchester Counties. The fines obtained in

TABLE 3.—Stone sold or used by producers, 1955–56, by kinds and uses

Kind and use	1955		1956	
	Short tons	Value	Short tons	Value
Dimension stone:				
Granite:				
Building stone:				
Rough construction	27,043	$205,727	11,555	$97,440
Dressed construction			900	22,500
Rubble			21,100	52,750
Curbing and flagging			445	5,340
Total (approximate short tons)	27,043	205,727	34,000	178,030
Miscellaneous: Building:				
Rough and dressed	12,074	71,124	5,705	31,113
Rubble and flagging	1,902	14,181	4,040	44,669
Total	13,976	85,305	9,745	75,782
Crushed and broken stone: Granite:				
Riprap	22,963	52,815	22,000	55,000
Concrete and roadstone	55,357	158,924	54,300	112,350
Total	78,320	211,739	76,300	167,350
Basalt and related rocks	692,908	1,040,345	709,703	1,200,278
Total	692,908	1,040,345	709,703	1,200,278
Limestone:				
Concrete and roadstone	3,258,241	5,001,433	[1] 3,958,452	[1] 6,203,759
Agricultural	29,502	125,413	44,507	171,403
Miscellaneous	1,231,230	1,899,604	[2] 1,355,183	[2] 4,500,816
Total	4,518,973	7,026,450	5,358,142	10,875,978
Undistributed [3]	11,748	230,478	40,959	807,312
Grand total	5,342,968	8,800,044	6,228,849	13,304,730

[1] Includes railroad ballast (1956).
[2] Includes riprap, flux, oystershell (1956), and other stone.
[3] Includes dimension limestone, dimension sandstone (1955), crushed sandstone (1956), marble, oystershell (1955), and miscellaneous stone.

crushing were utilized as agricultural stone and for soil improvement.

Producers of limestone, which make up 80 percent of the stone value of the State, reported demand from fair to good, wages and prices slightly higher. Some reported adverse weather conditions in the fall caused a considerable loss in business, as the companies could not maintain production.

Talc and Soapstone.—Soapstone for use as roofing material, asphalt filler, and foundry facing was produced in Carroll County and talc for use in foundry facings, ceramics, and as asphalt filler in Harford County. Clinchfield Sand & Feldspar Corp. sold its mine and crushing and grinding plants to Liberty Stone Co. in October 1956. Production dropped during the year owing to the slackened production of Clinchfield Sand & Feldspar Corp. before the sale of its property.

Vermiculite, Exfoliated.—The Zonolite Co. processed crude vermiculite produced at company quarries in Lincoln County, Mont., and Spartanburg County, S. C. An additional small quantity of imported ore was processed.

MINERAL FUELS

Coal.—Coal production in Maryland continued the trend of recent years, as it increased 30 percent over 1955. Strip production showed a 39-percent increase, underground 23-percent. Production was reported from 93 mines compared with 84 in the preceding year. Many other coal operators producing less than 1,000 tons were also active during the year. Of the total State coal output, 35 percent came from Allegany County and 65 percent from Garrett County. Most underground mines were small, nonmechanized operations, although 36 percent of the underground production (represented by 6 mines) was hand-loaded onto face conveyors. Of the total production, 29 percent was crushed and 6 percent treated before shipment.

TABLE 4.—Production of coal, 1947–51 (average) and 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton [1]			Total	Average per ton [1]
1947–51 (average)	1,123,468	$5,598,329	$4.98	1954	421,616	$1,879,018	$4.46
1952	587,903	2,694,842	4.58	1955	512,469	2,001,743	3.91
1953	530,590	2,441,605	4.60	1956	668,875	2,684,720	4.01

[1] Value received or charged for coal f. o. b. mine, selling cost. (Includes value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

Coke and Coal Chemicals.—Bethlehem Steel Corp. maintained production of coke from 11 batteries of 687 slot-type ovens at Sparrows Point producing 3,050,000 tons of coke. Associated coproducts produced were coke breeze, 176,500 tons; 45,626,000 thousand cubic feet of coke-oven gas; 89,178,000 pounds of ammonium sulfate; 36,237,000 gallons of tar; and 14,405,000 gallons of crude light oil. Light-oil derivatives included benzene (9,474,000 gallons), toluene (2,300,000 gallons), and xylene (718,000 gallons).

Natural Gas.—The output of natural gas in Maryland rose 48 percent in 1956 compared with the preceding year, but the value of output increased 87 percent owing to an increase in average price, from $2.01 to $2.53 per thousand cubic feet at the wellhead. Production in 1956 was again from the Mountain Lake Park field and the Accident field, both in Garrett County.

REVIEW BY COUNTIES

Allegany.—Coal, which contributed over one-third to the mineral value of the county, was reported from 32 underground and 11 strip pits—an increase of 6 over 1955. Moran Coal Co. was the leading producer, followed by Thrasher Contracting & Stripping Co., M. K. Coal Co., Phoenix Big Vein Coal Co., Gary Coal Co., Allegany Engineering Co., Central Sand & Gravel Co., Consolidated Fuel Co., Edna Fuel Co., and P & R Coal Co.

Stone production more than tripled in value owing to opening of a limestone quarry by Fry Coal & Stone Co. near Corrigansville. The Cumberland Cement & Supply Co. continued operations in the county. Over 95 percent of output was used in manufacturing cement.

Cumberland Cement & Supply Co., operator of two fixed sand and gravel plants near Cumberland, reported production of glass sand, engine sand, and structural and paving sand and gravel. Lewis & Hunter produced a small quantity of structural sand.

Fire clay for fire brick and block and mortar was mined by Mount Savage Refractories Co., Mount Savage, and Big Savage Refractories Corp., Frostburg. The Pen-Mar Brick & Supply Co., Cumberland, mined miscellaneous clay for heavy clay products. The value of clay output virtually doubled over 1955 owing primarily to the increased price of fire clay per ton.

TABLE 5.—Value of mineral production in Maryland, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Allegany	$1,622,867	$2,438,328	Coal, stone, sand and gravel, clays.
Anne Arundel	(1)	(1)	Sand and gravel, clays.
Baltimore	8,783,773	11,268,004	Stone, sand and gravel, shell, clays.
Calvert	(1)	(1)	Sand and gravel, greensand marl.
Caroline		17,243	Sand and gravel.
Carroll	(1)	(1)	Cement, soapstone.
Cecil	598,983	1,260,542	Sand and gravel, stone, clays, gem stones.
Charles	11,558	(1)	Sand and gravel.
Dorchester	(1)	(1)	Sand and gravel, shell.
Frederick	2,465,836	2,083,948	Stone, lime, clays.
Garrett	1,997,132	3,222,251	Coal, natural gas, stone, sand and gravel.
Harford	1,478,390	1,337,927	Sand and gravel, stone, talc.
Howard	(1)	(1)	Sand and gravel.
Kent	(1)	(1)	Sand and gravel, clays.
Montgomery	(1)	80,782	Stone.
Prince Georges	5,338,506	(1)	Sand and gravel, clays.
Queen Annes	(1)	(1)	Sand and gravel.
St. Marys	(1)	(1)	Do.
Somerset	1,600	886	Do.
Talbot	10,759	(1)	Sand and gravel, clays.
Washington	(1)	8,157,052	Cement, stone, potassium salts, clays, lime.
Wicomico	79,254	(1)	Sand and gravel, clays.
Worcester	12,886	(1)	Sand and gravel.
Undistributed [2]	13,088,990	10,665,313	
Total	35,491,000	40,532,000	

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes values indicated by footnote 1. Excludes value of clays and stone.

Anne Arundel.—Anne Arundel ranked third in the value of sand and gravel in the State. Sand, primarily for paving and structural purposes, was reported by the following companies: Arundel Corp., from pits near Annapolis, Brooklyn, and Baltimore; the property of R. T. Mohre and V. A. Hare operated by Wright Contracting Co. near Baltimore; Frederick Link Sons, Hanover; and The Brooklyn Corp., Baltimore. The Arundel Corp. also produced fire and furnace sand. Gravel, for road paving, was quarried by Dan Arminger, Owain Owens, Warren Hazard, and Maryland Street & Roads Commission. Alan E. Barton produced sand and gravel. John I. Rogers, a former sand and gravel producer, reported his pit depleted.

The Severn Clay Co., Glen Burnie, mined fire clay for floor and wall tile and sanitary ware.

Baltimore and Baltimore City.—First among the 23 mineral-producing counties in Maryland, Baltimore County contributed over 25 percent to the State's mineral value owing primarily to a leading position in output of stone, clay, and oystershell.

Limestone, basalt, and granite were quarried. There was no output of sandstone in 1956, as Hernwood Quarries reported its quarry closed. Harry T. Campbell Sons' Corp. Texas quarry at Texas was the largest source of limestone. The Arundel Corp., Pikesville, and A. A. Dyer, Reisterstown (formerly of Glyndon), were the other limestone producers. Eighty-seven percent of the limestone was crushed for use as concrete aggregate and roastone. Other uses were for agricultural, chemical, and metallurgical purposes, riprap, whiting, asphalt and fertilizer filler, mineral food, poultry grit, and stucco.

The J. E. Baker Co. Blue Mount quarry, White Hall, and The Arundel Corp., Baltimore, quarried basalt for road-paving purposes and as railroad ballast and riprap.

Granite was mined at the Gwynn Falls, Loch Raven, and Butler quarries of Harry T. Campbell Sons' Corp., and the Reckordville quarry of Carl B. Temple. Output was utilized as dressed and rough construction stone, curbing and flagging stone, rubble, riprap, as concrete aggregate and roadstone.

Ball clay was mined by United Clay Mines Corp., White Marsh—the only producer of this type of clay in the State. Miscellaneous clay was produced at the Monument Street plant and the Rossville clay plant of the Baltimore Brick Co. and the Champion Brick Co., both of Baltimore. The miscellaneous clay was used exclusively for heavy clay products, while the ball clay was utilized for various purposes, including pottery and stoneware, refractories, and floor and wall tile.

Oystershell for poultry grit and agricultural purposes was crushed by the Oyster Shell Corp., Baltimore.

Baltimore also was an important center for sand and gravel production; the county ranked second in the State in the value of output. Four operators reported tonnages of both sand and gravel. In order of decreasing value, they were Harry T. Campbell Sons' Corp., Whitemarsh plant, Cowenton; Nottingham Farms, Inc., Joppa Road plant; Harry A. Smuck & Sons, Lansdowne plant; and George W. Schwarz, White Marsh plant, all of Baltimore. Louis H. Richter,

Baltimore, and Charles B. Polesne, Fullerton, reported gravel production. The building and paving industries consumed the entire county output.

The National Gypsum Co. calcined imported gypsum for use in manufacturing plasters, lath, and wallboard and as a portland-cement retarder.

Expanded perlite for plaster, concrete, soil conditioning, and filtering was produced by Perma Rock Products, Inc., near Baltimore.

Calvert.—Greensand marl was mined near Dunkirk by the Kaylorite Corp.—the only producer in the State. Output was used primarily as soil conditioner.

Small quantities of gravel were produced by Frank Farrell, Oscar S. Bowen, Dorsey Hance, Hammett Gray, Wash Hance, and Calvert Construction Co. Sand and gravel was produced by Melvin Phipps and sand by Stanley Cox. Output was used for road paving.

Caroline.—The Maryland Street and Roads Commission reported gravel production from local deposits in the county for use in paving roads.

Carroll.—The principal mineral commodity produced in Carroll County was portland cement, manufactured by the Lehigh Portland Cement Co. at Union Bridge. Limestone for use in the cement was quarried by the company at Union Bridge.

Clinchfield Sand & Feldspar Corp. sold its soapstone operations at Marriottsville to the Liberty Stone Co. on October 1, 1956. The Liberty Stone Co. continued its operations at Sykesville; output from both plants was used for roofing, foundry facing, insecticides, and asphalt filler.

Cecil.—In order of decreasing value, Mason-Dixon Sand & Gravel Co. (Perryville), McDaniel Sand & Gravel Co., Inc. (North East), Waible, Inc. (Port Deposit), and Manley H. Jones (operator for Arthur D. Johnston, Port Deposit) produced sand and gravel, predominantly for building use. C. Ray Ott, Elkton, and Fred S. Russell, North East, reported output of paving gravel, and Vernon Kincaid reported output of building sand.

Crushed quartzite for silica brick was quarried by Harbison-Walker Refractories Co., North East.

The North East Fire Brick Co. and Fred S. Russell, both of North East, mined fire clay for refractories, such as fire brick and block.

The Mineralogical Society of Pennsylvania, Lapidary Section, collected williamsite (gem stones) at the limestone pits at Conowingo, Md., for ornamental purposes.

Charles.—Sand and gravel was produced for building purposes by Irene and Leroy Gamble at their fixed plant near La Plata. Output of paving gravel was reported by the Maryland Street and Roads Commission.

Dorchester.—J. Edwin Rosser operated a fixed plant on the River Road, Federalsburg, producing substantial quantities of sand and gravel for building and paving purposes. The company also produced sand for fill and lawn grading. The Maryland Street and Roads Commission reported production of gravel for paving use.

Oystershell were crushed for use as poultry grit and for fertilizer by J. M. Clayton Co., Cambridge.

Frederick.—Frederick County ranked second in the value of stone and was the larger of the two lime-producing counties. Limestone was quarried and crushed for use by the following five producers, in order of decreasing value: M. J. Grove Lime Co., Frederick; Le Gore Lime Co., Le Gore; S. W. Barrick & Sons, Inc., Woodsboro; Farmers Cooperative Association, Inc., New London; and Everett V. Moser, Middletown. Output was used predominantly (83 percent) as concrete aggregate and roadstone. The balance of production was used for lime (9 percent), railroad ballast (6 percent), and agricultural purposes (2 percent). The product was used primarily for agricultural purposes, although small quantities were employed for mason's lime and in prepared masonry mortar.

Miscellaneous clay was mined by Hudson Supply & Equipment Co., Buckeystown. Output was used for heavy clay products, such as building brick and tile, paving brick, drain tile, and sewer pipe.

Garrett.—The leading commodity of Garrett County was coal mined from 36 underground mines and 14 strip pits. The principal underground mines, in order of decreasing tonnage, were W. & W. Coal Co., Stanley Coal Co., Myers Coal Co., Harvey & Evans Coal Co., Inc., and B. B. & K. Coal Co. Primary strip producers were Schell Mining Co., Inc., Moran Coal Co., Thrasher Contracting & Stripping Co., Crambletts Mine, and Phoenix Big Vein Coal Co.

Limestone was quarried at the Fry quarry and the Oakland quarry by Vetter Bros., Inc., Oakland. The company crushed the output, principally for use in roadwork.

Sand for use in building and paving was reported by Silver Knob Sand Co., Inc., the leading producer, and Eagle Rock Sand Co., both of Oakland. A small quantity of sand was hand-screened for mortar and concrete by Jessie F. Graves, Friendsville.

Harford.—The largest producer of sand and gravel was Stancill's, Inc., which operated 4 fixed plants—2 at Joppa, 1 at Aberdeen, and 1 at Edgewood. Other plants were operated by Charlestown Sand & Gravel Co., Chestertown; Belcamp Sand & Gravel Co. and Abingdon Sand & Gravel Co., Inc., Abingdon; and Victor Mullin Sand & Gravel Co., Inc., Aberdeen. Output was used for building and paving. W. Noble Hamilton, Havre de Grace, and N. G. Spencer & Son, Abingdon, produced gravel for paving.

The Churchville quarry of Thomas B. Gatch & Sons, Inc., Churchville, yielded a large quantity of basalt, which was crushed for use as concrete aggregate and roadstone. The Maryland Green Marble Co., Cardiff, continued to produce green Maryland verde antique marble for use in building interiors and as terrazzo.

Talc for foundry facings, ceramics, and as asphalt filler was mined by Harford Talc & Quartz Co., Dublin.

There was no slate production in Maryland in 1956, as the Central Commercial Co., Whiteford, dismantled operations.

Howard.—Sand was produced by The Arundel Corp. (Laurel) and gravel by Cosca Sand & Gravel Co. (Jessup) for paving purposes.

Kent.—Sand and gravel for building and sand for paving was produced by The Kent Concrete Co., Inc., Chestertown, and Maryland Street and Roads Commission, respectively. Kaiss Bros. Sand Co. reported no production owing to depletion of supply.

Miscellaneous clay mining continued near Chestertown by the Chestertown Brick Co. The product was used for making building brick.

Montgomery.—Mica schist was quarried by Stoneyhurst Quarries, Bethesda, and Shuff & Son Co., Cabin John, for building and flagging. A small quantity of granite for concrete and riprap was reported by Albert D. Battista, Rockville. Frank Pennini quarried miscellaneous stone near Mount Rainier.

William H. McCeney, Jr., sold his sand and gravel plant to Contee Sand & Gravel Co., Inc. No production was reported in 1956.

Prince Georges.—One-tenth of Maryland's mineral value was derived from the sand and gravel industry of Prince Georges County. Smoot Sand & Gravel Corp., operating a dredge on the Potomac River, was the leading producer of sand and gravel, followed by S. S. Bevard for Silver Hill Sand & Gravel Co., Washington, D. C.; Contee Sand & Gravel Co., Inc., Laurel; Joseph Smith & Sons, Inc., for Buffalo Sand & Gravel Co., Washington; District Sand & Gravel Co., Silver Hill; Washington Sand & Gravel Co., Washington; and A. H. Smith for Davis Sand & Gravel Corp., Clinton. Sand was produced by Frank A. Bevard for Landover Sand Co., Bowie, and M. & M. Union Sand & Gravel, Inc., Glenn Dale. The Forestville Sand & Gravel Co., Forestville, and Uno Excavating Co., Berwyn, reported gravel. Fifty-five percent of the output was used in road paving and 41 percent for building purposes. Miscellaneous gravel comprised the balance of production.

Prince Georges ranked third in value of clay production. Washington Brick Co., Muirkirk, and West Bros. Brick Co., Washington, D. C., mined miscellaneous clay, primarily for building brick and other heavy clay products. A small portion of the output was used in manufacturing flowerpots. Fire clay for use in foundries and steelworks was mined by William L. Allen, Laurel.

Expanded perlite for use as lightweight aggregate in plaster—the principal use—and concrete aggregate was produced by the Atlantic Perlite Co., near Washington, D. C.

The Zonolite Co. processed crude vermiculite at a plant near Beaver Heights from raw material produced in Spartanburg County, S. C., and Lincoln County, Mont., plus a small tonnage of imported material.

The Mineral Pigments Corp. reported sales of finished natural and manufactured pigments of varying colors; red and yellow iron oxides and magnetic black predominated.

Queen Annes.—A small quantity of sand was produced by R. B. Baker & Sons, Inc., Queenstown, for use in building and paving.

St. Marys.—The Leonardtown Sand & Gravel Co., Leonardtown, reported output of sand and gravel for building and paving purposes.

Somerset.—Gravel for use in road paving was produced by the Maryland Street and Roads Commission.

Talbot.—Considerable quantities of gravel for use in paving streets and highways were produced by the State roads commission, Talbot County Highway Department.

Miscellaneous clay for brickmaking was mined by New Brick & Tile Co., Easton.

Washington.—Washington County ranked second in value of mineral output in Maryland, producing portland and masonry cements, stone, potassium salts, clay, and lime.

Of the two cement-producing counties, Washington was the principal area due to the output of North American Cement Corp. Security plant at Hagerstown. Portland and masonry cements were manufactured, and sulfate of potash was obtained as a byproduct of the cement mill. Limestone also was quarried on the site for use at the cement plant, plus a small quantity sold as roadstone and railroad ballast. Limestone for roadstone, agricultural purposes, and as an inert dust for coal mines was produced at the Pinesburg plant of Fry Coal & Stone Co., Williamsport. The Schetrompf Lime Co., Clear Spring, quarried dimension stone for use as rubble in construction work. Quicklime was produced by the company for agricultural purposes.

Miscellaneous clay (shale) for heavy clay products was mined at the open pit of Victor Cushwa & Sons, Inc., Williamsport.

Wicomico.—Richard H. Howard, the leading producer, and Basic Materials Supply Co., both of Hebron, produced sand and gravel for use in paving, plus a small quantity of gravel for building purposes. The Maryland Street and Roads Commission reported gravel production for paving purposes.

The Salisbury Brick Co., Inc., Salisbury, mined miscellaneous clay for heavy clay products.

Worcester.—Gravel production was reported by the Maryland Street and Roads Commission for use in road paving.

The Mineral Industry of Massachusetts

By Robert W. Metcalf [1]

MASSACHUSETTS mineral production in 1956 was valued at $25 million, an alltime record and 13 percent greater than in 1955, the previous top year. This record was due chiefly to the large increase in both quantity and value of crushed and broken stone in 1956; this category rose 32 percent in tonnage and 35 percent in value over 1955. The output of sand and gravel also rose moderately compared with 1955 and topped 1955 by 6 percent in quantity and 7 percent in value.

Mineral commodities produced in Massachusetts in 1956, in order of importance, were stone, sand and gravel, lime, clay, and peat. Types of stone produced were basalt, granite, limestone, sandstone, and miscellaneous stone (granitic gneiss). In order of value of product, Middlesex County ranked first among Massachusetts counties, followed by Berkshire, Hampden, Essex, and Norfolk. Stone was the principal mineral commodity in Middlesex, Essex, and Hampden Counties, lime in Berkshire, and sand and gravel in Norfolk.

TABLE 1.—Mineral production in Massachusetts, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	124,832	$141,654	127,547	$213,682
Lime	134,952	1,957,346	134,248	2,093,195
Peat	572	(2)	300	(2)
Sand and gravel	9,580,943	8,926,329	10,189,425	9,519,831
Stone	4,128,004	11,381,164	5,441,878	13,752,920
Value of items that cannot be disclosed: Mineral fuels and nonmetals		5,933		2,800
Total Massachusetts [3]		22,109,000		25,085,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total adjusted to eliminate duplicating value of stone.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—The Dragon Cement Co., New York, N. Y., optioned 550 acres of land along the Boston & Albany Railroad between Washington and Hindsdale in Berkshire County as a possible site for a

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.

new $10 million cement plant. Consideration of two previously proposed locations—West Stockbridge and North Adams—was dropped because of failure to obtain approval of the local authorities.[2]

Clays.—Production of clays in Massachusetts in 1956 was 2 percent higher than in 1955. Miscellaneous or surface clay only was mined and used largely for making building brick and other heavy clay products. The remainder of the clay was manufactured into flowerpots. Clays were mined in 4 counties by 5 firms in 1956. The largest producing county was Plymouth, followed in order of output by Hampden, Bristol, and Middlesex Counties.

Lime.—Production of quick and hydrated lime in 1956 declined slightly, although the value rose 7 percent compared with 1955. The average value per ton was $15.59—8 percent higher than in 1955, although 2 percent below that in 1953. The quantity of quicklime sold or used declined 9 percent, while the tonnage of hydrated material rose 10 percent in 1956 compared with 1955. The greater part of the output of both quick and hydrated lime was consumed for chemical and industrial purposes, with sizable tonnages for building and the balance (all hydrated) for agricultural use. The output of lime was entirely from Berkshire County.

TABLE 2.—Lime (quick and hydrated) sold by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1947–51 (average)	123,259	$1,540,024	$12.49	1954	127,836	$1,709,341	$13.37
1952	132,135	1,999,545	15.13	1955	134,952	1,957,346	14.50
1953	135,383	2,156,205	15.93	1956	134,248	2,093,195	15.59

Perlite.—Perlite was expanded by the Permalite Division, Whittemore Co., at Roslindale, Suffolk County. Crude material was obtained from Colorado and New Mexico. The expanded product averaged 8 pounds to the cubic foot and was consumed mostly as plaster aggregate (71 percent of sales) and concrete aggregate (26 percent of sales). Demand was less in 1956 than in 1955, due to changing market requirements.

Roofing Granules.—Bird & Son, East Walpole, Norfolk County, prepared and marketed slate-roofing granules.

Sand and Gravel.—Production of sand and gravel in 1956 rose 6 percent in tonnage and 7 percent in value. The active road-building program was reflected in the 27-percent increase of sand and gravel used for paving purposes in 1956 compared with 1955. Structural sand and gravel remained the principal type, but in 1956 it composed only 46 percent of the total sand and gravel produced, compared with 57 percent of the total in 1955. Molding sand, fire or furnace sand, railroad-ballast gravel, and ground sand were included among the other varieties of sand and gravel sold or used in Massachusetts in 1956. Although the tonnage of Government-and-contractor sand and gravel in 1956 rose nearly one-fifth (19

[2] Rock Products, vol. 59, No. 1, January 1956, p. 63; No. 6, June 1956, p. 53.

TABLE 3.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Structural	2,875,484	$2,508,822	$0.87	2,427,389	$2,415,922	$1.00
Paving	1,358,366	1,074,808	.79	1,582,281	1,288,516	.81
Filter	(1)	(1)	(1)	8,000	10,000	1.25
Other	(1)	(1)	(1)	301,042	259,108	.86
Gravel:						
Structural	2,433,690	2,870,499	1.18	2,274,967	2,890,757	1.27
Paving	1,643,426	1,168,074	.71	2,016,390	1,434,671	.71
Railroad ballast	15,025	5,259	.35	13,878	5,138	.37
Other	491,372	359,696	.73	804,429	575,198	.72
Undistributed [2]	257,396	420,812	1.63	158,414	350,073	2.21
Total commercial sand and gravel	9,074,759	8,407,970	.93	9,586,790	9,229,383	.96
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Structural	43,565	100,157	2.30	581	215	.37
Paving	71,735	130,461	1.82	85,284	55,000	.64
Gravel:						
Structural	152,594	124,819	.82			
Paving	238,290	162,922	.68	516,770	235,233	.46
Total Government-and-contractor sand and gravel	506,184	518,359	1.02	602,635	290,448	.48
Grand total	9,580,943	8,926,329	.93	10,189,425	9,519,831	.93

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes molding sand, fire or furnace sand (1956), engine sand (1955), ground sand, and uses indicated by footnote 1.

percent), commercial operations in 1956 totaled 94 percent of all sand and gravel sold or used in the State. The average value of commercial sand and gravel shipments rose slightly in 1956, while that of all sand and gravel remained at the same level as in 1955.

The largest producing counties in 1956, in order of tonnage, were Middlesex, Worcester, Bristol, Essex, and Hampden. These five counties supplied two-thirds of the total output in Massachusetts. The larger producers included: Worcester Sand & Gravel Co., Inc., Worcester County; Boston Sand & Gravel Co., Norfolk and Plymouth Counties; J. J. Cronin Co. and Thomas Quinn Co., Middlesex County; Yemma Bros., Inc., Essex County; Berkshire Gravel, Inc., Berkshire County; and E. A. Jenson & Sons, Inc., Hampden County.

Stone.—Stone produced in Massachusetts in 1956 reached a new high, totaling 5.4 million short tons valued at $13.8 million—an increase of 32 percent in quantity and 21 percent in value over 1955. Dimension and crushed or broken stone was produced, all from quarry operations. Of the dimension stone, granite composed 92 percent of the quantity and 97 percent of the value; basalt and sandstone made up the balance. The production of dimension stone in 1956 rose 13 percent in quantity and 2 percent in value compared with 1955 and represented 3 percent of the tonnage and 36 percent of the

value of Massachusetts stone. Curbing and flagging, the largest dimension-stone uses, totaled 54 percent of the tonnage and 45 percent of the value of all dimension. Dressed construction stone, the next largest use, accounted for 18 percent of the quantity and 26 percent of the value of dimension stone. Other types of dimension stone showing large increases in both tonnage and value over 1955 were rubble and rough architectural stone.

Production of crushed and broken stone again increased substantially, rising 32 percent in tonnage and 35 percent in value in 1956 compared with 1955. Large increases over 1955 in railroad ballast, agricultural limestone, and concrete aggregate and roadstone were indicated, although stone used for riprap declined in 1956. Crushed stone used for concrete and roadstone totaled nearly 4.5 million short tons valued at $6.9 million—a rise of 35 percent in tonnage and 41 percent in value. In 1956, 64 percent of the tonnage of crushed and broken stone marketed was basalt, and 20 percent was granite. Other types of crushed and broken stone produced in Massachusetts in 1956 were limestone and miscellaneous stone (granitic gneiss).

Twenty-eight firms or individuals operated 33 commercial stone quarries in Massachusetts in 1956. Basalt was produced at 12 quarries, granite at 14, limestone at 5, and sandstone and miscellaneous stone at 1 each (1 operator quarried both basalt and limestone). The chief centers for dimension-stone production were Middlesex and Worcester Counties and for crushed and broken stone Berkshire, Essex, Hampden, Norfolk, and Suffolk Counties.

TABLE 4.—Stone sold or used by producers, 1955–56, by uses

	1955		1956	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Rough construction short tons	10,238	$174,614	8,167	$220,751
Rubble do	6,415	11,647	18,534	27,742
Dressed construction do	22,240	1,157,918	24,821	1,290,598
Rough architectural do	1,035	32,678	4,769	174,372
Dressed architectural do	(1)	(1)	5,002	615,621
Rough monumental do	(1)	(1)	(1)	(1)
Dressed monumental do	(1)	(1)	(1)	(1)
Durax and paving blocks do	(1)	(1)	1,073	25,594
Curbing and flagging do	76,417	2,541,561	73,505	2,257,243
Undistributed [2]	5,590	966,570	1,461	358,127
Total dimension stone (quantities approximate, in short tons)	121,935	4,884,988	137,332	4,970,048
Crushed and broken stone:				
Riprap short tons	122,438	199,463	70,922	119,265
Concrete aggregate and roadstone do	3,336,645	4,867,622	4,490,731	6,871,430
Railroad ballast do	(3)	(3)	111,814	144,813
Agricultural (limestone) do	(3)	(3)	114,147	430,106
Other uses do	141,569	754,852	516,932	1,217,258
Undistributed [4] do	405,417	674,239		
Total crushed and broken stone do	4,006,069	6,496,176	5,304,546	8,782,872
Grand total (quantities approximate, in short tons)	4,128,004	11,381,164	5,441,878	13,752,920

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes items indicated by footnote 1.
[3] Included with "Undistributed."
[4] Includes furnace flux, limestone for lime, and items indicated by footnote 3.

Vermiculite.—Exfoliated vermiculite was produced by two companies in Middlesex County. Uses included plaster and concrete aggregate and house insulation. Both domestic and foreign vermiculite was exfoliated. Production in 1956 increased about one-third over 1955.

MINERAL FUELS

Peat.—Output of peat in Massachusetts in 1956 was confined to Essex County, near Lawrence. This product was consumed locally as a soil conditioner.

REVIEW BY COUNTIES

Barnstable.—Concrete Products Co. and Frederick V. Lawrence, Inc., both of Falmouth, produced building sand and gravel and paving sand and gravel, respectively. Dennis E. Dugan, Jr., John F. Noons, and Tri-City Concrete Co. (locations unknown) mined paving sand. Whitehead Bros. Co. produced molding sand from a pit at Provincetown. The Massachusetts Department of Public Works mined a small tonnage of paving sand and gravel for road construction. Granite for use as riprap for jetty construction in beach-improvement programs was produced by Turner & Breivogel, Inc., near Falmouth. The Massachusetts Department of Public Works quarried miscellaneous stone and used it in crushed or broken form as riprap and concrete aggregate and roadstone.

Berkshire.—Lee Lime Corp. (Lee), New England Lime Co. (Adams), and United States Gypsum Co. (Farnams) all burned limestone produced at their own quarries in Berkshire County. Both quick and hydrated lime was produced, chiefly for chemical and industrial consumption, such as metallurgical use, paper, paint, and dye manufacture, and many other applications. Shipments of lime were made largely to New England States, New Jersey, and New York. In addition to use in making lime, limestone was quarried by these three firms for riprap, blast-furnace flux, agricultural stone, whiting, asphalt, fertilizer and rubber filler, and for other purposes.

TABLE 5.—Value of mineral production in Massachusetts, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Barnstable	$261,289	$193,296	Sand and gravel, stone.
Berkshire	3,080,863	3,951,069	Lime, stone, sand and gravel.
Bristol	1,393,924	1,514,527	Sand and gravel, stone, clays.
Dukes	(1)	21,197	Sand and gravel, stone.
Essex	1,499,512	2,410,110	Stone, sand and gravel, peat.
Franklin	(1)	188,927	Stone, sand and gravel.
Hampden	(1)	(1)	Stone, sand and gravel, clays.
Hampshire	(1)	(1)	Sand and gravel, stone.
Middlesex	6,782,365	7,245,141	Stone, sand and gravel, clays.
Nantucket		463	Sand and gravel.
Norfolk	2,489,849	2,040,721	Sand and gravel, stone.
Plymouth	707,302	987,336	Sand and gravel, stone, clays.
Suffolk	1,401,839	1,200,307	Stone, sand and gravel.
Worcester	1,602,916	1,819,831	Sand and gravel, stone.
Undistributed [2]	2,889,593	3,512,394	
Total	22,109,000	25,085,000	

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes values indicated by footnote 1.

The New England Lime Co., Adams, has installed multiple cyclone dust collectors on 2 of its largest rotary kilns in the latest phase of a 4-year plan to reduce dust at the plant.[3] A detailed, illustrated description of a commercial-size fluidizing calciner or reactor installed by the same firm for preparing burned lime was published.[4] This process is an adaptation to lime manufacture of methods developed to obtain improved petroleum products during World War II. The operation proved so advantageous that a second fluidizing unit, with an estimated daily capacity of 100 tons of lime, was installed, full operation to begin in the early part of 1957.[5]

Structural and paving sand and gravel were mined in Berkshire County by 11 commercial producers and paving sand and gravel only by 2 Government-and-contractor agencies. Producers were Abby & Sons and Bernard Miner, Lee; Berkshire Gravel, Inc., with mines at Lee and Pittsfield; Frank Bushika, with pit at Cheshire; General Sand and Stone Corp., Dalton; Hutchinson Sand & Gravel Co., with pits at Dalton and Pittsfield; Maxymillian, Inc., with sand pit at North Adams; Mountain Sand & Gravel Co., Inc., Great Barrington; Mary Sekaske, with gravel bank at Becket; and Twentieth Century Concrete Works, Inc., Stockbridge. Sand and gravel for road and street paving was mined by the City of North Adams Highway Department, and paving gravel was produced by contractors for Massachusetts Department of Public Works. Pettinos New England, Inc., marketed ground sand prepared from quartz deposits near Cheshire. This product was consumed for foundry use, in soap and scouring preparations, and for other purposes.

The Otis Chester Granite Co., Inc., produced dimension blue granite for monumental stone from its quarry at Otis, mostly for local use in 1956. John S. Lane & Son, Inc., produced crushed limestone for concrete aggregate and roadstone at a quarry near West Stockbridge. No peat was reported from Berkshire County in 1956.

Bristol.—Stiles & Hart Brick Co. mined common clay at Taunton for use in manufacturing heavy clay products. The Blue Stone Division, Warren Bros. Roads Co., quarried riprap and roadstone from its granite quarry near Acushnet.

Bristol ranked third among Massachusetts counties in both the quantity and value of sand and gravel produced in the State. The 10 leading producers were: Joseph Borge & Sons, Inc., and Swansea Sand & Gravel Co., Swansea; Brockton Sand & Gravel Co., South Easton; Chiccine Sand Pit, operated by Dorothy C. Brooks, Dartmouth; McCabe Sand & Gravel Co., Taunton; Morse Sand & Gravel Co., Attleboro; Pine Hill Sand & Gravel Co., Westport; River Sand & Gravel Co., Seekonk; J. J. Stevens Co., Dartmouth; and Thomas Bros. Corp., Raynham (operated under lease to Tri-City Concrete Co., Inc.). Sand and gravel also was mined by three other operators in the county in 1956. Due to the continued building program the demand for sand and gravel in this area was good, although wages were increasing and the competition keen, according to the producers. A

[3] Rock Products, vol. 59, No. 1, January 1956, p. 63.
[4] Herod, Buren C., New England Lime Co. Obtains Efficient Results With Fluidizing Calcines: Pit and Quarry, vol. 48, No. 11, May 1956, pp. 122–124, 146.
[5] Pit and Quarry, Second Fluidizing Unit Producing Chemical Lime for New England Lime Company: Vol. 49, No. 5, November 1956, p. 53

diminishing supply of bank gravel affected adversely one or two operators. Paving gravel also was produced for local street construction by the City of Taunton Street Department and paving sand and gravel by the Town of Dartmouth Highway Department.

Dukes.—Colby Construction produced building and paving sand and building gravel at Oak Bluffs. Black Top Construction Co., Oak Bluffs, and Goodale Construction Co., locations unknown, produced paving and road sand. The Massachusetts Department of Public Works mined sand and gravel with its crews in Dukes County and contracted for the production of some paving gravel. That agency also produced some stone for riprap in 1956.

Essex.—Peat humus was recovered from bogs near Lawrence by Massachusetts Peat Humus Co. It was used locally as a soil-improvement medium.

Sand and gravel was produced in Essex County in 1956 by 20 commercial operators and 3 Government-and-contractor agencies. The more important of these producers were: Essex Sand & Gravel Co., Ballardvale, near Andover; Georgetown Sand & Gravel Co., Salem; Miles River Sand & Gravel, Inc., Ipswich; Harris D. Shea Co., Rowley; Topsfield Sand & Gravel Co., Topsfield; Videtta Construction Co., Peabody; Wright Contracting Co., Danvers; and Yemma Bros., Inc., Groveland. The demand for sand and gravel in the county was good, in spite of slightly higher prices and wages. The product was used largely as building sand and gravel, with smaller quantities for paving purposes and for fill. The City of Lawrence and Town of Amesbury produced paving sand and gravel. Sand and gravel was produced under contract for the Massachusetts Department of Public Works for paving and street construction, with a small quantity for use for structural purposes.

Dimension granite for use in rough construction and as rubble was quarried by Karl A. Perrson at Rockport from Johnson's Quarry. The Massachusetts Department of Public Works mined granite dimension stone (rough blocks for roads and bridges) and granite for concrete and roadstone in Essex County in 1956. Basalt was quarried for concrete aggregate and roadstone by Essex Sand & Gravel Co., West Peabody; Trimount Bituminous Products Co., Saugus; and Lynn Sand & Stone Co., Swampscott (which also sold basalt for use as riprap, railroad ballast, mineral filler, and other unspecified purposes). Demand for basalt products was good, particularly for use in housing construction. Wages were higher; but prices remained steady, and increased efficiency held earnings at a favorable rate.

Franklin.—Structural sand was produced by Mackin Sand & Concrete Products Co. at Greenfield, and the Boston & Maine Railroad mined gravel at Mount Herman for building purposes, for railroad ballast, and for roadway maintenance. Greenfield Massachusetts Broken Stone Co. quarried basalt at Deerfield for riprap, concrete aggregate and roadstone, and railroad ballast. This firm also produced some rubble dimension stone for building purposes.

Hampden.—The Westfield Clay Products Co. and Hampshire Brick Co. mined miscellaneous clay at Westfield and Chicopee, respectively, and utilized it in making brick.

Production of sand and gravel in 1956 in Hampden County was made by 10 commercial operators and 1 Government-and-contractor

agency. The leading producers were: Banas Sand & Gravel Co., Inc., and D. D. Ruxton Co., Ludlow; Baxter Sand & Gravel Co. and North Wilbraham Sand & Gravel Co., Inc., Springfield; E. A. Jenson & Sons, Inc., Granville Center; John Lizak Palmer; Monson Sand & Gravel Corp., Monson (formerly Edward N. Christianson Sand Co.); and Western Massachusetts Sand & Gravel, Inc., Westfield. Structural and paving sand and gravel were the chief products, with small tonnages of fire or furnace sand and miscellaneous sands. Nearly two-thirds of the total tonnage was washed or otherwise prepared before sale. Paving gravel was mined for road construction under contract with the Massachusetts Department of Public Works.

Basalt for concrete aggregate and roadstone was produced at 2 of the 3 quarries near Southwick owned by John S. Lane & Son, Inc. The third quarry was idle in 1956. McCormick Longmeadow Stone Co., Inc., quarried dimension sandstone at East Longmeadow. Marketed as dressed architectural stone, sales included exterior stone for seven dormitories at Wesleyan University, Middletown, Conn., and for St. Peter and St. Paul's Cathedral, Philadelphia, Pa.

Hampshire.—Sand and gravel for structural and paving use was produced in Hampshire County in 1956 by A. Giard & Sons, Inc., Ware; Hampshire Sand & Gravel, Inc., Westhampton; Omasta Bros. and Bill Willard, Inc., Northampton; and Eli Queeneville, South Hadley. Donovan Bros., Inc., Huntington, purchased the Strickland pit in December 1956 and plans to begin operation in the spring of 1957. John S. Lane & Son, Inc., quarried basalt near Amherst for use as concrete aggregate and roadstone.

Middlesex.—A. D. Hews & Co., Inc., produced miscellaneous clay near Cambridge for use in making flowerpots. Two firms—Zonolite Co. at North Billerica and California Stucco Products Co. at Cambridge—exfoliated vermiculite. This product was sold principally for use as plaster and concrete aggregate and as home insulation. The crude material came partly from South Africa and the balance from deposits in Montana and South Carolina.

Middlesex. County in 1956 ranked first among Massachusetts counties in order of production of sand and gravel. Increased prices and wages were general in the county, although demand remained active. Depletion and restrictive zoning laws, however, were restricting the supplies of new material, according to some producers. The output of sand and gravel from 21 commerical operations was reported in 1956. Structural and paving sand and gravel comprised by far the bulk of the output. Some molding sand and railroad-ballast gravel were produced, as well as a sizable tonnage of both sand and gravel for which no end use was specified. The leading producers were: Acme Sand & Gravel Co., and Akeson Sand & Gravel Co., both with mines at Woburn; Ashland Sand & Gravel Co., Inc., Ashland; Assabet Sand & Gravel Co., Inc., and Lexington Sand & Gravel Co., South Acton; J. J. Cronin Co., Wilmington; Thomas Quinn Co., Burlington; Riverside Sand & Gravel Co., Newton; and San-Vel Contracting Co., Littleton. The City of Everett mined paving sand and gravel under contract for its own use.

Dimension granite was produced at Westford by H. E. Fletcher Co. and Morris Bros. Granite Co., Inc. The chief products of the H.

E. Fletcher Co. were dressed stone for construction work and curbing. This firm also marketed rough construction stone, rubble, and architectural stone and dressed granite for architectural work, paving and monumental blocks. Curbing, rubble, and paving blocks were produced for sale by Morris Bros. Granite Co., Inc.

H. E. Fletcher Co., in addition to dimension stone, produced crushed or broken granite for riprap, roadstone, and other uses. The company granite quarry at Westford covered about 40 acres and was about 200 feet deep. Wire saws were used to make nearly all the subdivision of rock in the quarry. Gangs of 3 or 4 wire saws were used, as well as pairs and singles. Each wire was 16,000 feet long and consisted of a twisted ribbon of high-carbon steel. A smooth, uniform cut was made with the aid of aluminum oxide powder and water. Careful spacing of the wires considerably reduced subsequent millwork. Wire saws also were used in the mill.

The B. & M. Crushed Stone Co., Ashland, quarried granite for road construction. Basalt was quarried at Winchester by Winchester Crushed Stone Co. for use in concrete and as roadstone. A small quantity of rough dimension stone for building use was also produced. Granitic gneiss was quarried by John P. Condon Corp. at Dracut for concrete aggregate and roadstone.

Nantucket.—Nantucket Construction Co. produced paving sand, and the Massachusetts Department of Public Works mined paving sand and gravel with its own crews for road and street maintenance on the island.

Norfolk.—Structural and paving sand and gravel, and a small tonnage of filter sand and miscellaneous gravel were mined in Norfolk County in 1956. The chief producers reporting output were: Boston Sand & Gravel Co. and A. A. Will Sand & Gravel Corp., Canton; Edward T. Dwyer Sand & Gravel Corp., Braintree; Glacier Sand & Stone Co., Inc., Norwood; and Varney Bros. Sand & Gravel Corp., Milford. Other smaller producers were: Charles E. Wilkinson Estate, Wrentham; Frank W. Weaver, East Weymouth; and Ray Sand & Gravel Co., Canton. The Town of Needham Highway Department also mined paving and road sand for its own use.

J. E. Swingle, Inc., quarried dimension granite for monuments. Bates Bros. Seam Face Granite Co. produced rough dimension stone for both construction and architectural purposes. Granite for concrete and roadstone and railroad ballast and for sale as stone dust was quarried and prepared by Old Colony Crushed Stone Co. All of the above granite producers operated quarries near Quincy. Stoughton Crushed Stone Co. quarried basalt at Stoughton for concrete aggregate and roadstone. The demand for basalt products was higher, in spite of increased prices, due to rising cost of repairs and higher wages. Roofing granules were sold by Bird & Son, East Walpole.

Plymouth.—Clay was mined from open pits by Bridgewater Brick Co. at East Bridgewater and Stiles & Hart Brick Co. at South Bridgewater and manufactured into building brick and other heavy clay products. Sand and gravel in Plymouth County in 1956 was produced by 16 operators. Of these, the more important were: Boston Sand & Gravel Co., Greenbush; A. S. Cedergren, West Bridgewater; Marshfield Sand & Gravel Co., Marshfield; Petrino Co., Whitman; Bradford

Weston, Inc., Hingham; and Whitehead Brothers Co., Onset and Marion (dredge). Building, paving, molding, filter, and other sands and building and paving gravel were produced. The Massachusetts Department of Public Works produced paving sand and gravel with its own crews and also contracted for the mining of sizable tonnages of road sand and gravel.

Granite for riprap and for road construction was quarried by Bradford Weston, Inc., at Hingham. Stone for riprap and concrete aggregate and roadstone was quarried by the Massachusetts Department of Public Works.

Suffolk.—Expanded perlite was produced for sale by the Permalite Division, Whittemore Co., at Roslindale, largely as concrete and plaster aggregate. Crude perlite was shipped from Western States. D. B. Raymond, Burlington, produced gravel fill. Sand and gravel was produced under contract for the Massachusetts Department of Public Works for road and street construction. Granite was quarried and crushed by West Roxbury Crushed Stone Co., West Roxbury, for concrete and roadstone. Crushed limestone for concrete and roadstone and rough dimension block for roads and bridges were produced for its own use by the Massachusetts Department of Public Works. Crushed and broken basalt for concrete aggregate and roadstone for riprap were produced by Rowe Contracting Co., Malden, with quarry in Suffolk County, and William J. Barry Co., Roslindale. The latter firm also prepared roofing granules.

Worcester.—Worcester County in 1956 ranked second in both quantity and value of sand and gravel produced. Sand and gravel for paving and building use had the largest markets, with a small quantity for molding sand and the rest for miscellaneous or unspecified uses. Output was reported from 33 operations, the largest of which were: Allaire Brothers, Auburn; B. N. T. Sand & Gravel Co., Inc., and De Falco Concrete, Inc., Millbury; R. T. Curtis, Inc., Barre; E. L. Dauphinais, Inc., Grafton; P. J. Keating, Inc., Lunenberg; Joseph Rosenfeld, Hopedale; Henry Trulson, Holden; Webster-Dudley Sand & Gravel, Inc., Webster; and Worcester Sand & Gravel Co., Shrewsbury. One producer reported an increase in industrial and Government work but less private housing. Business in general was reported to be good. One operator (De Falco) erected a new plant, which affected the volume of his business temporarily.

Granite building stone was quarried by H. E. Fletcher Co., Milford; and Uxbridge Granite Co., Uxbridge. Output consisted of both rough and dressed construction and architectural stone. Holden Trap Rock Co. (Holden) quarried basalt for use as concrete aggregate and roadstone.

The Mineral Industry of Michigan

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Michigan Department of Conservation, Geological Survey Division, State of Michigan.

By Donald F. Klyce[1]

EXPLOITATION of lower grade mineral deposits, made possible by the application of improved mineral extraction techniques, had a marked effect on Michigan mineral production in 1956. In Marquette County iron ore was produced from the jasper iron formation in commercial quantities for the first time. Production of copper from the sulfide ores of Ontonagon County composed a major portion of the State total. Application of metallurgical techniques to sand and gravel processing is yielding a high-quality product that meets the rigid specifications of modern usage. Sand and gravel producers report good results in using a dense-medium process for separating lighter weight unwanted materials from their commodity at low cost to produce a premium product.

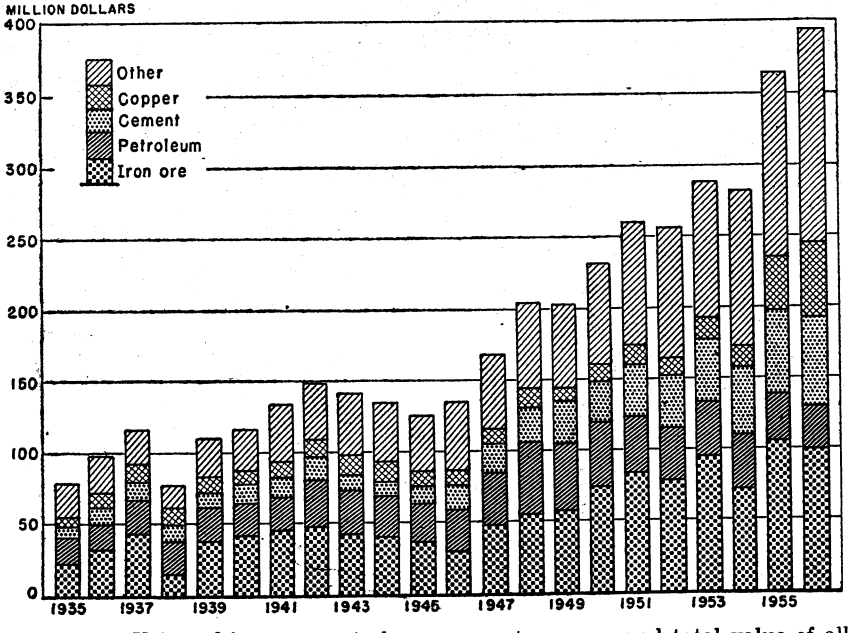

FIGURE 1.—Value of iron ore, petroleum, cement, copper, and total value of all minerals in Michigan, 1935–56.

[1] Commodity-industry analyst, Minneapolis Field Office, Division of Mineral Industries, Region V, Bureau of Mines, Minneapolis, Minn.

In 1956 Michigan mineral production was valued at $395 million—an increase of 8.5 percent over the 1955 record high of $364 million. Michigan led the Nation in the production of gypsum, marl, and salt and ranked second in output of iron ore, sand and gravel, and stone.

In order of value the leading minerals produced were: Iron ore, cement, copper, salt, sand and gravel, stone, and petroleum.

TABLE 1.—Mineral production in Michigan, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement:				
Portland ..... 376-pound barrels	18,128,068	$52,352,794	20,236,933	$61,749,391
Masonry ..... do	1,610,332	5,695,606	1,643,289	6,048,871
Clays	1,937,593	2,019,077	2,110,030	2,401,051
Copper (recoverable content of ores, etc.)	50,066	37,349,236	61,526	52,297,100
Gem stones	(2)	250	(2)	500
Gypsum	1,762,105	5,660,587	1,715,832	5,861,152
Iron ore (usable) ..... long tons, gross weight	14,143,509	104,258,188	12,536,009	98,110,779
Magnesium compounds	46,336	5,063,621	(3)	(3)
Marl, calcareous	119,313	57,176	157,246	94,821
Natural gas ..... million cubic feet	8,300	955,000	10,911	1,451,000
Peat	29,743	(3)	31,111	474,899
Petroleum (crude) ..... thousand 42-gallon barrels	11,266	32,900,000	10,740	30,824,000
Salt (common)	4,975,442	31,668,351	5,548,178	35,643,860
Sand and gravel [4]	37,214,459	29,490,775	42,149,946	35,145,953
Silver (recoverable content of ores, etc.) ..... troy ounces	478,000	432,614	379,990	343,910
Stone	33,635,612	28,908,784	33,998,830	31,010,175
Value of items that cannot be disclosed: Bromine, calcium chloride and calcium-magnesium chloride, lime, magnesium chloride (1955), natural-gas liquids, potassium salts, and value indicated by footnote 3	----------	31,849,463	----------	38,716,531
Total Michigan [5]	----------	363,787,000	----------	394,536,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Includes friable sandstone.
[5] Total has been adjusted to eliminate duplicating value of clays and stone.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Copper production in Michigan in 1956, in terms of recoverable metal, was 23 percent higher than in 1955. The increase was due in part to the price level for copper, which was at a record high for the first 6 months of the year. Another contributing factor was full-scale operation of the White Pine mine in Ontonagon County.

Calumet & Hecla, Inc., operated its mines, mill, and reclamation plant in Houghton and Keweenaw Counties. The highest production in recent years was reported by the company.

The Quincy Mining Co. reclamation plant and the Copper Range Co. Champion mine and concentrator were operated throughout the year.

Production for the State in 1956 totaled 61,526 short tons, valued at $52.3 million. Output was from 12 underground mines and 3 tailing-reclamation plants.

Two contracts between the Defense Minerals Exploration Administration (DMEA) and Calumet & Hecla, Inc., were in effect during 1956. One contract, covering copper-exploration activities in Houghton and Keweenaw Counties, was terminated in August. A second contract for exploration work in Ontonagon County continued through the year.

TABLE 2.—Mine production of copper in 1956, by months, in terms of recoverable metal

Month	Short tons	Month	Short tons
January	5,070	August	5,140
February	5,130	September	4,770
March	5,610	October	4,951
April	5,250	November	4,945
May	5,350	December	5,150
June	5,200		
July	4,960	Total	61,526

TABLE 3.—Mine production of copper, 1947–51 (average) and 1952–56, in terms of recoverable metal

Year	Mines producing		Material treated		Copper	
	Lode	Tailing	Ore (short tons)	Tailing (short tons)	Short tons	Value
1947–51 (average)	10	3	1,998,803	2,405,334	24,411	$10,528,125
1952	8	3	1,879,131	1,991,051	21,699	10,502,316
1953	9	2	2,314,420	1,878,297	24,097	13,831,678
1954	13	2	2,478,085	1,812,695	23,593	13,919,870
1955	11	2	5,319,699	1,488,854	50,066	37,349,236
1956	12	3	6,427,095	2,233,599	61,526	52,297,100

The average annual weighted price used to calculate the value of copper produced in 1956 was 42.5 cents per pound. In 1955 the average price used was 37.3 cents per pound. Quoted market prices for copper per pound, delivered Connecticut Valley, opened 1956 at 44 cents, increased to a high of 48 cents March 13, declined to 39.5 cents July 10, remained about 40 cents until October 25 when it dropped to 36.7 cents, and closed 1956 at 36 cents.

Iron Ore.—Shipments of usable iron ore in 1956 were 89 percent of the 1955 total, while the tonnage of crude iron ore mined in 1956 increased 8 percent over 1955. The value at the mine of the usable ore shipped in 1956 was $98 million compared with a 1955 value of $104 million. The average mine value of the ore, without respect to grade, was $7.83 per long ton in 1956 and $7.37 in 1955. The value applies more closely to the non-Bessemer grades, which constituted the bulk of the tonnage shipped. Dates of first and last lake shipments of ore in 1956 from Michigan and Wisconsin ports were: Ashland-Soo, April 23–November 25; Ashland-C&NW, April 25–November 28; Escanaba-C&NW, April 7–December 3; Marquette-DSSA, April 26–November 11; Marquette-LS&S, April 9–December 5; Superior-GN, April 5–December 8; and Superior-NP-Soo, April 8–November 25.

TABLE 4.—Production, shipments, and stocks of crude iron ore in 1956, by counties and ranges, in long tons [1]

County and range	Stocks of crude ore, Jan. 1 1956	Production in 1956		Shipments in 1956		Stocks of crude ore, Dec. 31, 1956
		Underground	Open pit	Direct to consumers	To beneficiation plants	
County:						
Baraga			225,999		225,999	
Dickinson			130,456	106,647		23,809
Gogebic	389,046	2,671,892	237,794	2,937,174		361,558
Iron	430,207	3,875,498	446,971	3,668,959	296,656	787,061
Marquette	[2] 814,984	5,168,953	1,228,388	5,318,832	913,229	980,264
Total	[2] 1,634,237	11,716,343	2,269,608	12,031,612	1,435,884	2,152,692
Range:						
Gogebic	389,046	2,671,892	237,794	2,937,174		361,558
Marquette	[2] 814,984	5,168,953	1,454,387	5,318,832	1,139,228	980,264
Menominee	430,207	3,875,498	577,427	3,775,606	296,656	810,870
Total	[2] 1,634,237	11,716,343	2,269,608	12,031,612	1,435,884	2,152,692

[1] Exclusive of iron ore containing 5 percent or more manganese.
[2] Revised.

TABLE 5.—Usable iron ore shipped from mines, 1947–51 (average) and 1952–56, by ranges, in long tons [1]

Year	Marquette range	Menominee range (Michigan portion)	Gogebic range (Michigan portion)	Total
1947–51 (average)	5,059,136	4,037,429	3,561,068	12,657,633
1952	4,516,509	4,258,996	3,003,861	11,779,366
1953	5,571,501	4,552,915	3,188,350	13,312,766
1954	3,675,429	3,655,995	2,377,743	9,709,167
1955	6,639,992	4,325,786	3,177,731	14,143,509
1956	5,688,720	3,889,213	2,958,076	12,536,009

[1] Exclusive of iron ore containing 5 percent or more manganese, natural.

TABLE 6.—Usable iron ore produced, 1947–51 (average), 1952–56, and total 1854–1956, by ranges, in long tons [1]

Year	Marquette range	Menominee range (Michigan portion)	Gogebic range (Michigan portion)	Total
1947–51 (average)	4,999,428	4,085,734	3,569,553	12,654,715
1952	4,668,550	4,168,465	2,972,930	11,809,945
1953	5,785,118	4,559,638	3,468,585	13,813,341
1954	4,670,603	3,640,320	2,439,763	10,750,686
1955	5,412,956	4,018,298	2,879,357	12,310,611
1956	5,869,171	4,264,407	2,909,686	13,043,264
Total 1854–1956	289,298,229	[2] 240,884,492	[2] 236,186,578	766,369,299

[1] Exclusive of iron ore containing 5 percent or more manganese, natural.
[2] Distribution by ranges partly estimated before 1906.

Manganese.—No manganiferous iron ores or ferruginous manganese ores were produced in Michigan during 1956.

Silver.—Although most Michigan copper ores contain silver, because of the refining process in general use (fire refining) the silver is seldom

recovered. During 1956 a portion of the copper concentrate and copper blister was electrolytically refined, and 379,990 fine ounces of silver valued at $343,910 was recovered.

TABLE 7.—Manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural) shipped from mines, 1947–51 (average) and 1952–56

Year	Long tons	Year	Long tons
1947–51 (average)	[1] 33,437	1954	13,715
1952	19,728	1955	----
1953	68,081	1956	----

[1] No shipments during period 1947–49.

NONMETALS

Cement.—Michigan cement plants shipped 20.2 million barrels of portland cement valued at $61.7 million in 1956—an increase of 12 percent in quantity and of 18 percent in value over 1955. Portland cement was produced in 8 plants—3 in Wayne County and 1 each in Alpena, Bay, Emmet, Lenawee, and St. Clair Counties. Continued strong demand from the construction industry was the prime factor in the increased production of cement. Raw materials used in manufacturing cement (clay, gypsum, slag, and iron sinter) were mined locally or purchased from nearby sources, except limestone, which was shipped principally by water from quarries in the northern part of the State.

The average value of Michigan portland-cement shipments in 1956 was $3.05 per barrel compared with $2.89 in 1955.

Masonry cements, manufactured from portland cement or cement clinker and other materials, were produced at five plants. Shipments totaled 1.6 million barrels valued at $6 million in 1956. The average value of masonry cements was $3.68 per barrel in 1956 and $3.54 in 1955.

TABLE 8.—Finished portland cement produced, shipped and in stock, 1947–51 (average) and 1952–56

Year	Active plants	Production (barrels)	Shipments from mills			Stocks at mills on Dec. 31 (barrels)
			Barrels	Value		
				Total	Average per barrel	
1947–51 (average)	7	12,350,019	12,260,506	$27,193,067	$2.22	1,239,212
1952	7	14,790,587	14,760,783	36,819,042	2.49	1,627,909
1953	7	15,532,853	15,853,096	41,860,464	2.64	1,307,666
1954	7	16,671,383	16,711,710	45,691,867	2.73	1,266,340
1955	7	18,204,826	18,128,068	52,352,794	2.89	[1] 1,525,000
1956	8	20,485,159	20,236,933	61,749,391	3.05	1,773,055

[1] Revised figure.

Clays.—Clay producers in Michigan in 1956 mined 2.1 million tons of miscellaneous clay valued at $2.4 million. The output was 9

percent greater than in 1955 and the value 19 percent higher. The average value per ton increased from $1.04 in 1955 to $1.14 in 1956. Nearly three-quarters of the clays produced was used in manufacturing cement. The balance was utilized for manufacturing brick, tile, and other heavy clay products, refractories, and light weight aggregates. Sixteen producers reported mining operations in 12 counties. A third of the production was from Wayne County. Production was also reported from Alpena, Bay, St. Clair, Lenawee, Emmet, Shiawassee, Eaton, Monroe, Clinton, Gratiot, and Saginaw Counties.

Gem Stones.—A small quantity of semiprecious gem stones—chiefly agates and thomsonite—were collected principally on the beaches of the Keweenaw Peninsula in 1956.

Gypsum.—The volume of crude gypsum mined in Michigan in 1956 was about 3 percent less than in 1955. The decrease can be attributed to the lowered demand for building materials that resulted from a decline in home construction. The average price per ton increased 21 cents (from $3.21 to $3.42), and the value of production in 1956 was $5.9 million—$200,000 higher than the 1955 figure. Four companies, two each in Kent and Iosco Counties, reported mining operations. Processing plants were operated at Alabaster, Detroit, Grand Rapids, and National City. The principal products were plaster board, lath, exterior sheathing, and plaster.

Lime.—Quick and hydrated lime was produced by 3 companies, 1 each in Bay, Mason, and Menominee Counties. High-calcium limestone quarried in northern Michigan was used. The principal uses for the output were at metallurgical plants and in paper manufacturing and water purification. Smaller quantities were used at sewage-disposal plants and in sugar refining.

Marl.—Michigan was the leading producer of calcareous marl in 1956, with a reported production of 157,000 tons. Output was nearly one-third greater than in 1955. The average price per ton increased from 48 cents in 1955 to 60 cents in 1956. The marl was sold chiefly for agricultural use in neutralizing acid soils. Over 80 percent of the production was from Isabella, Kalamazoo, Calhoun, Branch, Allegan, and Mecosta Counties. Production also was reported in eight other counties.

Natural Salines.—An important chemical industry has been built on natural brines from Michigan wells. During the year Standard Lime & Cement Co. was doubling the capacity of its chemical plant at Manistee. Pennsylvania Salt Manufacturing Co. was constructing facilities for producing calcium hypochloride at Wyandotte. Products, other than salt (see section on Salt), produced from the brines in 1956 were bromine and bromine compounds, calcium chloride, calcium-magnesium chloride, other magnesium compounds, and potassium salts. Production was reported from wells in Gratiot, Lapeer, Manistee, Mason, and Midland Counties. Output was valued at $37 million in 1956—8 percent higher than in 1955.

Perlite.—Crude perlite from Western States was expanded at two plants in Grand Rapids for use as a lightweight aggregate in plaster and concrete.

Salt.—Salt was produced from well brines in Gratiot, Manistee, Midland, Muskegon, St. Clair, and Wayne Counties. The product

was used for a variety of chemical and industrial purposes. About three-quarters of the total was used in producing chlorine and soda ash and for de-iceing highways.

One underground mine in Wayne County produced rock salt in several sizes and grades. In 1956, 10 companies operated a total of 11 plants. Production in 1956 was about 12 percent greater than in 1955.

Sand and Gravel.—Sand and gravel production was reported from 78 of the 83 counties in Michigan. Volume was 13 percent greater than in 1955, and value was up 19 percent. Over 90 percent of the output was used in the building- and road-construction industries. Over 40 percent of the State production was reported from counties in the Detroit area. A trend toward beneficiation of sand and gravel was indicated by the installation of dense medium separation-process plants by Bundy Hill Gravel Co. in Hillsdale County and Killins Gravel Co. in Washtenaw County. At both installations the sand and gravel deposits, glacial in origin, contain a considerable quantity of chert, shale, and sandstone. These materials absorb moisture, expand on freezing, and often result in spalling of concrete unless removed from the aggregate. Many of the best gravel deposits in the State have been depleted, but this process will enable marginal deposits to be worked and maintain a supply of high-grade aggregate.

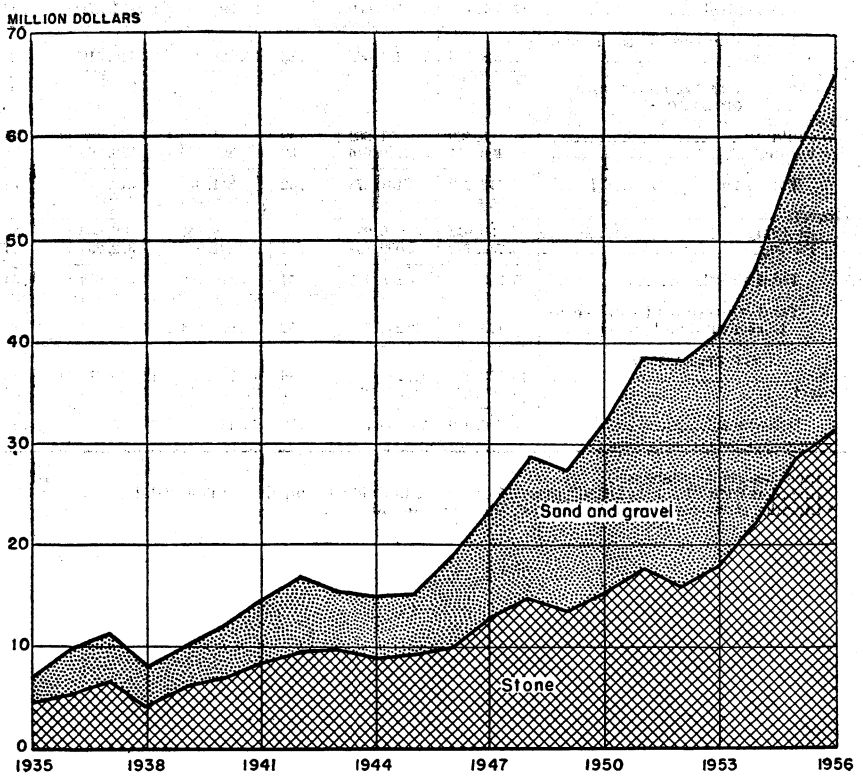

FIGURE 2.—Value of stone and sand and gravel in Michigan, 1935–56.

TABLE 9.—Sand and gravel, sold or used by producers, 1955–56, by classes of operations and uses

Class of operation and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand: [1]						
Glass	348,610	$919,403	$2.64	(2)	(2)	(2)
Molding	1,895,382	1,795,555	.95	1,753,195	$1,875,766	$1.07
Building	5,237,547	4,102,520	.78	6,145,545	4,710,610	.77
Paving	4,599,304	3,670,800	.80	5,157,927	4,044,540	.78
Grinding and polishing	291,472	102,015	.35	(2)	(2)	(2)
Blast	4,380	25,010	5.71			
Engine	84,895	101,191	1.19	80,782	62,597	.77
Filter	63,315	14,110	.22	(2)	(2)	(2)
Ground	16,233	129,155	7.96	(2)	(2)	(2)
Railroad ballast	78,256	21,185	.27	72,928	36,464	.50
Other	521,855	217,119	.42	423,578	224,799	.53
Undistributed [3]				600,860	1,154,472	1.92
Total sand	13,141,249	11,098,063	.84	14,234,815	12,109,248	.85
Gravel:						
Building	4,428,446	4,421,163	1.00	5,218,563	5,391,239	1.03
Paving	12,723,987	10,195,155	.80	15,185,556	13,552,530	.89
Railroad ballast	283,761	222,216	.78	233,721	226,509	.97
Other	461,070	314,475	.68	355,417	230,993	.65
Total gravel	17,897,264	15,153,009	.85	20,993,257	19,401,271	.92
Total commercial sand and gravel	31,038,513	26,251,072	.85	35,228,072	31,510,519	.89
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	5,539	1,662	.30	1,620	405	.25
Paving	406,711	129,616	.32	809,456	310,066	.38
Total sand	412,250	131,278	.32	811,076	310,471	.38
Gravel:						
Building	30,954	9,286	.30	8,897	2,669	.30
Paving	5,732,742	3,099,139	.54	6,101,901	3,322,294	.54
Total gravel	5,763,696	3,108,425	.54	6,110,798	3,324,963	.54
Total Government-and-contractor sand and gravel	6,175,946	3,239,703	.52	6,921,874	3,635,434	.53
ALL OPERATIONS						
Sand	13,553,499	11,229,341	.83	15,045,891	12,419,719	.83
Gravel	23,660,960	18,261,434	.77	27,104,055	22,726,234	.84
Grand total	37,214,459	29,490,775	.79	42,149,946	35,145,953	.83

[1] Includes friable sandstone.
[2] Included with "Undistributed" to avoid disclosing individual company confidential data.
[3] Includes glass, grinding and polishing, filter, and ground sand.

The 10 leading commercial producers of sand and gravel were: American Aggregates Corp., Kalamazoo, Livingston, and Oakland Counties; Construction Aggregates Corp., Ottawa County; Grand Rapids Gravel Co., Kent County; Sand Products Corp., Manistee and Muskegon Counties; H. F. Stukey, Branch County; Lyle J. Walker Sand & Gravel, Oakland County; Whittaker & Gooding Co., Washtenaw County; and O. E. Gooding & Co., Harry Pickitt, and John G. Yerington, all operating portable plants throughout the State.

Stone.—Stone production in 1956 was slightly greater than in 1955 and was valued at $31 million. Over 90 percent of the production was reported from 6 counties: Alpena, Chippewa, Mackinac, Monroe, Presque Isle, and Schoolcraft. Some of the world's largest limestone quarries are operated in Presque Isle and Schoolcraft Counties.

Relatively small quantities of dimension stone (limestone and sandstone) were produced. A very high proportion of the stone output was sold as crushed or broken stone. Crushed limestone and dolomite comprised 99 percent of the Michigan total. Changes in the distribution pattern reflect the economic forces at work in the State during 1956. As a result of the steel strike, the demand for flux was 1.6 million tons less than in 1955. Increased activity in road construction and in building and industrial uses for stone (notably in cement and lime manufacture) resulted in sizable increases in demand for stone in these categories.

Principal producers of limestone in 1956 were: Drummond Dolomite, Inc., Chippewa County; The France Stone Co. and Michigan Stone Co., Monroe County; Inland Lime & Stone Co., Schoolcraft County; Edward Kraemer & Sons, Wayne County; Michigan Limestone Division of United States Steel Corp., Mackinac and Presque Isle Counties; Penn-Dixie Cement Corp., Emmet County; Presque Isle Corp. (Chemstone Corp.), Presque Isle County; The Wallace Stone Co., Huron County; and Wyandotte Chemicals Corp., Alpena County.

TABLE 10.—Dimension stone sold or used by producers, 1952–56, by kinds

Year	Limestone		Sandstone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1952	5,322	$45,925	908	$5,126	6,230	$51,051
1953	4,849	53,425	369	2,624	5,218	56,049
1954	8,938	68,984	3,524	31,235	12,462	100,219
1955	29,907	113,912	9,429	79,410	39,336	193,322
1956	35,017	110,159	11,190	90,820	46,207	200,979

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TABLE 11.—Crushed and broken stone sold or used by producers, 1955–56, by kinds and uses

Kind and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
Limestone:						
Riprap:						
Commercial	20,142	$15,747	$0.78	(1)	(1)	(1)
Noncommercial	64,616	77,539	1.20			
Flux	15,717,028	13,657,112	.87	14,098,821	$12,954,583	$0.92
Concrete aggregate, roadstone:						
Commercial	4,527,389	4,839,244	1.07	5,315,862	5,781,629	1.09
Noncommercial	191,135	155,850	.82	229,605	213,664	.93
Railroad ballast	231,439	249,506	1.08	204,210	241,157	1.18
Agriculture	633,483	612,501	.97	538,439	657,919	1.22
Other [2]	12,106,499	8,954,300	.74	13,526,186	10,871,362	.80
Total commercial	33,235,980	28,328,410	.85	33,683,518	30,506,650	.91
Total noncommercial	255,751	233,389	.91	229,605	213,664	.93
Total limestone	33,491,731	28,561,799	.85	33,913,123	30,720,314	.91
Sandstone:						
Filler				1,080	540	.50
Foundry	50	100	2.00			
Total sandstone	50	100	2.00	1,080	540	.50
Miscellaneous stone:						
Concrete aggregate, roadstone:						
Commercial	49,916	95,416	1.91			
Noncommercial	54,579	58,147	1.07	38,420	88,342	2.30
Total miscellaneous stone	104,495	153,563	1.47	38,420	88,342	2.30
Total commercial	33,285,946	28,423,926	.85	33,684,598	30,507,190	.91
Total noncommercial	310,330	291,536	.94	268,025	302,006	1.13
Grand total	33,596,276	28,715,462	.85	33,952,623	30,809,196	.91

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Includes limestone for chemical uses, whiting or whiting substitutes, asphalt filler, dust for coal mines, mineral food, poultry grit, stone sand, cement, lime, other miscellaneous uses, and footnote 1.

MINERAL FUELS

Natural Gas and Natural-Gas Products.—Natural-gas output increased to 10,911 million cubic feet. At the end of 1956 natural gas was being produced from 70 fields.[2] The largest production was reported from Northville field in Wayne and Washtenaw Counties, Howell field in Livingston County, Beaver Creek field in Crawford and Kalkaska Counties, and North Hamilton field in Clare County. The production of natural-gas products was about the same as in1955.

Peat.—About 31,000 tons of peat valued at $475,000 was produced from bogs in Kalamazoo, Mason, and St. Clair Counties in 1956. Volume and sales were slightly higher than in 1955. The output was used for soil conditioning.

Petroleum.—Petroleum production declined to 10.7 million barrels in 1956. This was about half a million barrels less than in 1955.

[2] Michigan Department of Conservation, Geological Survey Division, Summary of Operations, Oil and Gas Fields 1956: Lansing, 1957, 37 pp.

The Michigan Department of Conservation [3] reported 165 producing oilfields at the end of 1956. In all, 196 exploratory and development oil wells were completed in 1956 compared with 204 in 1955. Production of over 1 million barrels each was reported from Arenac, Clare, and Isabella Counties. Fifteen refineries, with a rated capacity of 161,600 barrels daily, were operated in Michigan during 1956.

REVIEW BY COUNTIES

Alcona.—The county road commission produced sand and gravel for road construction. The Michigan State Highway Department contracted for road gravel.

Alger.—Mrs. Hilma Samuelson (Chatham), Olga Winkka (Marquette), and the county road commission produced sand and gravel for road construction. Duluth, South Shore & Atlantic Railroad Co. produced engine sand. The Michigan State Highway Department contracted for road gravel.

Allegan.—L. Z. Arndt (Fennville) and Gerald Arnsman (Hopkins) reported production of marl for agricultural use. Natural gas and petroleum were produced. Gravel for road construction was produced by Huitt & Son and Harry Pickitt, both of Allegan; John G. Yerington, Benton Harbor; Cleo L. Arndt, Fennville; Ralph W. Bodine, Otsego; and West Shore Construction Co., Zeeland. Building sand and gravel was produced by Ben Waanders (Allegan) and Ralph W. Bodine (Otsego).

Alpena.—Cement production in Alpena County was the largest in the State. Huron Portland Cement Co. (Alpena) produced portland and masonry cements and shale for cement manufacture. This plant, one of the largest in the country, has 24 kilns in operation. Wyandotte Chemicals Corp. (Wyandotte) produced limestone from a quarry near Alpena, chiefly for the manufacture of alkali and cement. Gilliland Gravel Co. (Alpena) produced gravel for road construction.

TABLE 12.—Value of minerals produced in Michigan, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Alcona	$25,442	$34,763	Sand and gravel.
Alger	106,312	72,921	Do.
Allegan	819,123	797,373	Petroleum, sand and gravel, marl.
Alpena	28,022,365	31,435,872	Cement, stone, clays, sand and gravel.
Antrim	62,835	159,437	Sand and gravel, stone.
Arenac	4,637,062	3,811,363	Petroleum, stone, sand and gravel.
Baraga	1,071,130	963,138	Iron ore, sand and gravel.
Barry	322,884	725,691	Sand and gravel, petroleum, marl.
Bay	7,997,665	11,187,626	Cement, petroleum, clays, lime.
Benzie	17,930	10,011	Sand and gravel.
Berrien	271,306	356,229	Do.
Branch	126,022	367,790	Sand and gravel, marl.
Calhoun	228,274	184,037	Sand and gravel, marl, stone.
Cass	188,329	148,600	Sand and gravel, marl.
Charlevoix	33,564	20,935	Stone.
Cheboygan	33,006	66,838	Sand and gravel, stone.
Chippewa	(2)	(2)	Stone, sand and gravel.
Clare	3,344,139	3,023,732	Petroleum, sand and gravel.
Clinton	323,374	434,107	Sand and gravel, clays.
Crawford	732,090	675,448	Petroleum, sand and gravel.
Delta	149,371	312,591	Sand and gravel.
Dickinson	342,256	362,226	Iron ore, stone, sand and gravel.
Eaton	435,024	431,880	Stone, sand and gravel, clays.
Emmet	(2)	8,091,239	Cement, stone, clays, sand and gravel.

See footnotes at end of table, p. 12.

Work cited in footnote 2.

TABLE 12.—Value of minerals produced in Michigan, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Genesee	$678,219	$639,706	Sand and gravel, petroleum.
Gladwin	1,263,853	1,242,317	Petroleum, sand and gravel.
Gogebic	23,291,941	23,271,399	Iron ore, sand and gravel.
Grand Traverse	67,998	105,556	Sand and gravel.
Gratiot	(2)	(2)	Salines, salt, sand and gravel, petroleum, clays.
Hillsdale	510,809	591,707	Sand and gravel, marl.
Houghton [3]	38,051,896	20,420,105	Copper, sand and gravel, stone.
Huron	(2)	991,701	Stone, sand and gravel, petroleum.
Ingham	646,306	754,219	Sand and gravel.
Ionia	130,777	(2)	Sand and gravel, petroleum.
Iosco	(2)	(2)	Gypsum.
Iron	31,247,129	28,348,290	Iron ore, stone, sand and gravel.
Isabella	4,038,519	3,648,878	Petroleum, sand and gravel, marl.
Jackson	472,400	545,386	Sand and gravel, stone, petroleum, marl.
Kalamazoo	584,567	977,413	Sand and gravel, petroleum, marl, peat.
Kalkaska	174,072	203,606	Petroleum, sand and gravel.
Kent	3,370,505	3,519,850	Sand and gravel, gypsum, petroleum.
Lake	95,061	68,832	Sand and gravel, petroleum.
Lapeer	333,527	396,825	Salines, sand and gravel, petroleum.
Leelanau	50,327	41,439	Sand and gravel.
Lenawee	(2)	(2)	Cement, sand and gravel, clays.
Livingston	3,370,581	3,995,526	Sand and gravel.
Luce	36,685	24,869	Do.
Mackinac	(2)	(2)	Stone, sand and gravel.
Macomb	1,274,801	1,425,795	Sand and gravel.
Manistee	8,549,216	9,552,643	Salt, salines, sand and gravel.
Marquette	49,435,661	46,216,560	Iron ore, sand and gravel, stone.
Mason	5,321,007	4,822,617	Salines, petroleum, lime, sand and gravel, peat.
Mecosta	478,100	445,636	Petroleum, sand and gravel, marl.
Menominee	841,499	(2)	Lime, sand and gravel.
Midland	(2)	(2)	Salines, salt, petroleum, sand and gravel.
Missaukee	1,613,162	1,542,465	Petroleum, sand and gravel, marl.
Monroe	1,415,547	1,266,333	Stone, petroleum, clays.
Montcalm	1,107,773	2,184,555	Petroleum, sand and gravel.
Montmorency	(2)	20,957	Sand and gravel.
Muskegon	1,650,251	1,422,666	Salt, sand and gravel, petroleum.
Newaygo	679,359	1,003,224	Petroleum, sand and gravel.
Oakland	5,975,531	7,071,834	Sand and gravel, petroleum.
Oceana	1,985,460	1,674,262	Petroleum, sand and gravel.
Ogemaw	2,702,964	2,479,529	Do.
Ontonagon	(4)	(2)	Copper, silver, sand and gravel.
Osceola	2,055,454	1,961,210	Petroleum, sand and gravel, marl.
Oscoda	15,012	16,025	Sand and gravel, petroleum.
Otsego	55,691	59,112	Do.
Ottawa	1,588,103	2,260,676	Sand and gravel, petroleum, marl.
Presque Isle	(2)	(2)	Stone, sand and gravel.
Roscommon	1,294,588	1,328,178	Petroleum, sand and gravel.
Saginaw	137,435	121,353	Petroleum, clays.
St. Clair	13,104,478	12,583,692	Salt, cement, peat, clays, sand and gravel, petroleum.
St. Joseph	172,099	364,157	Sand and gravel, marl.
Sanilac	98,774	193,653	Sand and gravel.
Schoolcraft	4,081,756	3,991,616	Stone, sand and gravel.
Shiawassee	201,097	225,624	Sand and gravel, clays.
Tuscola	1,306,500	1,602,496	Sand and gravel, petroleum.
Van Buren	313,736	222,725	Petroleum, sand and gravel.
Washtenaw	1,583,985	1,749,961	Sand and gravel, petroleum.
Wayne	29,470,153	38,827,736	Salt, cement, sand and gravel, clays, stone, petroleum.
Wexford	42,079	53,674	Sand and gravel.
Undistributed [5]	67,530,624	100,021,558	
Total	363,787,000	[6] 394,536,000	

[1] Gem stones, natural gas, and natural-gas liquids not listed by counties as data are not available. Value included with "Undistributed."
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Includes value of mineral production in Keweenaw County (1956) and Keweenaw and Ontonagon Counties (1955).
[4] Value indicated by footnote 3.
[5] Includes value of items referenced in footnotes 1 and 2 and value of petroleum and sand and gravel production not assignable to specific counties.
[6] Total has been adjusted to eliminate duplicating value of clays and stone.

Antrim.—Gravel for road construction was produced by The Taber Co., Grand Rapids; and Mid-America Engineering Corp., Skokie, Ill., and Harry Pickitt, Allegan (both operating pits near Alba). The county road commission produced road sand and gravel and crushed stone for concrete aggregate. The Michigan State Highway Department and the county road commission contracted for road sand and gravel.

Arenac.—Building sand and gravel was produced by Melvil O. Eastman and Shirley Van Deusen, both of Standish. Shirley Van Deusen also produced road gravel. Crushed limestone for concrete aggregate was produced by the Iosco County Highway Department and the Arenac County Road Commission. Petroleum was produced.

Baraga.—The Cleveland-Cliffs Iron Co. produced iron ore from the Ohio open-pit mine. The crude ore was concentrated in a plant using dense-medium and other gravity separation. Sand and gravel for road construction was produced by and for the county road commission. The Michigan State Highway Department contracted for road sand and gravel.

Barry.—Marl for agricultural use was produced by H. A. Carlton Schau, Kalamazoo. Sand and gravel was produced for building, road construction, and other uses. Sand and gravel producers who operated in the county were Harry Pickitt, Allegan; John G. Yerington, Benton Harbor; Cole Gravel Co., Dorr; Bender Gravel Co., Hastings; Nashville Gravel Co. and A. D. Pennock, both of Nashville; West Shore Construction Co., Zeeland; and the county road commission. The Michigan State Highway Department contracted for road gravel. Petroleum also was produced.

Bay.—Aetna Portland Cement Co. (Bay City) produced portland and masonry cement, and clay for the manufacture of cement. The company operated 5 kilns. The Monitor Sugar Division of Robert Gage Coal Co. (Bay City) produced quicklime for sugar refining Petroleum was produced.

Benzie.—The Michigan State Highway Department contracted for road gravel.

Berrien.—Production of engine and molding sand was reported by Producers Core Sand Corp. (Michigan City, Ind.) which operated at a site near Sawyer. Sand and gravel also was produced for building, road construction, and other uses. Producers that reported operations in Berrien County were John G. Yerington, Benton Harbor; Fred M. Ott, Bridgman; Wakeman and Neva Ryno, Coloma; Harold Kiell, Niles; and Ireland & Lester Co., St. Joseph. The Michigan State Highway Department contracted for road gravel.

Branch.—Case Bros. (Sherwood) and Cleveland & Taylor (Fremont, Ind.) produced marl for agricultural purposes. Marl pits were located near Coldwater and Union City. Sand and gravel was produced for building, road construction, and miscellaneous uses. Sand and gravel producers that operated in Branch County were H. F. Stukey and Woodward-Pollock Lumber Co., both of Coldwater; Union City Gravel Co., Union City; and the county road commission.

Calhoun.—Marl for agricultural purposes was produced by Carl Avery, Athens; Case Bros., Sherwood; and Arnie Delebaugh and Clyde M. Reed, both of Union City. Marl pits were located near Marshall and Union City. Sand and gravel was produced for building and road

construction by Harry Pickitt, Allegan; Battle Creek Gravel Co., Battle Creek; John Alexander, Sr., Marshall; Emil Combs, Tekonsha; and West Shore Construction Co., Zeeland. The Michigan State Highway Department contracted for road gravel. Sandstone used as rubble was produced by Earl A. Flock, Battle Creek.

The Battle Creek Gravel Co. used limestone chips in place of gravel in producing ready-mixed concrete because of the depletion of its gravel deposit.

Cass.—Marl for agricultural purposes was produced by Frank R. Hixon, Marcellus. Sand and gravel was produced for building and road construction. Sand and gravel producers that operated in Cass County were John G. Yerington, Benton Harbor; Nieb Concrete Products Co., Niles; and the county road commission.

Charlevoix.—Limestone used for rough construction, flux, and agricultural purposes was produced by Charlevoix Lime & Stone Co., Vanderbilt, which operated a quarry near Charlevoix.

Cheboygan.—Sand and gravel was produced for building and road construction by Harry Pickitt (Allegan) and Hugh H. Mason & Sons (Gaylord) The Michigan State Highway Department contracted for road gravel. Limestone for concrete aggregate was produced by Afton Stone & Lime Co., Afton.

Chippewa.—Road gravel was produced by I. L. Whitehead Co. (Sault Ste. Marie) and the county road commission. The Michigan State Highway Department contracted for road gravel. Limestone produced by Drummond Dolomite, Inc. (Sheboygan, Wis.), operating from a site near Drummond, was used for flux, concrete aggregate, and agricultural stone.

Clare.—Clare County ranked third in the production of petroleum. Natural gas also was produced. Road gravel was produced by Adrian Blades, Beaverton.

Clinton.—Clay for heavy clay products was produced by Grand Ledge Clay Products Co., Grand Ledge. Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Clinton County were Harry Pickitt, Allegan; E. P. Brady & Co., Flint; Boichot Concrete Products Corp., Lansing; Walling Gravel Co., St. Johns; West Shore Construction Co., Zeeland; and the county road commission. Walling Gravel Co. also reported production of filter sand.

Crawford.—Natural gas and petroleum were produced. The county road commission produced road sand and gravel.

Delta.—Sand and gravel was produced for building and road construction by Bichler Bros., Escanaba; Cloverland Milling & Supply Co. and Days River Sand & Gravel Co., both of Gladstone; and the county road commission. The Escanaba & Lake Superior Railroad reported the production of engine sand. The Michigan State Highway Department contracted for road gravel.

Dickinson.—Iron ore was produced by Jackson Iron & Steel Co. at the Bradley mine. The Cornell mine was operated by the Globe Mining Co. until July 20, when it was sold to Cornell Mining Co. (Pickands Mather & Co., operating agents). Road sand and gravel was produced by the county road commission. Limestone used largely for soil conditioning and other applications was produced by Superior Rock Products Co., Sagola. The Metro-Nite Co. (Mil-

waukee, Wis.) produced limestone from a quarry near Felch for concrete aggregate and whiting.

Eaton.—Clay for heavy clay products was produced by American Vitrified Products Co. and Grand Ledge Clay Products Co., both of Grand Ledge. Sand and gravel production for road construction and other uses was reported by Vermontville Gravel Co. (Vermontville) and West Shore Construction Co. (Zeeland). The Michigan State Highway Department contracted for road gravel. Limestone for rubble, concrete aggregate, and agricultural purposes, was produced by Cheney Limestone Co., Bellevue.

Emmet.—Penn-Dixie Cement Corp. (Petoskey) produced portland and masonry cements and clay and limestone used in manufacturing cement. An additional kiln, 375 feet long, was put in operation early in 1956, increasing the number of kilns in operation to 5. The Michigan State Highway Department contracted for road gravel.

Genesee.—Petroleum was produced. Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Genesee County were Harry Pickitt, Allegan; Justus Snelenberger, Burt (from dredge operations near Montrose); Kurtz Gravel Co., Flint; Hansen Gravel Co., Flushing; Mathews Gravel Co. and Otisville Stone Co., both of Mount Morris; Ferguson Excavating Co., Davison; Saginaw Core Sand Co., Saginaw; and John Post & Sons, Swartz Creek. Filter sand also was produced by Kurtz Gravel Co. and Mathews Gravel Co. The Michigan State Highway Department contracted for road gravel.

Gladwin.—Petroleum was produced. Paul C. Miller (Sparta) produced road gravel. The Michigan State Highway Department contracted for road sand and gravel.

Gogebic.—Iron ore was produced by North Range Mining Co. and Pickands Mather & Co. from an underground mine; Pittsburgh Pacific Co., from an open-pit; and Zontelli Bros., Inc., from its stockpile. Sand and gravel production for road construction was reported by Ironwood Concrete Products Co. and for building purposes by Lake Superior Gravel Co., both of Ironwood. Road gravel also was produced by the county road commission. The Michigan State Highway Department contracted for road gravel.

Grand Traverse.—Paul C. Miller (Sparta) produced road gravel. The Michigan State Highway Department contracted for road gravel.

Gratiot.—Bromine and bromine compounds, calcium magnesium chloride (liquid), magnesium compounds, and salt were produced from natural well brines by Michigan Chemical Corp., St. Louis. The salt output was for table use and various chemical and industrial purposes. The company planned new laboratories for research in the field of rare earths. Miscellaneous clay for heavy clay products was produced by Clay Products Co., St. Louis. Natural gas and petroleum were produced. Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Gratiot County were E. P. Brady & Co., Flint; The Taber Co., Grand Rapids; Roy Dayringer and North Star Gravel Co., both of Ithaca; and the county road commission.

Hillsdale.—Cleveland & Taylor (Fremont, Ind.) produced marl from a pit near Camden for agricultural purposes. Sand and gravel was produced for building and road construction. Producers that

operated in Hillsdale County were Elliott Ice & Coal Co. and Art Russell's Concrete Products, both of Hillsdale; Bundy Hill Gravel Co., Somerset Center; Hoover Bros., Waldron; Northwest Materials, Inc., Bryan, Ohio, and Southern Michigan Materials, Inc., Columbus, Ohio, both of whom operated pits near Ransom; and the county road commission.

Houghton.—Copper was produced by Calumet & Hecla, Inc., Calumet; Copper Range Co., Painesdale; and Quincy Mining Co., New York, N. Y. Duluth, South Shore & Atlantic Railroad Co. produced sand for railroad ballast. The Michigan State Highway Department contracted for road sand and gravel. The county road commission produced crushed stone for concrete aggregate.

Primary copper production at the Calumet & Hecla, Inc., operations reached the highest level in recent years. The grade of ore was below that of the preceding year because of mining in marginal areas and pillar extraction. The average daily production of ore, however, increased slightly. One shaft was closed early in the year, when its developed ore reserves were depleted. Production at another shaft, reopened late in 1955, and at the unwatered Osceola No. 13 shaft more than compensated for the shutdown. The company was producing through 9 shafts from 10 mines at the year end. Production of copper at the Tamarack reclamation plant increased, with copper recovery per pound of tailings treated again improving. All reclamation operations were on the Ahmeek sandbank, and 1 million tons of tailing was processed during 1956. Enough remained for approximately 10 more years of processing according to the company 1956 annual report.

Calumet & Hecla, Inc., leaching operations were on a limited scale in 1956 because of the high price and scarcity of secondary materials. Only the Lake Linden plant was operated.

Copper Range Co. Champion mine operated without interruption throughout the year. About 400,000 tons of copper ore was shipped to the Freda concentrator. Although the grade of ore was slightly better than in 1955, dilution of stope rock decreased the copper content. It was necessary to install pumps in the No. 3 shaft to maintain the water level below the 18th level. In addition to milling the Champion-mine ore, the Freda concentrator processed over 100,000 tons of tailing from the Redridge sands.

The Quincy Mining Co. operated its reclamation plant at Torch Lake and treated nearly 1 million tons of stamp sands—about 10 percent more than in 1955. The original reclamation-plant dredge sank during a severe storm in January 1956. An idle dredge formerly operated by Calumet & Hecla, Inc., was purchased, and reclamation operations continued. This dredge had greater capacity than the old Quincy dredge. The company smelter at Hancock was in continuous operation throughout the year, treating and refining company concentrates and concentrates from the Freda mill of Copper Range Co.

Huron.—Petroleum was produced. Production of sand and gravel for road construction was reported by O. E. Gooding & Co. (Ypsilanti) and the county road commission. The Michigan State Highway Department contracted for road sand. Dimension limestone for use as architectural and building stone and crushed limestone for con-

crete aggregate, flux, and agricultural purposes, was produced by The Wallace Stone Co., Bay Port.

Ingham.—Filter sand and sand and gravel for building, road construction, railroad ballast, and other uses were produced. Producers that reported operations in Ingham County were Central Michigan Sand & Gravel, East Lansing; Cheney Gravel Co., Holt; The Ferris Co. and Mason Gravel Co., both of Mason; West Lansing Gravel Co., Lansing; O. E. Gooding & Co., Ypsilanti; and the county road commission.

Ionia.—Road gravel was produced by Harry Pickett (Allegan) and the county road commission. Petroleum was produced.

Iosco.—Crude gypsum was quarried by the National Gypsum Co. (National City) and United States Gypsum Co. (Alabaster). The principal uses for gypsum were in manufacturing several types of plaster and wallboard and as a portland-cement retarder.

National Gypsum Co. planned development of a 75-million-ton gypsum deposit on a 2,700-acre tract near Tawas City.

Iron.—Iron ore from underground mines was produced by The Cleveland-Cliffs Iron Co., M. A. Hanna Co., Inland Steel Co., North Range Mining Co., Pickands Mather & Co., and Republic Steel Corp. The county road commission produced road gravel, and the Michigan State Highway Department contracted for road sand and gravel. Limestone for rubble, concrete aggregate, and miscellaneous purposes was produced by Caspian Lumber & Coal Co., Caspian. Iron River Lumber & Fuel Co. (Iron River) produced limestone for concrete aggregate.

Isabella.—Marl for agricultural purposes was produced by William Stuart, Mount Pleasant. Natural gas and petroleum were produced. Production of sand and gravel for building, road construction, and other uses was reported by George Hubscher & Son, Mount Pleasant.

Jackson.—Marl for agricultural purposes was produced by Barnes & Van Antwerp, Horton. Petroleum was produced. Sand and gravel was produced for building and road construction by W. A. Cecil & Sons, Concord; Klumpp Bros. Gravel Co., Grass Lake; Edward Palmer & Son, Jackson; O. E. Gooding & Co., Ypsilanti; and the county road commission. The county road commission also contracted for road gravel. Limestone for concrete aggregate and agricultural stone was produced by John C. Jeffrey, Parma. The Original Sandstone Quarry, Ray's Stone Quarry, and Star Sandstone Co.—all of Napoleon—produced sandstone, for use in rough construction and as rubble, flagging, and filler.

Kalamazoo.—Lawrence Hayward (Scotts) and Dan Slack (Kalamazoo) produced marl for agricultural purposes. Petroleum was produced. Sand and gravel was produced for building, road construction, and railroad ballast. Producers that operated in Kalamazoo County were Harry Pickitt, Allegan; John G. Yerington, Benton Harbor; Gravel Producers, Inc., and Casper H. Haas Co., both of Kalamazoo; and American Aggregates Corp., Greenville, Ohio, which operated at a site near Kalamazoo. The city engineer of Kalamazoo and the Michigan State Highway Department contracted for road sand and gravel. Peat was produced by Craven's Peat Moss, Kalamazoo.

Kalkaska.—Natural gas and petroleum were produced. Sand and gravel for road construction was produced by Paul C. Miller (Sparta) and the county road commission.

Kent.—Bestwall Gypsum Co. and Grand Rapids Plaster Co., both of Grand Rapids, mined crude gypsum and operated processing plants. Wallboard, lath, exterior sheathing, and prepared plasters, were produced. Sand and gravel for building, road construction, and other uses was produced in Kent County by Harry Pickitt, Allegan; Coit Avenue Gravel Co., Edward De Vries & Sons, Grand Rapids Gravel Co., Pekaar & Van Doorn, and Riverside Sand & Gravel Co., all of Grand Rapids; H. F. Postma Gravel Co., Grandville; West Shore Construction Co., Zeeland; The Chesapeake & Ohio Railway Co.; and the county road commission. The city engineer of Grand Rapids, the Michigan State Highway Department, and the county road commission contracted for road sand and gravel. Perlite, produced in Western States, was expanded by Bestwall Gypsum Co. and Gregg Products Co. (Grand Rapids) for use as lightweight aggregate and as a plaster admixture. Natural gas and petroleum were produced.

Keweenaw.—Copper was produced by Calumet & Hecla, Inc., Calumet. The county road commission produced road gravel.

Lake.—The Taber Co. (Grand Rapids) and the county road commission produced road sand and gravel. Petroleum was produced.

Lapeer.—Liquid calcium-magnesium chloride was produced by Wilkinson Chemical Corp., Mayville. Sand and gravel was produced for building and road construction by Pine Sand & Gravel (Lapeer) and the county road commission. The Michigan State Highway Department contracted for road gravel. Petroleum was produced.

Leelanau.—The Taber Co. (Grand Rapids) and the county road commission produced road gravel.

Lenawee.—Consolidated Cement Corp. (Cement City) produced portland and masonry cements. Comfort Brick & Tile Co. (Tecumseh) produced clay used in manufacturing heavy clay products. Sand and gravel for building, road construction, and other uses, was produced. Producers that reported operations in Lenawee County were Adrian Sand & Gravel, Stamm Bros. Gravel Co., and John Woerner, all of Adrian; Cy Page, Manitou Beach; Porter Sand & Gravel Co. and Tecumseh Gravel Co., both of Tecumseh; O. E. Gooding & Co., Ypsilanti; and the county road commission.

Livingston.—Natural gas was produced. Sand and gravel for building and road construction was produced by Harry Pickitt, Allegan; D & J Gravel Co., Fowlerville; Van E. Dailey, Howell; and American Aggregates Corp., Greenville, Ohio, which operated at a site near Brighton. The Michigan State Highway Department contracted for road sand and gravel.

Luce.—Road gravel was produced by the county road commission.

Mackinac.—Gravel for building purposes was produced by Duluth, South Shore & Atlantic Railroad Co. Fiborn Limestone Co., Sault Ste. Marie, Ontario, Canada, shipped limestone from a quarry near Fiborn for use as concrete aggregate. Limestone for flux, concrete aggregate, agricultural stone, asphalt filler, rock dust for coal mines, poultry grit, and lime was produced by the Michigan Limestone Division, United States Steel Corp. (Detroit) from a quarry near Cedarville.

Macomb.—Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Macomb County were Bernie Reif and Rosteck Contractors, both of Fraser; Maertens Sand & Gravel Co., Grosse Pointe; Allen Zavits, Mount Clemens; S. K. Rogers, New Baltimore; Ray Industries, Inc., Oxford; Fred Kaatz, Richmond; Hygrade Sand & Gravel Co. and Smith Sand & Gravel Co., both of Romeo; Louis Marsack & Sons, St Clair Shores; Advance Building Materials Co., Great Lakes Gravel Co., Macomb Sand & Gravel, Michigan Sand & Gravel, Morgan Sand & Gravel Co., and Underwood Sand & Gravel Co., all of Utica; and the county road commission. The Michigan State Highway Department and the county road commission contracted for road sand and gravel.

Manistee.—Bromine and bromine compounds, calcium-magnesium chloride (liquid), magnesium compounds, and salt were produced at Manistee, by the Morton Salt Co. Bromine and bromine compounds were produced also by Great Lakes Chemical Corp. (Manistee) and Michigan Chemical Corp. (Eastlake). Magnesium compounds were produced by Standard Lime & Cement Co (Manistee) for the manufacture of refractory magnesia. Salt produced by the Manistee Salt Works was sold for table use, animal food, and food processing. It was also employed in several industrial processes. Frank L. Gauthier (Onekama) produced sand and gravel for building and other uses. Molding and grinding and polishing sands were produced by Sand Products Corp. (Detroit) which operated a plant at Manistee. The Ann Arbor Railroad Co. produced gravel for railroad ballast. The county road commission produced road gravel. The Michigan State Highway Department and the county road commission contracted for road gravel.

Marquette.—Iron ore was produced by The Cleveland-Cliffs Iron Co. from 3 open-pit and 6 underground mines, Inland Steel Co. from 2 underground mines, Jones & Laughlin Steel Corp. and North Range Mining Co. from underground mines, and Pickands Mather & Co. from an open-pit mine.

The Republic and Humboldt open-pit mines of The Cleveland-Cliffs Iron Co. produced from the jasper iron formation. The ore consists of specular hematite, intermixed with cherty material. After concentration the material is sintered or pelletized.

Sand and gravel was produced for building and road construction by A. Lindberg & Sons, Inc. (Ishpeming), and the county road commission. Engine sand and railroad-ballast gravel were produced by Lake Superior & Ishpeming Railroad. The Michigan State Highway Department and the county road commission contracted for road sand and gravel. Limestone was crushed for use as concrete aggregate.

Mason.—The Dow Chemical Co. at Ludington produced bromine; calcium chloride; quicklime for use in paper, sewage, water purification, and other metallurgical and chemical uses; and magnesium compounds. Natural gas and petroleum were produced. The county road commission produced and also contracted for road gravel. Peat was produced by Irving L. Pratt & Son, Scottville.

Mecosta.—Wilson Frost (Blanchard) produced marl for agricultural purposes. Natural gas and petroleum were produced. Sand and gravel was produced for building and road construction. Producers that reported operations in the county were Steve Lyle Sand & Gravel,

Big Rapids; Paul C. Miller, Sparta; and the county road commission. The Michigan State Highway Department contracted for road gravel.

Menominee.—Limestone Products Co. (Menominee) produced quick and hydrated lime for various chemical and industrial uses. Sand and gravel for building and road construction was produced by Walsh Sand & Gravel Co., Menominee, and the county road commission.

Midland.—The Dow Chemical Co. at Midland produced bromine and bromine compounds, calcium chloride, magnesium compounds, potash, and salt for use in chlorine and other chemicals from brines obtained from wells at Midland. Natural gas and petroleum were produced. Saginaw Core Sand Co., Saginaw, produced molding sand.

Missaukee.—C. Stanley Hooker, Cadillac, produced marl for agricultural uses from a site near Lake City. Natural gas and petroleum were produced. The Michigan State Highway Department contracted for road gravel.

Monroe.—Clay used in the manufacture of pottery and stoneware was produced by F. W. Ritter Sons Co., South Rockwood. Petroleum was produced. Limestone for concrete aggregate was produced from a quarry near Monroe by The France Stone Co., Toledo, Ohio; The Michigan Stone Co., Ottawa Lake; and the county road commission. The France Stone Co. also produced limestone for flux, agricultural purposes, and railroad ballast.

Montcalm.—Natural gas and petroleum were produced. Production of gravel for road construction was reported by The Taber Co., Grand Rapids; A. L. Dyer & Sons, McBrides; Frank H. Stoerk, Pierson; Paul C. Miller, Sparta; and the county road commission. The county road commission also produced road sand.

Montmorency.—The county road commission produced sand and gravel for road construction.

Muskegon.—Natural gas and petroleum were produced. Hooker Electrochemical Co. (Montague) produced salt used in manufacturing chlorine and other chemicals. Production of molding sand was reported by Nugent Sand Co., Inc. (Muskegon) and Sand Products Corp. (Detroit), which operated a plant at Muskegon. Nugent Sand Co., Inc., also produced engine sand.

Newaygo.—Natural gas and petroleum were produced. Producers reporting output of road gravel in the county were Harry Pickitt (Allegan) and Paul C. Miller (Sparta). The Michigan State Highway Department contracted for road gravel.

Oakland.—Over 7 million tons of sand and gravel was produced for building, road construction, railroad ballast, and other uses. Producers that reported output in the county were Foley & Beardslee, Clarkston; White Lake Gravel, Inc., Clawson; The Benjamin Pit, Farmington; Groveland Gravel Co., Holly Sand & Gravel Co., and Koan Gravel Co., all of Holly; A. S. Leffler Gravel Co., Davison, from a site near Holly; John R. Sand & Gravel Co., Lake Orion; New Hudson Sand & Gravel and Lyle J. Walker Sand & Gravel, both of New Hudson; Mickelson Bros., Oxford; Koenig Coal & Supply Co., Detroit, and American Aggregates Corp., Greenville, Ohio, both from sites near Oxford; Floyd Beardslee, Pontiac; Underwood Sand & Gravel Co., Utica, from a site near Pontiac; Kemler Bros., Rochester; Paul C. Miller, Sparta; O. E. Gooding & Co., Ypsilanti; and the county

road commission. Sand and gravel for road construction was contracted for by the Michigan State Highway Department and the Detroit Department of Public Works. Petroleum was also produced in Oakland County.

Oceana.—Petroleum and natural gas were produced. Production of gravel for road construction was reported by Paul C. Miller (Sparta) and West Shore Construction Co. (Zeeland).

Ogemaw.—Gravel for road construction was produced from the Walter Rosevear pit, West Branch. The county road commission produced road sand and gravel. The Michigan State Highway Department contracted for road sand. Petroleum was produced.

Ontonagon.—Copper ore was produced by White Pine Copper Co. (White Pine), from which copper and some byproduct silver were recovered. In 1956—the first full year of operation—the White Pine mine produced nearly 4 million tons of ore, about a third more than in 1955. The mill operated 24 hours a day on a 7-day-week basis and treated about the same tonnage of ore as was produced at the mine. Near the end of the year 2 rod mills were being installed, and it was estimated that daily rated mill capacity would be increased by approximately 16 percent. The working faces in the mine became more and more distant from the underground crushing plant as the year progressed, with an increasing burden on trucks and personnel of longer hauls. Because of the increasing length of haul a system of lateral belts was designed and at year-end these belts were being installed to reduce the trucking problem.

The Algomah Mining Co. (Ontonagon) continued developing a copper property 17 miles east of Ontonagon.

Road gravel was produced by Mid-America Engineering Corp. (Skokie, Ill.) from a site near Silver City. The Michigan State Highway Department contracted for road gravel.

Osceola.—C. Stanley Hooker (Cadillac) produced marl for agricultural uses from pits near Evart, McBain, and Tustin. Natural gas and petroleum were produced. Gravel for road construction was produced by The Wallace Stone Co., Bay Port, from a site near Hersey; The Taber Co., Grand Rapids; and Paul C. Miller, Sparta. The Wallace Stone Co. also produced building and road sand. The Michigan State Highway Department contracted for road sand and gravel.

Oscoda.—Petroleum was produced. The Michigan State Highway Department contracted for road gravel.

Otsego.—Natural gas and petroleum were produced. Sand and gravel was produced for building and road construction by Harry Pickitt, Allegan; Hutchins Sand & Gravel, Gaylord; and the county road commission.

Ottawa.—Production of marl for agricultural uses was reported by Ralph Meyers, West Olive. Natural gas and petroleum were produced. Engine and molding sands and sand and gravel for building, road construction, and other uses were produced. Producers that reported sand and gravel operations in the county were Harry Pickitt, Allegan; Thomas F. Johnston and Standard Sand Co., both of Grand Haven; Henry De Went, Hudsonville; West Shore Construction Co., Zeeland; and Construction Aggregates Corp., Chicago, Illinois, who operated from a site near Grand Haven.

Presque Isle.—Sand and gravel for building, road construction, and railroad ballast was produced by Straits Aggregate & Equipment Corp. (East Tawas) which operated at a site near Millersburg. Harry Pickitt (Allegan) produced road gravel. The Michigan State Highway Department contracted for road gravel. Limestone was produced by Michigan Limestone Division, United States Steel Corp., Detroit, which operated from a site near Rogers City; and Presque Isle Corp., Cleveland, Ohio, operated by Chemstone Corp. Output was crushed for use as flux, concrete aggregate, agricultural stone, and for chemical uses, and in manufacturing cement and lime. Onaway Stone Co. (Onaway) quarried dimension limestone at Onaway. The product was sold for rough and architectural construction, flagging, and rubble.

Roscommon.—Natural gas and petroleum were produced. The Michigan State Highway Department contracted for road gravel.

Saginaw.—Minco Products Corp. (Saginaw) produced clay for use in foundries and steelworks, fertilizers, insecticides and fungicides, and rotary-drilling mud and for various other purposes. Petroleum was produced.

St. Clair.—Peerless Cement Corp. (Detroit) produced portland cement at Port Huron. Two 400-foot kilns were operated. Clay used in manufacturing cement was mined by the company. Salt was refined from artificial brines produced by dissolving rock salt from the Salina formation, by Diamond Crystal Salt Co. (St. Clair) and Morton Salt Co. (Marysville). Salt was sold for table use, food processing, and ice control and for use in a variety of industrial processes. Sand and gravel was produced for building, road construction, and other uses by William Click, Sr., Goodells; Harvey G. Hall and Lakeport Sand & Gravel Co., both of Port Huron; and O. E. Gooding & Co., Ypsilanti. Peat was produced by Michigan Peat, Inc., New York, from a bog near Capac. Natural gas and petroleum were produced.

St. Joseph.—F. Leslie Knox (Colon) and Case Bros. (Sherwood), which operated a pit near Colon, produced marl for agricultural purposes. Sand and gravel for building, road construction, and other uses was produced by John G. Yerington, Benton Harbor; Aggregate Processors, Inc., White Pigeon; and the county road commission. The Michigan State Highway Department and the county road commission contracted for road gravel.

Sanilac.—Sand and gravel was produced for building and road construction. Producers that operated in Sanilac County were the Charlotte Van Camp Estate, Croswell; Harold Peters, Decker; O. E. Gooding & Co., Ypsilanti; and the county road commission. The Michigan State Highway Department and the county road commission contracted for road gravel.

Schoolcraft.—Road sand and gravel was produced by the county road commission. The Michigan State Highway Department contracted for road gravel. Inland Lime & Stone Co. (Manistique), a division of Inland Steel Co., at its Port Inland quarry produced limestone employed for riprap, flux, concrete aggregate, railroad ballast, and agricultural stone; for chemical use in sugar and glass factories and paper mills; for use as asphalt filler and mineral food; and in cement and lime manufacture. This property, one of the

largest limestone operations in the State, has produced over 70 million tons of limestone during the past 25 years. Thornton Construction Co., Inc. (Hancock), which operated at a site near Blaney Park, produced limestone for concrete aggregate.

Shiawassee.—Clay for heavy clay products was produced by Michigan Vitrified Tile Co., Corunna. Sand and gravel was produced for building, road construction, and other uses. Producers that operated in Shiawassee County were Comstock Construction Co., Bay City, from a site near Henderson; Harry Fuoss and Shenk Gravel Co., both of Durand; Valley Gravel Co., Owosso; and O. E. Gooding & Co., Ypsilanti. The Michigan State Highway Department contracted for road sand and gravel.

Tuscola.—Petroleum was produced. Molding sand, and sand and gravel for building, road construction, and other uses, were produced. Producers that reported operations in Tuscola County were Comstock Construction Co., Bay City, from sites near Fostoria and Mayville; Hile Bros., Peterhans Bros., and Chuck Vaughan Gravel & Excavating, all of Caro; C. R. Hunt, Cass City; Great Lakes Foundry Sand Co., Detroit, from dredge operations near Vassar; Bernthel Sand & Gravel Co., Reese; Andersen Sand & Gravel Co. and Saginaw Core Sand Co., both of Saginaw; and the county road commission.

Van Buren.—Petroleum was produced. Molding and engine sands were produced by South Haven Sand Co. (Grand Haven), from a site near South Haven. Garrett Sand Co. (South Haven) also produced molding sand. John G. Yerington (Benton Harbor) produced gravel for road construction and other uses.

Washtenaw.—Natural gas and petroleum were produced. Sand and gravel was produced for building, road construction, and other uses by Harry Pickitt, Allegan; Killins Gravel Co., Ann Arbor; Dexter Gravel Co., Dexter; O. E. Gooding & Co., Kruse Gravel Pit, Whittaker & Gooding Co., and Youngs Sand & Gravel, all of Ypsilanti; and the county road commission, which also contracted for road gravel.

Wayne.—Portland cement was produced by Wyandotte Chemicals Corp. (Wyandotte), a subsidiary of Huron Portland Cement Co.; and portland and masonry cements were produced by Peerless Cement Corp. (Detroit). Clay for use in manufacturing cement, heavy clay products, and lightweight aggregates was produced. Clay producers that operated in Wayne County were Clippert Brick Co., Dearborn; Flat Rock Clay Products Co., Flat Rock; and Light Weight Aggregate Corp., Livonia. Natural gas and petroleum were also produced in the county.

The Solvay Process Division of Allied Chemical & Dye Corp. and International Salt Co. (both of Detroit) and Pennsylvania Salt Manufacturing Co. and Wyandotte Chemicals Corp. (both of Wyandotte) produced salt for use in manufacturing chlorine and soda ash. Other uses included food processing, ice control and many direct and indirect applications in a variety of products and services. The International Salt Co. produced salt by underground mining methods, while the other companies utilized artificial brines produced by dissolving rock salt from the Salina formation.

Glass, molding, and ground sands and sand and gravel for building, road construction, and other uses were also produced in the county. Producers who reported sand and gravel operations in Wayne County

were Harry Pickitt, Allegan; W. L. Emery Co., Detroit; Manning & Locklin, Northville Sand & Gravel Co., and Thomson Sand & Gravel, all of Northville; Michigan Silica Co., Rockwood; and Wayne Sand & Gravel Co., Wayne. The Michigan State Highway Department contracted for road sand.

Limestone for riprap and concrete aggregate was produced by Edward Kraemer & Sons (Plain, Wis.) and Michigan Foundation Quarry (Trenton).

Wexford.—Sand and gravel was produced for building and road construction by Leo Dunbar and Wexford Gravel Co. (both of Cadillac) and Paul C. Miller (Sparta). The Michigan State Highway Department contracted for road gravel.

The Mineral Industry of Minnesota

by Matthew G. Sikich [1]

MINNESOTA mineral production in 1956 was valued at approximately $501 million—the same as in 1955. Decreases, chiefly in total values of production of iron and manganiferous ores, offset marked increases in portland and masonry cements, lime, manganese ore, sand and gravel, and stone. Other decreases in values below 1955 were reported for abrasive stones, clays, and marl. The total values of gem stones and peat produced in 1956 were slightly greater than in the preceding year.

Minnesota ranked first in the Nation in the production of iron ore and in 1956 supplied 65 percent of the total usable iron ore produced in the United States. However, shipments of iron ore from mines in the State in 1956 decreased 10 percent below 1955, chiefly because of midseason labor strikes. Probably the outstanding event of the Minnesota mineral industry in 1956 was the first full-scale operation of the taconite-processing plant of Reserve Mining Co. at Silver Bay. Pelletized concentrate was first produced at this plant, called the E. W. Davis Works, in the fall of 1955. In March 1956 the company had all units of the plant in full operation. The first cargo of iron ore to be shipped from Silver Bay was loaded April 6, 1956. Over 3.5 million tons of taconite-concentrate pellets was shipped from this port during 1956. Erie Mining Co. continued its major taconite-plant construction program at Hoyt Lakes. By the end of 1956 the project was estimated to be over 75 percent complete. The plant was expected to begin production late in 1957.

Exploratory drilling of copper-nickel mineralization in northern Minnesota by International Nickel Co. was noteworthy. About 40 diamond-drilled holes reportedly were sunk, some as deep as 2,000 feet.[2] Results of the drilling program had not been revealed at the end of 1956.

Production of nonmetals increased 8 percent in total value in 1956, compared with 1955. New alltime highs were recorded in the total values of production of portland cement, lime, sand and gravel, and stone, reflecting high activity in building and road construction.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.
[2] Mining World, March 1956, p. 91.

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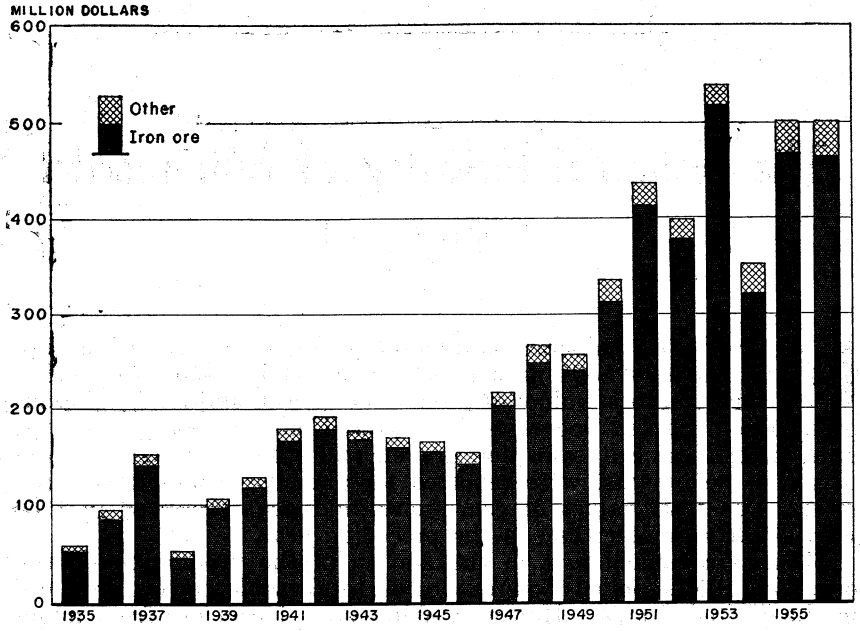

FIGURE 1.—Value of total mineral production and iron-ore shipments, in Minnesota, 1935–56.

TABLE 1.—Mineral production in Minnesota, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	(2)	(2)	[3] 79,700	[3] $91,229
Gem stones	(4)	$175	(4)	500
Iron ore (usable)—long tons, gross weight	69,419,334	465,169,412	62,637,317	461,904,029
Manganiferous ore (5 to 35 percent Mn) gross weight	864,627	(2)	633,919	(2)
Sand and gravel	25,896,426	17,429,334	28,196,892	18,254,301
Stone [5]	3,004,521	7,042,840	3,084,316	7,551,538
Value of items that cannot be disclosed: Abrasive stones (grinding pebbles, tube-mill liners) cement, clays, lime, manganese ore, manganiferous ore, marl (calcareous), peat, and quartzite		11,739,266		13,443,071
Total Minnesota [6]		501,151,000		501,027,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Incomplete figure—fire clay included with "Items that cannot be disclosed."
[4] Weight not recorded.
[5] Excludes certain stone, value for which is included with "Items that cannot be disclosed."
[6] Total has been adjusted to eliminate duplicating the value of stone.

REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—Shipments of usable iron ore from Minnesota mines in 1956 totaled 62.6 million long tons and composed 92 percent of the total value of mineral production of the State. A 34-day labor strike in the steel industry, which began July 1, and a subsequent 5-week strike of licensed officers on a large part of the Great Lakes ore-carrier fleet were the chief reasons for the 6.8-million-ton decrease in shipments below the tonnage shipped in 1955. However, loss in output during these strikes was reduced considerably by increased production during the operating period and extension of the Lake-shipping season to December 19.

Direct-shipping grades constituted 56 percent of the total usable iron ore shipped from the State in 1956, compared with 63 percent in 1955. An interesting fact, indicating the trend in beneficiation of Minnesota low-grade ores, is that in the decade 1947–56 the proportion of beneficiated to total usable ore shipped from the State rose from 23.5 percent to 43.5. Nearly 63 percent of the 94.5 million tons of crude ore mined in Minnesota in 1956 was sent to beneficiation plants for treatment. Open-pit mines supplied 98 percent of the crude ore mined in the State in 1956.

Mines were operated by 27 companies in Crow Wing, Fillmore, Itasca, and St. Louis Counties. Shipments from the Mesabi range (in Itasca and St. Louis Counties) constituted 94 percent of the total shipments of usable iron ore from Minnesota in 1956. Mines in the Cuyuna range in Crow Wing County, the Vermilion range in St. Louis County, and the Spring Valley district in Fillmore County supplied the remainder.

The highlight of the iron-ore industry in the State in 1956 was the beginning of full-scale operations at the E. W. Davis Works—the taconite-concentrating plant of Reserve Mining Co., owned jointly by Armco Steel Corp. and Republic Steel Corp. The plant, at Silver Bay in Lake County, is approximately 50 miles northeast of Duluth on Lake Superior. Contracts for construction of the plant, considered to be the first large-scale taconite-processing plant in the world, were let in 1951. The first of 12 concentrating units went into operation in October 1955, and all units were ready for production early in 1956. The first shipment of taconite-concentrate pellets produced at the plant was at the beginning of the 1956 navigation season. In 1956 the plant was operated at a rate slightly greater than the initial rated annual capacity—3.75 million tons of finished product. The ultimate annual capacity of the plant was to be 10 million tons, which would require mining approximately 30 million tons of taconite each year. The taconite mine of Reserve Mining Co. is near Babbitt, 47 miles inland from Silver Bay in the eastern end of the Mesabi range. There the taconite was mined and crushed in 2 stages to minus-3-inch size. Most of the crushed material was then shipped over the company interdepartment railroad to the E. W. Davis Works for further processing. Some of the material was concentrated and pelletized at the Babbitt plant, which the company has operated since 1952. The yearly capacity of the Babbitt plant is 300,000 tons of pellets. The ore body at Babbitt

was estimated to contain at least 1.5 billion tons of magnetic taconite containing 25 to 30 percent iron, which when processed would yield 500 million tons of concentrate averaging approximately 62 percent iron.

Erie Mining Co., with Pickands Mather & Co. as operating agent, continued constructing its large-scale taconite plant about 5 miles northeast of Aurora. This plant, with an initial rated annual capacity of 7.5 million tons of finished product, was to be the largest concentrator ever built as a single initial unit. Other phases of Erie's vast $300-million taconite project included construction of harbor, dock, and power facilities at Taconite Harbor, the shipping point on Lake Superior; a complete new town of Hoyt Lakes near the plant site; a 73-mile railroad connecting the plant with the harbor; and development of 2 open-pit mines near the concentrating plant, which were to supply the raw material for the plant. Erie Mining Co. had been producing taconite-concentrate pellets at its preliminary plant near Aurora since 1948. The annual capacity of this plant was about 200,000 tons of pellets. The company was expected to begin production at the large-scale plant late in 1957.

Oliver Iron Mining Division of United States Steel Corp. continued to produce taconite concentrate in 1956 at its Pilotac plant near Mountain Iron. Concentrate produced at this plant was agglomerated at the company Extaca plant at Virginia.

Stripping was under way during 1956 at several new mines, including the Stephens mine near Aurora, operated by Oliver Iron Mining Division and considered the largest undeveloped reserve of direct-shipping ore in the Mesabi range. Several new ore-treatment plants were put into operation or were being constructed at various points in the iron ranges.

According to company reports, all iron ore shipped from Minnesota mines in 1956 was for use in furnaces manufacturing pig iron and steel. Occasionally in past years, however, small quantities of crude iron ore have been sold for use in manufacturing iron oxide pigments.

Effective January 1, 1956, and throughout 1956, Lake Erie base prices for iron ore were: High Phosphorus, $10.85 per ton; Mesabi Non-Bessemer, $10.85; Mesabi Bessemer, $11.00; Old Range Non-Bessemer, $11.10; Old Range Bessemer, $11.25; and Open-Hearth Lump, $12.10. These prices were for ore delivered at lower Lake ports and were based on the following guaranteed-base analyses: Non-Bessemer grades, 51.50 percent iron (natural); and Bessemer grades, 51.50 percent iron (natural) and 0.045 percent phosphorus (dry). Premiums and penalties were applied for variations in analyses and physical structure. Most of the tonnage shipped from the State during 1956 was of non-Bessemer grades. In 1956 the average weighted value at the mine for Minnesota iron-ore shipments, as reported by producing companies, was $7.37 per long ton compared with $6.70 in 1955.

The 1956 navigation season for Minnesota ore shipments opened April 5 at the Great Northern Railway Co. docks at Superior, Wis. Heavy demand for iron ore at steel plants, which had been operating at near capacity during the winter, was the primary reason for the early opening. Weather conditions were favorable during the year,

TABLE 2.—Dates of first and final cargoes of iron ore at United States upper Lake ports, 1954–56 [1]

Port and dock	1954		1955		1956	
	First	Final	First	Final	First	Final
Ashland, Wis.:						
C&NW	May 2	Nov. 16	Apr. 24	Nov. 20	Apr. 25	Nov. 28
Soo Line	Apr. 24	Nov. 10	Apr. 24	Nov. 28	Apr. 23	Nov. 25
Duluth, Minn.: DM&IR	Apr. 21	Oct. 26	Apr. 13	Nov. 26	Apr. 8	Dec. 15
Escanaba, Mich.: C&NW	Apr. 19	Dec. 2	Apr. 7	Dec. 8	Apr. 7	Dec. 3
Marquette, Mich.:						
DSS&A	Apr. 30	Oct. 30	Apr. 22	Nov. 13	Apr. 26	Nov. 11
LS&I	Apr. 28	Nov. 28	Apr. 18	Dec. 3	Apr. 9	Dec. 5
Silver Bay, Minn.: Reserve					Apr. 6	Dec. 14
Superior, Wis.:						
G. N	Apr. 22	Nov. 29	Apr. 14	Dec. 3	Apr. 5	Dec. 8
NP-Soo Line	Apr. 20	Nov. 26	Apr. 21	Nov. 26	Apr. 8	Nov. 25
Two Harbors, Minn.: DM&IR	Apr. 19	Nov. 18	Apr. 13	Nov. 26	Apr. 8	Dec. 19

[1] Source: Skillings' Mining Review, Dec. 29, 1956, p. 6.

TABLE 3.—Total usable iron ore produced (direct-shipping, concentrate, and sinter), 1884–1956, by ranges, in long tons [1]

Year	Cuyuna	Mesabi	Vermilion	Spring Valley district	Total
1884–1943	31,390,054	1,314,036,795	74,237,762	279,645	1,419,944,256
1944	1,417,256	61,994,023	1,466,816		64,878,095
1945	1,784,010	58,355,320	1,481,007		61,620,337
1946	1,380,120	46,678,679	1,232,008		49,290,807
1947	2,100,846	58,772,404	1,471,879	147,787	62,492,916
1948	2,030,281	64,071,983	1,580,497	352,979	68,035,740
1949	1,826,711	52,551,346	1,381,327	102,158	55,861,542
1950	2,480,843	60,838,025	1,580,217	335,470	65,234,555
1951	2,651,724	73,574,908	1,806,818	452,405	78,485,855
1952	2,369,180	59,370,538	1,573,748	476,242	63,789,708
1953	2,900,579	75,324,236	1,643,039	217,760	80,085,614
1954	1,497,296	45,724,827	1,371,967	157,681	48,751,771
1955	2,770,738	64,860,493	1,454,365	270,670	69,356,266
1956	2,242,216	59,346,091	1,284,536	349,568	63,222,411
Total	58,841,854	2,095,499,668	93,565,986	3,142,365	2,251,049,873

[1] Exclusive after 1905 of iron ore containing 5 percent or more manganese.

TABLE 4.—Production, shipments, and stocks of usable iron ore in 1956, by counties and ranges, in long tons [1]

County or range	Stocks Jan. 1, 1956	Production	Shipments	Stocks Dec. 31, 1956	Iron content of production (in long tons)
County:					
Crow Wing	115,017	2,242,216	2,236,150	121,083	1,122,664
Fillmore		349,568	349,568		165,238
Itasca	[2] 731,461	15,677,918	15,236,391	1,172,988	8,184,934
St. Louis	[2] 842,005	44,952,709	44,815,208	979,506	23,081,304
Total	[2] 1,688,483	63,222,411	62,637,317	2,273,577	32,554,140
Range:					
Cuyuna	115,017	2,242,216	2,236,150	121,083	1,122,664
Mesabi	[2] 1,365,293	59,346,091	58,689,660	2,021,724	30,545,832
Vermilion	208,173	1,284,536	1,361,939	130,770	720,406
Spring Valley district (Fillmore County)		349,568	349,568		165,238
Total	[2] 1,688,483	63,222,411	62,637,317	2,273,577	32,554,140

[1] Exclusive of ore containing 5 percent or more manganese.
[2] Revised figure.

TABLE 5.—Production, shipments, and stocks of crude ore, in 1956, by counties and ranges, in long tons [1]

County or range	Stocks Jan. 1, 1956	Production		Shipments		Stocks Dec. 31, 1956
		Underground	Open pit	Direct to consumers	To beneficiation plants	
County:						
Crow Wing	31,812	282,196	2,713,907	1,053,672	1,943,422	30,821
Fillmore			502,295		502,295	
Itasca	38,088		32,769,030	995,561	31,811,557	
St. Louis	[2] 882,270	1,891,882	56,353,064	33,330,878	25,168,006	628,332
Total	[2] 952,170	2,174,078	92,338,296	35,380,111	59,425,280	659,153
Range:						
Cuyuna	31,812	282,196	2,713,907	1,053,672	1,943,422	30,821
Mesabi	[2] 712,185	607,346	89,122,094	32,964,500	56,979,563	497,562
Vermilion	208,173	1,284,536		1,361,939		130,770
Spring Valley district (Fillmore County)			502,295		502,295	
Total	[2] 952,170	2,174,078	92,338,296	35,380,111	59,425,280	659,153

[1] Exclusive of ore containing 5 percent or more manganese.
[2] Revised figure.

TABLE 6.—Salient statistics of iron ore shipped from mines 1947–56, in long tons [1]

Year	Crude ore to concentrators	Beneficiated			Total usable ore [2]	Proportion of beneficiated to total usable ore (percent)
		Sinter	Other	Total		
1947	26,841,902	295,045	14,972,344	15,267,389	62,436,102	24.45
1948	28,176,320	256,000	15,997,641	16,253,641	67,923,237	23.93
1949	24,941,064	260,403	14,091,248	14,351,651	55,943,714	25.65
1950	36,334,262	253,452	18,525,065	18,778,517	64,538,759	29.10
1951	43,972,058	194,971	21,575,427	21,770,398	78,164,527	27.85
1952	36,812,301	781,459	18,326,238	19,107,697	63,906,069	29.90
1953	49,924,037	1,080,413	25,097,519	26,177,932	80,533,670	32.51
1954	38,469,805	1,335,379	17,859,191	19,194,570	48,613,338	39.48
1955	50,733,839	1,793,125	23,987,939	25,781,064	69,419,334	37.14
1956	59,425,280	5,308,990	21,948,216	27,257,206	62,637,317	43.52

[1] Exclusive of ore containing 5 percent or more manganese.
[2] Direct-shipping and beneficiated ore.

allowing Lake shipping to continue late in the season. The final ore cargo of the 1956 season left Two Harbors December 19, bringing to a close one of the longest shipping seasons on record.

Nearly 95 percent of the usable iron-ore shipments from Minnesota mines in 1956 was shipped by Lake vessel to lower Lake ports and from thence to consuming districts. The remainder was shipped all rail to the final destination. During 1956 a substantial tonnage of Minnesota ore was consumed at Duluth in blast and steel furnaces operated by Interlake Iron Corp. and the American Steel & Wire Division of United States Steel Corp. Both companies also operated coke ovens at Duluth.

Statistical data for iron ores containing 5 percent or more manganese, natural, are not included with iron-ore data in this chapter but are treated separately as "Manganiferous ore."

Manganese Ore.—Manganese carbonate, manganese dioxide, and other manganese products were produced from Cuyuna-range man-

ganiferous ores by Manganese Chemicals Corp. at its plant near Riverton. Daily capacity of the plant, which utilizes the Dean-Leute ammonium carbamate leach process, was about 200 long tons of crude-ore input.

TABLE 7.—Shipments, with average iron and manganese contents, of usable [1] manganiferous iron ore (containing 5 to 10 percent Mn, natural) and ferruginous manganese ore (containing 10 to 35 percent Mn, natural) from mines in the Cuyuna range, 1947–51 (average) and 1952–56, in long tons

Year	Manganiferous iron ore			Ferruginous manganese ore			Total shipments
	Shipments	Contents (natural)		Shipments	Contents (natural)		
		Fe, percent	Mn, percent		Fe, percent	Mn, percent	
1947–51 (average)	905,830	36.93	6.01	6,146	32.93	11.52	911,976
1952	773,260	38.40	5.77	28,127	32.38	10.61	801,387
1953	795,001	37.79	5.69	179,545	33.73	11.62	974,546
1954	443,308	40.65	5.65	6,743	30.22	10.96	450,051
1955	669,056	39.63	5.90	102,933	33.47	13.15	771,989
1956	481,946	38.01	6.58	84,053	[2] 31.82	11.93	565,999

[1] Direct-shipping and beneficiated ore.
[2] Partly estimated.

Manganiferous Ore.—Shipments of manganiferous ore (containing 5 to 35 percent manganese, natural) totaled 633,919 short tons in 1956, a decrease of 27 percent below 1955. The chief reason for the decrease was interruption of operations brought about by the 5-week steel strike in midsummer. However, one producer reported that Cuyuna-range manganiferous ore was very difficult to sell due to competition from Labrador. Shipments were reported from seven open-pit mines—all in Crow Wing County in the Cuyuna range. Operators in 1956 were Hanna Coal & Ore Corp., Pickands Mather & Co., and Zontelli Bros., Inc.

Total shipments in 1956 consisted of 336,371 short tons of direct-shipping grades and 297,548 short tons of concentrate. Nearly 72 percent of the 1,186,000 short tons of crude manganiferous ore mined was beneficiated by washing, jigging, and dense-medium processes. Manganiferous iron ore (containing 5 to 10 percent manganese, natural) constituted 85 percent of the total shipments, and ferruginous manganese ore (containing from 10 to 35 percent manganese, natural) composed the remainder. Average manganese content of the total shipments in 1956 was 7.37 percent compared with 6.87 percent in 1955.

Over 99 percent of the manganiferous ore shipped from Minnesota to date has come from mines in the Cuyuna range. Last recorded shipments from the Mesabi range were in 1952; from the Vermilion range, in 1917.

Ores containing over 5 percent natural manganese generally have been priced as Old Range Non-Bessemer on their combined natural iron and manganese content, plus a premium for the natural manganese in excess of 5 percent.

Most of the ore shipped in 1956 was for use in blast furnaces. Some was sold to Manganese Chemicals Corp., which processed the material at its plant near Riverton.

The estimated tonnage of manganese-bearing material on the Cuyuna range was approximately 500 million tons, averaging about 5 percent manganese. The Federal Bureau of Mines continued research at its Minneapolis Station on utilization of low-grade domestic manganese resources, including studies on a sulfur dioxide-air roast process for beneficiating the low-grade manganiferous carbonate slates of the Cuyuna range.

NONMETALS

Abrasives.—The Jasper Stone Co. produced grinding pebbles and tube-mill liners from a quartzite deposit near Jasper, Rock County. Total output in 1956 was slightly lower than in 1955. However, demand for the products was fairly good. Sales were chiefly to cement, ceramic, and silica sand producers. Only 5 States in the Nation produced grinding pebbles, and 3 produced tube-mill liners in 1956.

Cement.—Portland and masonry cements were produced by Universal Atlas Cement Co., which operated the only cement plant in the State at Duluth. Shipments in 1956 increased over the previous year, keeping pace with the level of regional construction activity. Portland-cement output consisted of types I and II (general use and moderate heat). Masonry cement was marketed under the name of Atlas Mortar. Average mill values per barrel of both portland and masonry cements in 1956 increased over 1955. Cements were shipped from the plant by rail and truck in bulk and in paper-bag containers. Raw materials used in 1956 were principally gypsum, limestone, sand, slag, and iron dust.

Clays.—Fire clay and miscellaneous clay were produced in Minnesota in 1956 chiefly for the manufacture of pottery, floor and wall tile, and heavy clay products, such as building brick, drain tile, and sewer pipe. The total quantity sold or used was 5 percent greater than in 1955; the total value, however, decreased slightly. Output was credited to seven companies, with operations in Beltrami, Brown, Carlton, Goodhue, Polk, and Ramsey Counties.

Gem Stones.—A small quantity of semiprecious gem stones was collected by several hobbyists along the north shore of Lake Superior and in the southeastern part of the State in Winona County. The material collected was chiefly agate and thomsonite. Gem materials were not explored for in the State on a commercial basis, but as a hobby by amateurs. Semiprecious gem materials were used primarily for personal gem collections and handmade jewelry.

Lime.—Cutler-Magner Co. was the only lime producer in Minnesota in 1956. The company operated a plant at Duluth and reported shipments of quick and hydrated lime. Although the total value of sales increased over 1955, the quantity sold decreased slightly. The output was chiefly consumed for building, agricultural, industrial, and chemical uses.

Marl.—Calcareous marl production in 1956 decreased both in quantity and total value below that in 1955, chiefly as a result of

lower demand. Output, reported by two companies in Chisago and Crow Wing Counties, was used entirely for agricultural purposes.

Perlite.—Crude perlite produced in Colorado and Nevada was expanded at plants operated by Minnesota Perlite Corp. and Western Mineral Products Co. in Minneapolis. The expanded material was used as lightweight aggregate in plaster and concrete and for other purposes.

Sand and Gravel.—Production of sand and gravel was reported from every county in the State in 1956. The total output in 1956 was approximately 28 million short tons, establishing a new alltime high; this was a 9-percent increase over the quantity produced in 1955, the previous record year. Chief reason for the increase was the intensive building- and road-construction activity in the State. Counties from

TABLE 8.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Class of operation and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass	5,795	$39,822	$6.87	20,332	$83,026	$4.08
Building	3,387,806	2,802,358	.83	3,335,880	2,771,103	.83
Paving	806,919	632,736	.78	1,228,132	746,262	.61
Railroad ballast	[1]	[1]	[1]	6,300	3,568	.57
Other	89,004	245,013	2.75	220,132	464,601	2.11
Undistributed [2]	76,019	152,778	2.01	43,330	73,285	1.69
Total	4,365,543	3,872,707	.89	4,854,106	4,141,845	.85
Gravel:						
Building	2,226,484	3,258,073	1.46	2,430,843	3,558,361	1.46
Paving	4,300,762	3,223,247	.75	4,292,588	2,822,249	.66
Railroad ballast	890,572	362,475	.41	1,366,553	604,865	.44
Other	178,260	35,714	.20	379,094	212,364	.56
Total	7,596,078	6,879,509	.91	8,469,078	7,197,839	.85
Total sand and gravel	11,961,621	10,752,216	.90	13,323,184	11,339,684	.85
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	4,050	1,215	.30	4,050	1,215	.30
Paving	110,172	40,913	.37	344,125	112,883	.33
Total	114,222	42,128	.37	348,175	114,098	.33
Gravel:						
Building	3,517	1,055	.30	70,000	21,000	.30
Paving	13,817,066	6,633,935	.48	14,455,533	6,779,519	.47
Total	13,820,583	6,634,990	.48	14,525,533	6,800,519	.47
Total sand and gravel	13,934,805	6,677,118	.48	14,873,708	6,914,617	.46
ALL OPERATIONS						
Sand	4,479,765	3,914,835	.87	5,202,281	4,255,943	.82
Gravel	21,416,661	13,514,499	.63	22,994,611	13,998,358	.61
Grand total	25,896,426	17,429,334	.67	28,196,892	18,254,301	.65

[1] Figures withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[2] Includes railroad-ballast sand (1955) and foundry, engine, and molding sands (1955–56) to avoid disclosing individual company confidential data.

which over 1 million tons were produced in 1956 were Hennepin, St. Louis, Stearns, and Washington.

Of the quantity produced in 1956, nearly 93 percent was for building and paving use. Approximately 5 percent was for railroad ballast. Smaller quantities of special types of sands were consumed for molding, engine use, and the manufacture of glass. About 47 percent of the total output was produced at commercial operations and the remaining 53 percent at Government-and-contractor operations. Methods of transportation to consumers consisted chiefly of truck and rail haulage, with truck shipments composing 91 percent of the total.

The 10 leading commercial producers in 1956 were: Anderson Aggregates, Barton Contracting Co., Chas. M. Freidheim & Co., and Industrial Aggregates Co., all of Minneapolis; Becker County Sand & Gravel Co. and Hallett Construction Co., Crosby; Cemstone Products Co. and J. L. Shiely Co., St. Paul; Silica Sand Corp., Le Sueur; and Ulland Bros., Inc., Austin.

Stone.—Total production of stone in Minnesota in 1956 increased 3 percent over that in 1955 and established a new record high, surpassing the previous high set in 1955. Stone products included granite, limestone, basalt, and quartzite.

Output of granite in the State in 1956 increased 8 percent over the previous year. Granite quarries were operated in three widely

TABLE 9.—Granite sold or used by producers in 1955–56, by uses

Use	1955			1956		
	Quantity	Value		Quantity	Value	
		Total	Average per unit of measure		Total	Average per unit of measure
Dimension:						
Rough construction:						
Commercial, short tons	581	$6,000	$10.33			
Noncommercial, do	249	6,000	24.09			
Rubble:						
Commercial, do	46,838	27,279	.58	24,665	$15,610	$0.63
Noncommercial, do				5,200	26,000	5.00
Rough architectural, cubic feet	[1] 117,281	[1] 1,110,110	[1] 9.47	[1] 149,492	[1] 1,654,009	[1] 11.06
Rough monumental, do	41,924	191,708	4.57	57,089	217,015	3.80
Dressed architectural, do	(1)	(1)	(1)	(1)	(1)	(1)
Dressed monumental, do	109,411	1,184,195	10.82	79,151	1,014,176	12.81
Total dimension equivalent short tons [2]	69,963	2,525,292	36.09	53,581	2,926,810	54.62
Crushed and broken:						
Riprap:						
Commercial, short tons	(3)	(3)	(3)	12,084	10,288	.85
Noncommercial, do				1,800	700	.39
Concrete aggregate and roadstone, short tons	(3)	(3)	(3)	(3)	(3)	(3)
Railroad ballast, do	432,962	475,474	1.10	(3)	(3)	(3)
Other, do	[3] 143,605	[3] 347,650	[3] 2.42	[3] 630,002	[3] 806,761	[3] 1.28
Total crushed and broken, do	576,567	823,124	1.43	643,886	817,749	1.27
Grand total, do	646,530	3,348,416	5.18	697,467	3,744,559	5.37

[1] Figures for dressed and rough architectural use are combined to avoid disclosing individual company confidential data.
[2] Average weight of 166 pounds per cubic foot used to convert cubic feet to short tons.
[3] Figures for riprap (1955), concrete aggregate and roadstone 1955–56, and railroad ballast (1956) are combined with "Other" to avoid disclosing individual company confidential data.

separated regions—Central Minnesota in Kanabec, Mille Lacs, and Stearns Counties; the upper Minnesota River Valley in Big Stone, Chippewa, Lac qui Parle, Redwood, Renville, and Yellow Medicine Counties; and the northeastern part of the State, in St. Louis County. Finishing plants were operated in Cold Spring, Delano, and St. Cloud. Dimension granite was produced chiefly for building and monumental purposes. Output of crushed and broken granite was used for riprap, concrete aggregate and roadstone, railroad ballast, and other applications.

TABLE 10.—Crushed and broken limestone sold or used by producers in 1955–56, by uses

Use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Crushed and broken:						
Riprap	60,468	$97,160	$1.61	83,511	$94,353	$1.13
Flux	425	1,500	3.53	250	883	3.53
Concrete aggregate and roadstone:						
Commercial	1,823,786	1,984,493	1.09	1,909,287	2,058,947	1.08
Noncommercial	166,132	169,972	1.02	45,297	45,642	1.01
Railroad ballast	2,381	4,919	2.07	5,530	8,140	1.47
Agriculture	235,014	335,674	1.43	223,708	329,109	1.47
Other uses	42,835	197,233	4.60	42,038	196,712	4.68
Total	2,331,041	2,790,951	1.20	2,309,621	2,733,786	1.18

Limestone was produced in 1956 chiefly from deposits along the Minnesota and Mississippi Rivers in the eastern and south central part of the State. This total output decreased below 1955. Most of the crushed limestone produced was crushed for use as concrete aggregate, roadstone, and agricultural stone. Small quantities of crushed or broken limestone were used for railroad ballast, riprap, flux, and other purposes. Dimension limestone for building and architectural use and flagging totaled 27,228 short tons valued at $973,193 in 1956.

The Zenith Dredge Co. produced crushed basalt for concrete aggregate and roadstone in St. Louis County.

Waste material resulting from the production of grinding pebbles and tube-mill liners from a quartzite quarry near Jasper in Rock County was sold for use as riprap.

Vermiculite.—Crude vermiculite produced in Montana was exfoliated at plants in Minneapolis and St. Paul. Major uses of the exfoliated product were in the construction industry, as insulating material, and as lightweight aggregate in plaster and concrete.

MINERAL FUELS

Peat.—The quantity of peat produced in Minnesota in 1956 increased over that in 1955. Output was reported by only one producer from a bog in Aitkin County. Although classed as a fuel, peat was used chiefly for horticultural purposes. Minnesota contains about half the United States reserves of peat. Under the sponsorship of

the Minnesota Iron Range Resources and Rehabilitation Commission, research work has continued to develop methods of utilizing the vast peat resource of the State. Emphasis has been placed on developing chemical products from peat.

REVIEW BY COUNTIES

Aitkin.—Moss peat was produced by the Colby Pioneer Peat Co. of Hanlontown, Iowa, from a bog near Floodwood. Material was processed at a plant in Wawina, Itasca County and sold for horticultural purposes.

Road gravel was produced by and for the Minnesota Highway Department.

Anoka.—Charles Weaver Sons, Inc., operated a portable plant near Anoka and produced gravel for miscellaneous uses. The county highway department produced sand for road use.

Becker.—Sand and gravel for building and road construction, engine use, railroad ballast, and other purposes was produced by Becker County Sand & Gravel Co. Road gravel was produced by and for the State and county highway departments.

Beltrami.—Ritchie & Tell operated a fixed plant near Bemidji and produced sand and gravel for building and road purposes. Melvin Samuelson reported output of sand and gravel for road use from a pit near Kelliher. The State and county highway departments produced and contracted for sand and gravel for road use. The Bemidji Brick Co. produced clay for manufacturing heavy clay products.

Benton.—Road gravel was produced by Ahles & Lush, by the county highway department, and by and for the Minnesota Highway Department.

TABLE 11.—Value of mineral production in Minnesota, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Aitkin	(1)	(1)	Sand and gravel, peat.
Anoka	(1)	$13,500	Sand and gravel.
Becker	(1)	263,694	Do.
Beltrami	$68,763	106,726	Sand and gravel, clays.
Benton	12,523	39,706	Sand and gravel.
Big Stone	(1)	(1)	Stone, sand and gravel.
Blue Earth	465,708	547,510	Sand and gravel, stone.
Brown	104,324	325,156	Sand and gravel, clays.
Carlton	159,264	201,949	Do.
Carver	(1)	(1)	Sand and gravel.
Cass	84,151	49,534	Do.
Chippewa	113,950	271,357	Sand and gravel, stone.
Chisago	44,754	47,969	Sand and gravel, marl.
Clay	244,273	337,364	Sand and gravel.
Clearwater		8,693	Do.
Cook	10,602	2,888	Do.
Cottonwood	110,982	125,992	Do.
Crow Wing	23,906,927	21,909,552	Iron ore, manganiferous ore, synthetic manganese ore, sand and gravel, marl.
Dakota	455,197	606,216	Stone, sand and gravel.
Dodge	(1)	86,632	Sand and gravel, stone.
Douglas	57,783	101,756	Sand and gravel.
Faribault	268,319	(1)	Do.
Fillmore	2,110,190	(1)	Iron ore, stone, sand and gravel.
Freeborn	138,297	171,823	Sand and gravel.
Goodhue	172,803	342,378	Stone, sand and gravel, clays.
Grant	45,386	137,720	Sand and gravel.

[1] Figure withheld to avoid disclosing individual company confidential data; value included with "Undistributed."

TABLE 11.—Value of mineral production in Minnesota, 1954–55, by counties—Continued

County	1955	1956	Minerals produced in 1956 in order of value
Hennepin	$3,256,245	$3,074,647	Sand and gravel, stone.
Houston	146,688	113,622	Stone, sand and gravel.
Hubbard		163,195	Sand and gravel.
Isanti	7,036	21,962	Do.
Itasca	114,092,412	117,965,312	Iron ore, sand and gravel.
Jackson	92,114	126,595	Sand and gravel.
Kanabec	(1)	69,716	Sand and gravel, stone.
Kandiyohi	292,025	384,655	Sand and gravel.
Kittson	176,685	90,618	Do.
Koochiching	1,094	129,561	Do.
Lac qui Parle	250,994	731,535	Stone, sand and gravel.
Lake	19,218	25,662	Sand and gravel, gem stones.
Lake of the Woods	14,300	16,287	Sand and gravel.
Le Sueur	1,009,322	1,300,649	Stone, sand and gravel.
Lincoln	63,899	40,973	Sand and gravel.
Lyon	115,052	64,868	Do.
McLeod	72,397	51,764	Do.
Mahnomen	12,407	113,685	Do.
Marshall	12,226	229,683	Do.
Martin	22,635	45,051	Do.
Meeker	(1)	104,761	Do.
Mille Lacs	426,278	(1)	Stone, sand and gravel.
Morrison	31,496	123,354	Sand and gravel.
Mower	131,615	104,673	Sand and gravel, stone.
Murray	(1)	20,782	Sand and gravel.
Nicollet	(1)	97,236	Do.
Nobles	108,596	125,968	Do.
Norman		75,350	Do.
Olmsted	194,300	312,170	Stone, sand and gravel.
Otter Tail	212,378	177,092	Sand and gravel.
Pennington	13,538	23,938	Do.
Pine	8,035	59,833	Do.
Pipestone	234,865	225,804	Do.
Polk	183,154	390,014	Sand and gravel, clays.
Pope	59,169	102,118	Sand and gravel.
Ramsey	198,093	180,907	Sand and gravel, clays, stone.
Red Lake		85,307	Sand and gravel.
Redwood	58,182	209,107	Sand and gravel, stone.
Renville	473,503	529,024	Stone, sand and gravel.
Rice	340,662	606,426	Sand and gravel, stone.
Rock	383,629	180,619	Abrasives, sand and gravel, stone.
Roseau	52,056	81,596	Sand and gravel.
St. Louis	337,483,687	334,973,928	Iron ore, cement, sand and gravel lime, stone.
Scott	505,282	649,084	Stone, sand and gravel.
Sherburne	17,500	37,965	Sand and gravel.
Sibley	1,667	63,030	Do.
Stearns	1,274,603	2,273,420	Stone, sand and gravel.
Steele	201,751	363,045	Sand and gravel, stone.
Stevens		353	Sand and gravel.
Swift	(1)	111,478	Do.
Todd	(1)	176,253	Do.
Traverse	24,912	116,774	Do.
Wabasha	(1)	156,250	Sand and gravel, stone.
Wadena	(1)	230,831	Sand and gravel.
Waseca		(1)	Do.
Washington	1,449,324	1,518,949	Do.
Watonwan	62,680	36,022	Do.
Wilkin	24,114	31,495	Do.
Winona	541,726	493,293	Stone, sand and gravel, gem stones.
Wright	104,756	198,705	Sand and gravel.
Yellow Medicine	(1)	353,269	Stone, sand and gravel.
Undistributed	8,118,145	4,968,772	
Total	501,151,000	501,027,000	

[1] Figure withheld to avoid disclosing individual company confidential data; value included with "Undistributed."

Big Stone.—Cold Spring Granite Co. operated the Agate quarry near Ortonville, and the Delano Granite Works, Inc., operated a quarry near Odessa. Rough granite from these quarries was processed at plants operated by both companies—one at Cold Spring and the other at Delano. The finished product was used chiefly as architec-

tural and monumental stone. The State highway department produced and contracted for road gravel.

Blue Earth.—Guaranteed Gravel & Sand Co. and Hiniker Sand & Gravel Co. produced sand and gravel for building construction. Hallett Construction Co. produced building sand at a fixed plant at Mankato. Sand and gravel for building and road purposes was produced by North Star Concrete Co., which also operated a fixed plant at Mankato. Ed Swartout reported output of road gravel and crushed limestone for agricultural use. The State highway department produced and contracted for gravel for road construction. T. R. Coughlan Co. produced limestone for road material, riprap and agricultural stone. Agricultural limestone was produced by Mankato Stone Co.

Brown.—Sand and gravel for building and road construction was produced in Brown County during the year. Portable plants were operated by Carlson Bros., Inc., and Roberts Bros. near Comfrey and New Ulm, respectively. Fixed plants were operated by Lawrence Wallner near New Ulm and by M. M. Youngmann near Sleepy Eye. Other sand and gravel producers included Math N. Schumacher and the State and county highway departments. Miscellaneous clay for use in manufacturing building brick and other heavy clay products was produced by Ochs Brick & Tile Co. near Springfield.

Carlton.—The Zenith Dredge Co. operated a fixed sand and gravel plant at Carlton and reported output for building use, railroad ballast, and other purposes. Gravel for railroad ballast and other uses was produced by the Great Northern Railway Co. and Minneapolis, St. Paul and Sault Ste. Marie Railroad Co. Building sand and gravel was produced by Albert Obraske and White & Almer, who operated fixed plants near Moose Lake and Cloquet, respectively. Road gravel was produced by the State and county highway departments. The Nemadji Tile & Pottery Co. of Moose Lake reported output of clay used in manufacturing pottery and floor and wall tile. The Wrenshall Brick Co. of Duluth sold a small quantity of miscellaneous clay for use in water purification.

Carver.—Ahles & Lush operated a portable plant and reported output of road gravel. Rosenwinkel Sand & Gravel Co., Inc., operated a fixed plant near Chaska and produced sand and gravel for building use. Sand and gravel for building and road construction was produced by Wm. Mueller & Sons, operating a fixed plant near Carver. The State highway department produced road gravel.

Cass.—Road gravel was produced by, and under contract for, the State and county highway departments.

Chippewa.—Hallett Construction Co. operated a fixed sand and gravel plant near Montevideo and reported output for building and other purposes. Jay Volden produced sand for building and road use. The State highway department produced and contracted for road gravel. The Melrose Granite Co. produced dimension granite for architectural and monumental use from a quarry near Montevideo. The stone was processed at the company plant in St. Cloud.

Chisago.—Sand and gravel for road use was produced under contract for the county highway department. The Minnesota Highway

Department produced and contracted for road gravel. William Danner reported output of marl for agricultural stone.

Clay.—Sand and gravel for building and road construction was produced by Ames Sand & Gravel, Inc., Kost Bros., Inc., and Ulven Gravel Co. Rollo Lewis operated a portable plant near Sabin and produced sand and gravel for road use. Road gravel was produced by H. A. MacDonald, Thomson Bros., and under contract for the State and county highway departments.

Clearwater.—The Minnesota Highway Department produced road gravel.

Cook.—Sand and gravel for road use was produced by the State and county highway departments.

Construction at Taconite Harbor—the Erie Mining Co. harbor on the north shore of Lake Superior—was in the final stages at the end of 1956. From this point taconite concentrate pellets to be produced by the company at its new plant near Aurora will be shipped to lower Lake ports. First shipments from Taconite Harbor were expected to begin in the fall of 1957. Excavation of the harbor was performed, utilizing a coffer dam, which consisted of a string of 50-foot-diameter sheet-piling cells driven to the bottom of Lake Superior. These interconnected cells were filled with gravel, forming the dam. After the water was pumped out of the future harbor area, the contractor was able to proceed with the excavation in much the same manner as quarrying in an open pit. The ore dock is about 1,800 feet long and has a storage capacity of 100,000 tons of pellets. Traveling-belt conveyors were to be used for loading pellets into ore freighters. Other facilities at Taconite Harbor included a powerplant (which was to supply power for Erie's entire taconite project) and unloading facilities for coal and petroleum products. By the end of 1956 conveyors for ore and coal and other equipment and machinery had been installed and were being tested by contractors.

Cottonwood.—Windom Sand & Gravel Co. operated a fixed plant near Windom and reported output of sand and gravel for building use and fill. Road gravel was produced by and for the State and county highway departments.

Crow Wing.—Iron ore was the chief mineral product of the county. Operating companies and mines from which iron ore was shipped in 1956 were:

Company:	*Mines operated*
Dates Mining Co	Pennington.
M. A. Hanna Co	North Yawkey, Portsmouth group, and Rowe Tailings.
Hanna Coal & Ore Corp	Feigh, Huntington, Louise, Maroco, and South Hillcrest.
Inland Steel Co	Armour No. 1.
Pickands Mather & Co	Mahnomen and Rabbit Lake.
Rhude & Fryberger	Carlson-Nelson and South Hillcrest.
Zontelli Bros., Inc	Mangan-Joan, Mangan-Stai, Manuel, Virginia, and West Airport.

All mines except the Armour No. 1 were open pit. Ore from the Armour No. 2 mine was hoisted through the No. 1 shaft. Of the total iron ore shipped from the county in 1956, approximately 47 percent was of direct-shipping grade, and the remainder was concentrate, including sinter. First shipments were recorded from the Carlson-

Nelson mine, operated by Rhude & Fryberger near Riverton, which was under development since 1954. The South Yawkey and Section 6 mines, which were operated in 1955, were idle during 1956. Tailing from the Rowe mine was reprocessed and sintered by M. A. Hanna Co. at the Portsmouth concentrating and sintering plants.

All shipments of manganiferous ore (containing 5 to 35 percent manganese, natural) from Minnesota in 1956 were from Crow Wing County. Operating companies and mines in 1956 were: Hanna Coal & Ore Corp., the Alstead group; Pickands Mather & Co., the Mahnomen and Sagamore mines; and Zontelli Bros., Inc., the Mangan-Joan, Mangan-Stai, Merritt stockpile, and the Virginia mines.

Manganese Chemicals Corp. operated its plant near Riverton and produced manganese carbonate, manganese dioxide, and other manganese products. Capacity of the plant was 200 long tons of crude ore input daily. Raw material for the plant was Cuyuna-range manganiferous ore. The recovery method utilized was the Dean-Leute ammonia-leaching process.

Hallett Construction Co. operated a portable sand and gravel plant near Fort Ripley and reported output for building and road construction and other uses. The State and county highway departments produced and contracted for road gravel.

Marl for agricultural use was produced by Tweed Bros. near Pequot Lakes.

Dakota.—J. L. Shiely Co. produced dimension and crushed limestone at its Mendota quarry. Output was used for rubble, architectural stone, flagging, riprap, concrete aggregate, roadstone, railroad ballast, and agricultural stone. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced limestone riprap.

Sand and gravel for building use was produced by Standard Building Materials Co. in South St. Paul and Edward M. Husting near Hastings. Emil Hanson produced road gravel near Farmington. Bituminous Surface Treating Co. produced gravel, chiefly for asphalt mix. The Minnesota Highway Department produced and contracted for gravel for road use. Road gravel was also produced under contract for the Hennepin County Highway Department.

Dodge.—The Dodge County highway department produced crushed limestone, chiefly for road maintenance. Road gravel was produced by and for the State highway department.

Douglas.—Alexandria Sand & Gravel Co. operated a fixed plant near Carlos and produced building sand and gravel. The State highway department produced and contracted for road gravel. The county highway department also produced road gravel.

Faribault.—H. R. Loveall produced sand and gravel near Winnebago for building and road construction. Road gravel was produced by Clarence Zufall and the State highway department and also under contract for the State and county highway departments.

Fillmore.—Iron ore was produced by two companies in the county in 1956. Hanna Coal & Ore Corp. operated its Spring Valley group of mines, from which 275,575 long tons of concentrate was shipped during the year. The Schroeder Mining Co. shipped 73,993 long tons of concentrate from the Krueger mine near Chatfield. Both companies treated their ores at washing plants.

Output of crushed limestone for road surfacing and agricultural use was reported by Hadland & Vreeman from quarries near Spring Valley and Preston and by Pederson Bros. from a quarry near Harmony. Other limestone producers in the county were Johnson Construction Co. and Edwin C. Kappers.

Paving sand was produced by Oliver Moen near Lanesboro. Allen Thompson operated a fixed plant near Peterson and reported output of sand for building use. The State highway department produced road gravel.

Freeborn.—Sand and gravel for building and road construction was produced by M. N. Nelson near Clarks Grove and by Emil Olson & Sons. Road gravel was produced by the State Highway Department and also under contract for the State and county highway departments.

Goodhue.—Mann Construction Co. operated various limestone quarries in the county in 1956 and reported output for agricultural and road purposes. Valley Construction Co. produced crushed limestone near Zumbrota for railroad ballast and agricultural stone. Fischer Construction Co. produced crushed limestone for concrete aggregate and roadstone.

Output of building sand and gravel was reported by Hallett Construction Co. from a pit near Frontenac. Harry M. Berktold produced sand and gravel near Lake City for building and road purposes. Arthur Mickow operated a fixed plant near Lake City and produced building and paving sand. Sand and gravel for road use was produced by, and under contract for, the city of Red Wing. Road gravel was produced by the city of Cannon Falls and the State highway department and also under contract for the State and county highway departments.

Clay for manufacturing heavy clay products was produced near Goodhue by the Red Wing Sewer Pipe Corp.

Grant.—Sand and gravel for railroad ballast and other uses was produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad. Sam Olson produced building sand and gravel. The State highway department produced and contracted for road gravel.

Hennepin.—Over 2.5 million tons of sand and gravel was produced in Hennepin County in 1956. Output was used for a variety of purposes, including building and road construction, railroad ballast, and roofing. Commercial operators reporting production in 1956 were: Anderson Aggregates, Barton Contracting Co., Concrete Service, Inc., Consolidated Builders Supply Co., J. W. Craig Co., Chas. M. Freidheim Co., Glacier Sand & Gravel Co., J. V. Gleason, Great Northern Railway Co., F. W. Hedberg & Sons, Industrial Aggregate Co., Keller Bros. Gravel Co., Landers-Norblom-Christenson., Mapco Sand & Gravel Co., Oscar Roberts Co., Inc., and Woodrich Construction Co. All operations were in the vicinity of Minneapolis. Sand and gravel for road use was also produced by and for the State and county highway departments. Crushed limestone was produced by Landers-Norblom-Christenson Co. for use on parking lots and driveways, for railroad ballast, and as filler for asphalt and fertilizers.

Lithium Corp. of America continued production of lithium salts and metal at its plant in St. Louis Park. In 1956 the company completed expanding its lithium and lithium hydride operations,

which would approximately double productive capacity in those fields. Lithium minerals processed at the plant were produced in North Carolina; Quebec, Canada; and Southern Rhodesia.

Crude perlite was expanded in Minneapolis at plants operated by Minnesota Perlite Co. and Western Mineral Products Co. The expanded product was used as lightweight aggregate in plaster and concrete and for other purposes. Raw material for these plants was produced in Colorado and Nevada. Western Mineral Products Co. also produced exfoliated vermiculite from crude material mined in Montana for use as insulation and lightweight aggregate.

Houston.—Hector Construction Co., Inc., operating a limestone quarry near Caledonia, and Botcher Bros. & Son, who operated quarries near La Crescent and Mound Prairie, produced crushed limestone for road material. Heintz & Smith produced crushed and broken limestone for riprap, concrete aggregate and roadstone, and agricultural stone.

Road gravel was produced by Roverud Construction Co. near Spring Grove and by the State highway department.

Hubbard.—The Minnesota Highway Department produced and contracted for road gravel.

Isanti.—Road gravel was produced by Lindquist-Olson Co. near Cambridge and under contract for the county highway department.

Itasca.—Mineral production in the county consisted principally of iron ore. Shipments of usable iron ore from mines in the county in 1956 decreased 4 percent below 1955, because of a 5-week labor strike in midsummer. Over 93 percent of the total usable ore shipments from the county was beneficiated; the remainder was of direct-shipping grade. Operating companies and mines from which iron ore was shipped in 1956 were:

Company:	*Mines operated*
Butler Bros	Aromac, Harrison group, MacKillican, Patrick "A" group, Patrick "C," Snyder, and Wyman.
Cleveland-Cliffs Iron Co	Canisteo, Hawkins, Hawkins Tailings, Hill-Trumbull, Holman-Cliffs, and Sargent.
M. A. Hanna Co	Buckeye, Hunner, and Mississippi group.
Hanna Coal & Ore Corp	Carlz No. 2 and Perry.
Jessie H. Mining Co	Jessie.
Jones & Laughlin Steel Corp	Hill Annex.
Oliver Iron Mining Division, U. S. Steel Corp.	Arcturus group, King group, and Plummer.
Pacific Isle Mining Co	Mississippi No. 1, and St. Paul.
Pickands Mather & Co	Bennett group, Danube, Tioga No. 2, and West Hill.

All mines were open-pit operations; no underground mining has been done in the county since 1953.

First shipments of iron ore were recorded from the Hunner mine, operated near Coleraine by M. A. Hanna Co. Stripping at the mine, formerly called the Parcel No. 3, was begun in the summer of 1955. A new concentrating plant was put into operation at the mine in the summer of 1956. The plant included a standard wash section, a dense-medium separation unit, and a spiral section.

Work was begun near Calumet on a new plant of Jones & Laughlin Steel Corp. for concentrating material contained in a tailing-pond basin near the Hill Annex mine. The tailing was to be mined by a hydraulic dredge and pumped to the plant for treatment by spirals and froth flotation.

Oliver Iron Mining Division of United States Steel Corp. began constructing a dense-medium plant adjacent to the company Trout Lake Concentrator near Coleraine.

A new screening, crushing, and washing plant was constructed at the St. Paul mine, operated by Pacific Isle Mining Co. near Keewatin.

Cleveland-Cliffs Iron Co. added a cyclone ore-treatment plant to its concentrating facilities at the Holman-Cliffs mine near Taconite.

Mines operated in 1955 but not in 1956 were: The Argonne (Hanna Coal & Ore Corp.), Galbraith (Butler Bros.), and Missouri L. O. S. P. (Pacific Isle Mining Co.). The Argonne was considered exhausted.

The State and county highway departments produced and contracted for road gravel.

Jackson.—Sand and gravel for building purposes was produced by Willett Gravel Co., which operated a fixed plant near Jackson. The State and county highway departments produced and contracted for road sand and gravel.

Kanabec.—Cold Spring Granite Co. produced architectural and monumental dimension granite at its Mora Grey quarry. The company processed the rough material at its finishing plant in Cold Spring. Blomberg Sand & Gravel Co. produced building sand and road gravel near Braham. Road gravel also was produced by the State highway department and under contract for the Isanti County Highway Department.

Kandiyohi.—New London Materials & Construction Co. produced sand and gravel near New London for building and road construction, railroad ballast, and other uses. Ed Beske (Atwater Sand & Gravel) reported output of sand and gravel for building and road purposes. The Great Northern Railway Co. produced gravel for railroad ballast and other uses. The State highway department produced and contracted for road gravel.

Kittson.—Road gravel was produced by and for the Minnesota Highway Department.

Koochiching.—The State highway department produced and contracted for road gravel.

Lac qui Parle.—Dimension granite for monumental use was produced by North Star Granite Corp. from its No. 9 quarry near Odessa. The rough stone was finished at the company plant in St. Cloud. Cold Spring Granite Co. produced granite for architectural and monumental purposes at its Cold Spring Red quarry near Odessa. Output was processed at the company finishing plant in Cold Spring. Granite for monumental use was also produced in the county by the Dakota Granite Co. of Milbank, S. Dak., near Bellingham and from the Simonson quarry, operated by Liberty Granite Co., Inc.

Hallett Construction Co. produced sand and gravel near Odessa for building and road construction and other uses. Road gravel was produced by and for the State and county highway departments.

Lake.—In March 1956 Reserve Mining Co. began the first full-scale operation of the E. W. Davis Works, its taconite-processing plant at Silver Bay on the north shore of Lake Superior. On April 6, 1956, the first cargo of taconite-concentrate pellets was shipped from Silver Bay. In spite of the steel strike interruption in midsummer, over 3.5 million tons of pellets were shipped from this port in 1956.

Crude taconite was crushed to about 3-inch size at the mine and hauled by company-owned railroad to Silver Bay for further processing.

The concentrating plant at Silver Bay, which is approximately 1,300 feet long, consists of 12 processing sections, each made up of two 3,000-ton storage bins, 1 rod mill, 2 magnetic cobbers, 2 ball mills, 8 rougher magnetic separators, 2 rough hydroseparators, 6 finisher magnetic separators, 2 finisher hydroseparators, and 1 filter.

After the filtering process the concentrate was conveyed to the pelletizing plant, consisting of six pelletizing sections. Each of these sections contained three rotating drums, in which the concentrate was rolled into pellets. About 9 pounds of bentonite per ton of concentrate was added as a binder. The pellets were next rolled in drums, in which finely ground anthracite was added to the pellets as a coating before they were sent to the pelletizing furnace. At each section a pelletizing furnace, about 6 feet wide and 168 feet long, baked pellets on a horizontal grate to a hard finish at about 2,400° F. After being cooled, finished pellets were sent either to stockpile or loading bins. Although the E. W. Davis Works is operated year round, pellets are stockpiled during the winter when Lake shipping is closed. Electric power for taconite processing at both Babbitt and Silver Bay was provided by the company-owned powerplant at Silver Bay, which was part of the $190-million project. Approximately 85 kw.-hr. was required for each ton of pellets produced. Water for the plant was pumped from Lake Superior. An estimated 10,000 gallons of water was required to process 1 ton of concentrate.

Road gravel was produced by the State and county highway departments and also under contract for the State highway department.

A small quantity of gem materials, consisting chiefly of agate and thomsonite, was collected by hobbyists along the north shore of Lake Superior.

Lake of the Woods.—The State and county highway departments produced road gravel.

Le Sueur.—Limestone for architectural use, flagging, rubble, and riprap was produced by the Babcock Co. Part of the output was marketed as "marble" for interior trim and facings. Silica sand from the Jordan Sandstone formation was produced near Ottawa by the Silica Sand Corp. Output was used for building, glass manufacture, molding, and engine use and as oilfield fracturing sand. Glander Washed Sand & Gravel Co. operated a fixed plant near Le Sueur and produced sand and gravel for building and road construction. Gravel for railroad ballast and grading purposes was produced by the Chicago, St. Paul, Minneapolis & Omaha Railway Co. Road gravel was produced by Ed Swartout and by and for the State highway department.

Lincoln.—Tyler Cement Tile & Silo Works operated a fixed sand and gravel plant near Lake Benton and reported output for building

use. The county highway department produced gravel for building purposes and contracted for road gravel. The State highway department produced road gravel.

Lyon.—Marshall Sand & Gravel Co. produced sand and gravel for building use near Lynd. Road gravel was produced by McLaughlin & Schultz and the State highway department.

McLeod.—Sand and gravel for building and road construction was produced by Bullert Construction Co. The Minneapolis, Northfield & Southern Ry. produced gravel for railroad ballast. Road gravel was produced under contract for the county highway department.

Mahnomen.—Mahnomen Construction Co. produced road gravel near Mahnomen. The State and county highway departments produced and contracted for road gravel.

Marshall.—Ben Bjorgaard produced gravel for road use. Road gravel was also produced by the State highway department and under contract for the State and county highway departments.

Martin.—Daniel F. Winter operated a portable plant near Ceylon and produced road gravel. Sand and gravel for road use was produced by and for the State and county highway departments.

Meeker.—Grove City Surfacing Co. produced sand and gravel for road use. Sand and gravel for building and road construction was produced near Litchfield by Hallett Construction Co. and Wolter's Washed Sand. The State highway department produced and contracted for road gravel.

Mille Lacs.—Cold Spring Granite Co. produced dimension granite for architectural and monumental purposes at its Diamond Grey quarry near Isle. The rough material was processed at the company finishing plant in Cold Spring. The Mille Lacs Sand & Gravel Co. operated a fixed sand and gravel plant near Milaca and reported output for building use. Road gravel was produced by and under contract for the Minnesota Highway Department.

Morrison.—The State and county highway departments produced and contracted for gravel for road use.

Mower.—Austin Ready-Mix Concrete Co. produced sand and gravel at a dredging operation near Austin for use in building and road construction. The State highway department produced road gravel and the county highway department paving sand.

Ulland Bros. and Olson & Siefert produced crushed limestone for concrete aggregate and roadstone. Osmundson Bros. produced crushed limestone for agricultural and road use. Hickok Calcium White Rock Co. produced crushed limestone near LeRoy for use as flux, soil conditioner, poultry grit, and other purposes.

Murray.—Muecke Bros. produced sand and gravel for building use and other purposes. Road gravel was produced by the State highway department.

Nicollet.—Hallett Construction Co. produced sand and gravel near St. Peter for building and road use. Road gravel was produced by A. H. & J. H. Massopust near New Ulm and under contract for the Minnesota Highway Department.

Nobles.—Worthington Sand Co. produced sand and gravel, chiefly for building and road purposes, at a fixed plant near Rushmore.

The State and county highway departments produced and contracted for road gravel.

Norman.—Road gravel was produced under contract for the State highway department.

Olmsted.—Crushed limestone for agricultural and road use was produced in the county in 1956. Producers during the year included Barton Construction Co., Patterson Quarries, O. W. Swanson Construction Co., and Ulland Bros. Rochester Sand & Gravel Co. produced sand and gravel for building and road use and other purposes at a fixed plant near Rochester. Paving sand was produced under contract for the county highway department. Road gravel was produced by and for the Minnesota Highway Department.

Otter Tail.—Sand and gravel for building and road construction was produced by Mark Sand & Gravel Co. and Orville R. Edner. The Minneapolis, St. Paul & Sault Ste. Marie Railroad produced gravel for railroad ballast and other purposes. The city of Fergus Falls produced building sand and road gravel. The State highway department produced and contracted for road gravel.

Pennington.—Walker Sand & Gravel Co. produced sand and gravel for building use. Road gravel was produced by and for the State highway department.

Pine.—Louis Hultgren & Sons produced sand for molding use. Road gravel was produced by and under contract for the Minnesota Highway Department.

Pipestone.—Sand and gravel for building and road construction and other purposes was produced from pits near Edgerton and Woodstock by Hallett Construction Co. Gravel for railroad ballast and other uses was produced by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. Pronk Bros. produced building sand. The State highway department produced and contracted for road gravel.

Polk.—Spring Gravel Co. operated a fixed sand and gravel plant and reported output for building and road construction and other purposes. Thorson Gravel Co. produced gravel for road use and railroad ballast near Melvin. The Great Northern Railway Co. produced gravel for building use, railroad ballast, and other purposes. Road gravel was produced under contract for the State highway department.

Miscellaneous clay was produced near Fertile by the Red River Valley Brick Corp. of Grand Forks, N. Dak., for use in the manufacture of heavy clay products.

Pope.—Sand and gravel for building and road use was produced by Schmidgall Sand & Ready Mix Co., operating a fixed plant near Starbuck. The Starbuck Cement Products Co. produced sand and gravel for building use and fill near Starbuck. Road gravel was produced by the county highway department and by and for the Minnesota Highway Department.

Ramsey.—Silica sand was mined by the Ford Motor Co. from the St. Peter sandstone formation underlying its property in St. Paul. Output was used by the company for manufacturing glass. The East Side Stone Co. produced sand and gravel for building purposes. Sand and gravel for road use was produced by E. J. Pennig Co. and the city of St. Paul. Road gravel was produced under contract for

the United States Corps of Engineers and the State highway department.

Hurley Construction Co. produced crushed limestone for road use.

The Twin City Brick Co. reported output of miscellaneous clay, which the company used in manufacturing heavy clay products.

Red Lake.—The Minnesota Highway Department produced and contracted for road gravel.

Redwood.—Sand and gravel for building and road construction was produced by Chapman Gravel Co. near Belview and by Buterbaugh Sand Co. near Walnut Grove. Both companies operated fixed plants. Road gravel was produced by and for the State highway department.

Johnson Bros. Quarry Co. and View Quarry Co. produced dimension granite for monumental use near Belview.

Renville.—Granite for architectural and monumental purposes was produced by the Cold Spring Co. at its Rainbow quarry near Morton. Melrose Granite Co. operated the Melrose Tapestry quarry near Morton and produced granite for monumental use. The former company operated a finishing plant in Cold Spring; the latter, at St. Cloud.

The Danube Sand & Gravel Co. operated a fixed plant near Danube and reported output of sand and gravel for building and road construction. Fairway Construction Co. produced gravel for road use. The State highway department produced and contracted for road gravel.

Rice.—Sand and gravel for building and road construction was produced by Concrete Materials, Inc., and Melvin Kielmeyer. James Condon Sand & Gravel operated a portable plant near Northfield and produced sand for building use and gravel for fill. Faribault Washed Sand & Gravel produced gravel for building and road purposes. Road gravel was produced by the State highway department and under contract for the State and county highway departments.

Crushed limestone for agricultural and road uses was produced in the county in 1956. Producers during the year included Bryan Rock Products, Inc., Fischer Construction Co., and Amos Helgeson. The county highway department also purchased crushed limestone from Faribault Quarries and Klemmer Construction Co. for road stone.

Rock.—Grinding pebbles and tube-mill liners were produced by the Jasper Stone Co. from a quartzite deposit near Jasper. Waste material from this operation was sold for use as riprap.

Sand and gravel was produced near Luverne by the Hallett Construction Co. and C. H. Hatting Gravel Co., Inc. Output was chiefly for building and road purposes. Road gravel was produced by the Minnesota Highway Department.

Roseau.—The State and county highway departments produced and contracted for road gravel.

St. Louis.—Mineral products of St. Louis County in 1956 included cement, iron ore, lime, sand and gravel, and stone. Shipments of usable iron ore from St. Louis County in 1956 decreased 11 percent below 1955, principally because of a 34-day labor strike in the steel industry in midsummer. However, St. Louis County supplied nearly 72 percent of the total usable iron ore shipped from Minnesota mines in 1956. Approximately 74 percent of the total shipments from the

county was direct-shipping grade; the remainder was beneficiated. Operating companies and mines from which iron ore was shipped in 1956 were:

Company:	*Mines operated*
Butler Bros	Weggum, Agnew No. 2, and South Agnew.
Charleson Iron Mining Co	Various LOSP.
Cleveland-Cliffs Iron Co	Agnew, Alworth, and Wanless.
Haley-Young Mining Co	Elbern.
M. A. Hanna Co	Douglas, Duncan, Enterprise, Morton-South Eddy, and Norpac-Impro B.
Jones & Laughlin Steel Corp	Columbia, Leetonia, Longyear, Missabe Mountain, Pettit, Schley, and Wentworth.
W. S. Moore Co	Alice, Graff, Judson Lease, Margaret, Mariska, Norman, Pilot Annex, Stubler, and Yawkey.
North Range Mining Co	Leonidas.
Oglebay, Norton & Co	St. James.
Oliver Iron Mining Division, U. S. Steel Corp.	Canton, Canton (St. James), Dormer group, Pillsbury-Brown (Douglas), Franklin, Gilbert, Hopewell, Hull-Rust group, Kosmerl, Leonidas stockpile, Mariska Extension, Midway No. 2, Monroe group, Morris, Mountain Iron group, Niles, Pillsbury, Pilotac, Rouchleau group, Rouchleau Prospect, Sherman group, and Spruce.
Pacific Isle Mining Co	Croxton-Syme, Cyprus-Rust, Drew, Emmett, Graham No. 2, Holland, Kerr, Lamberton, Langdon & Warren, Missabe Mountain, Missabe Mountain LOSP, Nordine, North Shiras, South Stevenson, Stevenson, Susquehanna LOSP, and Wacootah.
Pickands Mather & Co	Albany, Bennett Annex, Carmi-Carson Lake (incl. Campbell D), Embarrass, Erie Preliminary Taconite Plant, Lamberton Annex, Mahoning group, and Scranton.
Pioneer Mining Co	Mary Ellen.
Pittsburgh Pacific Co	Alpena LOSP, Bradford, Bradford Annex, Chataco, Commodore, Genoa Sparta, Sidney, Union, and Union stockpile.
Republic Steel Corp	Susquehanna.
Reserve Mining Co	Peter Mitchell.
Rhude & Fryberger	Boeing and Troy.
Rhude-Gilbert Corp	Alworth.
Skubic Bros. Co	Forsyth, Wheeling, and Wheeling LOSP.
Snyder Mining Co	Webb-Sellers and Whiteside.
E. A. Young, Inc	Minnewas.
Zontelli Bros., Inc	Graham No. 1.

All except three mines operated in St. Louis County in 1956 were in the Mesabi range. The Pioneer and Soudan mines, operated by Oliver Iron Mining Division of United States Steel Corp., and the Zenith mine, operated by Pickands Mather & Co., were in the Vermilion range.

Development of the taconite industry in the county was continued during the year. As a result of Reserve Mining Co. beginning full-

scale operation of its E. W. Davis Works at Silver Bay, production of crude taconite at the company mine near Babbitt was increased considerably in 1956. During 1956 approximately 11 million tons of crude taconite was produced at the mine (named the Peter Mitchell), compared with 1.8 million tons in 1955. The mine supplied raw material for both the E. W. Davis Works and the pilot plant near Babbitt. The pilot plant had been operated since 1952. The ore body is on the eastern end of the Mesabi range and contains an estimated 1.5 billion tons of magnetic taconite. The deposit is about 9 miles long, averages 2,800 feet in width, and has a maximum thickness of 175 feet. Taconite mined at Babbitt was reduced to about 8-inch size in a large gyratory crusher with a capacity of 3,500 long tons per hour. Secondary crushing was also done at Babbitt in 3 smaller gyratory crushers in which the crude material was reduced to approximately 3-inch size. Most of the crushed material was then shipped over the company 47-mile interdepartmental railroad to the E. W. Davis Works at Silver Bay for further processing. The remainder was processed at the Babbitt pilot plant, which had an annual capacity of 300,000 tons of finished pellets.

Substantial progress was made during the year in the construction of the Erie Mining Co. large-scale taconite project near the new town of Hoyt Lakes. Most of the structural work at the mine site, concentrator, and pelletizing plant was completed by the end of 1956, and installation of concentrating equipment was begun. Track was laid on the 73-mile railroad which connects the plant with Taconite Harbor—the shipping port on Lake Superior. More houses for employees were completed during 1956 at Hoyt Lakes; the new town was expected to have an eventual population of about 5,000.

The new plant will be able to treat about 63,000 long tons of taconite ore per day; it has an initial rated capacity of 7.5 million tons of high-grade pellets annually. The company plans to begin production at the plant in the fall of 1957. During 1956 Erie Mining Co. continued production of taconite-concentrate pellets at its preliminary plant, which has been operated since 1948. Annual capacity of this plant is 200,000 tons of finished product. Erie Mining Co. is owned by Bethlehem Steel Corp., Youngstown Sheet & Tube Co., Interlake Iron Corp., and the Steel Co. of Canada. Pickands Mather & Co. is the operating agent.

Oliver Iron Mining Division of United States Steel Corp. also produced taconite concentrate in 1956. The company operated its Pilotac mine and plant near Mountain Iron. Concentrate produced at the Pilotac plant was agglomerated by sintering and nodulizing at the company Extaca plant at Virginia.

Development work was begun by Oliver Iron Mining Division at its Stephens mine near Aurora and the Sauntry mine near Virginia. The Stephens was operated by Oliver in 1903–5 but has been held in reserve since then. It was considered the largest inactive reserve of direct-shipping ore in the Mesabi range. Both mines were to be worked by open-pit mining methods. Oliver began constructing a large ore-sizing plant at Virginia, which will treat direct-shipping ores from the Auburn, Rouchleau, and Sauntry mines. The plant was expected to be completed in the spring of 1957. A similar plant

was also being constructed at the company Sherman group near Chisholm. Oliver concluded mining operations at the Mountain Iron open-pit mine at Mountain Iron at the end of the 1956 season.

Cleveland-Cliffs Iron Co. ceased underground mining at the Agnew mine near Hibbing in the spring of 1956. Most of the shipments from the mine in 1956 were from surface stockpile. Shipments were again resumed by Cleveland-Cliffs Iron Co. at the Wanless open-pit mine near Buhl. The last recorded shipments from the Wanless were in 1953.

M. A. Hanna Co. added a dense-medium section to its concentrating facilities at the Douglas mine near Chisholm.

Construction of a new washing and dense-medium plant was begun at the Mahoning mine, operated by Pickands Mather & Co. near Hibbing. The plant was to be ready for the 1957 season. The Mahoning mine is famous for its outstanding production record, having shipped over 100 million tons of direct-shipping ore since it was opened in 1895.

At the end of 1956 the lease on the Godfrey underground mine was assigned by Oliver Iron Mining Division of United States Steel Corp. to the Snyder Mining Co. Shipments from the mine, which is near Chisholm, were to be resumed in 1957. Work was begun on a new washing plant for the Webb open-pit mine, operated by Snyder Mining Co. near Hibbing. The plant was to have a capacity of 200 tons of ore per hour. Completion date for the plant was scheduled for the opening of the 1957 ore-shipping season.

W. S. Moore Co. moved its Virginia concentrator from the Prindle mine to the Mariska mine near Gilbert. The plant was designed for treating ores by washing, dense-medium separation, and jigs.

Construction of a dense-medium ore treatment section was begun at the Troy open-pit mine, operated near Eveleth by Rhude & Fryberger. The new plant was to supplement washing-plant facilities at the mine.

Effective April 1, 1956, mining properties of E. W. Coons Co. were merged with those of Pittsburgh Pacific Co. Thereafter, operations of both companies were to be operated under the latter name, but under the management of Pacific Isle Mining Co.

The American Steel & Wire Division of United States Steel Corp. and the Interlake Iron Corp. operated blast furnaces and coke ovens at Duluth. The former company also operated basic open hearth steel furnaces. Total annual coke, pig-iron, and steel capacities in Minnesota at the end of 1956 were 893,600; 637,000; and 973,000 net tons, respectively.[3]

Universal Atlas Cement Co., the only cement producer in the State, produced portland and masonry cements at its Duluth plant. Shipments in 1956 increased over those in 1955.

Quick and hydrated lime was produced by Cutler-Magner Co. at Duluth. The company was the only lime producer in the State in 1956. Shipments were principally for building, agricultural, industrial, and chemical uses.

Granite for monumental use was produced by the Mesaba Granite Co. from a quarry near Mountain Iron. The United States Army

[3] American Iron and Steel Institute, Annual Statistical Report: 1956.

Corps of Engineers produced and purchased granite, chiefly for constructing breakwaters.

Sand and gravel output in the county in 1956 was employed for building and road construction, railroad ballast, engine use, fill, and other purposes. Commercial operators during the year included: Arrowhead Sand & Gravel Co., Biwabik Gravel Co., E. W. Coons Co., Enrico Ghilardi, Great Northern Railway Co., Hallett Construction Co., Guitu Ready Mix Co., Mesaba Construction Co., N. W. Gravel Co., and Pioneer Mining Co. Sand and gravel for road use was produced by the city of Superior, Wis., by and for the State and county highway departments, and under contract for the United States Army Corps of Engineers.

Scott.—Bryan Rock Products, Inc., reported output of crushed limestone for agricultural and road uses. Concrete Service, Inc., produced crushed limestone for concrete aggregate and roadstone. Belle Plaine Sand & Gravel Co. produced paving sand near Belle Plaine. Haferman & Stark reported output of sand for miscellaneous uses. Shakopee Sand & Gravel Co. operated a fixed plant near Shakopee and produced sand and gravel for building. Road gravel was produced by and for the State and county highway departments.

Sherburne.—Gravel for building and road uses was produced near Big Lake by the Big Lake Gravel Co. The State highway department produced and contracted for road gravel.

Sibley.—Hallett Construction Co. produced sand and gravel for building and road construction and other uses near Henderson. Road gravel was produced by Ed Swartout, Zarnott Construction Co., the State highway department, and also under contract for the State and county highway departments.

Stearns.—Granite for architectural and monumental purposes was produced by the Cold Spring Granite Co., which operated the Crystal Gray, Diamond Pink, Opalescent, and the Rockville quarries. The company operated its sawing and finishing plant at Cold Spring. Some waste granite was reclaimed at the plant by crushing it to small size for use as poultry grit. Dimension granite for monumental use was also produced by the Melrose Granite Co., which operated the Melrose Red and Melrose Gray quarries near St. Cloud, and by North Star Granite Corp. from its No. 4 and No. 5 quarries near St. Cloud. Both companies operated finishing plants in St. Cloud. Shiely-Petters Crushed Stone Co. produced approximately 287,000 short tons of crushed granite for concrete aggregate and roadstone, railroad ballast, and stone sand. A. C. Petters produced broken granite for riprap and sand and gravel for building use. Megarry Bros. produced gravel, chiefly for roads. The State highway department produced and contracted for road gravel.

Steele.—Owatonna Aggregates Corp. operated a fixed sand and gravel plant near Medford and reported output for building and road construction. Geo. Kohlmier, Inc., produced building sand and road gravel near Owatonna. Glass sand and sand and gravel for building and road use were produced by the Medford Washed Sand & Gravel Co. Road gravel was produced by the State highway department and under contract for the State and county highway departments. Faribault Quarries produced limestone for use as roadstone and rubble.

Klemmer Construction Co. produced crushed limestone for agricultural and road purposes.

Stevens.—The Minnesota Highway Department produced road gravel.

Swift.—The Great Northern Railway Co. produced gravel for railroad ballast and other uses. Gravel for road use and railroad ballast was produced by the Chicago, Milwaukeee, St. Paul & Pacific Railroad Co. The State and county highway departments produced and contracted for road gravel.

Todd.—Gravel for building use, railroad ballast, and other applications was produced by the Great Northern Railway Co. Road gravel was produced by the county highway department and under contract for the State and county highway departments.

Traverse.—The Minnesota Highway Department produced and contracted for road gravel.

Wabasha.—The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced gravel for road use and railroad ballast. Road gravel was produced by and for the State highway department. Patterson Quarries produced crushed limestone near Plainview for roadstone.

Wadena.—Sand and gravel for building and road construction, engine use, railroad ballast, and other purposes was produced by the Becker County Sand & Gravel Co. Road gravel was produced under contract for the State highway department.

Waseca.—Gene Sutter produced gravel near Waseca for building use.

Washington.—Approximately 1.5 million tons of sand and gravel was produced in Washington County in 1956, chiefly for building and road construction. Commercial operators during the year included Gemstone Products Co., Certified Aggregates, Inc., David Johnson, Moelter Construction Co., Shalander & Shaleen, and J. L. Shiely Co. Sand and gravel was also produced by and for the State and county highway departments.

Watonwan.—George Allen produced gravel for miscellaneous purposes. The State and county highway departments produced sand and gravel for road use.

Wilkin.—Behrens Construction Co. of Beatrice, Nebr., produced gravel for road use at its dredging operation near Wolverton. Road gravel was produced by the county highway department and under contract for the State and county highway departments.

Winona.—Dimension limestone for architectural use was produced by the Biesanz Stone Co. Crushed limestone was produced by Fred Fakler for road use and by Patterson Quarries for agricultural and road purposes. Winona Sand & Gravel Co. operated a dredge near Winona and produced sand and gravel for building and road construction, railroad ballast, and other uses. The county highway department produced paving sand. Road gravel was produced by and for the Minnesota Highway Department. Agate was recovered in the county by an amateur collector of semiprecious gem materials.

Wright.—Sand and gravel for building and road construction was produced near South Haven by Ed Schram. Road gravel was pro-

duced by Charles & Anna Frank near Delano, by Oliver Ordorff near Hanover, and by the Hennepin County Highway Department. The State and Wright County Highway Departments produced and contracted for sand and gravel. The Delano Granite Works, Inc., operated its sawing and finishing plant at Delano, where rough granite quarried by the company in Big Stone County was processed.

Yellow Medicine.—Dimension granite for rubble and crushed granite for railroad ballast and fill were produced near Granite Falls by the Great Northern Railway Co. Burdett C. Long operated a gravel pit near Hazel Run and reported output for road use. Road gravel was produced by the State highway department and under contract for the State and county highway departments.

The Mineral Industry of Mississippi

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Mississippi Geological Survey.

By Robert S. Sanford [1] and William C. Morse [2]

MISSISSIPPI'S mineral production in 1956 rose to $133.1 million in value—the highest annual total ever recorded and 9 percent over the 1955 value ($122.6 million)—primarily because of the increased output of petroleum, natural gas, and natural-gas liquids.

Petroleum represented 75 percent and natural gas 14 percent of the State's total mineral production. Other minerals (in order of importance) were sand and gravel, cement, clays, natural-gas liquids, stone, and iron ore.

The value of cement shipments increased over 1955, as did natural gas (18 percent), natural-gas liquids (18 percent), petroleum (7 percent), sand and gravel (2 percent), and stone (14 percent). Clays decreased slightly following the trend of normal construction activities after the 1955 boom.

TABLE 1.—Mineral production in Mississippi, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	700,615	$3,913,113	612,617	$3,590,344
Iron ore (usable)—long tons, gross weight			183	(2)
Natural gas—million cubic feet	163,167	15,664,000	185,137	18,143,000
Natural-gas liquids:				
Natural gasoline and cycle products—thousand gallons	22,382	1,573,000	24,829	1,751,000
LP-gases—do	12,242	396,000	10,698	580,000
Petroleum (crude)—thousand 42-gallon barrels	37,741	92,840,000	40,824	100,019,000
Sand and gravel	5,624,878	4,603,032	5,314,676	4,701,296
Stone	572,816	572,816	655,764	655,764
Value of items that cannot be disclosed: Iron ore and nonmetals		3,589,504		4,173,856
Total Mississippi [3]		122,620,000		133,098,000

[1] Production as measured by mine shipments, mine sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] The total has been adjusted to eliminate duplication in the value of clays and stone.

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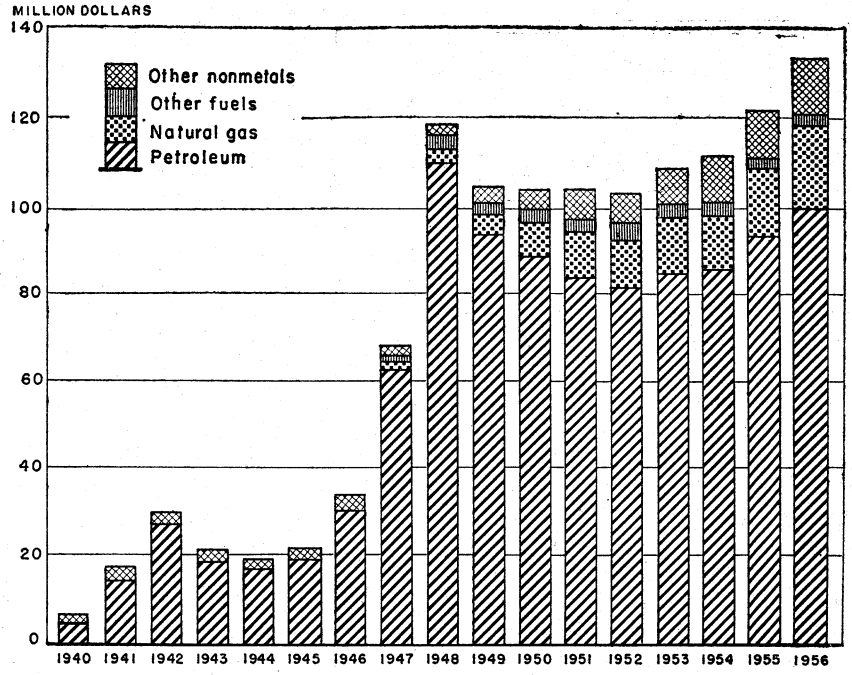

FIGURE 1.—Value of petroleum, natural gas, and total value of mineral production in Mississippi, 1940–56.

TABLE 2.—Average unit value of mineral commodities produced in Mississippi, 1952–56

Commodity	1952	1953	1954	1955	1956
Cement:					
Portland, 376-pound barrel	$2.53	$2.71	$2.69	$2.76	$3.02
Masonry, do					3.64
Clays:					
Ball clay, short ton	14.90	14.57	15.13	16.19	16.09
Bentonite, do	7.89	10.72	10.77	11.28	10.77
Fire clay, do	1.61	1.69	1.61	1.61	1.00
Fuller's earth, do	43.65	41.94	36.80	36.80	36.80
Miscellaneous clay, do	1.08	1.06	1.06	1.00	1.00
For cement manufacture, do	1.00	1.00		1.00	
Natural gas, thousand cubic feet	.06	.08	.083	.096	.098
Natural-gas liquids:					
Natural gasoline and cycle products, gallon	.077	.071	.07	.07	.07
LP-gases, do	.04	.04	.035	.032	.054
Petroleum (crude), 42-gallon barrel	2.23	2.36	2.50	2.46	2.45
Sand and gravel, short ton	.80	.82	.79	.82	.88
Stone: Limestone (crushed), do	1.15	1.15	1.00	1.00	1.00

EMPLOYMENT AND INJURIES

Employment in the mineral industries remained relatively stable, and no fatal accidents occurred. There were 13 temporary injuries in nonmetal industries and a total of 260 days of lost time.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

The value of liquid and gaseous fuel production in 1956 reached an alltime high of $120.5 million—a gain of $10.0 million (9 percent) over 1955.

Only 9 percent of the State's crude petroleum production was processed in Mississippi's two petroleum refineries—Southland Oils, Inc., at Sandersville, and Paluxy Asphalt Co. at Crupp Station; and 25 percent of the gross production of natural gas was processed in the State's two natural-gasoline and cycle plants, Brookhaven Gas Cycling Plant in Lincoln County and Cranfield Gas Cycling Operations, Adams and Franklin Counties. Large quantities of petroleum and natural gas continued to be transmitted by pipelines to industrial sections of other States. Less than 8 percent of the gasoline sold in Mississippi was processed in the State.

In all, 155 oil pools and 36 gas pools were producing in 124 fields in the State at the year end; 2,374 wells were in production (an increase of 35 wells over 1955), including 626 flowing and 1,748 artificial lift wells.

According to the Mississippi State Oil and Gas Board, the number of wells drilled in the State in 1956 totaled 402, or 35 less than in 1955. Of these, 201 were exploratory wells, and the remaining 201 were field-development wells. Dry holes totaled 271, representing 188 exploratory and 83 field failures. Field wells drilled in 1956 and completed as producers resulted in 105 oil and 13 gas wells. The 402 wells drilled represented 2.9 million feet of drilled holes, an average depth of 7,168 feet per well compared with 3.3 million feet of drilled holes, an average depth of 7,509 feet per well in 1955. Exploratory drilling was increased from 176 wells in 1955 to 201 in 1956. Twelve petroleum discoveries and one gas discovery were made as follows: 6 in Adams, 2 each in Jefferson and Wilkinson, and 1 each in Franklin, Issaquena, and Monroe Counties. The proved reserves declined for the second successive year as follows: Petroleum, 5 percent; natural gas, 8 percent; and natural-gas liquids, 3 percent.

Natural Gas.—The value of marketed production of natural gas attained the alltime high of $18.1 million. Mississippi was the eighth ranking natural-gas producer in the Nation. Gross withdrawal of natural gas was 288,000 million cubic feet and marketed production 185,137 million cubic feet. Counties leading in natural-gas production in 1956 were Jefferson Davis, Adams, Forrest, Lincoln, Lamar, and Marion.

Underground storage of natural gas in the State was increased from 1 pool with 3 active wells in 1955 to 2 pools with 22 active wells in 1956. These 2 pools had a total reservoir capacity of 1,051 million cubic feet. The 2 field compressor stations, with a total of 2,600 horsepower installed capacity, were increased 2,000 horsepower during the year.

Natural-Gas Liquids.—Production of natural-gas liquids reversed the 3-year downward trend and gained in quantity and value during

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TABLE 3.—Total well completions in 1956, by counties [1]

County	Proved field or development wells			Exploratory wells			Total			Grand total
	Oil	Gas [2]	Dry	Oil	Gas	Dry	Oil	Gas	Dry	
Adams	29		33	6		41	35		74	109
Amite						1			1	1
Claiborne						3			3	3
Clarke	2		1			8	2		9	11
Copiah						1			1	1
Forrest	4	9	4			5	4	9	9	22
Franklin	3		9	1		10	4		19	23
Greene						2			2	2
Hancock	2		2			3	2		5	7
Harrison						1			1	1
Hinds	6					3	6		3	9
Issaquena				1		5	1		5	6
Itawamba						1			1	1
Jasper	10	2	4			4	10	2	8	20
Jefferson	6		11	2		27	8		38	46
Jefferson Davis		1						1		1
Jones	7		2			1	7		3	10
Lamar						2			2	2
Lauderdale						1			1	1
Lawrence						1			1	1
Leflore						1			1	1
Lincoln	1		1			1	1		2	3
Madison	1		1			3	1		4	5
Marion						1			1	1
Monroe					1	1		1	1	2
Panola						1			1	1
Pearl River	4	1	2			6	4	1	8	13
Perry						2			2	2
Pontotoc						1			1	1
Rankin						2			2	2
Simpson						1			1	1
Smith	5					6	5		6	11
Stone						2			2	2
Sunflower						1			1	1
Tippah						1			1	1
Warren						1			1	1
Wayne	10		2			8	10		10	20
Wilkinson	12		11	2		26	14		37	51
Yazoo	3					3	3		3	6
Total: 1956	105	13	83	12	1	188	117	14	271	402
1955 [3]	147	16	98	10		166	157	16	264	437

[1] Mississippi State Oil and Gas Bulletin, Jackson, Miss., vol. 57, No. 5, July 1957, pp. 165–176.
[2] Includes condensate.
[3] Revised figures.

TABLE 4.—Estimated proved reserves of crude oil, natural-gas liquids, and natural gas [1]

	Proved reserves, Dec. 31, 1955	Changes in proved reserves, due to extensions and new discoveries in 1956	Proved reserves, Dec. 31, 1956 (production was deducted)	Change from 1955, percent
Crude oil—thousand barrels	387,702	19,553	368,205	−5
Natural-gas liquids [2] [3]—do	57,876	1,636	56,003	−3
Natural gas [3]—million cubic feet	2,608,340	73,240	2,403,326	−8

[1] Gas Facts, 1956 (published by American Gas Association), pp. 9, 13, 16.
[2] Innludes condensate, natural gasoline, and LP-gases.
[3] Proved recoverable reserves.

1956. The production of natural-gas liquids, as shown on county table 13 for 1955 and 1956, are not comparable. In 1956 production of natural-gas liquids was credited to the county in which the natural-gasoline and cycle plant was situated; in 1955 it was credited to the county where the wells were situated.

TABLE 5.—Marketed production of natural gas, 1947–51 (average) and 1952–56

Year	Quantity (million cubic feet)	Value (thousand dollars)	Year	Quantity (million cubic feet)	Value (thousand dollars)
1947–51 (average)	88,199	5,345	1954	140,448	11,657
1952	174,100	10,620	1955	163,167	15,664
1953	154,254	12,340	1956	185,137	18,143

TABLE 6.—Gross withdrawals and disposition of natural gas, 1952–56, in million cubic feet

Year	Withdrawals [1]			Disposition		
	From gas wells	From oil wells	Total	Marketed production [2]	Repressuring	Vented and wasted [3]
1952	184,200	81,500	265,700	174,100	47,605	43,995
1953	180,000	75,000	255,000	154,254	53,223	47,523
1954	167,000	70,000	237,000	140,448	58,645	37,907
1955	193,000	73,000	266,000	163,167	62,598	40,235
1956	206,000	82,000	288,000	185,137	66,654	36,209

[1] Marketed production plus quantities used in repressuring, vented, and wasted.
[2] Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
[3] Includes direct waste on producing properties and residue blown to air (partly estimated).

TABLE 7.—Natural-gas liquids produced, 1947–51 (average) and 1952–56

Year	Natural gasoline		LP-gases		Total	
	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand gallons	Total (thousand dollars)
1947–51 (average)	28,347	1,954	[1] 16,870	674	45,217	2,628
1952	33,726	2,606	19,614	777	53,340	3,383
1953	32,214	2,295	17,724	713	49,938	3,008
1954	27,804	1,944	15,288	528	43,092	2,472
1955	22,382	1,573	12,242	396	34,624	1,969
1956	24,829	1,751	10,698	580	35,527	2,331

Petroleum.—The 1956 value of petroleum production—$100.0 million—was surpassed only during the peak year 1948, when $110.3 million was realized. Petroleum was produced in 26 of the State's 82 counties; the 5 leading were: Adams, Jasper, Lamar, Yazoo, and Lincoln, in order of their importance.

TABLE 8.—Production of crude petroleum, 1947–51 (average) and 1952–56

Year	Production (thousand barrels)	Value	
		Thousand dollars	Average per barrel
1947–51 (average)	38,785	87,290	$2.25
1952	36,310	80,970	2.23
1953	35,620	84,060	2.36
1954	34,240	85,600	2.50
1955	37,741	92,840	2.46
1956	40,824	100,019	2.45

TABLE 9.—Indicated demand, production and stocks of crude petroleum in 1956, by months

(Thousand barrels)

Month	Indicated demand	Production	Stocks originating in Mississippi
January	3,378	3,443	2,977
February	3,336	3,210	2,851
March	3,286	3,529	3,094
April	3,328	3,250	3,016
May	3,726	3,376	2,666
June	3,196	3,310	2,780
July	3,147	3,423	3,056
August	3,542	3,442	2,956
September	3,522	3,324	2,758
October	3,625	3,410	2,543
November	2,687	3,438	3,194
December	3,814	3,669	2,897
Total: 1956	40,587	40,824	----------
1955	37,651	37,741	----------

TABLE 10.—Production of crude petroleum, 1952–56, by fields

(Thousand barrels)

Field	1952	1953	1954	1955	1956
Baxterville	6,212	5,940	5,137	5,301	5,874
Bolton	----------	----------	----------	----------	842
Brookhaven	3,905	4,211	3,724	3,511	3,019
Cranfield	2,792	2,398	1,776	1,497	1,299
Eucutta	1,670	1,542	1,352	1,355	1,484
Heidelburg	3,437	3,336	3,098	3,253	3,641
La Grange	3,277	2,701	2,269	2,128	2,137
Mallalieu	1,944	1,484	1,252	1,117	1,021
Soso	288	316	748	3,110	4,289
Tinsley	4,934	4,545	4,326	4,475	4,399
Yellow Creek	1,633	1,652	1,526	1,433	1,494
Other fields	6,218	7,495	9,032	10,561	11,325
Total	36,310	35,620	34,240	37,741	40,824

NONMETALS

Cement.—The Brandon cement plant of Marquette Cement Manufacturing Co. continued to be the only facility in the State producing cement. Production and sales of portland cement from this plant continued to gain but masonry cement decreased slightly during 1956.

In May 1956 Mississippi Valley Portland Cement Co., started to construct a cement plant on the Yazoo River about 10 miles north of Vicksburg. The plant will have a rated daily capacity of 2,000 barrels of cement and will employ approximately 100 workers. Also, provision was made for expansion to 4,500 barrels daily. Production was scheduled to begin during November 1957.[3]

Clays.—During the year, 612,600 short tons of clays valued at $3.6 million was produced in 19 Mississippi counties. Appreciable quantities of bentonite, fuller's earth, miscellaneous clay, ball clay, and fire clay were produced.

Bentonite production, reported from Itawamba, Monroe, Pearl River, and Smith Counties, declined in quantity and in average price from $11.28 to $10.77 per ton during 1956. Bentonite was used

[3] Pit and Quarry, vol. 48, No. 9, March 1956, p. 38; Rock Products, vol. 59, No. 11, November 1956, p. 46.

locally and exported to other States for use as a binder in refractories, decoloration and filtration of oils, detergents and emulsions, drilling muds, and filtering.

Production of fuller's earth from Tippah County, used for absorbents, decreased in quantity and value during the year. The average price remained stable at $36.80.

TABLE 11.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds

Year	Bentonite		Ball clay, fire clay, and fuller's earth		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	243,740	$1,496,611	33,574	$409,934	240,151	$226,220	517,465	$2,132,765
1952	224,903	1,774,930	72,429	677,505	211,767	229,128	509,099	2,681,563
1953	189,211	2,028,040	71,235	814,516	299,601	315,829	560,047	3,158,385
1954	185,554	1,998,052	57,779	770,265	316,068	334,815	559,401	3,103,132
1955	226,852	2,558,399	79,922	959,373	393,841	395,341	700,615	3,913,113
1956	219,216	2,360,031	93,787	930,699	299,614	299,614	612,617	3,590,344

Production of miscellaneous clay decreased from 1955 both in tonnage and total value. The average price remained stable at $1.00 a ton.

Mississippi ball clay, produced in Panola County and consumed mainly by the refractory industry, increased in quantity and total value but declined in price from $16.19 to $16.09 a ton from the previous year.

Production of fire clay, all from Marshall County, increased over 1955; the average price declined from $1.61 to $1.00 during the year. Fire clay was used for heavy clay products.

Mosaic Tile Co. affiliated with a new tile manufacturing plant in Jackson, Miss., to produce 12 million square feet of glazed ceramic wall tile yearly. The new plant, which was part of Mosaic's long-term expansion program, was to have 2 tunnel kilns each 300 feet long.[4]

Holly Springs Brick & Tile Co., Holly Springs, Miss., added 2 new periodic kilns in 1956 for a capacity increase of 500,000 bricks a month.

Salt.—Two salt domes were discovered during exploration for petroleum. Although salt was not mined in Mississippi, 51 salt domes were known within the State.[5]

Sand and Gravel.—The value of sand and gravel produced in Mississippi reached an alltime high of $4.7 million despite a 6-percent decrease in quantity from 1955. In the order of importance, sand was used for paving, building, molding, miscellaneous uses, engine sand, railroad ballast, and blast sand. Gravel was used for paving, building, railroad ballast, and other purposes. Sand and gravel was produced in 23 of the State's counties; the most important, in order of value, were: Adams, Holmes, Forrest, De Soto, and Washington Counties.

Stone.—Production of stone, all as crushed limestone, reached an alltime high of 655,764 short tons valued at $655,764, a 14-percent increase over 1955. All of the limestone was used in manufacturing cement and as agricultural lime for soil conditioning.

[4] Ceramic Age, vol. 67, No. 1, January 1956, p. 39.
[5] Mississippi State Oil and Gas Bulletin, Jackson, Miss., vol. 57, No. 5, July 1957, pp. 10-11.

TABLE 12.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952-56

Year	Commercial		Government-and-contractor		Total		Average per ton
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	2,186,367	$1,535,607	597,909	$321,512	2,784,276	$1,857,119	$0.67
1952	1,845,864	1,482,581	450,713	350,725	2,296,577	1,833,306	.80
1953	2,070,123	1,713,362	583,523	460,509	2,653,646	2,173,871	.82
1954	5,208,459	4,179,421	233,378	107,450	5,441,837	4,286,871	.79
1955	5,027,127	4,335,799	597,682	267,233	5,624,809	4,603,032	.82
1956	4,990,499	4,554,103	324,177	147,193	5,314,676	4,701,296	.88

Water.—Recognizing the importance of water to its welfare and economy, Mississippi in 1956 became the first of the high-rainfall Eastern States to adopt a comprehensive water-rights law based on the western type of water law, rather than on the "riparian rights" doctrine of common law, which has applied in the East. The statute created a 17-man board of water commissioners, headed by a hydraulic engineer, to accept or reject all applications for municipal, agricultural, industrial, and recreational use of water. The law declares that water in any watercourse, lake, or other natural water body of the State is public water and public wealth of the State and thus subject to the control of the water commission. Streams flowing through a property are removed from a landowner's sole jurisdiction, and building of dams or diversion structures that will interfere with downstream users must be approved by the water board. He cannot use more water from a limited source than may be interpreted to be in the public interest.

METALS

Iron Ore.—An effort was made during the year to revive iron mining in Mississippi. J. E. Patridge opened a mine near the boundary between Montgomery and Webster Counties, where 183 tons of iron ore was mined and shipped.

REVIEW BY COUNTIES

Minerals were produced in 53 (50 in 1955) of Mississippi's 82 counties. Petroleum was produced in 26 (22 in 1955) counties, natural gas in 25 (21 in 1955), natural-gas liquids in 2 (13 in 1955), clay in 19, and sand and gravel in 23. Counties producing natural-gas liquids in 1956 are not comparable with those reported in 1955, because in that year all of the natural-gas liquids were credited to the counties of origin. In 1956 these data were not available, and all natural-gas liquid produced was credited to the county in which the natural-gasoline plant was located.

Adams.—Adams County led in the value of minerals produced and ranked first in petroleum, natural-gas liquids, and sand and gravel and second in natural gas. Adams County continued to yield the most encouraging exploration results. The drilling of 47 exploratory holes resulted in the discovery of 6 new petroleum fields. Sixty-two development holes resulted in 29 petroleum producers and 33 dry holes. St. Catherine Gravel Co., Inc., operated a fixed plant, portable

TABLE 13.—Value of mineral production in Mississippi, 1955–56, by counties [1]

County	1955	1956	Percent change	Minerals produced in 1956 in order of value
Adams	$22,558,177	$23,352,204	+3	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Alcorn	59,049	50,480	−15	Clays.
Amite	51,611	43,721	−15	Petroleum, natural gas.
Attala	6,000	2,813	−53	Clays.
Carroll	18,000	75,000	+317	Sand and gravel.
Chickasaw	86,001	58,403	−32	Natural gas, petroleum.
Choctaw	11,000			
Clarke	422,920	408,864	−3	Petroleum, natural gas.
Clay	81,822	130,901	+60	Stone, sand and gravel.
Copiah	704,839	460,609	−35	Sand and gravel.
De Soto	(2)	(2)		Do.
Forrest	2,545,566	4,452,086	+75	Natural gas, petroleum, sand and gravel, clays.
Franklin	1,834,293	1,834,167		Petroleum, natural gas.
George	(2)	(2)		Sand and gravel.
Greene	10,113	8,812	−13	Petroleum, natural gas.
Grenada	10,800	10,800		Sand and gravel.
Hancock	78,510	195,812	+149	Petroleum, natural gas, sand and gravel.
Harrison	94,000	94,000		Sand and gravel.
Hinds	1,420,817	2,396,040	+69	Petroleum, sand and gravel, clays, natural gas.
Holmes	170,450	(2)		Sand and gravel.
Issaquena		2,445		Petroleum.
Itawamba	(2)	(2)		Clays.
Jasper	16,537,328	15,593,048	−6	Petroleum, natural gas.
Jefferson	5,373,413	5,779,006	+7	Do.
Jefferson Davis	5,974,981	7,358,483	+23	Natural gas, petroleum.
Jones	592,634	2,913,341	+392	Petroleum, natural gas, clays.
Lamar	11,424,779	13,232,643	+15	Petroleum, natural gas.
Lauderdale	19,200	13,300	−31	Clays.
Lee	(2)	(2)		Do.
Leflore	190,000	(2)		Sand and gravel.
Lincoln	14,374,695	12,766,739	−11	Petroleum, natural gas, natural-gas liquids, clays.
Lowndes	413,951	401,137	−3	Sand and gravel, clays.
Madison	1,237,646	1,053,803	−15	Petroleum, natural gas.
Marion	4,679,487	3,720,803	−20	Petroleum, natural gas, sand and gravel.
Marshall	(2)	(2)		Clays.
Monroe	1,754,152	1,971,429	+12	Clays, natural gas, petroleum, sand and gravel.
Montgomery		(2)		Iron ore.
Noxubee	44,000	70,000	+59	Stone, sand and gravel.
Panola	266,264	(2)		Clays, sand and gravel.
Pearl River	1,279,037	1,508,550	+18	Petroleum, natural gas, sand and gravel, clays.
Perry	78,407	35,916	−54	Petroleum, natural gas.
Pontotoc	(2)	(2)		Clays.
Prentiss		7,500		Do.
Rankin	(2)	(2)		Cement, sand and gravel.
Sharkey	20,449			
Simpson	410,004	554,366	+35	Natural gas, petroleum.
Smith	(2)	2,876,587		Petroleum, clays, natural gas.
Sunflower	(2)	22,400		Clays.
Tippah	(2)	(2)		Do.
Washington	532,000	(2)		Sand and gravel.
Wayne	7,362,750	7,896,352	+7	Petroleum, natural gas.
Webster		(2)		Iron ore.
Wilkinson	1,586,940	2,294,105	+45	Petroleum, natural gas.
Yalobusha		(2)		Sand and gravel.
Yazoo	12,024,415	11,512,075	−5	Petroleum, sand and gravel, natural gas.
Undistributed	6,279,149	7,948,756		
Total	122,620,000	133,098,000		

[1] The following counties are not listed because no production was reported: Benton, Bolivar, Calhoun, Claiborne, Coahoma, Covington, Humphreys, Jackson, Kemper, Lafayette, Lawrence, Leake, Neshoba, Newton, Oktibbeha, Pike, Quitman, Scott, Stone, Tallahatchie, Tate, Tishomingo, Tunica, Union, Walthall, Warren, and Winston.
[2] Value included with "Undistributed."

plant, and dredge, which produced building and paving sand and gravel, both washed and pit run. Natchez Gravel Co. produced building sand and gravel at its fixed plant.

Alcorn.—Corinth Brick & Tile Co. manufactured heavy clay products from miscellaneous clay mined near Corinth.

Benton.—A Mississippi State Geological Survey publication discussed iron, bauxite, kaolin, and miscellaneous clay deposits in Benton County.[6] In World War I the Memphis Mining & Manufacturing Co. had erected a hot-blast charcoal furnace at Winborn, Benton County, for processing iron ore. The enterprise was of short duration, and only 125 tons of pig iron was made. In 1930 siderite had been mined for paint pigment. According to the bulletin, the typical kaolins are of such purity in their native state that it is desirable to wash them, as such beneficiation would make them comparable with the better grades of domestic and foreign kaolins.

Carroll.—The Leflore county engineer (Greenwood) produced pit-run gravel with his own crew.

Clay.—State of Mississippi Lime Plant Board continued to produce agricultural limestone from the quarry near Cedarbluff. West Point Gravel Co. produced sand for building and gravel for building and paving and for miscellaneous uses.

Copiah.—Traxler Gravel Co., Inc., operated a portable plant to produce paving sand and gravel; Gatesville Sand & Gravel Co. produced paving sand and some railroad-ballast gravel; Green Bros. Gravel Co. operated a fixed plant producing paving sand and gravel. Exploration for petroleum resulted in one dry hole. One salt dome was discovered during 1956 and 4 had been discovered previously.

De Soto.—The county ranked fourth in the value of sand and gravel produced. Memphis Stone & Gravel Co. and Smiley Sand & Gravel Co. produced sand and gravel for building and paving.

Forrest.—The county ranked third in production of natural gas and sand and gravel. American Sand & Gravel Co. produced building and paving sand and gravel, engine sand, railroad-ballast gravel, and miscellaneous sand and gravel. Hattiesburg Brick Works manufactured heavy clay products from miscellaneous clay. Drilling of 17 development wells resulted in 4 oil producers, 9 gas producers, and 4 dry holes.

Franklin.—Exploratory drilling resulted in 1 oil discovery and 10 dry holes; development drilling resulted in 3 oil producers and 9 dry holes. Petroleum and natural gas were produced in the county.

Hancock.—The county became a petroleum and natural-gas producer with discovery of the Ansley field in December 1955. Three exploratory wells were dry; development holes resulted in 2 oil producers and 2 dry holes. Jahncke Service, Inc., operated a dredge to produce molding sand.

Harrison.—Bell Gravel Co., Gulfport Gravel Co., and Leggett Sand & Gravel Co., all of Gulfport, produced building and paving sand and gravel, molding sand, and "other" sand. One dry exploratory hole was drilled.

Hinds.—Petroleum, natural gas, clay, and sand and gravel were produced in the county. Traxler Gravel Co., Inc., operated a portable plant to produce paving sand and gravel. Three dry exploratory wells were drilled. Six development wells were completed; all were oil productive. Johnson Cone Brick Co. and Tri-State Brick & Tile Co. manufactured heavy clay products from miscellaneous clay.

[6] Lusk, Tracy Wallace, Benton County Geology, Mississippi State Geol. Survey, Bull. 80, 1956, 104 pp.

Holmes.—Holmes County ranked second in the value of sand and gravel produced. Hammett Gravel Co. operated a portable plant producing paving sand and gravel.

Issaquena.—Exploratory drilling of 6 holes resulted in the discovery of the Valley Park field and thus Issaquena County joined the oil producing counties of the State.

Itawamba.—The county ranked second in clay production. Filtrol Corp. and American Colloid Co. quarried bentonite for use in filtering and decolorizing petroleum and vegetable oils. One exploratory hole was dry.

Jasper.—The county was the second largest producer of petroleum in the State. Natural gas was also produced. Four exploratory holes were drilled; all were dry. Sixteen development wells were drilled; 10 were oil productive, 2 were gas producers, and 4 were dry.

Jefferson.—The county was an important producer of petroleum and natural gas. Exploratory drilling resulted in 27 dry holes and in the discovery of the Rodney Island and Reeves fields; development drilling resulted in 6 oil producers and 11 dry holes.

Jefferson Davis.—The county continued to rank first in natural-gas production. Only one development hole was drilled in the county during the year; it was gas productive.

Jones.—Laurel Brick Works produced miscellaneous clay for manufacturing heavy clay products.

Lamar.—The county continued to rank third in production of petroleum and fifth in production of natural gas. Two dry exploratory holes were drilled.

Lauderdale.—Meridian Brick Co. mined miscellaneous clay and manufactured heavy clay products.

Lee.—Tupelo Brick & Tile Co. mined miscellaneous clay and manufactured heavy clay products.

Leflore.—Ferguson Bros. produced gravel from a pit near Greenwood.

Lincoln.—The county ranked fifth in petroleum production and fourth in natural-gas production during the year. Brookhaven Pressed Brick & Manufacturing Co. mined miscellaneous clay for manufacturing brick.

Lowndes.—In Columbus, the Columbus Gravel Co. operated a fixed plant and a dredge; Smith Gravel Co. operated a dredge and Williams Sand & Gravel Co. a fixed plant. Production included engine sand, building and paving sand and gravel, railroad-ballast gravel, and sand and gravel for ready-mix concrete, concrete block, and concrete pipe. Columbus Brick Co. mined clay for the manufacture of heavy clay products.

Monroe.—The county ranked first in value of bentonite produced. American Colloid Co. and Eastern Clay Products Department of the International Mining & Chemical Co. produced bentonite for refractories, foundries and steelworks, insecticides, and fungicides. Dee Nash (operating a dredge) and Francis Sand & Gravel Co. produced building and paving sand and gravel. Exploratory drilling of 2 holes resulted in 1 dry hole and discovery of the Okolona gasfield.

Montgomery and Webster.—J. E. Patridge of Winona mined iron ore from an open pit on or near the county line. This was the first reported production of iron ore from Mississippi in many years.

Noxubee.—The State of Mississippi Lime Plant Board produced limestone for use as a soil conditioner.

Panola.—Kentucky and Tennessee Clay Co. produced ball clay for use as refractories. J. L. O'Neal produced paving gravel. One dry exploratory hole was drilled.

A Mississippi Geological Survey publication discussed Panola County ceramic clay deposits.[7] According to the bulletin,

> The clays have many desirable properties some of which are unexcelled by other American bond clays. They also have some undesirable properties which limit their uses. The plastic, drying, and working properties of the clays are typical of high grade ball clays. The clays mature at low temperatures and are not overburned at cones 12–14. Typical clay burns to cream and light buff colors through cone 8. At cones 10, 12, and 14 the color darkens to grayish buff and brown.

Pearl River.—Bean & Wilkes Co. produced paving sand and gravel. Pearl River Clay Co. quarried montmorillonite clay for use in drilling mud and as a filler for insecticides and fungicides. Six exploratory holes were drilled; all were dry. Development drilling of 7 holes resulted in 4 oil producers, 1 gas producer, and 2 dry holes. Petroleum and natural gas were produced.

Rankin.—Marquette Cement Manufacturing Co. continued to increase the production and shipments of portland cement. Production of masonry cement declined slightly during the year. Worley Bros. operated a dredge and produced building sand and gravel. Two dry exploratory holes were drilled.

Smith.—Petroleum and natural gas were produced in the county. Oil-field crews drilled six dry exploratory holes and 5 oil-productive development wells. Filtrol Corp. mined bentonite for use in filtering and decolorizing.

Sunflower.—Delta Brick & Tile Co., Inc., mined clay for the manufacture of heavy clay products. One dry exploratory hole was drilled.

Tippah.—Wyandotte Chemical Corp. mined fuller's earth for use as an absorbent. One dry exploratory hole was drilled.

Washington.—The county ranked fifth in the value of sand and gravel. This was produced by Greenville Gravel Co. and used for building and paving and also by the Army Corps of Engineers for revetments.

Wayne.—The county continued as the sixth largest producer of petroleum in the State. Eight dry exploratory holes were drilled; 10 development wells were oil productive and 2 were dry holes.

Wilkinson.—Petroleum and natural gas were produced in the county. Exploratory drilling of 28 holes resulted in 26 dry holes and in the discovery of the Fort Adams and Doloroso fields. Development drilling of 33 holes resulted in 12 oil producers and 11 dry holes.

Yalobusha.—Grenada Gravel Co. operated a fixed plant to produce building and paving sand and gravel.

Yazoo.—Yazoo County was the fourth largest producer of petroleum in 1956. Field crews drilled 3 dry exploratory wells and 3 oil-productive development wells. Anderson Sand & Gravel Co. produced pit-run paving gravel for use as highway base course.

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[7] Vestal, Franklin Earl, Panola County Geology: Mississippi State Geol. Survey, Bull. 81, 1956, pp. 131, 157.

The Mineral Industry of Missouri

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Division of Geological Survey and Water Resources, Department of Business Administration of Missouri.

By W. G. Diamond [1] and G. A. Muilenburg [2]

MISSOURI'S mineral industry set a new high record in 1956; mineral production was valued at $164 million, compared with the previous record—$152 million in 1955. Missouri led the Nation in lead production for the 49th consecutive year, ranked second in barite output, and was third in fire-clay production. Eighteen mineral commodities were produced in the State—7 metals, 7 nonmetals, and 4 mineral fuels. The five principal minerals, in

TABLE 1.—Mineral production in Missouri, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite	363,692	$4,003,842	381,642	$4,461,955
Cement: Portland, 376-pound barrels	12,255,346	34,912,186	12,013,773	36,888,178
Clays	2,402,401	6,902,323	2,657,815	8,016,220
Coal	3,232,485	12,771,570	3,282,978	13,222,780
Copper (recoverable content of ores, etc.)	1,722	1,284,612	1,890	1,606,500
Iron ore (usable), long tons, gross weight	260,560	(2)	[3] 364,981	(2)
Lead (recoverable content of ores, etc.)	125,412	37,372,776	123,783	38,867,862
Lime	1,464,828	14,408,279	1,481,611	15,813,573
Natural gas, million cubic feet	15	3,000	12	2,000
Petroleum (crude), thousand 42-gallon barrels	72	190,000	65	176,000
Sand and gravel	9,983,624	9,980,878	9,585,268	10,117,351
Silver (recoverable content of ores, etc.), troy ounces	268,620	243,115	295,111	267,090
Stone	[4] 22,368,768	[4] 29,580,414	24,578,243	33,577,211
Zinc (recoverable content of ores, etc.)	4,476	1,101,096	4,380	1,200,120
Value of items that cannot be disclosed: Native asphalt, masonry cement, cobalt, iron oxide pigments, nickel, stone (dimension marble 1955), and values indicated by footnote 2	----------	4,833,392	----------	5,896,808
Total Missouri [5]	----------	151,626,000	----------	163,693,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Value included with "Value of items that cannot be disclosed."
[3] Final figure; supersedes figure given in commodity chapter.
[4] Revised figure.
[5] Total adjusted to eliminate duplicating value of clays and stone.

[1] Commodity-industry economist, Region IV, Bureau of Mines, Bartlesville, Okla.
[2] Assistant State geologist, Geological Survey and Water Resources, Rolla, Mo.

order of value, were lead, cement, stone, lime, and coal. Mineral production was reported from 108 of the 114 counties. The counties in order of production value were: St. Francois, St. Louis, Ste. Genevieve, Jackson, and Washington.

TABLE 2.—Average unit value of certain mineral commodities, 1952–56 [1]

Commodity	1952	1953	1954	1955	1956
Barite—short ton	$9.60	$10.09	$9.74	$11.01	$11.69
Cement (portland)—376-pound barrel	2.53	2.66	2.76	2.85	3.07
Coal—short ton	4.08	4.12	3.99	3.95	4.03
Copper—pound	.242	.287	.295	.373	.425
Gravel—short ton	.77	.74	.93	.85	.90
Lead—pound	.161	.131	.137	1.49	.157
Lime—short ton	10.02	9.97	9.92	9.84	10.67
Sand—do	1.02	1.02	1.13	1.15	1.20
Silver—troy ounce	.905	.905	.905	.905	.905
Stone:					
Granite:					
Dimension—short ton	33.17	59.04	57.40	71.20	108.73
Crushed—do	1.36	1.69	2.32	3.58	5.08
Marble:					
Dimension—do	(2)	121.50	154.35	135.30	82.88
Crushed—do	6.12	9.44	4.91	12.00	5.00
Limestone:					
Dimension—do	4.47	5.21	2.68	6.59	3.12
Crushed—do	1.48	1.47	1.29	1.34	1.34
Sandstone:					
Dimension—do	4.00	2.14	17.31	19.57	19.62
Crushed—do	1.32	1.48			
Miscellaneous:					
Crushed—do	.37	.61	.67	.36	.59
Zinc—pound	.166	.115	.108	.123	.137

[1] For greater detail on prices, by grades and markets, see vol. I, Minerals Yearbook, 1956.
[2] Data not available.

EMPLOYMENT AND INJURIES

Employment.—Average annual employment in the Missouri mining industries in 1956 increased slightly, reversing a downward trend started in 1953. Average employment in the metal-mining industries increased in 1956 after decreasing for 3 consecutive years, employment in the nonmetals industries increased for the third consecutive year, and employment in the coal mining industries decreased, according to the Division of Employment Security, Department of Labor and Industrial Relations of Missouri.

Injuries.—Six fatal accidents occurred in Missouri metal and nonmetal industries in 1956, 1 in iron-ore mining, 1 in lead-zinc mining, 2 in clay mining, and 2 in stone mining. The fatal injuries were caused by fall of side of open pit; fall of roof (underground); rolling, shifting, or sliding material from bins, platforms, etc.; handling materials; flying particles set in motion by machinery; and miscellaneous haulage involving railroad cars and locomotives.

Wages.—The upward trend in wages continued as average hourly and weekly earnings advanced again in 1956, according to the Division of Employment Security, Department of Labor and Industrial Relations of Missouri.

TABLE 3.—Average annual employment and earnings of mining industries, 1955–56 [1]

Industry	1955				1956			
	Average employment	Average weekly earnings	Average weekly hours	Average hourly earnings	Average employment	Average weekly earnings	Average weekly hours	Average hourly earnings
Metal mining	3,371	$80.65	40.1	$2.01	3,458	$86.33	40.1	$2.15
Nonmetal mining	3,999	72.37	43.9	1.65	4,026	77.27	44.9	1.72
Coal mining	970	(2)	(2)	(2)	921	91.20	37.8	2.41

[1] Letter from Henry J. St. Clair, Division of Employment Security, Department of Labor and Industrial Relations, State of Missouri, to Bureau of Mines.
[2] Annual averages not comparable owing to change in sample structure.

DEFENSE MINERALS EXPLORATION ADMINISTRATION PROJECTS

Government participation in financing exploration projects in search of reserves of strategic minerals through the program of the Defense Minerals Exploration Administration (DMEA) continued during 1956. The program in 1956 included the investigating of lead, copper, cobalt, and nickel sources in Bollinger and Madison Counties by the National Lead Co.

REVIEW BY MINERAL COMMODITIES

METALS

Production and value of metals increased substantially in 1956. The year was also marked by extensive exploratory drilling and a major iron-ore discovery.

Mine Mills and Smelters.—National Lead Co. refined cobalt-nickel at Fredericktown throughout 1956. At Herculaneum, St. Joseph Lead Co. smelted and refined lead; over half the tonnage produced was cast in 1-ton ingots, simplifying handling and shipping. The Dale mill in Newton County, Southwestern Missouri, was operated through April by Dale Mining Co. and from May through August by Big Four Mining Co., and then abandoned. St. Joseph Lead Co. operated its Federal, Bonne Terre, Desloge, and Leadwood mills in St. Francois County and its Indian Creek mill in Washington County. Two new 9- by 12-foot rodmills were installed in the Leadwood mill to increase efficiency and cut grinding costs, according to the President's Report to Employees, St. Joseph Lead Co. The Mine La Motte mill and the Madison mill were operated in Madison County by Mine La Motte Corp. and National Lead Co.

Cadmium, Gallium, Germanium, and Indium.—These minor metals occur as trace elements in Missouri lead-zinc ores and were recovered as byproducts from flue dusts from zinc smelting. Determination of the origin of these metals by States is not possible, because the domestic and imported concentrates were accumulated, and accurate analyses were not made.

Cobalt.—Cobalt was recovered from the complex lead-copper-cobalt-nickel ores in Madison County by National Lead Co. at the cobalt-nickel refinery in Fredericktown. Title to the refinery was transferred to the United States Government during the year; the company leased the facilities.

Columbium-Tantalum.—Domestic euxenite concentrate was processed by Mallinckrodt Chemical Co. at St. Louis to separate columbium-tantalum and uranium products. Most of the concentrate came from a placer mine in Idaho. The products were purchased by the Government under contract.

Copper.—Recoverable copper was reported from mining in Madison and St. Francois Counties. Production in 1956 was greater than in 1955, as the average metal price rose to 42.5 cents per pound compared with 37.3 cents in 1955. Copper production was reported by National Lead Co. and St. Joseph Lead Co.

Iron Ore.—Iron-ore production commanded a more prominent position in 1956 as output increased 40 percent over 1955. The renewed interest in iron-ore mining in Missouri resulted from several factors. Expansion in the steel industry created demands on previously untouched deposits. Missouri iron ore is accessible to the steel mills in Alabama, Tennessee, and Illinois; the brown ore (limonite) contains very little phosphorus and can be blended with other iron ores to reduce the phosphorus percentage. Increased production of brown ore in Howell and Oregon Counties contributed greatly to the increased iron-ore output in the State. Hematite ore was mined in St. Francois County.

A significant iron-ore discovery was made by St. Joseph Lead Co., according to the company 1956 Annual Report. Three centers of iron-ore deposition were discovered about 40 miles northwest of Bonne Terre as the result of an airborne magnetometer survey in 1951 and subsequent exploratory work. Drilling at 1 center, known locally as the Pea Ridge deposit, indicated a large ore deposit at a depth of 1,400 to 3,000 feet. The other two bodies in the area were drilled less extensively but were considered to be of definite interest.

Lead.—The 1956 mine production of recoverable lead was slightly less than the 1955 output, but total value increased 4 percent. Missouri contributed 35 percent of the Nation's total lead production, and St. Joseph Lead Co., the Nation's leading-producing company, operated in St. Francois and Washington Counties. Mine production included 7 million tons of crude ore and 1.2 million tons of old tailings, which yielded 175,000 tons of concentrate containing 124,000 tons of recoverable metal valued at $38.9 million. The Southwestern Missouri region produced less than 1 percent of the State's recoverable lead; the 4 leading companies were: St. Joseph Lead Co., Mine La Motte Corp., National Lead Co., and Potter-Sims Mines, Inc.

Lead-metal price opened the year at 16.0 cents per pound, New York, rose to 16.5 cents on January 4, and dropped back to 16.0 cents on January 13, at which price it remained the rest of the year.

TABLE 4.—Mine production of silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	23,658	142	10,087	392
February	24,838	143	10,499	420
March	26,323	174	11,343	413
April	24,547	170	10,237	388
May	25,504	167	10,614	312
June	23,444	152	9,816	297
July	23,865	161	9,927	486
August	26,944	192	11,099	488
September	21,981	142	9,196	332
October	26,454	161	11,083	261
November	23,160	153	9,733	268
December	24,393	133	10,149	323
Total: 1956	295,111	1,890	123,783	4,380
1955	268,620	1,722	125,412	4,476

TABLE 5.—Mine production of silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1860–1956, in terms of recoverable metals

Year	Mines producing	Material sold or treated		Silver		Copper	
		Crude ore (short tons)	Old tailings (short tons)	Fine ounces	Value	Short tons	Value
1947–51 (average)		6,029,978	1,149,565	150,379	$136,100	2,641	$1,125,304
1952	67	7,128,550	1,750,818	517,432	468,302	2,576	1,246,784
1953	28	6,674,300	1,483,157	359,781	325,620	2,374	1,362,676
1954	16	6,598,647	1,579,068	352,971	319,457	1,925	1,135,750
1955	18	6,734,346	1,546,126	268,620	243,115	1,722	1,284,612
1956	19	6,996,696	1,223,575	295,111	267,090	1,890	1,606,500
1860–1956		(1)	(1)	6,707,809	5,210,385	43,364	17,768,924

Year	Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	
1947–51 (average)	124,076	$38,830,455	9,823	$2,763,987	$42,855,846
1952	129,245	41,616,890	13,986	4,643,352	47,975,328
1953	125,895	32,984,490	9,981	2,295,630	36,968,416
1954	125,250	34,318,500	5,210	1,125,360	36,899,067
1955	125,412	37,372,776	4,476	1,101,096	40,001,599
1956	123,783	38,867,862	4,380	1,200,120	41,941,572
1860–1956	9,449,628	1,316,897,508	3,704,503	491,895,285	1,831,772,102

[1] Data not available.

TABLE 6.—Mine production of silver, copper, lead, and zinc in 1956, by classes of ore or other sources of material, in terms of recoverable metals

Source	Number mines	Material sold or treated (short tons)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lead ore [1]	17	8,065,092	295,111	1,890	123,395	3,345
Zinc ore	1	1,967				52
Zinc-lead	1	153,212			388	983
Total	19	8,220,271	295,111	1,890	123,783	4,380

[1] Includes lead-copper ore from 1 mine; also 1,223,575 tons of old tailings remilled, concentrates from which were mixed with those from crude ore.

TABLE 7.—Mine production of lead and zinc in Southeastern and Central Missouri, 1947–51 (average) and 1952–56, in terms of concentrates and recoverable metals [1]

Year	Lead concentrate (galena)		Zinc concentrates [2] (sphalerite)		Recoverable metal content [3]			
					Lead		Zinc	
	Short tons	Value [4]	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	175,275	$31,166,183	1,884	$184,166	122,508	$38,336,668	[5] 1,178	$359,377
1952	178,746	33,325,589	5,703	637,709	122,942	39,587,324	[6] 3,872	1,285,504
1953	182,418	26,622,152	5,369	347,482	125,273	32,821,526	[6] 3,180	731,400
1954	131,790	29,680,857	6,069	480,412	125,173	34,297,402	[6] 3,169	684,504
1955	180,262	32,428,093	7,507	700,022	125,357	37,356,386	3,934	967,764
1956	174,131	33,266,135	6,484	542,000	123,395	38,746,030	3,345	916,530

[1] Based on Southeastern and Central Missouri ore "dirt" and old tailings treated at mills during calendar year indicated.
[2] Includes zinc-lead carbonate concentrates.
[3] In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate "ore" and metal, it should be noted that the value given for the concentrate is that actually received by the producer whereas the value of the lead and zinc is calculated from the average price for all grades.
[4] Values given are to a certain extent arbitrary as part of the lead concentrate is smelted by the producer.
[5] Includes zinc recovered from lead-smelter slag.
[6] Includes zinc recovered from byproduct matte from lead smelting as follows: 1952, 900 tons; 1953, 327 tons; 1954, 427 tons.

TABLE 8.—Mine production of lead and zinc in Southwestern Missouri, 1947–51 (average) and 1952–56, in terms of concentrates and recoverable metals [1]

Year	Lead concentrate				Zinc concentrate			
	Galena		Carbonate		Sphalerite		Silicate	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	1,991	$416,486	69	$10,114	16,223	$1,651,131	189	$11,952
1952	8,113	1,701,121	----------	----------	18,671	2,138,108	----------	----------
1953	791	135,603	----------	----------	12,257	849,141	----------	----------
1954	103	16,826	----------	----------	3,713	378,782	----------	----------
1955	75	12,750	----------	----------	1,048	74,528	----------	----------
1956	496	102,096	----------	----------	1,862	161,502	----------	----------

Year	Recoverable metal content [2]			
	Lead		Zinc	
	Short tons	Value	Short tons	Value
1947–51 (average)	1,569	$493,788	8,645	$2,404,610
1952	6,303	2,029,566	10,114	3,357,848
1953	622	162,964	6,801	1,564,230
1954	77	21,098	2,041	440,856
1955	55	16,390	542	133,332
1956	388	121,832	1,035	283,590

[1] Based on Southwestern Missouri ore "dirt" and old tailings treated at mills during the calendar year indicated.
[2] In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate "ore" and metal, it should be noted that the value given for the concentrate is that actually received by the producer whereas the value of the lead and zinc is calculated from the average price for all grades.

Nickel.—The National Lead Co. recovered nickel along with cobalt at the cobalt-nickel refinery in Fredericktown.

Silver.—Silver recovery from Missouri lead and lead-copper ores in 1956 increased 10 percent over 1955. Silver was recovered from the refining of pig lead obtained from the smelting of ores from St. Francois and Madison Counties.

Zinc.—Mine production of recoverable zinc declined in 1956 for the fourth consecutive year although production increased in Southwestern Missouri. Producers included St. Joseph Lead Co., Potter-Sims Mines, Inc., and A. B. J. Mining & Development Co.; output was reported from St. Francois, Washington, Jasper, and Newton Counties. Southeastern Missouri supplied 76 percent of the total zinc output and Southwestern Missouri, 24 percent. Prime Western slab zinc opened the year at 13.0 cents per pound, East St. Louis, rose to 13.5 cents January 6; this latter price held through December.

TABLE 9.—Tenor of lead and zinc ore, old tailings, and slimes milled and concentrates produced in 1955–56, by districts

	Southeastern Missouri		Southwestern Missouri	
	1955 crude ore [1]	1956 crude ore [1]	1955 crude ore [2]	1956 crude ore
Total material milled: Crude ore—short tons	8,204,676	8,065,092	75,796	155,179
Total concentrate produced:				
Lead—short tons	180,262	174,131	75	496
Zinc—do	7,507	6,484	1,048	1,862
Ratio of concentrate to ore, etc.:				
Lead—percent	2.20	2.16	0.10	0.32
Zinc—do	.09	.08	1.38	1.20
Metal content of ore, etc.: [3]				
Lead—do	1.53	1.53	.07	.25
Zinc—do	.05	.04	.72	.67
Average lead content of galena concentrate—do	70.89	72.26	76.00	79.77
Average zinc content of sphalerite concentrate—do	58.23	57.33	57.35	61.82
Average value per ton:				
Galena concentrate	$179.89	$191.04	$170.00	$205.84
Sphalerite concentrate	93.25	83.59	71.11	86.74

[1] Includes lead-copper ore and old tailing remilled: 1955, 1,503,466 tons; 1956, 1,223,575 tons.
[2] Includes old tailing remilled: 1955, 42,660 tons.
[3] Figures represent metal content of crude ore only insofar as it is recovered in the concentrates; data on tailing losses not available.

TABLE 10.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1956

[E&MJ Metal and Mineral Markets]

Zinc concentrate		Lead concentrate	
Period	Price per short ton	Period	Price per short ton
Jan. 1–Jan. 7	$80.00	Jan. 5–Jan. 14	$208.52
Jan. 9–Dec. 31	84.00	Jan. 15–Dec. 31	201.32
Jan. 1–Jan. 4	202.25		

TRI-STATE DISTRICT

The Tri-State district of Southwestern Missouri, Kansas, and Oklahoma produced 3.6 million tons of crude ore that yielded 28,600 tons of lead concentrate containing 20,400 tons of recoverable lead and also 108,000 tons of zinc concentrate that contained 57,200 tons of recover-

able zinc. Approximately 2 percent of the district lead and zinc concentrates came from Southwestern Missouri. (See Oklahoma chapter for further details on Tri-State activity.)

TABLE 11.—Mine production of lead and zinc in the Tri-State district in 1956 in terms of material treated, concentrates, and recoverable metals

(Short tons)

State	Material treated		Concentrates		Recovered metal content	
	Crude ore	Old tailings	Lead	Zinc	Lead	Zinc
Kansas	1,674,116		10,130	53,142	7,635	28,665
Southwestern Missouri	155,179		496	1,862	388	1,035
Oklahoma	1,755,607		17,971	52,993	12,350	27,515
Total	3,584,902		28,597	107,997	20,373	57,215

SECONDARY METALS

Iron and Steel Scrap.—Consumption of iron and steel scrap in Missouri in 1956 totaled 1 million tons, comprising approximately 1.3 percent of the national total. Almost 23 tons of scrap was consumed for each ton of pig iron consumed in 1956, compared with a ratio of 20:1 in 1955.

TABLE 12.—Consumption of ferrous scrap and pig iron in 1955–56

(Short tons)

Year	Total scrap	Pig iron	Total scrap and pig iron
1955	1,017,473	51,864	1,069,337
1956	1,039,866	45,722	1,085,588

NONMETALS

Nonmetals contributed 63 percent of the total mineral value of Missouri in 1956 with production totaling $104 million. Cement, stone, lime, sand and gravel, and clays were the principal nonmetals in terms of value.

Barite.—Missouri continued to rank second in the Nation as a producer of barite for the 13th consecutive year. A new record was established by the shipment of 381,600 tons valued at $4.5 million. Missouri led in value of shipments. Increased drilling activities in the petroleum industry supplied the rise in output. Production was

TABLE 13.—Barite sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1947–51 (average)	250,242	$2,187,751	$8.74	1954	312,791	$3,047,436	$9.74
1952	304,080	2,919,795	9.60	1955	363,692	4,003,842	11.01
1953	330,763	3,338,395	10.09	1956	381,642	4,461,955	11.69

reported in Washington and Jefferson Counties. Barite was ground at plants in Washington and St. Louis Counties.

Cement.—Production of portland cement increased to a new peak of 12.4 million barrels in 1956 as the plants operated at 96 percent of total capacity. Plants in St. Louis, Ralls, Jackson, and Cape Girardeau Counties produced 52 percent of the total manufactured by wet-process methods and 48 percent by dry-process methods. Shipments totaled over 12 million barrels for the second consecutive year, as demand for use on construction projects remained high. Over 96 percent of the shipments was transported by railroad and almost 4 percent by boat. Bulk shipments comprised 77 and bag shipments 23 percent.

The annual capacity of the St. Louis plant of Alpha Portland Cement Co. was increased 200,000 barrels early in 1956. Plans were announced for a 700,000-barrel expansion of this plant. New equipment will include an 11- by 380-foot kiln, 3 finish mills, slurry-storage tanks, a cooler, and 140,000-barrel bulk-loading cement-storage silos. The new 1,250,000-barrel, $7 million wet-process plant of Marquette Cement Manufacturing Co., which was being built alongside the existing plant at Cape Girardeau, neared completion. Missouri Portland Cement Co. began the expansion program at its Sugar Creek plant (near Independence), which will double its capacity. The project is scheduled for completion early in 1957. A new 10- by 32-foot, 2-compartment clinker mill was installed at the company Prospect Hill plant (near St. Louis.).[3]

TABLE 14.—Production and shipments of portland cement, 1947–51 (average) and 1952–56, in 376-pound barrels

Year	Production (barrels)	Shipments		
		Barrels	Value	
			Total	Average per barrel
1947–51 (average)	9,063,362	8,994,999	$20,167,432	$2.24
1952	10,007,609	10,086,850	25,523,038	2.53
1953	10,281,230	9,860,179	26,238,460	2.66
1954	11,201,697	11,379,257	31,425,190	2.76
1955	12,001,304	12,255,346	34,912,186	2.85
1956	12,440,825	12,013,773	36,888,178	3.07

Masonry cement also was manufactured at each of the cement plants.

Clays.—Because of its many deposits of high-quality diaspore, burley, and fire clays, Missouri ranked high as a refractory-manufacturing State. Demand for refractory clay continued high in 1956, owing to the great demand for steel, to rising production in the ceramic and chemical fields, and to increasing production at refineries. All these industries use refractories. Production of miscellaneous clay also rose in 1956 to meet increased demands of the heavy clay products and cement industries. Clays were produced in 20 counties. Leading clay-producing counties included Gasconade, Audrain, Callaway, St. Louis, and Montgomery.

[3] Pit and Quarry, vol. 49, No. 7, January 1957, pp. 150–153.

TABLE 15.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds

Year	Fireclay		Diaspore		Burley	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	1,246,837	$4,348,294	42,778	$501,320	49,901	$352,127
1952	1,734,612	9,089,960	44,757	705,269	71,433	664,358
1953	1,392,022	8,562,318	50,144	962,384	53,971	563,043
1954	1,170,305	4,460,438	3,322	16,610	9,265	50,835
1955	1,486,253	5,692,467	11,546	134,298	31,460	208,259
1956	1,699,416	6,498,644	24,637	292,898	41,868	325,279

Year	Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value
1947–51 (average)	660,805	$555,974	2,000,321	$5,757,715
1952	1,140,217	1,638,833	2,991,019	12,098,420
1953	735,459	1,094,351	2,231,596	11,182,096
1954	744,393	1,330,873	1,927,285	5,858,756
1955	873,142	867,299	2,402,401	6,902,323
1956	891,894	899,399	2,657,815	8,016,220

Lime.—Lime production in 1956 advanced slightly over 1955, and value increased nearly 10 percent owing mainly to the rise in unit value from $9.84 per ton in 1955 to $10.67 per ton in 1956. Approximately 84 percent of the lime was used for chemical and industrial purposes, 10 percent in refractories, and 6 percent in building lime. Quicklime comprised 85 percent of lime production and hydrated lime, 15 percent. Six lime plants were active in 1956—2 in Greene County and 1 each in Marion, Newton, St. Francois, and Ste. Genevieve Counties.

TABLE 16.—Lime (quick and hydrated) sold by producers, 1947–51 (average) and 1952–56 [1]

Year	Quicklime (short tons)	Hydrated lime (short tons)	Total lime	
			Short tons	Value
1947–51 (average)	795,130	191,894	987,024	$8,954,756
1952	949,572	181,398	1,130,970	11,326,941
1953	1,006,393	205,714	1,212,107	12,084,130
1954	917,684	208,235	1,125,919	11,165,381
1955	1,241,051	223,777	1,464,828	14,408,279
1956	1,254,447	227,164	1,481,611	15,813,573

[1] Includes lime used by producers.

Nitrogen Compounds.—Atmospheric nitrogen (anhydrous ammonia) plants were operated by Hercules Powder Co. at Louisiana, and Mississippi River Fuel Corp. at Crystal City.

Iron Oxide Pigments.—Crude iron oxide pigments were mined in Dent County in 1956. Production was reported by George B. Smith Chemical Works, Inc.

Perlite.—Perlite was expanded at a plant in St. Louis from crude rock mined in Western States and used mainly as a lightweight aggregate. Crude perlite is not known to occur in Missouri. Demand was down in 1956 due to a decrease in private housing.

Sand and Gravel.—Sand and gravel output of Missouri in 1956 was reported from 73 counties; St. Louis, Jefferson, St. Charles, Taney, and Lewis Counties led in value of production. The major use was as an aggregate for building and highway construction. Quality silica sand was obtained in Jefferson and St. Louis Counties and used in glass and other ceramic industries. Commercial operations furnished 85 percent of total tonnage and 88 percent of total value; Government-and-contractor operations supplied 15 percent of the tonnage and 12 percent of the value.

TABLE 17.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Commercial		Government-and-contractor		Total sand and gravel		
						Value	
	Short tons	Value	Short tons	Value	Short tons	Total	Average per ton
1947–51 (average)	4,937,964	$4,445,584	[1] 757,556	[1] $436,986	[1] 5,695,520	[1] $4,882,570	$0.86
1952	5,695,296	5,417,628	1,095,126	704,567	6,790,422	6,122,195	.90
1953	4,932,617	4,770,451	859,441	463,548	5,792,058	5,233,999	.90
1954	8,822,467	9,555,223	1,068,838	648,258	9,891,305	10,203,481	1.03
1955	8,352,467	8,789,439	1,631,157	1,191,439	9,983,624	9,980,878	1.00
1956	8,160,792	8,872,944	1,424,476	1,244,407	9,585,268	10,117,351	1.06

[1] Excludes Government-and-contractor production for 1947 to avoid disclosing individual company confidential data.

Stone.—Missouri production of stone in 1956 totaled 24.6 million tons valued at $33.6 million. Limestone, marble, granite, sandstone, and miscellaneous stone were quarried. Limestone, from over 200 producers, in 81 counties supplied 94 percent of the total stone production and 92 percent of total value. Crushed marble was obtained in Jefferson County and dimension marble in Jasper, Greene, and Ste. Genevieve Counties. Crushed and dimension granites were quarried in Iron County. Shannon, Wayne, and Camden Counties reported production of dimension sandstone. Miscellaneous stone (chats) was produced in Jasper, St. Francois, and Newton Counties. The principal uses for crushed stone were for concrete aggregate, roadstone, riprap, and agricultural stone. Dimension stone was used as monumental and building stone. Total 1956 stone tonnage comprised 90 percent commercial production and 10 percent noncommercial production.

TABLE 18.—Stone sold or used by producers, 1952–56, by kinds

Year	Granite		Marble		Limestone	
	Short tons	Value	Short tons	Value	Short tons	Value
1952	11,618	$149,196	(1)	(1)	12,709,705	$18,877,717
1953	5,882	164,792	12,132	$708,794	12,727,029	18,924,418
1954	3,827	169,935	22,893	1,067,742	17,770,749	22,913,657
1955	2,821	179,433	[2] 8,500	[2] 102,000	21,283,587	28,850,387
1956	3,456	301,857	[2] 5,000	[2] 25,000	23,152,644	31,051,285

Year	Sandstone		Miscellaneous stone [3]		Total stone	
	Short tons	Value	Short tons	Value	Short tons	Value
1952	(1)	(1)	2,372,812	$889,254	15,106,544	$20,676,958
1953	10,972	$23,413	1,191,819	731,423	13,947,834	20,552,840
1954	633	10,957	874,137	589,319	18,672,239	24,751,610
1955	3,036	59,407	1,070,824	389,137	22,368,768	29,580,414
1956	(1)	(1)	1,395,776	820,022	24,578,243	33,577,211

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Excludes dimension marble.
[3] Chats; also includes small quantity of stone.

Tripoli.—Tripoli was processed by American Tripoli Division of The Carborundum Co. at its Seneca plant in Newton County from ore quarried in Oklahoma. The company stated that demand declined from 1955. The processed tripoli was used for abrasive polishing and buffing compounds in the metal-finishing trades, as a chemically inert filler, and for foundry facings.

Vermiculite.—Vermiculite was exfoliated in St. Louis and Jackson Counties from crude material from Western States.

MINERAL FUELS

Asphalt (Native).—Barton County Rock Asphalt Co. obtained native asphalt from its pit in Barton County. Production declined from 1955.

Coal.—Bituminous-coal production in Missouri in 1956 increased for the third consecutive year. Production of more than 1,000 tons each of coal was reported by 43 mines in 16 counties; 96 percent of the tonnage was supplied by 28 strip mines, and 4 percent was furnished by 15 underground mines. Production was valued at more than $1 million in 6 counties—Henry, Bates, Macon, Randolph, St. Clair, and Barton.

TABLE 19.—Coal production, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	3,627,747	$14,095,166	1954	2,513,593	$10,028,293
1952	2,954,450	12,048,141	1955	3,232,485	12,771,570
1953	2,393,304	9,848,903	1956	3,282,978	13,222,780

Natural Gas.—Quantities of natural gas were reported from several northwestern counties. Production approximated that in 1955.

Petroleum.—Output and value of petroleum declined in 1956 for the second consecutive year. Crude petroleum was recovered in the St. Louis area and near Tarkio in Atchison County.

REVIEW BY COUNTIES

Mineral production was reported in 108 of the 114 counties in Missouri in 1956; 21 counties reported production of $1 million or more. The 5 principal producing counties—St. Francois, St. Louis, Ste. Genevieve, Jackson, and Washington—contributed 59 percent of the total mineral-production value. No mineral production was reported in Chariton, Mississippi, New Madrid, Ripley, Schuyler, and Scotland Counties.

Adair.—Coal was mined underground by Billy Creek Coal Co. Inc., Blacksmith Coal Co., Inc., and Number Eight Coal Co., Inc. Bailey Limestone Quarry produced crushed limestone for concrete aggregate, roadstone, and agricultural stone. Missouri State Highway Department obtained crushed limestone for road construction.

Andrew.—George W. Kerford Quarry and the United States Army Corps of Engineers quarried and crushed limestone for concrete aggregate and roadstone and for riprapping the banks of the Missouri River to stabilize the channel.

TABLE 20.—Value of mineral production in Missouri by counties, 1955–56 [1]

County	1955	1956	Minerals produced in 1956 in order of value
Adair	$359,122	$337,135	Coal, stone.
Andrew	(2)	(2)	Stone.
Atchison	37,549	(2)	Petroleum.
Audrain	1,431,046	1,357,854	Clays, sand and gravel.
Barry	22,210	(2)	Stone.
Barton	(2)	(2)	Coal, native asphalt.
Bates	2,954,108	2,794,933	Coal, stone, sand and gravel.
Benton	(2)	(2)	Sand and gravel.
Bollinger	37,159	(2)	Do.
Boone	649,607	655,614	Stone, sand and gravel, clays, coal.
Buchanan	275,184	302,444	Stone, sand and gravel, clays.
Butler	56,740	(2)	Sand and gravel.
Caldwell	120,312	161,103	Stone.
Callaway	2,127,155	1,988,183	Clays, coal, stone, sand and gravel.
Camden	10,700	(2)	Sand and gravel, stone.
Cape Girardeau	6,058,735	6,708,961	Cement, stone, sand and gravel, clays.
Carroll	(2)	8,169	Sand and gravel, stone.
Carter	33,300	400	Sand and gravel.
Cass	217,728	349,587	Stone, clays.
Cedar	(2)	(2)	Stone.
Chariton	(2)		
Christian	(2)	8,000	Stone.
Clark	(2)	(2)	Do.
Clay	1,181,781	966,994	Stone, coal.
Clinton	(2)	117,627	Stone.
Cole	162,520	175,228	Sand and gravel, stone.
Cooper	110,391	116,890	Do.
Crawford	(2)	30,875	Stone, sand and gravel, clays.
Dade	(2)	(2)	Stone, coal.
Dallas	10,400	10,400	Sand and gravel.
Daviess	(2)	(2)	Stone.
De Kalb		80,584	Do.
Dent	79,018	12,900	Sand and gravel, stone, crude iron oxide pigments.
Douglas	6,200	101,100	Sand and gravel.
Dunklin	(2)	(2)	Stone, sand and gravel.
Franklin	837,967	643,867	Sand and gravel, stone, clays.
Gasconade	2,200,196	2,555,923	Clays, sand and gravel.
Gentry	117,887	136,893	Stone, sand and gravel.
Greene	2,500,230	2,549,655	Lime, stone, sand and gravel.
Grundy	(2)	(2)	Stone.
Harrison	208,383	244,845	Stone, sand and gravel, coal.
Henry	3,445,858	3,904,361	Coal, stone.
Hickory	(2)	(2)	Sand and gravel, stone.
Holt	(2)	362,492	Stone.
Howard	132,634	238,481	Stone, sand and gravel.
Howell	214,060	430,740	Iron ore, sand and gravel.

See footnotes at end of table.

TABLE 20.—Value of mineral production in Missouri by counties, 1955–56 [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Iron	$248,728	$369,557	Stone, sand and gravel.
Jackson	9,066,124	8,773,826	Cement, stone, sand and gravel, clays.
Jasper	2,102,156	2,749,101	Stone, sand and gravel, zinc, lead.
Jefferson	978,513	1,088,656	Sand and gravel, stone, barite.
Johnson	240,382	185,819	Stone.
Knox	(2)	(2)	Do.
Laclede	29,075	36,258	Sand and gravel, stone.
Lafayette	169,166	225,621	Coal, stone, sand and gravel.
Lawrence	6,900	(2)	Stone.
Lewis	666,057	(2)	Sand and gravel, stone.
Lincoln	314,203	231,326	Clays, stone, sand and gravel.
Linn	(2)	(2)	Stone.
Livingston	246,244	260,490	Stone, clays, sand and gravel.
Macon	(2)	(2)	Coal, stone.
Madison	5,222,604	6,257,522	Lead, copper, cobalt, nickel, sand and gravel, silver.
Maries	52,577	196,066	Clays, stone, sand and gravel.
Marion	617,219	658,131	Lime, stone, sand and gravel.
McDonald	2,900	1,600	Sand and gravel.
Mercer	57,661	36,500	Stone.
Miller	21,242	79,128	Sand and gravel, stone.
Moniteau	45,300	39,550	Stone, sand and gravel.
Monroe	182,271	281,007	Clays, stone, sand and gravel.
Montgomery	626,409	679,084	Do.
Morgan	35,600	41,488	Sand and gravel, stone.
Newton	511,951	432,379	Lime, stone, zinc.
Nodaway	(2)	(2)	Sand and gravel.
Oregon	113,973	290,482	Iron ore, stone, sand and gravel.
Osage	382,426	293,017	Clays, sand and gravel.
Ozark	12,150	14,074	Sand and gravel, iron ore.
Pemiscot	(2)	(2)	Sand and gravel.
Perry	101,520	(2)	Stone, sand and gravel.
Pettis	476,000	(2)	Stone.
Phelps	172,136	202,110	Clays, stone, sand and gravel.
Pike	158,133	182,429	Stone, sand and gravel.
Platte	209,324	231,780	Clays, stone.
Polk	13,800	26,550	Sand and gravel.
Pulaski	67,665	54,100	Do.
Putnam	52,805	135,839	Coal.
Ralls	6,719,384	6,912,724	Cement, stone, coal, sand and gravel.
Randolph	502,928	1,728,423	Coal, stone.
Ray	144,864	191,539	Stone.
Reynolds	4,100	(2)	Sand and gravel.
Ripley	(2)		
St. Charles	1,043,939	1,349,592	Stone, sand and gravel.
St. Clair	1,335,872	1,340,505	Coal, stone, sand and gravel.
St. Francois	39,976,287	40,036,036	Lead, iron ore, stone, lime, zinc, copper, silver, sand and gravel.
St. Louis	24,950,751	27,022,267	Cement, sand and gravel, stone, clays, petroleum.
Ste. Genevieve	11,757,545	13,379,958	Lime, stone, sand and gravel.
Saline	475,804	263,952	Stone.
Scotland	(2)		
Scott	(2)	(2)	Sand and gravel.
Shannon	70,388	125,702	Stone, iron ore, sand and gravel.
Shelby	(2)	(2)	Stone.
Stoddard	174,290	(2)	Sand and gravel.
Stone	45,400	47,300	Stone, sand and gravel.
Sullivan	(2)	369,021	Stone.
Taney	352,800	513,800	Sand and gravel.
Texas	39,348	31,125	Sand and gravel, stone.
Vernon	235,191	312,246	Coal, stone, sand and gravel.
Warren	325,396	324,964	Clays, stone, sand and gravel.
Washington	5,782,647	8,154,007	Barite, lead, zinc, sand and gravel.
Wayne	143,199	213,247	Stone, sand and gravel, iron ore.
Webster	7,100	4,100	Sand and gravel.
Worth	(2)	(2)	Stone.
Wright	27,850	17,500	Do.
Undistributed	8,709,147	9,949,422	
Total	151,626,000	163,693,000	

[1] The following counties are not listed because no production was reported in 1955 or 1956: Mississippi, New Madrid, and Schuyler.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Atchison.—Petroleum was produced near Tarkio in Atchison County.

Audrain.—Audrain County, second in the State in clay production for the second consecutive year, reported production of fire clay for refractories. Producers included Mexico Refractories Co., A. P. Green Fire Brick Co., North American Refractories Co., Wellsville Fire Brick Co., Harbison-Walker Refractories Co., Laclede-Christy Co., and Walsh Refractories Corp. Molino Lime Co. mined paving gravel.

Barry.—Douthitt Lime Co. quarried and crushed limestone for soil conditioner.

Barton.—Clemens Coal Co., N. Coal Co., Inc., and John Zibert Coal Co. strip-mined coal. Barton County ranked sixth in the State in coal production. Native asphalt was obtained by Barton County Rock Asphalt Co.

Bates.—Bates County ranked second in the State in coal production for the second consecutive year. Coal was strip-mined by Peabody Coal Co. and Mullies Coal Co. Alvis Limestone & Concrete Co. and Frank Underwood quarried and crushed limestone for concrete roadstone, and agricultural purposes. Fuller Lime Co. and Clyde S. Miller produced building and paving gravels.

Benton.—Junge Gravel Co. obtained building, paving, and other gravels from deposits in Benton County.

Bollinger.—Mayfield Gravel Co. and Penzel Construction Co. obtained gravel for building and road construction.

Boone.—Limestone was quarried and crushed for concrete aggregate, roadstone, and riprap by Boone Quarries, Inc., N. R. Garrett, Adrian Materials Co., Central Stone Co., and the United States Army Corps of Engineers. Structural sand and gravel was produced by Columbia Sand & Towing Co. and the Columbia Special Road District. Columbia Brick & Tile Co. obtained shale and fire clay for use in heavy clay products. Coal was mined by William R. Carter and Earl S. Hussey.

Buchanan.—Everett Quarries, Inc., L. S. Stafford, Buchanan County Highway Department, and the United States Army Corps of Engineers quarried and crushed limestone for concrete aggregate, roadstone, agricultural stone, and riprap. Pioneer Sand Co. prepared building, paving, and engine sands. Moorhead Brick & Tile Co. quarried shale for common building brick and tile.

Butler.—Kittredge Gravel Co. and Grobe & Sons produced building and paving sand and gravel.

Caldwell.—Limestone was quarried and crushed for concrete aggregate, roadstone, and agricultural purposes by Farmers Rock & Lime Co., A. L. Houghton Stone Co., and the City of Braymer.

Callaway.—The county ranked third in the production value of clays in Missouri in 1956. Flint and plastic fire clays were mined for use in refractories. Leading producers included Harbison-Walker Refractories Co., Walsh Refractories Corp., A. P. Green Fire Brick Co., Laclede-Christy Co., and Clayton & Crawson. Marriott-Reed Coal Co. mined coal at its strip mine. Limestone was quarried and crushed by Auxvasse Stone & Gravel Co., Sulgrove Mining & Quarry Co., and Adrian Quarries, Inc., for concrete aggregate, roadstone, and agricultural stone. Paving gravel was obtained by Callaway County Highway Department and Missouri State Highway Department.

Camden.—Missouri State Highway Department contracted for paving gravel. Trio Stone Co. quarried dimension sandstone for use as undressed building stone.

Cape Girardeau.—The county ranked seventh in the value of Missouri mineral production in 1956. Federal Materials Co., Inc., and Farmers Limestone Co. quarried and crushed limestone for concrete aggregate, roadstone, riprap, railroad ballast, and agricultural purposes. Sand and gravel was produced for building and paving purposes by Cape Girardeau Sand Co., Inc., and Penzel Construction Co. Common red clay was mined by Ceramo Co., Inc., and Kasten Bros. Brick Co. for building brick, pottery, and stoneware. Marquette Cement Manufacturing Co. produced clay and limestone for cement. Portland and masonry cements were produced.

Carroll.—Paving sand was contracted for by the Missouri State Highway Department. Limestone was quarried for riprap by the United States Army Corps of Engineers.

Carter.—The Missouri State Highway Department produced paving gravel from county deposits.

Cass.—Deitz Hill Development Co., Peculiar Rock & Lime Co., Emmet Brosnahan Rock Co., and S & W Quarries produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Miscellaneous clay for brick and tile was mined by United Brick & Tile Co.

Cedar.—Alvis Limestone & Concrete Co. quarried and crushed limestone for concrete, roadstone, and agricultural purposes.

Christian.—Joe Howard quarried and crushed limestone near Billings for soil conditioner.

Clark.—Limestone was quarried and crushed for concrete aggregate, roadstone, and agricultural purposes. Producers included Myron Baker Construction Co., operating near Kahoka, and Brooks Construction Co.

Clay.—Clay County ranked seventh in the State in value of stone production. Crushed limestone, used mainly for riprap, concrete aggregate, and roadstone, was produced by Midwest Pre Cote Co., J. H. Oldham Stone Co., Tobin Quarries, Inc., Kansas City Quarries Co., Everett Quarries, Inc., Clay County Highway Engineer, and the United States Army Corps of Engineers. Mosby Coal Co. mined coal underground in Clay County.

Clinton.—Limestone was quarried and crushed by Everett Quarries, Inc., for concrete aggregate, roadstone, riprap, and agricultural purposes.

Cole.—Sand and gravel, obtained along the Osage and Missouri Rivers, was used mainly for building and paving. Producers included Jefferson City Sand Co., Adrian Materials Co., Thompson Sand Co., Cole County Highway Department, and Missouri State Highway Department. Limestone for riprap was quarried by the United States Army Corps of Engineers.

Cooper.—Building and paving sand and gravel were obtained from local deposits by Missouri River Sand & Gravel Co., Ralph V. Reuter, H. A. Harms, and Missouri State Highway Department for use mainly in building and paving. The United States Army Corps of Engineers obtained limestone for riprap from two quarries in the county.

Crawford.—Fire clay was mined for use by Laclede-Christy Co. in refractories under contract by Francis & Drewel. The Missouri State Highway Department contracted for paving gravel.

Dade.—George M. Baker quarried and crushed limestone for concrete aggregate, roadstone, and railroad ballast. Tyler Coal Co. mined coal from an open pit.

Dallas.—The Missouri State Highway Department contracted for paving gravel.

Daviess.—Snyder Quarries, Inc., quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes.

De Kalb.—Limestone was quarried and crushed by Everett Quarries, Inc., for concrete aggregate, roadstone, riprap, and agricultural purposes.

Dent.—The Missouri State Highway Department contracted for paving gravel. Limestone for soil conditioner was produced by Ozark Contractors, Inc. George B. Smith Chemical Works, Inc., produced crude iron oxide pigments.

Douglas.—Welton & Gray and the Missouri State Highway Department prepared paving gravel.

Dunklin.—Everett Quarries, Inc., quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Wilkey & Lankford, Inc., obtained paving gravel.

Franklin.—The county ranked sixth in the production value of sand and gravel in Missouri in 1956. Building and paving sand and gravel were produced by Meramec Sand & Gravel Co., Pacific Pebbles, Inc., Missouri State Highway Department, Washington Sand Co., Sullivan Sand & Gravel Co., O. E. Jessup, and Clifford Dewert. Limestone and dolomite were quarried and crushed for concrete aggregate, roadstone, and agricultural and riprap purposes at eight places in the county. Leading producers included Oliver L. Taetz Co., Inc., City of Washington, Edwin Bebermeyer, United States Army Corps of Engineers, and J. E. McKeever. A. P. Green Fire Brick Co. and Rousset Bros. Clay Co. mined diaspore and other fire clays for use in refractories.

Gasconade.—Gasconade County continued to lead the State in producing clays. Burley, flint, and diaspore fire clays were mined near Swiss, Hermann, Bland, and Owensville mainly for use in refractories. Producers included A. P. Green Fire Brick Co., General Refractories Co., Laughlin Bros., Harbison-Walker Refractories Co., North American Refractories Co., and Walsh Refractories Corp. Fire clay was mined by the General Chemical Division of Allied Chemical & Dye Corp. for chemical uses. The Missouri State Highway Department contracted for paving gravel.

Gentry.—Limestone was quarried and crushed for concrete, roadstone, and agricultural purposes by Gentry County Quarry and H. V. Windsor. Albany Gravel Co. obtained paving gravel from local deposits.

Greene.—Greene County ranked third in the State in value of lime production and sixth in value of stone production. Ash Grove Lime & Portland Cement Co. quarried limestone at its Galloway and Springfield quarries for use in lime and for concrete aggregate, roadstone, and soil conditioner. Quicklime and hydrated lime were produced for chemical, industrial, and building purposes. Garrett

Construction Co. and Joseph J. Griesemer produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Carthage Marble Corp. produced dressed and undressed marble from its quarry in Greene County. The Missouri State Highway Department contracted for paving gravel.

Grundy.—Jay Wilcox Limestone Quarry Co. and E. E. Trenary produced crushed limestone, mainly for concrete, roadstone, and agricultural purposes.

Harrison.—Mathes Quarries and L. W. Hayes, Inc., produced crushed limestone near Bethany and Ridgeway for concrete aggregate, roadstone, and as agricultural limestone. Mathes Quarries and Harrison County Highway Department produced paving gravel. Missouri State Highway Department produced paving sand. New Black Diamond Coal Co. mined coal underground in Harrison County.

Henry.—Henry County continued to lead in coal production in Missouri; 8 strip mines each produced 1,000 tons or more. Approximately 95 percent of the coal was shipped by rail to consumers, and 5 percent was shipped by truck. Producers included Peabody Coal Co., Windsor Coal Co., A. G. Pence Coal Co., Clary Coal Co., W. W. Coal Co., Inc., and Redding Coal Co. Crushed limestone for concrete aggregate roadstone, and agricultural purposes was produced by Williams Rock Co., Davis Rock Co., Alvis Limestone & Concrete Co., and O. A. Knisley.

Hickory.—Missouri State Highway Department contracted for paving gravel. Roy Worthington quarried and crushed limestone for soil conditioner.

Holt.—George W. Kerford produced limestone riprap.

Howard.—Glasgow Quarries and Armstrong Special Road District produced crushed limestone for concrete aggregate and roadstone. The United States Army Corps of Engineers produced limestone riprap. Glasgow Sand Co. obtained sand for building and other purposes.

Howell.—Iron-ore production in Howell County in 1956 more than tripled that in 1955 as the demand for brown iron ore by Alabama steel plants increased. A total of 13 mines was operated during the year. Leading producers included Patillo Bros., Four Mining Co., E. E. and E. H. Carroll, Mineral Point Mining Co., and Shook & Fletcher Supply Co. Missouri State Highway Department produced paving gravel.

Iron.—Heyward Granite Co. produced dimension granite for rough architectural and rough monumental purposes and granite for riprap. Dolomite was quarried by Duncan Bros. for use as agstone. The Missouri State Highway Department contracted for paving gravel.

Jackson.—Jackson County led the State in value of stone production, ranked 4th in total value of mineral production, and 7th in value of sand and gravel production. Limestone was quarried and crushed for concrete aggregate, roadstone, riprap, and agricultural purposes by 11 operators. Leading producers included Beyer Crushed Rock Co., Stewart Sand & Material Co., Centropolis Crusher Co., Union Construction Co., and Rock Acres Lime Co., Inc. Undressed dimension limestone for use as rubble was produced by Gerald Hodgins Building Rock Co., Dick Carson, McClain Stone Co., Strongs Quarries, and

Rove & Son. Dressed dimension limestone was produced by Dick Carson and Rove & Son. Stewart Sand & Material Co. dredged sand from the bed of the Missouri River for use in ready-mix concrete and for engine and other sands. United Brick & Tile Co. mined miscellaneous clay for use in heavy clay products. Missouri Portland Cement Co. quarried limestone and shale near Independence for portland and masonry cements.

Jasper.—The county ranked fourth in the value of stone produced in Missouri in 1956 for the second consecutive year. Carthage Marble Corp. quarried dimension marble for sale as undressed rough building stone, dressed building stone, and dressed monumental stone. Crushed limestone was produced by Carthage Crushed Limestone Co., Carthage Marble Corp., and Independent Gravel Co. for concrete aggregate, roadstone, agricultural, and other purposes. Miscellaneous stone (chats) was produced by American Zinc, Lead & Smelting Co., Independent Gravel Co., Calcium Products Co., and Jasper County Highway Department. Independent Gravel Co. mined and processed sand for use mainly as blast sand. Smaller quantities were used as glass, molding, grinding and polishing, furnace, engine, and filter sands. Potter-Sims Mines, Inc., obtained lead and zinc from ores mined in the county.

Jefferson.—This county ranked second in the State in sand and gravel production value in 1956. High-purity silica sand for use in plate glass and for grinding and polishing was quarried in the St. Peter formation by Aubuchon Silica Mining Co. near Festus and by Pittsburgh Plate Glass Co. near Crystal City. Building and paving sand and gravel were produced by Jefferson County Highway Department, Missouri State Highway Department, Walter Ficken, Masters Bros. Silica Sand Co., and Linus Miller. Crushed limestone and dolomite were produced by Henry Trautman, Kitson Bros. Quarry, Paul H. Giudicy, and Hess Bros. for concrete aggregate, roadstone, and agstone. Giudicy Marble Terrazzo & Tile Co. produced crushed limestone for agstone and crushed marble for terrazzo. Barite was produced by Burford Mining Co. Mississippi River Fuel Corp. operated its atmospheric nitrogen (anhydrous ammonia) plant at Crystal City.

Johnson.—Limestone was quarried and crushed by Deitz Hill Development Co. and Marr Bros. for concrete aggregate, roadstone, and as a soil conditioner.

Knox.—Knox County Stone Co., Inc., and McSorley Lime Co. quarried and crushed limestone for concrete, roadstone, and agricultural purposes.

Laclede.—The Missouri State Highway Department contracted for paving sand and gravel. Wissbaum Quarry produced crushed limestone for soil conditioner.

Lafayette.—Coal was mined underground by Earl Ashford Coal Co., Hughes Coal Co., H. S. Peek Coal Co., and Winfrey Mining Co.; the entire output was shipped to consumers by truck. Limestone was quarried for riprap by the United States Army Corps of Engineers and for concrete aggregate and roadstone by Deitz Hill Development Co. Waverly Sand Co. and Lexington Sand & Gravel Co. dredged sand for building and paving.

Lawrence.—Floyd Rose produced crushed limestone for use as a soil conditioner. E. L. Britain produced undressed dimension limestone for rough construction.

Lewis.—Lewis County ranked fifth in the State in value of sand and gravel production in 1956. Missouri Gravel Co. obtained building and paving sand and gravel from deposits near LaGrange. Hamill Limestone Co. and Missouri Gravel Co. quarried and crushed limestone for concrete aggregate, roadstone, and agricultural uses.

Lincoln.—Fire clay for refractories was mined by Harbison-Walker Refractories Co. Limestone was quarried and crushed for concrete aggregate, roadstone, riprap, and agricultural uses by Columbia Quarry Co., Gessman Lime Quarry, and Watson Quarry. The Missouri State Highway Department contracted for paving gravel.

Linn.—Limestone for concrete aggregate, roadstone, and agricultural purposes was quarried and crushed by Bailey Limestone Co.

Livingston.—Cooper Contracting Co. and Fred McVey produced crushed limestone for concrete aggregate, roadstone, riprap, and agricultural uses. Cooley Gravel Corp. obtained paving and railroad-ballast sands and building gravel from local deposits. Midland Brick & Tile Co. mined miscellaneous clay for use in brick and tile.

Macon.—Macon County ranked third in coal production in Missouri in 1956. Peabody Coal Co. strip-mined coal. Frank Trager produced crushed limestone for concrete aggregate and roadstone.

Madison.—National Lead Co. mined ores containing lead, copper, silver, cobalt, nickel, and iron at its Madison mine near Fredericktown. It recovered cobalt and nickel from iron rejects of the lead-copper circuit of its Madison mill at its refinery near Fredericktown. Ores containing lead, copper, and silver were mined near Mine La Motte by the Mine La Motte Corp. The Missouri State Highway Department contracted for paving gravel.

Maries.—A. P. Green Fire Brick Co., Wallace Bros., Laclede-Christy Co., and Harbison-Walker Refractories Co. mined diaspore, burley, and fire clays for refractories. Virgil Smith quarried and crushed limestone for concrete aggregate, roadstone, and agricultural uses. The Missouri State Highway Department contracted for paving gravel.

Marion.—Marblehead Lime Co. quarried limestone near Hannibal for quick and hydrated lime. S. D. Fessenden & Sons and Marblehead Lime Co. produced crushed limestone for soil conditioner. Building and blast sands were obtained from local deposits by Bolton Sand & Gravel Co.

McDonald.—The Missouri State Highway Department contracted for paving gravel in McDonald County.

Mercer.—The Missouri State Highway Department quarried and crushed limestone for roadstone and concrete aggregate.

Miller.—Gravel was obtained by C. W. Roweth Co. for railroad ballast and by the Missouri State Highway Department for paving. Franklin Groose produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes.

Moniteau.—Moniteau County Agricultural Association, Inc., quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Missouri State Highway Department contracted for paving gravel.

Monroe.—Monroe County ranked seventh in the State in the value of clays produced in 1956. Gilliam Mining Co., Walsh Refractories Corp., Bethlehem Co., and Fluetsch Bros. mined fire clay for use in refractories. Crushed limestone was produced by Hamilton Lime Co., Central Stone Co., and Ullmer Wilkerson for concrete aggregate, roadstone, and agricultural purposes. The Missouri State Highway Department and Monroe County Highway Department contracted for paving gravel.

Montgomery.—The county ranked fourth in the State in the value of clays produced. Fire clay was mined from local pits for refractories by A. B. Carter, Wellsville Fire Brick Co., General Refractories Co., and A. P. Green Fire Brick Co. McClain Lime Quarry and Danville Stone Co. produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Two Rivers Sand & Gravel Co. and the Missouri State Highway Department obtained building and paving sand and gravel.

Morgan.—The Missouri State Highway Department contracted for paving gravel. Limestone was quarried and crushed for soil conditioning by Harold Campbell at the Morgan County Lime Crusher.

Newton.—The county ranked fifth in the State in lime production. Quick and hydrated limes were produced near Neosho by Southwest Lime Co. from locally quarried limestone; a small quantity was sold for agstone. The Missouri State Highway Department produced crushed limestone for concrete aggregate and roadstone. Independent Gravel Co. produced miscellaneous stone. Ores containing zinc were mined by the A. B. J. Mining & Development Co. Tripoli for use in polishing and buffing compounds was processed at a plant near Seneca. The raw tripoli was shipped from Ottawa County, Okla.

Nodaway.—Earl Wilson Sand Co. dredged sand and gravel for building and other uses.

Oregon.—Miller & Reynolds, Ozark Mining Corp., Kilkenney Limestone Co., and A. T. Utley mined brown iron ore from open-pit mines. Limestone was quarried and crushed for concrete aggregate, roadstone, and agricultural purposes by O. O. Mainprize. The Missouri State Highway Department obtained paving gravel.

Osage.—Osage County ranked fifth in the State in the value of clay production. Fire clay was mined by Mexico Refractories Co., Harbison-Walker Refractories Co., A. P. Green Fire Brick Co., and Russell Phillips for manufacturing refractories. The Missouri State Highway Department contracted for paving sand. Osage County Highway Department obtained paving gravel.

Ozark.—Carter & Hamilton mined brown iron ore from deposits in Ozark County. Paving gravel was obtained by the Missouri State Highway Department and the Ozark County Highway Department.

Pemiscot.—Taylor Sand & Gravel Co. and Caruthersville Sand & Gravel Co. recovered building and paving sand and gravel.

Perry.—Crushed limestone for concrete aggregate, roadstone, and agricultural purposes and gravel for paving were produced by Gibbar Bros.

Pettis.—Howard Construction Co. quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes.

Phelps.—A. P. Green Fire Brick Co., Dillon Bros., and Robinson Clay Products Co. mined fire clay for refractories. Limestone was

quarried and crushed for concrete aggregate, roadstone, and agricultural purposes. Producers included Bray Construction Co., Jessie Nivens, and Brown, Lenox & Schafer. The Missouri State Highway Department contracted for paving gravel.

Pike.—Crushed limestone for concrete aggregate, roadstone, and agricultural purposes was produced by Magnesium Mining Co., Ashley Quarries, Inc., and Galloway Limestone Co. The Missouri State Highway Department contracted for paving gravel. Hercules Powder Co. operated its atmospheric nitrogen (anhydrous ammonia) plant at Louisiana.

Platte.—Carter-Waters Corp. mined miscellaneous clay for use in lightweight aggregates. The United States Army Corps of Engineers used broken and crushed limestone for stabilizing the banks of the Missouri River. Mid West Precote Co. and Everett Quarries, Inc., produced limestone for concrete aggregate and roadstone.

Polk.—H. F. Butcher obtained gravel from deposits near Humansville for building and paving. The Missouri State Highway Department contracted for paving gravel.

Pulaski.—Sand and gravel was obtained from local deposits by J. H. Walser Construction Co. near Waynesville and by the Missouri State Highway Department for building and paving.

Putnam.—Coal was mined underground by Clark Coal Co. and Hays Coal Co.; coal was strip-mined by Kirkville Coal Co. and Husted Bros. Coal Co.

Ralls.—Ralls County ranked second in the value of cement and sixth in total mineral production. Both portland and masonry cements were manufactured by Universal Atlas Cement Co. at its plant near Ilasco. Limestone and shale for cement were obtained near the plant. Central Stone Co. quarried and crushed limestone for concrete aggregate, roadstone, railroad ballast, and agricultural purposes. Paving gravel was mined by Edward B. Cooper. Maple Valley Coal Co. strip-mined coal.

Randolph.—The county ranked fourth in the State in coal production. Coal was mined underground by Moberly Fuel Co., D. L. Bradley Coal Co., Inc., Fateley Coal Co., and Nejedly Coal Co. Peabody Coal Co. operated a strip coal mine. N. J. Cooksey Co., Glasgow Quarries, Inc., Ralph Potter Quarry Co., and Alfred Vanskike Lime Quarry produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes.

Ray.—Limestone was quarried and crushed near Richmond by Steva Stone Co. and near Orrick by Orrick Stone for concrete aggregate, roadstone, and agricultural purposes. The United States Army Corps of Engineers produced limestone riprap.

Reynolds.—Penzel Construction Co. obtained paving gravel.

St. Charles.—St. Charles County ranked third in sand and gravel production value in Missouri in 1956. Tavern Rock Sand Co. obtained glass, molding, and other sands from local deposits. Paving gravel was produced by the Missouri State Highway Department and the St. Charles County Highway Department. St. Charles Quarry Co., O'Fallon Quarry, Joerling Bros., and Schiermeier Limestone Quarry produced crushed limestone, mainly for concrete aggregate, roadstone, riprap, and agricultural purposes. The United States Army Corps of

Engineers produced limestone for riprap. The O'Fallon Quarry produced undressed dimension limestone for rubble.

St. Clair.—The county ranked fifth in the State in coal production in 1956. Coal was recovered from strip mines by Pioneer Mining Corp. and Coones Coal Co. Limestone was quarried and crushed for concrete aggregate, roadstone, and agricultural purposes by Hunt Limestone Co. and Alvis Limestone Concrete Co. Joe Brinkman, Herman Schneider, and the Missouri State Highway Department obtained paving and building gravels.

St. Francois.—St. Francois County led Missouri in the value of total minerals produced and in lead, iron ore, silver, zinc; it ranked second in copper, stone, and lime production value. At Iron Mountain, Ozark Ore Co. mined hematite iron ore, which was shipped to steel furnaces. St. Joseph Lead Co. mined and milled lead ore (yielding zinc, copper, and silver as byproducts). Chats from lead and iron mining were used for concrete aggregate, roadstone, and railroad ballast. Valley Dolomite Corp. produced crushed dolomite for use as flux, as refractory material, and as a soil conditioner. The company also produced dead burned dolomite for building, refractory, chemical, and other industrial uses. St. Joseph Lead Co. quarried and crushed dolomite for agricultural and fluxing purposes. The Missouri State Highway Department contracted for paving gravel.

Ste. Genevieve.—The county was the leading lime producer, ranked third in the State in total value of mineral production, and ranked fifth in value of stone produced. Limestone was quarried and crushed by Mississippi Lime Co. of Missouri for quick and hydrated lime at its plant near Ste. Genevieve. Lime was used for chemical, industrial, and building purposes. The company sold limestone for glass, whiting, asphalt filler, coal-mine rock dust, poultry grit, concrete, riprap, and various purposes. Crushed and dimension limestone was produced by Ste. Genevieve Building Stone Co. and Ste. Genevieve Marble Co. and Weiler Marble Co., Inc., quarried dimension marble for use as undressed rough building stone. Bauman Bros. obtained sand and gravel for building and paving purposes.

St. Louis.—St. Louis County led in cement and sand and gravel production value, ranked second in total mineral production value, and was third in value of stone output. Crushed and dimension limestone was produced from quarries near Leman, Maplewood, and Clayton. Crushed stone was used for cement, roadstone, riprap, and agricultural purposes. Dimension stone was employed for curbing, flagging, and rough architectural uses. West Lake Quarry & Material Co. and Riverview Stone & Material Co. produced crushed and dimension limestone. Crushed limestone was also supplied by Vigus Quarries, Inc., Rock Hill Quarries Co., Des Peres Quarry, Bussen Quarries, Inc., F. Ruprecht & Sons, Fred Weber, and Orth Bros. Quarry. Portland and masonry cement were manufactured near Lemay by Alpha Portland Cement Co. and near Prospect Hill by Missouri Portland Cement Co. Glass, molding, grinding, and polishing sands were obtained from local deposits and sand and gravel for building and paving uses. Leading producers, in terms of value, were: Winter Bros. Materials Co., Inc., Missouri Aggregates, Inc., Dennis Materials Co., Pioneer Silica Products Co., and St. Charles Sand Co.

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Shale and plastic fire clay for heavy clay products and refractory brick were mined by Alton Brick Co., Hydraulic Press Brick Co., Thomas Mining Corp., Laclede-Christy Co., Evens & Howard Sewer Pipe Co., and Guth & Sons. Petroleum was produced.

Saline.—The United States Army Corps of Engineers operated five limestone quarries in Saline County in 1956. The stone was used to riprap the banks of the Missouri River. Duderstadt Construction Co. and Howard Construction Co. produced crushed limestone for concrete aggregate, roadstone, and agricultural purposes and as a fertilizer filler.

Scott.—Sikeston Concrete Products Co., Inc., and Penzel Construction Co. obtained building sand and paving gravel, respectively.

Shannon.—Brown iron ore was mined by Ozark Mining Corp. at its open-pit mine in Shannon County. Crider Bros. quarried and crushed limestone for use as a soil conditioner. Ozark Stone Products, Inc., and Salem Stone Co. quarried dimension sandstone for rough architectural uses. Paving gravel was obtained by the Missouri State Highway Department.

Shelby.—Central Stone Co. and Turner Lime & Rock Quarry quarried limestone for concrete aggregate, roadstone, and agricultural uses.

Stoddard.—Building and paving sand and gravel were obtained by Brown Sand & Gravel Co., Hill & Stuart, Inc., and the Missouri State Highway Department.

Stone.—United States Army Corps of Engineers and the Missouri State Highway Department produced paving sand and gravel. Limestone was quarried and crushed for riprap by the United States Army Corps of Engineers.

Sullivan.—Limestone was quarried and crushed by Partin Lime & Rock Co., Howard Construction Co., and the Missouri State Highway Department for concrete aggregate, roadstone, and agricultural uses.

Taney.—Taney County ranked fourth in the State in the value of sand and gravel production in 1956. Sand and gravel was produced by the United States Army Corps of Engineers and the Missouri State Highway Department for use in road construction.

Texas.—Limestone was quarried and crushed by Long Bros. for soil conditioner. The Missouri State Highway Department obtained paving gravel.

Vernon.—Coal was strip-mined in Vernon County in 1956 by M. L. Schooley Coal & Construction Co., Ellis Coal Co., Thornhill Coal Co., and K & M Coal Co. Blue Mound Township Clerk produced paving gravel for road maintenance. Crushed limestone for concrete aggregate and roadstone was produced by R. E. Jones and Alvis Limestone & Concrete Co.

Warren.—The county ranked sixth in the State in value of clay production. Harbison-Walker Refractories Co., Walsh Refractories Corp., and Acme Mining Co. mined fire clay for refractories. Limestone for riprap, concrete aggregate, roadstone, and agricultural uses was quarried by Sprick Quarry and the United States Army Corps of Engineers.

Washington.—The county was the State's leading barite producer and ranked fifth in total mineral production value. Barite production was reported by 16 companies. Leading producers included Superbar Co., Baroid Division of National Lead Co., Magnet Cove Barium Corp., Mobar Corp., De Soto Mining Co., H & P Mining Co., and Midwest Mining Co. Lead ore, containing small quantities of zinc, was mined and milled by St. Joseph Lead Co. at its Indian Creek plant. Quantities of galena were recovered in mining and washing barite. Building sand and gravel was obtained by A. M. Mount. The Missouri State Highway Department contracted for paving gravel.

Wayne.—Williamsville Stone Co. quarried dimension sandstone for use as rubble and flagging. Limestone was quarried and crushed by Wm. Harris & Son Lime Quarry for use as agstone and by the Missouri State Highway Department for concrete aggregate and roadstone. Keener Gravel Co., Inc., obtained paving and building sand and gravel and railroad-ballast gravel. Brown iron ore was mined by Wayne County Mining Co.

Webster.—The Missouri State Highway Department contracted for paving gravel.

Worth.—Grand River Limestone Co. quarried and crushed limestone in Worth County for concrete aggregate, roadstone, and agricultural uses.

Wright.—Limestone was quarried and crushed for soil conditioner by Thomson Lime Co.

The Mineral Industry of Montana

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Montana Bureau of Mines and Geology.

By Kenneth D. Baber,[1] Frank B. Fulkerson,[1] Norman S. Petersen,[1] and Albert J. Kauffman, Jr.[2]

RECORD production of petroleum and a new postwar high in copper output were the most important developments in the mineral industry of Montana in 1956.

The total value of mineral production ($214 million), continuing the rapid increase begun in 1955, advanced more than one-fourth and exceeded $200 million for the first time in State history. Copper and petroleum, which together supplied 65 percent of the State value, were responsible for the bulk of the $47 million increase. Net gain in production of mineral products other than copper and petroleum was $5 million.

Several commodities advanced significantly in output, including gold, fluorspar, lead, phosphate rock, silver, zinc, and cement. Production volume of sand and gravel was down and stone declined slightly but the values for these commodities increased substantially. Coal, manganese, and vermiculite declined in both quantity and value.

Metals accounted for 62 percent of the State total value; mineral fuels, 28 percent; and nonmetals, 10 percent. Compared with the 1955 totals for these groups, increases in value were: Metals, 23 percent; fuels, 50 percent; and nonmetals, 10 percent. A total of 31 mineral commodities was produced, and the first recovery of sulfur from refinery gases in the State was recorded.

Trends and Markets.—The market for copper—the State's principal mineral commodity—was featured by a high demand early in the year, followed by a decline in the market, accompanied by falling prices. The prices of electrolytic-refined copper, which had risen from 30 cents in January 1955 to 46 cents in early 1956, was cut to 40 cents in July and reduced further to 36 cents in October. Strikes at United States and foreign operations in 1955 were a major factor in the price increase of copper in that year, and the decrease in price in 1956 was caused by greater supplies of the metal from United States and foreign mines. Lead-zinc ore mining in Montana gained, owing to a slight price increase and settlement of a strike at one

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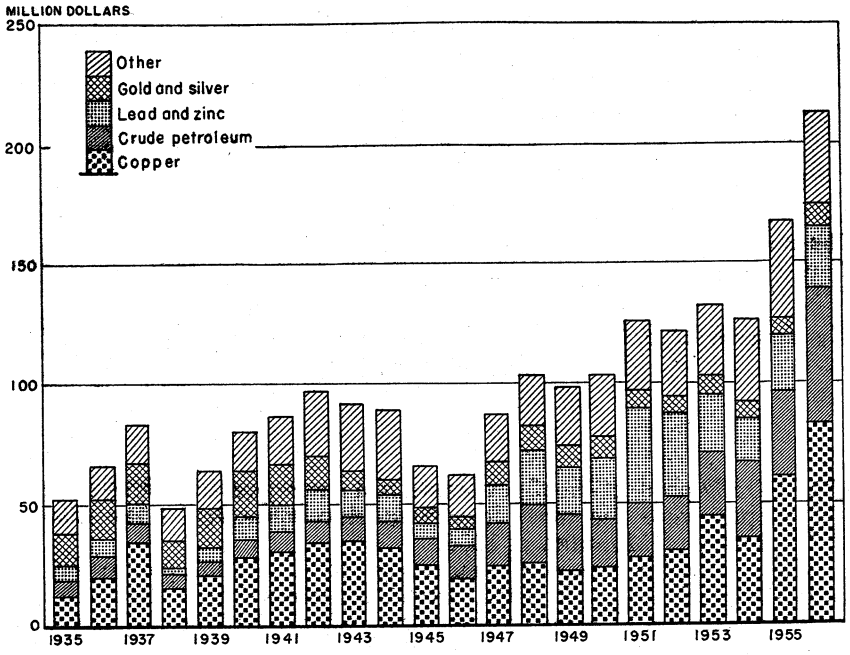

FIGURE 1.—Value of copper, crude petroleum, lead, zinc, gold, and silver, and total value of mineral production in Montana, 1935–56.

mine. Average prices for lead and zinc were up approximately 6 and 10 percent compared with 1955. The price of lead was stabilized at 16 cents after a drop of ½ cent per pound in January. The price of zinc increased ½ cent per pound to 13½ cents in the same month and remained at this figure for the remainder of the year. The demand for lead remained strong in 1956; but the market for zinc

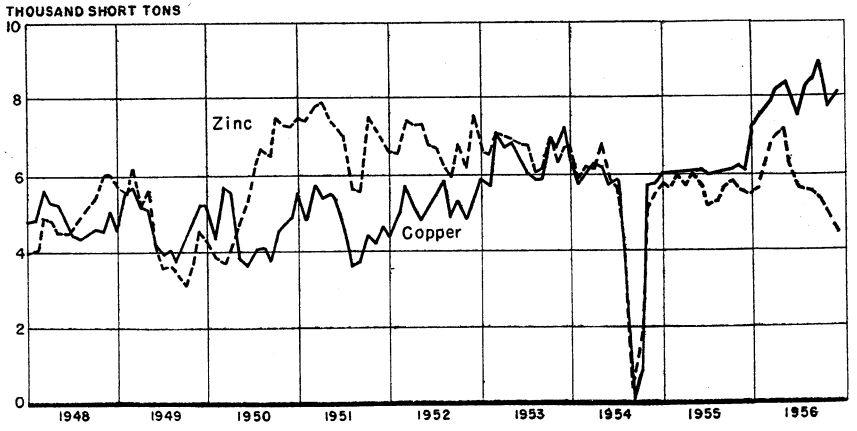

FIGURE 2.—Mine production of copper and zinc in Montana, 1948–56, by months, in terms of recoverable metals.

TABLE 1.—Mineral production in Montana, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Chromium—gross weight	118,703	$3,718,882	118,780	$3,806,926
Clays	(2)	(2)	33,074	31,095
Coal: Bituminous and lignite	1,247,253	3,781,879	846,134	3,468,000
Copper (recoverable content of ores, etc.)	81,542	60,830,332	96,426	81,962,100
Fluorspar	25,223	(2)	59,775	(2)
Gold (recoverable content of ores, etc.)—troy ounces	28,123	984,305	38,121	1,334,235
Iron ore (usable)—long tons, gross weight	6,631	(2)	11,643	(2)
Lead (recoverable content of ores, etc.)	17,028	5,074,344	18,642	5,853,588
Manganese ore and concentrate (35 percent or more Mn)—gross weight	106,026	(2)	80,553	(2)
Manganiferous ore and concentrate (5 to 35 percent Mn) [3]—gross weight	6,341	(2)	4,752	(2)
Mica, sheet—pounds			56	525
Natural gas—million cubic feet	28,255	1,724,000	25,847	1,758,000
Petroleum (crude)—thousand 42-gallon barrels	15,654	35,380,000	21,760	56,141,000
Phosphate rock—long tons	(2)	(2)	557,479	3,956,673
Sand and gravel	13,771,609	6,615,326	10,024,370	7,173,810
Silver (recoverable content of ores, etc.)—troy ounces	6,080,390	5,503,060	7,385,908	6,684,620
Stone	1,273,600	1,199,619	1,247,385	1,815,648
Tungsten ore and concentrate (60-percent WO_3 basis)	1,211	(2)	1,230	(2)
Zinc (recoverable content of ores, etc.)	68,588	16,872,648	70,520	19,322,480
Value of items that cannot be disclosed: Barite, cement, gem stones, gypsum, lime, natural-gas liquids, pumice, pyrites, sulfur (1956), talc, vermiculite, and values indicated by footnote 2		25,637,201		21,325,443
Total, Montana [4]		166,993,000		213,728,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originated in Montana cannot be credited owing to lack of information (see last paragraph of introduction).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Production figures on manganiferous ores (less than 35 percent Mn) mined and shipped to Government stockpile depots not included in State totals (see text; section on manganese).
[4] Total has been adjusted to eliminate duplicating the value of stone.

weakened in midyear, and continued Government purchases for the national stockpile were instrumental in preventing a price decline.

At Butte a multi-million-dollar development program known as the Northwest project was just getting under way in 1956. Two new shafts—Ryan and Missoula—were to be sunk to enable development of huge copper and lead-zinc low-grade ore bodies in a previously undeveloped portion of Butte Hill, as well as to provide a more efficient method for handling the high-grade ore from the original mines at Butte. In addition, $7 million was assigned for purchase of equipment for the new Berkeley open-pit copper mine and $9 million for purchase of railroad rolling stock and enlargement of the metallurgical works at Anaconda. Expansion of Butte mining indicated a need for more than 1,000 additional miners by 1960.

The aluminum plant at Columbia Falls completed its first full year of operation. Operations at the plant were begun in August 1955. A large-scale mining enterprise was established at phosphate deposits in Beaverhead County on the Montana-Idaho line.

Production and exploration for crude oil increased. Record production of crude oil was reported, owing largely to an increase in volume from the Williston Basin. Output was stimulated by completion in 1955 of the Butte Pipeline from eastern Montana to Wyo-

ming to tie in with lines to the Midwest. Exports of crude oil more than doubled in 1956. Production by Montana refineries also increased owing to greater capacity. Construction continued at Sidney on an $8 million steam-electric plant, which was to use lignite as fuel.

The sharp decline in sand and gravel output and the small decrease in stone production resulted from completion of the Bureau of Reclamation Tiber Dam, which used huge tonnages of bank-run sand and gravel and broken stone as fill material. However, production of prepared sand and gravel and crushed stone, as well as cement output, was up in 1956, due primarily to expanded highway construction. Other heavy-construction projects that used large quantities of construction materials were the new airbase at Glasgow, expansion of airbase facilities at Great Falls, and the Sidney steam-electric plant. Initial construction was begun by electric-utility companies on the $85 million Noxon Rapids Dam on the Clark Fork River near Thompson Falls in northwestern Montana and the smaller Cochrane Dam on the Missouri River at Great Falls. These projects were expected to maintain cement production in Montana at capacity and increase the production of mineral aggregate for concrete.

Employment by construction contractors averaged 11,700 compared with 10,400 in 1955. In common with most States, residential building dropped in Montana, but commercial and industrial construction increased at the larger cities in the State. Value of construction authorized by building-permit issuing agencies in the State totaled $41.5 million, a 0.5-percent decrease. Sand and gravel, crushed stone, and other aggregate needed above normal requirements in 1957–59 for the new highway system in Montana were estimated by the National Crushed Stone Association as follows: 1957, 11,863,000 tons; 1958, 12,919,000 tons; and 1959, 14,280,000 tons.[3]

Employment and Earnings.—Average monthly employment in mining increased from 12,000 to 12,400, according to the Montana State Employment Service. Most of the gain was in metal mining, the State's largest nonagricultural industry. In mineral manufacturing the number of workers at primary metals plants increased from 4,300 to 4,600, while employment in petroleum refining was unchanged.

Average weekly earnings in metal mining and primary metals reached a record between January and October as the result of higher basic hourly rates, as well as a 6-day workweek in these industries; however, in late 1956 a 5-day week again prevailed in both industries. Average weekly earnings in primary metals were 8 percent above the average for all State manufacturing industries, while average weekly earnings in metal mining were slightly higher than in all mining.

Annual employment and payrolls in the mining undustry for the fiscal year 1956 (July 1, 1955–June 30, 1956) were published by the Unemployment Compensation Commission of Montana. The figures include extraction of fuels as well as metal and nonmetal mining and quarrying. A sharp increase was registered over the fiscal 1955 strike-reduced totals, with the number of wage earners gaining 14 percent, payrolls increasing 33 percent, and the wage level (average earnings per full-time equivalent employee) advancing 17 percent.

[3] Rock Products, vol. 60, No. 1, January 1957, pp. 78–79.

TABLE 2.—Employment in mining, primary metals, and petroleum refining, 1947–51 (average) and 1952–56 [1]

	Total mining	Metal mining	Nonmetallic, including coal	Petroleum and natural gas	Processing	
					Primary metals	Petroleum refining
1947–51 (average)	10,100	7,400	1,400	1,300	4,100	(2)
1952	11,400	8,200	1,100	2,100	3,600	(2)
1953	11,600	8,200	1,000	2,400	3,600	1,200
1954	10,700	7,400	900	2,400	3,300	1,200
1955	12,000	8,400	900	2,700	4,300	1,200
1956:						
January	12,400	8,900	900	2,600	4,500	1,200
February	12,100	8,800	900	2,400	4,600	1,100
March	12,100	8,800	800	2,500	4,500	1,200
April	12,300	8,800	800	2,700	4,500	1,200
May	12,200	8,600	800	2,800	4,500	1,200
June	12,500	8,600	900	3,000	4,600	1,200
July	12,100	8,300	900	2,900	4,700	1,200
August	12,500	8,700	900	2,900	4,800	1,200
September	12,800	8,800	1,000	3,000	4,800	1,200
October	12,200	8,600	1,000	2,600	4,700	1,300
November	12,500	8,700	1,000	2,800	4,800	1,200
December	12,800	9,000	900	2,900	5,000	1,200
Year (average)	12,400	8,700	900	2,800	4,600	1,200

[1] Montana State Employment Service. Estimates in this series, which was begun in 1947, are published monthly in the Montana Labor Market and revised annually on the basis of more complete data. Data include all full- and part-time wage and salary workers who worked or received pay during the pay period ending the 15th of the month. Excludes proprietors and self-employed.
[2] Figures not published before 1953.

The number of employers remained about the same as in the previous year. Comparing the 1956 totals with those for 1950, the number of wage earners, payrolls, and the wage level increased 29, 107, and 61 percent, respectively.

Mining consistently held top position among the State's industries in average wages in the last decade except in 1950, when average earnings in the construction industry were higher. The average number of wage earners and wages in mining in leading counties were as follows in fiscal 1956: Silver Bow, 6,815 and $37.7 million; Yellowstone, 897 and $5.3 million; Deer Lodge, 988 and $5.4 million; Glacier, 451 and $2.2 million; and Stillwater, 331 and $1.9 million.

TABLE 3.—Average weekly earnings, weekly hours, and hourly earnings of workers in selected industries, 1950–56 [1]

	1950	1951	1952	1953	1954	1955	1956
Average weekly earnings:							
Manufacturing	$64.58	$72.13	$79.46	$79.76	$79.20	$85.66	$91.30
Primary metals	60.87	75.75	83.99	87.64	75.69	84.95	98.89
Mining	67.27	79.84	85.74	90.81	81.93	91.63	102.77
Metal mining	64.98	78.37	85.27	91.23	77.43	90.77	103.41
Average weekly hours:							
Manufacturing	40.1	41.2	41.0	41.4	39.9	41.3	41.3
Primary metals	40.4	45.0	45.4	45.1	39.4	41.5	44.1
Mining	39.1	42.3	41.4	41.6	38.1	40.3	41.7
Metal mining	38.9	42.6	41.9	42.6	37.1	40.3	42.2
Average hourly earnings:							
Manufacturing	$1.61	$1.75	$1.86	$1.93	$1.99	$2.08	$2.21
Primary metals	1.51	1.68	1.85	1.95	1.92	2.05	2.24
Mining	1.72	1.89	2.07	2.18	2.15	2.28	2.47
Metal mining	1.67	1.84	2.03	2.14	2.09	2.25	2.45

[1] Montana State Employment Service. Estimates in this series, which was begun in 1950, are published monthly in the Montana Labor Market and revised annually on the basis of more complete data. Hours and earnings data exclude administrative and salaried personnel. Average weekly and hourly earnings include overtime and other premium pay, not to be confused with rate of pay.

TABLE 4.—Employers, wage earners, and wages in mining, fiscal years 1950–56 [1]

Fiscal year	Average number of employers	Average number of wage earners	Wages	Average wage level
1950	463	9,483	$31,502,931	$3,322
1951	458	10,561	41,470,947	3,927
1952	474	10,562	46,941,121	4,444
1953	517	11,406	53,308,193	4,674
1954	528	11,635	54,105,365	4,650
1955	524	10,710	49,036,402	4,578
1956	528	12,193	65,154,932	5,344

[1] Unemployment Compensation Commission of Montana. Data on a fiscal year basis are published annually in the Montana Labor Market in a report that deals only with industries and employment covered under unemployment insurance laws of Montana. All mining establishments are subject to the State system of unemployment insurance.

TABLE 5.—Defense Minerals Exploration Administration contracts active during 1956

County and contractor	Property	Commodity	Contract		
			Date	Total amount	Government participation, percent
BROADWATER					
Hogan and Pohl	Silver Saddle	Lead	June 6, 1955	$16,460	50
Pohl and Hogan, et al	January	Lead, zinc, copper.	Jan. 28, 1952	36,449	50
CASCADE					
Boss Mines, Inc	Boss & Atlantus	Lead, zinc	Sept. 18, 1956	57,208	50
DEER LODGE					
Tip Top Mining Co	Tip Top	Tungsten	Aug. 28, 1956	16,540	75
FALLON					
Burmac Exploration Corp	Cox Lease	Uranium	July 5, 1956	15,512	75
GALLATIN					
Daniel T. Barham, et al	Thumper Lode	Mica	Sept. 15, 1955	14,000	75
GRANITE					
American Machine & Metals, Inc.	Mullen	Manganese	Dec. 15, 1953	89,460	75
Peter Antonioli	Scratch All	Manganese, lead, zinc.	July 28, 1954	128,320	62½
Jennie M. Moore	Mystery Manganese.	Manganese	Apr. 12, 1955	55,620	75
Taylor-Knapp Co	True Fissure & Durango.	do	Feb. 1, 1954	648,727	75
JEFFERSON					
George Hoffman	White Pine	Uranium	May 18, 1955	26,025	75
SILVER BOW					
Umont Mining, Inc. (assignee of Irving & Nelson).	Plutus & Norwich.	Manganese	Sept. 19, 1956	106,010	75

Defense Minerals Exploration Administration Program.—Projects of the Defense Minerals Exploration Administration (DMEA) program to assist in the systematic investigation of strategic and critical mineral occurrences were active as follows: 4 manganese, 2 uranium,

and 1 each for lead, lead-zinc, lead-zinc-copper, manganese-lead-zinc, mica, and tungsten.

In addition to the mineral values credited to Montana, some were omitted owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, selenium, tellurium, gallium, and germanium. The quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues obtained from refining such metals as copper and lead and those obtained in other ways. It is not possible in many instances to allocate the mineral products by State or origin; sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value, the production of which usually cannot be separated as to source, is byproduct sulfuric acid.

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—Activity in Montana in connection with the new aluminum industry was carried out by The Anaconda Co. and subsidiaries at Columbia Falls, Great Falls, and Anaconda. The aluminum-reduction plant of Anaconda Aluminum Co. at Columbia Falls completed its first full operating year, and production (61,512 tons) exceeded the rated capacity of 60,000 tons of metal annually. The Anaconda Co. annual report also stated that metal quality and other operating results fully met all expectations. A long-term contract was completed with Kaiser Aluminum & Chemical Corp. to obtain alumina from Kaiser's alumina plant at Gramercy, La., after expiration of a supply agreement with Reynolds Metals Co. Anaconda Aluminum Co. was to advance $17 million to provide part of the cost of expanding the Louisiana plant. This advance was to be liquidated through credits on alumina purchased by Anaconda. The contract, which was to run a minimum of 12 years and a maximum of 15 years, assured a supply of alumina for the Columbia Falls smelter for an extended period.

Production of aluminum in the Pacific Northwest reached a record high in 1956 owing to activation of the Columbia Falls plant as well as to expansion of established plants. Washington, supplying the bulk of the output, produced 486,000 tons of aluminum at 5 reduction works. Oregon had one plant in operation and another under construction.

Anaconda Wire & Cable Co. operated its new semiautomatic aluminum-rod rolling mill at Great Falls throughout 1956. The plant supplied the requirements of all company plants for aluminum rod.

At the Anaconda Reduction Works, a test plant was set up and successfully recovered refined alumina from Idaho clays. A pilot plant, with a capacity of 50 tons of clay per day, was under construction at a cost of $1 million to obtain data on the operating costs, methods, and equipment necessary to produce alumina from clay on a commercial basis. Reports indicated that successful results might

lead to the establishment of a $10 million aluminum oxide plant at Moscow, Idaho, to process clay from the huge deposits in that area. The process was to involve calcination with natural gas (which became available in 1956 through completion of a pipeline), leaching, and high-pressure filtration. The project would lead to reduction of costly long-haul transportation charges for the Columbia Falls smelter as well as provide The Anaconda Co. and affiliated firms with a completely integrated operation of mining, processing, and fabricating.

Chromite.—Production of chromite concentrate by the American Chrome Co. at the Mouat mine (Stillwater County) totaled 114,021 short dry tons (estimated gross weight, 118,780 short tons). Total quantity delivered to the General Services Administration (GSA) at the end of 1956 was 372,289 tons, leaving a balance of 527,711 tons to be delivered through 1961. Renegotiation of the company contract with the Government resulted in establishing a price of $33.32 per ton for the first 9 months of 1956, after which the price was advanced to $33.60 through escalation provisions of the contract to cover, in part, increased costs at the mine. The annual report of the American Chrome Co. disclosed that the increased prices in 1956, combined with improved operating efficiency, resulted in earnings of $344,246 at the Mouat mine compared with $110,819 for 1955. It was planned to continue production in 1957 at approximately the same rate as in 1956. The company, continuing a research and development program, was completing studies that might lead to establishing a ferrochromium-smelting operation at the mine site.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total 1862–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	243	38	3,258,033	59,641	$2,087,435	6,513,689	$5,895,154
1952	164	9	4,625,750	24,161	845,635	6,138,185	5,555,367
1953	142	7	6,101,348	24,768	866,880	6,689,556	6,054,386
1954	113	11	5,104,288	23,660	828,100	5,177,942	4,686,299
1955	100	12	7,259,917	28,123	984,305	6,080,390	5,503,060
1956	152	7	9,535,789	38,121	1,334,235	7,385,908	6,684,620
1862–1956	----------	----------	[3]	17,489,159	396,573,777	813,190,250	605,035,553

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	56,929	$24,470,291	18,687	$5,916,812	62,440	$18,115,013	$56,484,705
1952	61,948	29,982,832	21,279	6,851,838	82,185	27,285,420	70,521,092
1953	77,617	44,552,158	19,949	5,226,638	80,271	18,462,330	75,162,392
1954	59,349	35,015,910	14,820	4,060,680	60,952	13,165,632	57,756,621
1955	81,542	60,830,332	17,028	5,074,344	68,588	16,872,648	89,264,689
1956	96,426	81,962,100	18,642	5,853,588	70,520	19,322,480	115,157,023
1862–1956	7,239,882	2,276,495,460	880,152	133,915,784	2,537,002	475,106,416	3,887,126,990

[1] Includes recoverable metal content of gravel washed (placer operation), ore milled, old tailings re-treated, and ore, old slag, and copper precipitates shipped to smelters during calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

Litigation resulting from a Federal Government "declaration of taking" which involved the Mouat mine was resolved during the year with payment of $241,001 to M. W. Mouat and other owners. After Government seizure during World War II as a strategic mineral property, the mine was operated by The Anaconda Co. under a Government contract, and a $13 million mill was built. The operation later was abandoned with the easing of shipping hazards from enemy submarine activity that threatened chromite supply.

TABLE 7.—Gold produced at placer mines, 1947–51 (average) and 1952–56, by classes of mines and methods of recovery

Class and method	Mines producing [1]	Material treated (cubic yards)	Gold recovered		Average value per cubic yard
			Fine ounces	Value	
Surface placers:					
Gravel mechanically handled:					
Bucketline dredges:					
1947–51 (average)	2	2,531,138	9,277	$324,695	$0.128
1952					
1953					
1954					
1955	1	447,000	1,764	61,740	.138
1956	1	36,800	339	11,865	.322
Dragline dredges:					
1947–51 (average)	2	245,693	725	25,368	.103
1952	1	250	46	1,610	6.440
1953					
1954	2	82,500	1,394	48,790	.591
1955	4	123,000	1,443	50,505	.411
1956 [2]	2	219,150	1,025	35,875	.164
Nonfloating washing plants: [3]					
1947–51 (average)	7	279,069	1,440	50,414	.181
1952					
1953	3	42,500	1,216	42,560	1.001
1954	2	3,950	79	2,765	.700
1955	2	10,700	84	2,940	.275
1956					
Gravel hydraulically handled:					
1947–51 (average)	1	4,186	65	2,261	.540
1952	1	600	9	315	.525
1953					
1954					
1955	1	200	4	140	.700
1956	2	11,000	119	4,165	.379
Small-scale hand methods: [4]					
1947–51 (average)	25	7,632	124	4,333	.569
1952	7	2,500	23	805	.322
1953	4	400	7	245	.613
1954	6	1,350	53	1,855	1.374
1955	4	50	57	1,995	39.900
1956	2	437	13	455	1.041
Underground placers: Drift:					
1947–51 (average)	2	516	30	1,057	2.048
1952					
1953					
1954	1	200	3	105	.525
1955					
1956					
Grand total placers:					
1947–51 (average)	39	3,068,234	11,661	408,128	.133
1952	9	3,350	78	2,730	.815
1953	7	42,900	1,223	42,805	.998
1954	11	88,000	1,529	53,515	.608
1955	12	580,950	3,352	117,320	.202
1956	7	267,387	1,496	52,360	.196

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Includes dragline dredges and nonfloating washing plants for which production cannot be individually published.
[3] Includes all placer operations using power excavator and washing plant, both on dry land; and outfit with movable washing plant in termed a "dry-land dredge."
[4] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Montana.

Copper.—Copper production increased 18 percent above the 1955 total. The 1956 output of 96,000 tons of metal was the largest annual yield since the war year of 1944. Virtually all of the ore was mined at the Butte Hill operations of The Anaconda Co. in Silver Bow County. Minor contributions to the State total were reported by several smaller operations in other areas of Montana. The smaller operators produced almost entirely from lead and lead-zinc ores. U & W Uranium Co. reported development of the open-pit Royal copper mine in the Coloma district, Missoula County, after leasing the mine in midyear.

Operations were not interrupted by labor difficulties throughout 1956. The immediate future appeared assured in that respect when negotiations by The Anaconda Co. and the International Union of Mine, Mill & Smelter Workers agreed to a 3-year wage pact which could not be reopened during the contract period. Anaconda was the second major copper producer to reach an agreement with the Mine-Mill union.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Beaverhead	10		468	$16,380	24,992	$22,619
Broadwater	17	1	1,028	35,980	4,043	3,659
Cascade	4				26,815	24,269
Granite	6		478	16,730	413,380	374,130
Jefferson	30		2,824	98,840	86,657	78,429
Lewis and Clark	14		178	6,230	22,606	20,460
Madison	14		114	3,990	742	672
Mineral	5	3	1,092	38,220	756	684
Missoula	5		62	2,170	620	561
Powell	10	2	378	13,230	540	489
Sanders	2		26	910	14,117	12,777
Silver Bow	21		31,132	1,089,620	6,772,380	6,129,346
Undistributed [1]	14	1	341	11,935	18,260	16,525
Total	152	7	38,121	1,334,235	7,385,908	6,684,620

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Beaverhead	15	$12,750	540	$169,560	72	$19,728	$241,037
Broadwater	1	850	29	9,106	31	8,494	58,089
Cascade			24	7,536	25	6,850	38,655
Granite	33	28,050	554	173,956	2,046	560,604	1,153,470
Jefferson	23	19,550	374	117,436	127	34,798	349,053
Lewis and Clark	37	31,450	813	255,282	4,411	1,208,614	1,522,036
Madison			7	2,198	1	274	7,134
Mineral	1	850	6	1,884	1	274	41,912
Missoula	1	850	5	1,570			5,151
Powell			5	1,570	2	548	15,837
Sanders	16	13,600	1,258	395,012	419	114,806	537,105
Silver Bow	96,292	81,848,200	14,989	4,706,546	63,375	17,364,750	111,138,462
Undistributed [1]	7	5,950	38	11,932	10	2,740	49,082
Total	96,426	81,962,100	18,642	5,853,588	70,520	19,322,480	115,157,023

[1] Includes values and quantities that cannot be shown separately for Fergus, Flathead, Judith Basin, Lincoln, Meagher ,Park, Phillips, Ravalli ,and Sweet Grass Counties.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons	Zinc (short tons)
January	1,700	498,702	7,324	1,082	5,429
February	2,130	584,312	7,678	1,314	5,653
March	2,950	639,986	7,965	1,536	6,833
April	2,340	663,586	8,252	2,012	7,135
May	2,850	663,259	8,440	1,981	7,245
June	2,690	643,855	7,959	1,822	6,375
July	2,670	557,927	7,434	1,638	5,726
August	3,020	608,382	8,295	1,682	5,634
September	3,650	637,331	8,375	1,434	5,588
October	5,547	709,568	8,926	1,582	5,414
November	4,775	583,220	7,739	1,257	4,983
December	4,699	595,780	8,039	1,302	4,505
Total	38,121	7,385,908	96,426	18,642	70,520

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Ore:							
Dry gold	38	10,159	2,355	4,909	1,300	29,700	18,800
Dry gold-silver	16	16,245	852	77,116	17,500	581,400	159,500
Dry silver	20	152,955	3,982	785,880	13,317	60,000	96,600
Total	74	179,359	7,189	867,905	32,117	671,100	274,900
Copper	16	7,782,458	13,540	3,033,314	183,804,804	----------	----------
Copper-lead	1	4,900	970	5,168	15,400	33,700	4,000
Copper-lead-zinc	1	70	1	1,836	8,400	9,100	7,600
Lead	39	10,699	643	54,753	96,500	2,545,800	305,200
Lead-zinc	23	1,496,700	13,955	3,337,077	5,674,862	32,697,500	129,778,900
Zinc	4	11,033	150	83,904	48,700	407,200	1,872,100
Total	84	9,305,860	29,259	6,516,052	189,648,666	35,693,300	131,967,800
Other "lode" material:							
Dry gold:							
Mill cleanings	1	6	82	33	----------	----------	----------
Old tailings	1	6,300	91	2	----------	----------	----------
Copper: Precipitates	1	----------	----------	----------	3,170,017	----------	----------
Zinc:							
Old tailings	1	364	4	1,661	700	9,500	42,900
Old slag	2	43,900	----------	183	500	910,100	8,754,400
Total	6	50,570	177	1,879	3,171,217	919,600	8,797,300
Total "lode" material	152	9,535,789	36,625	7,385,836	192,852,000	37,284,000	141,040,000
Gravel (placer operation)	7	[2]	1,496	72	----------	----------	----------
Total, lode and placer	159	----------	38,121	7,385,908	192,852,000	37,284,000	141,040,000

[1] Detail will not necessarily add to total, because some mines produce more than 1 class of material.
[2] 267,387 cubic yards.

Increased supplies of copper in 1956 resulted in price reductions from 46 to 36 cents per pound by the major copper producers. Simultaneously with the last price drop of the year, The Anaconda Co. announced a 16-percent curtailment in production, effective October 29. The cutback was accomplished by eliminating overtime and holiday work.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by types of material processed and methods of recovery, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation	1,047	137			
Concentration, and smelting of concentrates: Ore	28,699	6,445,968	189,509,367	33,090,800	131,622,000
Total	29,746	6,446,105	189,509,367	33,090,800	131,622,000
Direct smelting:					
Ore	6,793	937,854	171,416	3,273,600	620,700
Mill cleanings	82	33			
Old tailings	4	1,661	700	9,500	42,900
Old slag		183	500	910,100	8,754,400
Copper precipitates			3,170,017		
Total	6,879	939,731	3,342,633	4,193,200	9,418,000
Placer	1,496	72			
Grand total	38,121	7,385,908	192,852,000	37,284,000	141,040,000

The long-term outlook for copper mining in the State continued to improve in 1956. The Anaconda Co. inaugurated a $36 million long-range development and expansion program. Projects already underway were the Berkeley pit and the Northwest project. Future developments planned included: (1) East project, an underground operation in the alluvial-covered valley between Butte Hill and the Continental Divide, and (2) Continental project, a second big open pit still farther east toward the Continental Divide that would be developed if metallurgical tests indicated that the ore could be treated with satisfactory recovery of copper.

The year was marked by the first substantial production of ore by open-pit mining at Butte. Shipments of ore from the new Berkeley pit increased from 3,000 tons per day in January to nearly 10,000 tons at the end of 1956. The ore was crushed first at the pit site. Waste was hauled by truck to an area north of the pit. Advance stripping of waste was slightly ahead of schedule. It was planned to install a system of belt conveyors to transport crushed ore to a nearby spur of the Butte, Anaconda & Pacific Railway for shipment to the Anaconda Reduction Works. Ore bins and shops were under construction at the pit site. Information on the project, as well as on other mining and metallurgical developments of the company, was contained in the Anaconda annual report for 1956. A full-scale operation at the Berkeley project was to be attained by mid 1957, at which time production was to be 17,500 tons of ore per day. Annual yield of copper was expected to be 65 million pounds.

The first work on the Northwest project was begun during 1956. Two new shafts—Ryan and Missoula—were to be sunk. These shafts were to provide expanded hoisting facilities to handle high-grade copper and zinc ores from the lower levels of mines in the northwest portion of the Butte district and provide means to develop large known reserves of lower grade copper and zinc-bearing deposits in outlying areas not readily available from existing shafts. Sinking of the Ryan shaft and construction of a spur line of the Butte, Anaconda & Pacific Railway were to be begun in 1957. The Missoula shaft

was planned as an auxiliary hoisting and service shaft to permit development in the northwestern part of the district. A shaft raised 182 feet from the Alice-Lexington tunnel was equipped with hoist. Actual sinking of the Missoula shaft below the tunnel level was to begin in 1957.

Also in connection with the Northwest project, haulage crosscuts were started from the 2,100 level of the Anselmo mine and the 3,400 level of the Mountain Con mine. First production through the Ryan shaft was scheduled for late 1959. Further development was to increase ore hoisting through the shaft to 7,500 tons of ore per day by 1961, and capacity later could be expanded to 15,000 tons per day.

Production from the Kelley mine (Greater Butte block-caving project) was approximately 15,000 tons of ore per day from the 600 and 1,300 levels. Haulage crosscuts on the 1,600 and 2,000 levels were being driven. Production from the Butte high-grade copper mines continued at the same rate as in 1955.

At the Anaconda Reduction Works improvement and expansion were continued to process the increased copper-ore output from Butte. The first of 3 new large grinding units, as well as an improved and expanded flotation system, was placed in operation at the copper mill, and the remaining 2 sections were to be installed in 1957. Milling capacity was to be increased from 28,000 to 43,000 tons per day through installation of these units. No addition in smelter capacity was to be required, because the improved flotation methods produced concentrate of higher grade. Infrared thawing units were installed at the East Anaconda tipple to improve ore dumping in freezing weather. At the Great Falls plant a 3-year program of remodeling and enlargement was begun to increase copper-refining capacity by one-third.

Gold.—For the second consecutive year, gold production increased significantly. Total putput of the precious metal rose 36 percent above the previous year, despite a decline in placer gold. The major gain in lode output was due largely to expanded operations at the Butte Hill mines of The Anaconda Co. A substantial shipment from the White Development Co. Golden Sunlight mine (Jefferson County) contributed to the increase. The last reported production from this mine was in 1950. Over three-quarters of the State total was derived from Silver Bow County.

Development was reported at several gold mines. Little Rockies Mining & Development Co. completed a 50-ton flotation plant at its property in the Little Rockies mining district (Phillips County). In the same area, Northern Mining & Milling Co. built a 75-ton flotation mill at the Hawkeye open-pit property and did considerable bulldozing. Basin Jib Mines, Ltd., completed shaft sinking at the Basin Jib mine in Jefferson County; previously the firm operated the mine by open-pit methods. Production was reported by Montana Mining & Milling Co. from its newly acquired Empire mine (Lewis and Clark County near Marysville), and in Lincoln County activity was reported at the Morning Glory mine after reorganization of the old Morning Glory Mining Co.

Gold recovered at placer mines totaled 1,496 ounces compared with 3,352 ounces in 1955. Production was reported from only seven mines. E. T. Vincent & Clay Lewis operated a dragline dredge in

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons)	Gold (lode and placer) (fine ounces)	Silver (lode and placer) (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
Beaverhead County:									
Argenta	5		4,331	463	13,541	20,600	1,053,200	131,400	$220,569
Bryant	1		70	1	1,836	8,400	9,100	7,600	7,737
Blue Wing, Medicine Lodge, and Polaris (Lost Cloud) [1]	4		157	4	9,615	1,000	17,700	5,000	12,731
Broadwater County:									
Backer and Beaver [1]	7	1	181	150	595		17,500	5,300	9,262
Cedar Plains	4		333	34	824	1,400	17,700	41,200	10,954
Park or Indian Creek	6		805	844	2,624	600	22,800	15,500	37,873
Cascade County: Barker and Montana [1]	4		709		26,815		48,000	50,000	38,655
Granite County:									
Boulder and South Boulder, Dunkleburg, and Red Lion [1]	3		209	40	134	2,000	2,900		2,827
Flint Creek	3		36,347	438	413,246	64,000	1,105,100	4,092,000	1,150,643
Jefferson County:									
Basin, Bigfoot and State Creek, Boulder, and Warm Springs Creek [1]	5		5,163	1,112	6,014	17,200	44,100	6,600	59,500
Cataract	7		597	156	4,677	13,000	20,700	38,300	23,715
Clancy and Lump Gulch	6		1,989	62	11,620	1,800	61,000	39,300	28,413
Colorado	6		14,243	510	59,862	12,800	557,700	146,500	185,098
Elkhorn	1		440	97	3,854	600	44,100	20,900	16,925
Whitehall	5		7,926	887	630	600	20,400	2,400	35,402
Lewis and Clark County:									
Bear Gulch	1		9	2	148		2,400	100	595
Canyon Ferry	1		2,457		1,611	2,000	385,900	25,600	66,401
Canyon Creek, Heddleston, and Lincoln [1]	4		2,364	62	19,116	71,000	322,300	63,300	108,919
Marysville	3		233	31	972		1,000	5,000	2,807
Rimini, Scratch Gravel, and York [1]	4		516	83	759	1,000	7,900	5,100	5,956
Smelter	1		43,809				906,500	8,722,900	1,337,358
Madison County:									
Alder Gulch, Rabbit, Rochester, and Sheridan [1]	7		203	84	610		13,600	1,800	5,873
McCarthy Mountain	1		11	1	3		200		69
Pony and South Boulder	1		14	15	13				537
Silver Star, Tidal Wave (Twin Bridges), and Washington [1]	5		32	14	116		200	200	655
Mineral County:									
Cedar Creek and Cedar and Trout Creek [1]	2	3	6,306	1,091	19				38,202
Iron Mountain and Saltese [1]	3		152	1	737	2,000	12,000	2,000	3,710
Missoula County:									
Caloma	1		17		1	1,600			681
Nine Mile	1		6	54	1				1,891
Clinton, Copper Cliff, and Wallace [1]	3		67	8	618	400	10,000		2,579

Powell County:									
Big Blackfoot	1		12	15	2				527
Elliston and Pioneer [1]	4	2	7	354	69		400		12,516
Nigger Hill	5		334	9	469		9,600	4,000	2,794
Sanders County:									
Eagle	1		7,620	25	12,344	31,600	2,414,300	796,400	513,629
Prospect Creek (Burns)	1		1,009	1	1,773	400	101,700	41,600	23,476
Silver Bow County: Summit Valley	21		9,394,981	31,132	6,772,380	192,584,000	29,978,000	126,750,000	111,138,462
Undistributed [2]	14	1	2,130	341	18,260	14,000	76,000	20,000	49,082
Total Montana	152	7	9,535,789	[3] 38,121	[4] 7,385,908	192,852,000	37,284,000	141,040,000	115,157,023

[1] Combined to avoid disclosing company confidential data.

[2] Includes values and quantities that cannot be shown separately for Warm Springs district, Fergus County; Hog Heaven district, Flathead County; Barker and Yoge districts, Judith Basin County; Libby district, Lincoln County; Castle Mountain district, Meagher County; New World district, Park County; Little Rockies district, Phillips County; Mineral Point and Overwich districts, Ravalli County; and Independence district, Sweet Grass County.

[3] Source of gold: 36.625 ounces from lode mines; 1,496 ounces from placers.

[4] Source of silver: 7,385,836 ounces from lode mines; 72 ounces from placers.

Cedar and Trout Creek district (Mineral County). Another principal producer was Montana Gold & Chemical Co. This firm operated the Reservoir placer, 4 miles south of Gold Creek (Powell County), during September, October, and part of November. A Yuba bucketline dredge, a bulldozer, and 8 hydraulic giants made up the equipment; 340 ounces of gold was recovered.

Iron Ore.—Ralls & Harris Bros. continued to operate the Iron Cross open-pit mine 3 miles north of Radersburg (Broadwater County), with production from an outcrop of magnetic iron ore; all output was shipped to a cement plant for use in manufacturing special cements. Discovery of a huge deposit of iron ore in the Dillon area (Beaverhead County) by Minerals Engineering Co. was reported. Drilling of the ore body, which was found on Carter Creek 12 miles southeast of Dillon, indicated 42 million tons of ore in a deposit 12,000 feet long and 900 feet wide. According to company officials, metallurgical tests showed that Premium-grade iron concentrate, containing 60 to 65 percent iron with less than 5 percent silica, could be recovered from the ore. At the end of the year plans for developing the deposit had not been announced. In the Little Belt Mountains southeast of Stanford (Judith Basin County) mining to recover Direct-Shipping-grade ore was initiated by the Young-Montana Corp., a newly organized concern. Operations were by open-pit methods.

Lead.—Production of lead continued to increase from the low point of 1954 and gained 9 percent compared with 1955. As in previous years, The Anaconda Co. in Silver Bow County supplied most of the output (80 percent). Production totaled 14,989 tons in Silver Bow County compared with 14,331 tons in 1955, while the remaining counties produced 3,653 tons as against only 2,697 tons in 1955. The number of mines producing lead and lead-zinc ores increased only slightly—from 56 to 62; however, all of the larger operations reported a greater output of lead than in the previous year. In addition to the Butte operations, 2 mines in the State produced over 500 tons of recoverable metal—the Maulden mine operated by Ida B. Hand (Beaverhead County) and the Jack Waite mine of American Smelting and Refining Co. (Sanders County).

Settlement in February of a strike that idled the Jack Waite operation during the latter half of 1955 explained the substantial increase from this property. Increases were also made at the Trout-Algonquin and Scratch All mines (Granite County); the Alta mine (Jefferson County); and the Nick & Dick and Mike Horse mines (Lewis and Clark County). A slight gain in recovery of lead from old slag was recorded at The Anaconda Co. fuming plant (Lewis and Clark County). Small shipments of crude ore were made from the Snowshoe and St. Paul mines (Lincoln County) as the result of development projects begun during the year. American Smelting and Refining Co. operated the East Helena lead smelter throughout 1956.

Manganese.—The principal markets for the manganese produced in Montana were steel plants, dry-cell-battery and chemical manufacturers, and Government stockpiles. The Butte manganese mines continued to supply the bulk of the output. The Butte ore (from the Emma and Niagara mines) was concentrated, sintered, and nodulized and used mainly at the Anaconda and Great Falls metallurgical plants in making ferromanganese for the steel industry; smaller tonnages of

nodules were consigned to eastern manufacturing centers. Trout Mining Division, American Machine & Metals, Inc., continued to produce Battery-grade manganese concentrate at the Trout-Algonquin property near Philipsburg. The firm also shipped lower grade material to a consumer. Also near Philipsburg the Taylor-Knapp Co. operated the Moorlight mine and shipped beneficiated material, analyzing 42 to 45 percent manganese, to the Government high-grade stockpile under the carlot program.

Shipments to the low-grade stockpiles at Butte and Philipsburg are not included in State mineral-production totals until the ore is removed from the stockpiles and beneficiated for commercial use. In all 69,952 short dry tons of ore and concentrate valued at $1,869,231 was shipped to these stockpiles compared with 60,197 short dry tons valued at $1,257,023 in 1955. Larger shippers to the low-grade stockpiles included: Granite County—Peter Antonioli, Scratch All mine; Taylor-Knapp Co., Moorlight (True Fissure) mine; and Trout Mining Division, Trout-Algonquin mine. Missoula County—Pioneer Corp., Arrowhead mine. Silver Bow County—Lloyd Brynie, Nettie-Hubernic mine; Butte Mines Merger Corp., Minnie Jane mine; Irving & Nelson, Norwich-Plutus-Little Sara mine; and Peter Antonioli, Tzarena mine.

An article describing the mineralogy of the manganese vein deposits of the Butte mining district, the oxidation and the enrichment processes, and the use of this information in prospecting was published.[4] Information was derived from a study of the Emma, Star West, Tzarena, and Norwich mines, selected as representative of the district.

Silver.—Expanded production from Butte mines upped Montana silver production for the second consecutive year. Total output was nearly 7.4 million fine ounces, a 21-percent gain over 1955. By-product silver from the Butte operations accounted for virtually all of Silver Bow County production, as well as 91 percent of the State total. The largest of the other mines supplementing the total were the Trout-Algonquin and Scratch All (Granite County). These operations also yielded manganese, lead, and zinc.

Substantial quantities of silver were recovered from the Alta mine (silver ore) (Jefferson County); Boss mine (silver ore) (Cascade County); and Moorlight mine (manganese-zinc ore) (Granite County).

Tungsten.—The Ivanhoe mine of Minerals Engineering Co. near Glen in Beaverhead County continued to supply the bulk of the State output. Mine production remained high, despite uncertainty as to whether the Government tungsten-purchase program would be continued. Operations at the Ivanhoe mine were suspended for a short period in the spring but were resumed after passage by the United States Congress of a bill authorizing additional purchases of tungsten. As in previous years, high-grade concentrate from the company mill was shipped to GSA, and low-grade concentrate was shipped to the Salt Lake Tungsten Co. in Salt Lake City, Utah, for conversion to a high-grade synthetic scheelite product. The company also began operations at the new Red Button property northwest of Glen. Indications were that the property could be developed into a substantial producer.

[4] Allsman, T. L., Oxidation and Enrichment of the Manganese Deposits of Butte, Mont.: Min. Eng., vol. 8, No. 11, November 1956, pp. 1110-1112.

Uranium.—Uranium prospecting and development were centered in Mineral and Ravalli Counties in western Montana and in Carbon and Jefferson Counties in the central part of the State. Plans for an exploration program of a new discovery known as the Lucky Joe claims south of Darby (Ravalli County) were reported late in the year. A prospect east of Saltese in Mineral County also was to be developed. Activity was reported in the Pryor Mountains 45 miles south of Billings where ore of commercial grade was discovered on the Old Glory claim in 1955. No large shipments of uranium ore from Montana operations were reported in the year.

An information circular giving general information on uranium prospecting in Montana was published.[5] The circular was designed to serve as a prospectors' guide to sources of information on uranium occurrences in the State.

Zinc.—Zinc production increased again in 1956 but still was substantially below 1951–53. Output of 70,520 tons represented a 3-percent gain over 1955. As in previous years, The Anaconda Co. operations supplied nearly all of the metal produced in the State (97 percent). Of the total, Silver Bow County supplied 90 percent, the bulk of the ore coming from the Anselmo, Lexington, and Orphan Girl lead-zinc mines and the Emma manganese mine, all at Butte. Project ores from the Elm Orlu development and Syndicate pit yielded small quantities of zinc. In other areas the East Helena fuming plant (Lewis and Clark County), which treated old zinc slag, and the Trout-Algonquin mine (lead-zinc-manganese ore) and Scratch All mine (zinc-manganese ore) (Granite County) produced more than 500 tons of recoverable zinc. Milling capacity at the Trout-Algonquin mine was expanded to 150 tons of ore in 1956. Other zinc producers included the Moorlight mine (zinc ore and manganese tailing) (Granite County) and the Jack Waite mine (lead-zinc ore) (Sanders County).

Miscellaneous Metals.—Minor metals contained in base-metal ores processed in Montana included arsenic, bismuth, cadmium, indium, palladium, and platinum. Production of cadmium totaled 1,956,315 pounds compared with 1,552,004 pounds in 1955, according to The Anaconda Co. annual report.

NONMETALS

Barite.—Baroid Sales Division, National Lead Co. acquired the mine and grinding plant of the Finlen & Sheridan Mining Co. near Greenough, Missoula County, on June 1. This continued to be the only barite producer in the State. Output, which was above that of 1955, was marketed in crushed form to sugar refineries and as a ground product for use in rotary-drilling mud.

Cement.—Production of cement continued to advance for the third consecutive year. Increases in output and value were 8 and 15 percent, respectively. The Montana Division, Ideal Cement Co., Trident plant in Gallatin County was the only producer in the State. The plant continued to use limestone from the Trident quarry and gypsum from the company quarry in Fergus County. Small quantities of silica rock and iron ore, also for use at the plant, were purchased. Plans revealed by the company for a general expansion program included construction of a new plant adjacent to the Trident facility.

[5] Sahinen, Uuno M., Prospecting for Uranium in Montana: Montana Bureau of Mines and Geol., Inf. Circ. 6, 2d ed., May 1956, 13 pp.

Clays.—The combined production of fire clay and miscellaneous clay declined 4 percent compared with 1955; in contrast, the value advanced in about the same proportion. The principal plants using miscellaneous clay for manufacturing heavy clay products included: Lewistown Brick & Tile Co. (Fergus County), Lovell Clay Products Co. (Yellowstone County), and Western Clay Manufacturing Co. (Powell County). These products also were made in Cascade and Hill Counties. The Anaconda Co. metallurgical plant at Anaconda was furnished fire clay from the underground Armington mine in Cascade County.

Mining of bentonite at the Alzada pit (Carter County) by Baroid Sales Division, National Lead Co., was curtailed. The product was marketed mainly for use in rotary-drilling mud and as a bonding agent in manufacturing refractories.

Fluorspar.—The Cummings-Roberts Crystal Mountain mine near Darby, Ravalli County, yielded over twice the total mined in 1955. This accelerated activity resulted mainly from shipments to the GSA stockpile and also from substantial increases in consumption at steel plants and other metallurgical installations.

Development mining was begun in October by Finlen & Sheridan Mining Co. at a newly discovered fluorspar deposit at the headwaters of Fish Creek in southern Mineral County near the Idaho–Montana border. Output in 1957 was to be shipped to the GSA stockpile.

The Government (GSA) purchase program for Acid-grade fluorspar authorized acquisition by December 31, 1958, of 250,000 tons of newly mined material containing not less than 97 percent CaF_2 at $53 per short dry ton, f. o. b. mine.

Gem Stones.—Accurate and detailed information relative to the production of gem stones in Montana cannot be obtained readily because of the nature of the industry. There was no large-scale mining; the bulk of the material was collected by hobbyists and a few commercial dealers. Montana moss agate, the gem material for which the State is famous, was being depleted and becoming more difficult to find, according to many reports. The value of crude gem stones collected each year has been estimated at about $35,000.

According to an article,[6] Thomas P. Sidwell (Billings, Mont.) and Commercial Uranium Mines (Denver, Colo.), jointly purchased the controlling interest in the New Mine Sapphire Syndicate, a British firm that owned the Yogo sapphire deposit in Judith Basin County. The deposit was worked during 1890–1927 but has been inactive since. The new owners planned immediate production.

Gypsum.—The combined output from the Shoemaker mine (United States Gypsum Co.), and Hanover mine (Ideal Cement Co.), was about 20 percent less than in 1955. These operations, both in Fergus County, were the only sources of gypsum in the State. Only once in the preceding 10 years had production been so low. This decline reflected in part the general slow-down in dwelling construction during 1956.

Lime.—A 35-percent increase in lime production was reported compared with 1955. At its plant 18 miles west of Helena, the Elliston Lime Co. (Powell County) continued to burn limestone to quicklime, most of which was marketed as hydrated lime. It was used at metal-

[6] Mining World, vol. 18, No. 10, September 1956, pp. 131–132.

lurgical plants, ore concentrators, chemical works, petroleum refineries, and water purification and softening installations. Limestone was calcined by The Anaconda Co. for use at various plant operations at Anaconda, Deer Lodge County. Demand at the plants was reflected in increased production at the kilns.

Mica.—Development by Daniel T. Barham at the Thumper Lode No. 1 resulted in shipment of two small lots of hand-cobbed mica to the GSA Custer (S. Dak.) Purchase Depot. This pegmatite deposit, about 20 miles southeast of Bozeman, Gallatin County, was being developed under a DMEA assistance loan.

Phosphate Rock.—Output of marketable phosphate rock increased for the sixth consecutive year. The 1956 total more than double that in 1950. Montana Phosphate Products Co. (Garrison, Powell County) operated its Anderson underground and strip mines throughout the year at an advanced pace. In contrast, production from the company Graveley mine declined considerably, and the operation was closed permanently during the latter part of the year. The Luke and Gimlet mines were inactive. The company shipped phosphate rock to chemical-fertilizer plants at Trail and Kimberley, British Columbia. Also in Powell County, the George Relyea mine continued active.

Victor Chemical Works also contributed substantially to the State total. Rock from the Canyon Creek mine (Beaverhead County) and Maiden Rock mine (Silver Bow County) was processed at the company elemental phosphorus plant at Silver Bow.

Initial production was reported by the J. R. Simplot Co. from its Centennial Mountain open-pit operation near Lakeview, Beaverhead County, early in August. Ore, trucked to the railhead about 40 miles from the mine, was crushed before it was loaded for shipment to chemical-fertilizer plants in British Columbia.

Triple superphosphate and phosphoric acid production was reported by The Anaconda Co. from its plant at Anaconda. Rock processed in the plant was shipped from a company-operated mine at Conda, Idaho. Increased demand for ammonium phosphate fertilizers caused the company to begin construction of a new plant to make this product.

A Bureau of Mines publication [7] detailed progress in research leading toward adaptation of planing machines, such as had been developed for use in coal mines, to the mining of underground seams of phosphate rock.

Pumice.—A small quantity of volcanic cinder was produced by Baker Cement Products Co. from a deposit near Baker, Fallon County. This material was used as an aggregate for making cement blocks.

Pyrite.—The output of pyrite concentrate declined almost 25 percent compared with 1955. This product was recovered by The Anaconda Co. from mill tailings resulting from processing Silver Bow County base-metal ores. At Anaconda the company produced sulfuric acid for use at its chemical-fertilizer plant and metallurgical works from this concentrate.

Sand and Gravel.—The output of sand and gravel—a little over 10 million tons—was about 27 percent less than in 1955. In contrast, the value of this production ($7.2 million) advanced 8 percent. Distribution between commercial and Government-and-contractor was

[7] Howard, T. E., Design and Development of a Pneumatic Vibrating-Blade Planer for Mining Phosphate Rock: Bureau of Mines Rept. of Investigations 5219, 1956, 29 pp.

3.0 million tons ($3.2 million) and 7.0 million tons ($4.0 million), respectively. The quantity of commercial sand and gravel recorded in 1956 was almost 1 million tons greater than 1955, while output in the Government-and-contractor category declined 4.7 million tons. Operations in 34 of the State's 56 counties contributed to the output.

It was expected that the falloff in demand for sand and gravel which resulted from completion of construction at the Bureau of Reclamation Tiber Dam project in Liberty County would be offset by initiation of construction at the Noxon Rapids Dam (Sanders County) and at two airbases, as well as by expansion of State highway-department

TABLE 13.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956			Percent of change in—	
	Short tons	Value	Average	Short tons	Value	Average	Tonnage	Average value
COMMERCIAL OPERATIONS								
Sand:								
Building	210,112	$345,563	$1.64	344,923	$577,392	$1.67	+64	+2
Road material	51,746	59,548	1.15	116,105	131,596	1.13	+124	−2
Other	165,321	95,334	1.58	30,576	7,730	.25	−82	−57
Total sand	427,179	500,445	1.17	491,604	716,718	1.46	+15	+25
Gravel:								
Building	393,072	563,394	1.43	597,291	720,493	1.21	+52	−15
Road material	489,674	421,730	.86	1,019,952	1,065,104	1.04	+108	+21
Railroad ballast	390,608	286,463	.73	598,032	523,895	.88	+53	+21
Other	307,003	142,608	.46	263,318	136,548	.52	−14	+13
Total gravel	1,580,357	1,414,195	.89	2,478,593	2,446,040	.99	+57	+11
Total sand and gravel	2,007,536	1,914,640	.95	2,970,197	3,162,758	1.06	+48	+12
GOVERNMENT-AND-CONTRACTOR OPERATIONS								
Sand:								
Building	113,209	47,932	.42	328,925	134,732	.41	+191	−2
Road material	6,763	1,030	.15	12,825	1,900	.15	+90	0
Total sand	119,972	48,962	.41	341,750	136,632	.40	+185	−2
Gravel:								
Building	5,204,433	1,747,833	.34	18,660	46,143	2.47	−99	+626
Road material	6,439,668	2,903,891	.45	6,693,763	3,828,277	.57	+4	+27
Total gravel	11,644,101	4,651,724	.40	6,712,423	3,874,420	.58	−42	+45
Total sand and gravel	11,764,073	4,700,686	.40	7,054,173	4,011,052	.57	−40	+43
TOTAL ALL OPETATIONS								
Sand:								
Building	323,321	393,495	1.22	673,848	712,124	1.06	+108	−13
Road material	58,509	60,578	1.04	128,930	133,496	1.04	+120	0
Other	165,321	95,334	.58	30,576	7,730	.25	−82	−57
Total sand	547,151	549,407	1.00	833,354	853,350	1.03	+52	+3
Gravel:								
Building	5,597,505	2,311,227	.41	615,951	766,636	1.24	−89	+202
Road material	6,929,342	3,325,621	.48	7,713,715	4,893,381	.63	+11	+31
Railroad ballast	390,608	286,463	.73	598,032	523,895	.88	+53	+21
Other	307,003	142,608	.46	263,318	136,548	.52	−14	+13
Total gravel	13,224,458	6,065,919	.46	9,191,016	6,320,460	.69	−30	+50
Total all sand and gravel	13,771,609	6,615,326	.48	10,024,370	7,173,810	.72	−27	+50

activities. These projects did not develop as rapidly as anticipated. The use of sand for construction and as road material increased 108 and 120 percent, respectively, over 1955. Gravel for construction purposes declined 89 percent compared with advances of 11 and 53 percent for road material and railroad ballast during the same period.

Stone.—A minor decrease in the output of stone (2 percent) during 1956 was accompanied by a 51-percent advance in value brought about by higher reported unit values for the various rock products. Firms in 15 of the 56 counties in Montana contributed to the total yield of 1.2 million tons valued at $1.8 million. New construction was begun at the Washington Water Power Co. Noxon Rapids Dam and at airbases at Glasgow and Great Falls helped to offset the effect of completion of the Tiber Dam project upon consumption of crushed stone.

Mining operations were active in the following categories, arranged in order of tonnage produced: Limestone (14), sandstone (7), granite (8), and basalt (3). Output of limestone again increased, continuing the upward trend begun in 1953. The major limestone producers were Ideal Cement Co. Trident quarry, Gallatin County; The Anaconda Co. Brown's quarry, Deer Lodge County; Maronick Limestone Co. McClellan Creek quarry, Jefferson County; Bighorn Limestone Co. Warren quarry, Carbon County; and American Crystal Sugar Co. Spring Gulch quarry, Granite County. Most of the limestone was used at cement and lime plants; the bulk of the remainder went to metallurgical works and sugar refineries. The other rock types found use as road metal (granite), railroad ballast (sandstone and basalt), and riprap (basalt, sandstone, and granite). A small tonnage of dimension granite was quarried in Jefferson County.

Quartzite was mined by Victor Chemical Works at a quarry near Melrose, Beaverhead County, for use at its elemental phosphorus plant at Silver Bow.

Sulfur.—Construction of a plant for recovering elemental sulfur from hydrogen sulfide gas was completed in June by Montana Sulphur & Chemical Co. at Billings, Yellowstone County. Residual gases from two oil refineries in the vicinity were processed in the plant. This represented the only byproduct sulfur operation in the State.

Talc.—Substantial individual gains in output by the 3 producing companies resulted in a total increase of 29 percent compared with 1955. Tri-State Minerals Co. continued to operate the Keystone, Treasure State, and Smith-Dillon-Crown mines in the Beaverhead-Madison County area near Dillon. During the year the company began processing talc at its newly constructed grinding plant near Barratts. Previously, all of the company output was shipped to Ogden, Utah, for grinding.

The Yellowstone mine of Sierra Talc & Clay Co. near Norris, Madison County, was active, and the company operated the Beaverhead mine near Dillon, which it acquired in September 1955. Talc from both mines was shipped for grinding to a company-owned plant at Grand Island, Nebr. The open-pit mine of Nonmetallics, Inc., near Alder, Madison County, was purchased in April by the American Chemet Corp. of East Helena. As in the past, grinding was done at the East Helena plant.

Distribution by uses were: Ceramics, 55 percent; paint, 36 percent; and miscellaneous (paper, textiles, and rice polishing), 9 percent.

Vermiculite.—Montana continued to be the principal vermiculite-producing State in the Nation, in spite of a decline of about 10 percent compared with 1955 in the output of the Zonolite Co. from its open-pit mine near Libby, Lincoln County. Some of the mined product was expanded by the company. Robinson Insulation Co. of Great Falls expanded and marketed purchased raw material. The product found use in insulation, as aggregate material in concrete and plaster, for agricultural purposes, and in refractories.

MINERAL FUELS

Coal.—Production of bituminous coal and lignite declined 33 and 15 percent, respectively, compared with 1955, marking the 12th consecutive year of diminishing bituminous-coal output. The 1956 total of 846,134 tons was 83 percent less than the peak production in 1944 (4.8 million tons). About 93 percent of the coal output was recovered from 2 mines in Rosebud County and 10 mines in Musselshell County. Other producing counties in order of production, were Carbon, Sheridan, Custer, Blaine, Richland, Dawson, Cascade, and Hill. All of the lignite output came from Sheridan, Custer, Richland, and Dawson Counties.

Northwestern Improvement Co. Rosebud strip mine, operated by Foley Bros., Inc., continued to be the leading coal producer in Montana. Early in November the underground Klein No. 2 mine of Republic Coal Co., the second largest producer, closed.

Koal Krudes, Inc. (Spokane, Wash.) began constructing a coal-processing plant at Red Lodge, Carbon County, to make char (carbonized coal used by smelters and reduction plants as a source of carbon for metallurgical processes), creosote, and other byproducts from coal. Montana-Dakota Utilities Co. began building an $8 million steam-electric generating plant near Sidney, Richland County, on the west bank of the Yellowstone River. The plant, expected to begin operation in the fall of 1958, will utilize pulverized lignite as fuel.

Petroleum and Natural Gas.[8]—Montana's petroleum industry continued to set new production records during 1956, as output of this essential commodity increased 39 percent to 21.8 million barrels ($56.1 million) compared with 15.6 million barrels ($35.4 million) in 1955. Accelerated exploration and development resulted in completion of 493 wells—89 more than last year—and the rate of discovery of crude oil or gas per well drilled improved from 41 percent to 50. New fields included: Bredette-North (4 wells), Roosevelt-Daniels County; Clarks Fork-North (4 wells), Carbon County; Outlook area, Sheridan County; and Repeat (1 well), Carter County. In Dawson County the Sand Creek field was abandoned, with no production reported for the year. Poplar field (Roosevelt County) again was the major producing area in the State, with a total output of almost 4 million barrels. Over 1 million barrels was reported for the following fields: Pine—Fallon, Prairie and Wibaux Counties; Cut Bank—Glacier, Pondera, and Toole Counties; Elk Basin—Carbon County;

[8] Production figures for crude oil and natural gas, by fields, were obtained from the Montana Oil and Gas Statistical Bulletin, a monthly publication of the State Oil and Gas Conservation Commission.

Cabin Creek—Fallon County; Sumatra—Rosebud County; and Kevin-Sunburst—Toole County.

According to the Oil and Gas Conservation Commission of the State of Montana, during 1956, 3,640 wells yielded a daily average of 59,615 barrels of crude oil from 59 fields, and over 9.0 million barrels of Montana crude was refined in the State.

Major improvements in the industry included completion of the Butte pipeline from eastern Montana to Wyoming and expansion of capacity at refineries of the Carter Oil Co. and Continental Oil Co. Connections with pipelines to the Midwest provided new markets for Montana crude oil. Plant improvements by both companies resulted in the production of automotive and diesel fuels with lower sulfur content. Residual gases from the refineries were processed by Montana Sulphur & Chemical Co. at Billings to recover elemental sulfur.

Marketed production of natural gas totaled 25.8 billion cubic feet. Almost half of the natural-gas output (13.8 billion cubic feet) came from the Cut Bank field (including Reagan) in Glacier and Toole Counties. Continuing as the leading field, Cut Bank was followed, in order of output, by Cedar Creek, Dry Creek, Bowdoin, Whitlash, and Kevin-Sunburst; each produced over 1 billion cubic feet.

Texas Natural Gas Corp. began constructing a natural-gas-processing plant near Glendive (Dawson County) during the year. The plant was designed to remove propane, butane, and natural gasoline from gas produced in the Cabin Creek and Pine oilfields of eastern Montana.

REVIEW BY COUNTIES AND DISTRICTS

Beaverhead.—Minerals Engineering Co. continued to operate the Ivanhoe mine near Glen and supplied the major share of the State output of tungsten ore. High-grade concentrate produced in the company mill was shipped to GSA, and low-grade concentrate was consigned to the Salt Lake Tungsten Co.—an associated firm in Salt Lake City, Utah, which converted the concentrate to a high-grade artificial scheelite. The company also began operations at the newly acquired Red Button mine in the Wise River area. Production was by open-pit methods. Preliminary drilling of a new iron-ore deposit by Minerals Engineering Co. indicated reserves exceeding 42 million tons. It was believed the iron could be recovered magnetically to produce an iron concentrate of 60- to 65-percent grade and containing less than 5 percent silica. The deposit, in the Sweetwater Hills 12 miles south of Dillon, was 12,000 feet long and 900 feet wide. The full extent of the depth of the deposit had not been determined. Shipments to Government low-grade stockpiles were made from the following manganese mines: Blackstone, Shaffer, and Gob.

Victor Chemical Works continued to operate the Canyon Creek mine near Melrose to produce phosphate rock used at its elemental-phosphorus plant at Silver Bow. Quartzite for fluxing purposes was mined by the company in the same area. Initial production of phosphate rock was reported by J. R. Simplot Co. from the Centennial open-pit mine in the Centennial Mountains near Lakeview. Two talc-mining operations were active. Output of the Smith-Dillon-Crown mine by Tri-State Minerals Co. was ground both at the new

TABLE 14.—Value of mineral production in Montana, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Beaverhead	$4,584,855	$5,424,390	Tungsten, phosphate rock, lead, talc, stone, silver, zinc, gold, copper.
Big Horn	348,878	469,661	Petroleum, sand and gravel.
Blaine	657,455	498,792	Petroleum, coal, sand and gravel.
Broadwater	138,815	147,292	Iron ore, gold, sand and gravel, lead, zinc, silver, stone, copper.
Carbon	4,250,078	5,654,557	Petroleum, stone, coal, sand and gravel.
Carter	(2)	(2)	Clays, petroleum.
Cascade	449,858	1,011,508	Sand and gravel, silver, coal, lead, zinc, clays.
Chouteau	(2)		
Custer	89,272	93,695	Sand and gravel, coal.
Daniels and Roosevelt	[3] 6,659,824	10,541,491	Petroleum.
Dawson and McCone	[3] 2,235,552	3,007,459	Petroleum, sand and gravel, coal.
Deer Lodge	1,258,872	645,498	Lime, stone, sand and gravel, tungsten, clays.
Fallon, Prairie, Wibaux	[3] 3,696,386	14,518,923	Petroleum, sand and gravel, pumice.
Fergus	(2)	(2)	Gypsum, clays, gold, lead, zinc, silver.
Flathead	178,395	373,071	Stone, sand and gravel, gold, silver.
Gallatin	(2)	(2)	Cement, stone, sand and gravel, mica.
Garfield and Petroleum	[3] 446,779	(2)	Petroleum, sand and gravel.
Glacier, Pondera, Teton, and Toole	[3] 12,731,011	12,774,203	Petroleum, sand and gravel.
Golden Valley	(2)	(2)	Petroleum.
Granite	(2)	1,656,671	Zinc, silver, manganese ore, lead, stone, manganiferous ore, copper, gold, tungsten.
Hill	(2)	(2)	Sand and gravel, coal, petroleum, clays.
Jefferson	(2)	444,779	Lead, gold, stone, silver, zinc, copper.
Judith Basin	(2)	38,877	Sand and gravel, iron ore, lead, silver, copper, zinc, gold.
Lake	(2)	(2)	Sand and gravel.
Lewis and Clark	1,477,735	(2)	Zinc, lead, sand and gravel, copper, silver, gold.
Liberty	2,129,726	(2)	Petroleum, stone, sand and gravel.
Lincoln	(2)	(2)	Vermiculite, silver, sand and gravel, lead, zinc, gold.
Madison	(2)	(2)	Talc, gold, lead, tungsten, silver, zinc.
Meagher	10,220	44,904	Sand and gravel, copper, silver.
Mineral	(2)	87,912	Sand and gravel, gold, lead, copper, silver, zinc.
Missoula	360,474	371,299	Sand and gravel, barite, stone, gold, lead, copper, silver.
Musselshell	2,612,260	2,855,828	Coal, petroleum, stone.
Park	(2)	90,065	Stone, sand and gravel, silver, lead, zinc, gold.
Phillips	(2)	239,940	Sand and gravel, silver, gold.
Powell	(2)	(2)	Phosphate rock, lime, gold, stone, clays, sand and gravel, lead, zinc, silver.
Ravalli	(2)	(2)	Fluorspar, sand and gravel, gold, silver.
Richland	176,596	105,978	Petroleum, coal.
Rosebud	5,160,055	(2)	Petroleum, coal, sand and gravel.
Sanders	(2)	537,105	Lead, zinc, copper, silver, gold.
Sheridan	(2)	303,868	Sand and gravel, coal, petroleum.
Silver Bow	94,137,939	118,213,646	Copper, zinc, silver, manganese, lead, gold, phosphate rock, pyrite, sand and gravel.
Stillwater	3,723,509	3,814,883	Chromite, petroleum.
Sweet Grass		1,755	Sand and gravel, lead, silver, gold.
Treasure	(2)	9,000	Sand and gravel.
Valley	26,000		
Yellowstone	393,273	1,431,345	Petroleum, sand and gravel, clays, stone.
Undistributed [4]	19,387,779	29,225,592	
Total [5]	166,993,000	213,728,000	

[1] The following counties are not listed because no production was reported: Powder River and Wheatland.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Daniels and Roosevelt; Dawson and McCone; Fallon, Prairie, and Wibaux; Garfield and Petroleum; and Glacier, Pondera, Teton, and Toole Counties have been combined because of joint oilfield production.
[4] Includes value of gem stones, natural gas, natural-gas liquids, sand and gravel, and tungsten that cannot be assigned to specific counties and values indicated by footnote 2.
[5] Total has been adjusted to eliminate duplicating the value of stone.

company plant near Barratts and at its Ogden (Utah) facility, while talc from the Beaverhead mine was shipped by Sierra Talc & Clay Co. to its grinding plant at Grand Island, Nebr.

Argenta District.—The Maulden mine, owned by John and Ida B. Hand, was the largest metal producer in the district. About 4,013 tons of lead ore containing 398 ounces of gold, 11,570 ounces of silver, 23,500 pounds of copper, 1,033,300 pounds of lead, and 200,000

pounds of zinc was shipped. Development totaled 2,000 feet of drifts. Also active were the Ferdinand, Goldsmith, and Governor Tilden lead mines and the Yellow Band gold property, which was acquired by French Creek Mining Co.

Blue Wing District.—F. E. Herr operated the Charter Oak lead mine, and a shipment of lead-zinc ore was made by Blue Dot Mining Co. from the New Departure mine.

Bryant District.—The only active property was the Hecla lead-zinc mine of the Lively Mining Co. Seventy tons of ore was trucked to Melrose for shipment by rail to a smelter. Shaft sinking totaled 200 feet and drifting 300 feet.

Medicine Lodge District.—Some lead-zinc ore was shipped from the SS&R mine.

Polaris (Lost Cloud) District.—Berry & James terminated work at the Polaris silver mine on April 2 after operating the mine for 6 months under a lease. A shipment of ore was made early in 1956.

Big Horn.—Output of crude oil from the Soap Creek, Ash Creek, and Hardin fields was 81,918 barrels greater than 1955. The total valuation was $460,277. Natural gas recovered from the Hardin field totaled 57.4 million cubic feet. Two companies produced sand and gravel.

Blaine.—Production of crude oil from the Bowes field declined in 1956. Natural-gas withdrawals from the same field were 717 million cubic feet. The Milk River Coal Mine Co. (G. S. & L. W. Sargent) was active near Chinook. The United States Army Corps of Engineers contracted for a small quantity of road gravel, and county road crews mined and processed gravel for road use.

Broadwater.—Ralls & Harris Bros. shipped iron ore from the Iron Cross mine to a cement plant at Trident, Gallatin County.

Gravel for railroad ballast and limestone for riprap were produced by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

Backer District.—The Millerl-Slim Jim mine yielded gold ore in 1956.

Beaver District.—Six meta mines were active. January Mines, Inc., operated the January group but shipped only 8 tons of ore containing 41 ounces of gold, 57 ounces of silver, and 800 pounds of lead. Gold ore was shipped from the Lonesome Pine property and the Acme mine. Harold Hogan operated the Silver Saddle-North Star claims from January to October, completed a shaft 50 feet in depth and 250 feet of drifting, and shipped a small tonnage of lead-zinc development ore. Louis Peura shipped 1 car of dump material and repaired an access road at the Stray Horse gold-silver mine. Production of lead ore from the Hyantha property was reported.

Cedar Plains District.—The Black Hawk-North Star mines yielded lead-zinc ore, and the Copper Queen mine shipped copper ore. Dump ore was produced from the Keating and Eagle mines.

Park or Indian Creek District.—The Marietta gold mine, 16 miles northwest of Townsend, was the most important nonferrous-metal producer in the county. Forminco, Inc., a Pennsylvania corporation, operated the mine under lease from Dance & Anders. Lead ore, gold ore, and silver ore, respectively, were produced at the Endeavor, Diamond Hill, and Ace-in-Hole mines, and lead ore and concentrate were shipped from the Iron Mask mine.

Carbon.—Pryor Mining Corp. continued development work at its uranium-mining operation in the Pryor Mountains. The work was centered on the Old Glory mining claim. Lisbon Uranium Corp. also was developing a prospect. Ore mineralization in the area was metatyuyamunite, localized in a silicified collapse-breccia zone 5 to 6 miles in length along the east flank of the Pryor anticline.[9] The vanadium content was twice that of the uranium. Following an additional discovery of uranium in the Pryor Mountains in September 1955 by 3 prospectors there was a rush of claim staking, and by early 1956 some 450 location notices had been filed with the Carbon County recorder at Red Lodge. Small tonnages of ore have been shipped from the Pryors by three companies to the AEC Riverton (Wyo.) ore-buying station.

The county ranked third in order of petroleum production by virtue of increased output from the Elk Basin field. Other fields that contributed to the output were Clark's Fork, Dry Creek, Frannie, Devils Basin, and Golden Dome. Substantial quantities of natural gas were recovered in the county, particularly from the Cedar Creek field. Bighorn Limestone Co. reported a slight increase in quantity of limestone mined at the Warren quarry. The rock, after grinding, was used at sugar refineries. Coal was mined at the Brophy Coal Co. Smokeless and Sootless mine and at the Smith Mine Coal Dock, Foster mine. Sand and gravel was prepared by two commercial companies. The Northern Pacific Railway Co. produced gravel for ballast and other purposes.

Carter.—The quantity of bentonite mined at the Alzada pit by Baroid Sales Division, National Lead Co., was below that in 1955. Initial output of petroleum in the county was made at a newly drilled well in the Repeat field. Production totaled 31,946 barrels worth $57,503.

Cascade.—At The Anaconda Co. Great Falls metallurgical plant construction was begun to remodel and enlarge the copper refinery. The plant processed blister copper in the form of anodes from the smelter at Anaconda (Deer Lodge County). The electrolytic-zinc plant treated concentrate produced at Anaconda, as well as custom concentrate from several Western States and foreign countries. An outdoor electrical substation was completed in July. The Anaconda Wire & Cable Co. operated two facilities adjacent to the metallurgical works. The new aluminum-rod mill supplied requirements of all company plants for aluminum rod. The copper-rod and wire mill produced all shapes of bare wire and rod. Output was shipped to American Brass Co. plants in Connecticut and to Anaconda Wire & Cable Co. plants throughout the United States.

Sand and gravel was produced by the Bureau of Reclamation for use at its Sun River project at Fairfield and by county and municipal road crews, the Great Northern Railway Co., and five commercial companies, to be used for railroad ballast, construction, and road building. Contractors supplied a small quantity of road gravel to the United States Army Corps of Engineers. Coal was mined at the East Belt mine (East Belt Coal Mine) and Surmi mine (William Surmi & Son Coal Co.). Fire clay from the Armington mine was used to

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[9] Work cited in footnote 5.

make firebrick at The Anaconda Co. metallurgical works at Anaconda (Deer Lodge County). The Great Falls Brick Co. made brick and tile from clay mined at the Gianinni pit. Robinson Insulation Co. (Great Falls) expanded vermiculite purchased from the Zonolite Co. (Lincoln County) and marketed it for insulation and aggregate purposes.

Barker District.—Lead ore from the Sunshine mine was the only metal production credited to the district.

Montana District.—The Boss mine of Boss Mines, Inc., yielded a sizable tonnage of silver ore, and the Silver Belle and Star mines produced small tonnages of lead ore. A lead-zinc exploration project was begun at the Boss mine under the DMEA program.

Custer.—Sand and gravel was processed by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co., county road crews, and two commercial operators in Miles City. T. J. Fleming mined lignite at the Storm King mine near Miles City.

Daniels and Roosevelt.—These counties were combined because a new oilfield (Bredette-North) extends over the Roosevelt County line into Daniels County. Production of crude from Poplar-East (wholly within the confines of Roosevelt County) totaled 3.9 million barrels ($10 million) and again was the leading field in the State. Four wells in the new Bredette field had a combined output of 51,586 barrels valued at $119,164.

Dawson and McCone.—Petroleum output increased, gaining slightly over 1955. Production was reported from fields within the boundaries of both counties; but, because the Richey field extends across the McCone County line into Dawson County, both are considered together. The Glendive, Gas City, and Deer Creek fields contributed to the Dawson County yield. Building sand and gravel was produced by Minot Sand & Gravel Co. and paving gravel by county road crews, all from Dawson County. Contractors furnished the Bureau of Reclamation with structural gravel.

A small quantity of lignite was mined at operations of Jacob Albrecht, Bloomfield, and Clyde Clapp, Jr., and Gordon Peuse, both of Glendive.

Deer Lodge.—The Anaconda Reduction Works processed copper, lead-zinc, and manganese ores from the Butte mines; copper precipitates from Butte and Yerington, Nev.; toll zinc concentrate and purchased zinc ore; and phosphate rock from Conda, Idaho. The works also produced blister copper, electrolytic zinc, sulfuric acid, phosphate fertilizers, managnese nodules, ferromanganese, and arsenic. A program to expand copper-ore handling and concentrating facilities was continued. Three new large grinding units were installed in the copper mill. Completion of 2 more sections in 1957, plus addition of cyclone classifiers to several units, was to increase milling capacity from 28,000 to 43,000 tons per day.

New flotation methods were placed in operation and produced concentrate of higher grade. Because of these improvements, no expansion of smelting capacity would be needed to process the increased copper-ore output from Butte.

Electric-furnace equipment to melt copper precipitate from Yerington was on hand and was to be installed in 1957. Construction also was to begin in 1957 on an electric furnace to melt zinc cathodes.

A pilot plant was under construction to test, on a production basis, successful experimental results in recovering alumina from low-grade aluminous clays. The test plant was to be housed in existing buildings at the Anaconda Reduction Works. The total cost of construction and installing equipment was to be in excess of $1 million. Clay for the new process was to be obtained from company holdings in the Moscow (Idaho) area. If the process proved to be successful, the experiment could lead to the establishment of a metallurgical plant near Moscow to supply alumina for the Columbia Falls aluminum-reduction works. The aluminum industry in America has depended for its basic raw material largely upon bauxite from foreign sources.

The McCabe, Trigger, and Storm Lake tungsten mines were active part of 1956. Tip Top Mining Co., initiated an exploration project at its Tip Top tungsten mine under a contract with DMEA:

At Anaconda several nonmetal raw materials were processed by The Anaconda Co., mainly for use at its various plants. Included were pyrite, recovered from Silver Bow County base-metal ores, converted to sulfuric acid for use at the phosphate plant; limestone, burned to quicklime for metallurgical applications; phosphate rock from Conda, Idaho, converted to triple superphosphate and phosphoric acid; and clay from Cascade County, for use at the reduction-works refractories plant. Tri City Concrete Products, Inc., produced sand and gravel for building and paving purposes and also a small quantity of engine sand. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. prepared gravel for railroad ballast.

Fallon, Prairie, and Wibaux.—These counties were combined because of crude-oil production from the Pine field, which extends into portions of the three counties. The Cabin Creek field in Fallon County ranked fifth in the State with output of 1.7 million barrels. Pennel—1 of 2 fields brought into production during 1955—increased crude-oil recovery compared with the level of that year, and ranked second to Cabin Creek in production of this commodity in Fallon County. Extension of the Pine field from Wibaux County into Prairie and Fallon Counties was accompanied by an advance in crude-oil output compared with 1955. Withdrawals of natural gas from the Cedar Creek field, Fallon County, totaled 4.7 billion cubic feet ranking this field in second position in the State. The Bureau of Reclamation (Prairie County) contracted for production of gravel for road use, and Baker Cement Products Co. (Fallon County) mined a small quantity of pumice for use in making building blocks.

Fergus.—All of the gypsum mined in Montana during 1956 came from Fergus County. United States Gypsum Co. operated the Shoemaker mine and processed raw gypsum at the Heath plant. Ground gypsum, wallboard, and lath were marketed. Ideal Cement Co. produced gypsum at the Hanover mine near Trident, mainly for use as a retarder in cement manufacture. Some of the output went for agricultural purposes. Lewistown Brick & Tile Co. continued to make heavy clay products from clay mined at its pit near Lewistown. An expansion plan begun by the company during the year included construction of a tunnel kiln, one of the first in the State. The new kiln and drier were designed to produce face and common brick and building tile at a rate of about 30,000 a day.

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Warm Springs District.—Production of gold ore and lead-zinc ore, respectively, was credited to the Black Bull mine and the Iron Chancellor mine.

Flathead.—The new aluminum plant of the Anaconda Aluminum Co. completed its first full operating year. Initial production at the plant was begun in August 1955, and all pots were in full production by November 1955. The $60 million facility, 2 miles northeast of Columbia Falls, obtained power from the Hungry Horse Dam on the south fork of the Flathead River, 8 miles from the reduction plant. Two hundred and forty pots, housed in 4 potrooms, were in production with rated capacity of 60,000 tons of aluminum annually. The pots were of Soderberg vertical-pin anode type operating on 90,000 to 100,000 amperes. The annual report of the company disclosed production of 123 million pounds of aluminum in 1956. Alumina, the basic raw material, was obtained from Gulf Coast States. The plant was the only aluminum-reduction facility in Montana and was 1 of 7 in operation in the Pacific Northwest.

The United States Forest Service contracted for production of granite for road metal, and the Great Northern Railway Co. crushed quartzite for ballast and rubble. Four commercial operators in Kalispell prepared sand and gravel for building and paving uses.

Hog Heaven District.—The O. F. Martin operation in Hog Heaven district yielded a small tonnage of gold-silver ore.

Gallatin.—The Ideal Cement Co., Montana Division, plant at Trident continued to be the principal mineral industry in the county as well as the only source of cement in the State. The plant utilized limestone quarried at a nearby site. County road crews used granite for riprap and gravel for highway maintenance. Four commercial concerns, 2 at Bozeman and 1 each at Three Forks and West Yellowstone, produced sand and gravel for construction purposes. Two small lots of hand-cobbed mica were shipped to GSA from a pegmatite deposit 20 miles southeast of Bozeman.

Garfield and Petroleum.—Petroleum recovery from the Cat Creek field on the border between Garfield and Petroleum Counties totaled 163,998 barrels valued at $423,115. Output, although only slightly less than 1955, declined for the ninth consecutive year. The Rattlesnake Butte field in Petroleum County yielded almost four times more crude than in 1955. Paving gravel was prepared by an operator at Winnett, Petroleum County.

Glacier, Pondera, Teton, and Toole.—The disregard of earth-bound petroleum occurrences for political or geographical boundaries again makes it necessary to consider certain producing counties as a group. Cut Bank—the third ranking crude-oil-producing field in Montana and the principal gasfield (including Reagan)—underlies portions of Glacier, Pondera, and Toole Counties. About 41 percent of the 4-county total output (4.6 million barrels valued at $12.6 million), as well as 13.8 billion cubic feet of natural gas, came from the Cut Bank field. The Pondera field, which includes portions of Pondera and Teton Counties, yielded 680,000 barrels to place third in the county grouping.

The largest production from within the confines of a single county in this grouping came from Toole County. Kevin-Sunburst—the most important field in the county—produced 1 million barrels. Of

the major fields mentioned, the Reagan field in Glacier County ranked next in output. Pondera field was the only one that reported increased production over 1955. In Toole County the Berthelote and Border fields had small gains. Decreases from one-half to two-thirds of the 1955 output were reported by 3 small fields, the largest of which yielded less than 2,000 barrels.

The United States Army Corps of Engineers contracted for production of road gravel in Glacier and Toole Counties. Two commercial operators in Teton County and three in Toole County prepared sand and gravel.

Golden Valley.—A small quantity of crude petroleum was produced from the Women's Pocket field.

Granite.—Shipments to Government low-grade stockpiles were made from the following small manganese mines: Chicago (Earl Bellm), Climax (James R. Hunter), Comanche (James W. Young), Iron Age and Redemption (Iron Age and Redemption Mining Claims), Mountain View (Page & Hartley), and Mystery (Jennie Moore and Phil and L. J. Salois). The Tarlach tungsten mine was active part of 1956.

Limestone was mined at the Spring Gulch quarry of the American Crystal Sugar Co. for use at its Missoula refinery. Contractors quarried granite for use as road metal by the United States Forest Service.

Boulder and South Boulder District.—Production of lead ore from the Nonpareil mine was recorded.

Flint Creek District.—Trout Mining Division of American Machine & Metals, Inc., expanded processing capacity for lead-zinc ore to 150 tons per day at its lead-zinc-manganese operation near Philipsburg by installing an additional milling unit. Drifting totaled 2,500 feet and diamond drilling 500 feet. The Scratch All (Hasmark) operation of Peter Antonioli supplied a sizable tonnage of zinc-manganese ore, and Taylor-Knapp Co. mined and milled zinc-manganese ore at the Moorlight mine in the same area.

Hill.—Sand and gravel was produced by two commercial concerns at Havre. Alfred Laursen mined a small quantity of coal from the Rocky Boy mine. Less than 300 barrels of crude oil was recovered from the Rudyard field (opened in 1955). Heavy clay products were made from locally mined clay by the Havre Brick Co.

Jefferson.—A uranium prospect on Rock Creek in the Basin area was developed by Great Shield Uranium Mines, Ltd., of Calgary, Alberta, Canada. One carlot shipment was made near the end of the year after an old tunnel was reopened; however, the shipment proved to be of subcommercial grade, and further work at the old property was to be undertaken in 1957 to find the source of high-grade samples in the mine dump.

Stone was the only nonmetal mined in the county. The Maronick Limestone Co. operated the McClellan Creek quarry to obtain limestone for fluxing purposes. Output was shipped to the East Helena lead smelter of American Smelting and Refining Co., Louis Dumas and Trevillion-Johnson Memorials, both of Whitehall, quarried monumental granite.

Basin District.—The Basin Jib mine, operated by Basin Jib Mines, Ltd., was one of the leading producers of gold in the State. A shaft-sinking project, begun in 1955, was completed to a depth of 345 feet,

and drifting was done on the 300 level to develop enough ore for an operation of 300 tons per day. A new mill was completed and placed in operation on development ore. A new type of mechanical mucker was used in the shaft-sinking project. This was the initial appearance of the machine in the United States; in its first test the device efficiently handled large, blocky, granite boulders encountered in the shaft muck.

Boulder District.—Madden & Naegli developed the Bernice lead mine for open-pit production and installed a small mill at Basin having 10-ton capacity. The Morning gold mine also was active.

Cataract District.—Active mines included Aurora (lead-zinc ore), Bluebird (lead ore), Boulder (gold ore), Crescent (lead-zinc ore), Golden Thread (lead-zinc ore), Morning Glory (gold-silver ore), and Silver Hill (gold-silver ore).

Clancy and Lump Gulch District.—The Nellie Grant lead mine was active, and Louis Peura shipped silver dump ore from the Little Nell mine from May to July.

Colorado District.—The Alta gold-silver mine of Lahey Leasing Co. contributed the largest share of metal production of the district. Louis Peura produced gold-silver ore from the Gregory dump, as well as silver ore from the Midway mine. At the latter property an old adit was reopened for the purpose of development. Also active were the Minah mine (silver ore) and the Silver Claim mine (lead-zinc ore).

Elkhorn District.—New Elkhorn Queen, Inc., operated the Queen lead mine for the first 6 months of the year. The mine then was idle owing to litigation and financial difficulties.

Whitehall District.—Lead ore was shipped from the Carbonate and M & T mines. Gold ore was produced from the Golden Sunlight mine, which was under development by White Development Co.

Judith Basin.—An iron-ore-mining operation in the Little Belt Mountains near Stanford was begun by Young-Montana Corp. Ore was to be consigned to eastern metallurgical centers from the Running Wolf mine. According to company officials, the Running Wolf ore deposit contained reserves of 1 million tons of ore of the Bessemer lump type, averaging 60 percent iron. The open-pit site was cleared for mining, and drilling of test holes was in progress.

Sand and gravel was processed by Royston Gravel Co., Inc., of Moore. An article on the Yogo sapphire deposit appeared during the year.[10]

Barker District.—The Tiger lead mine (Croff & Montague) was again active in 1956.

Yogo District.—A small quantity of gold ore was shipped from the Yogo mine.

Lake.—Sand and gravel for building and paving purposes was prepared by the Clairmont Trucking Co. of Polson. The material came from the San Pablo reservoir area.

Lewis and Clark.—The East Helena smelter, American Smelting and Refining Co., operated throughout the year and processed lead ore and concentrate from Montana and Idaho mines, zinc-plant residues from Great Falls and Anaconda, and ore and concentrate from several foreign countries. Products were lead bullion, reverberatory furnace matte and speiss, and lead-bearing cadmium dust, all of which were consigned to other company plants for further processing. Adjacent

[10] Work cited in footnote 6.

to the smelter was the slag-fuming plant of the Anaconda Co., which recovered zinc fume by treating molten slag from the smelter and old slag from a dump.

Structural sand and paving gravel were produced by the Helena Sand & Gravel Co. and Valley Gravel Products, both of Helena, and by the Long Construction Co. of East Helena.

Bear Gulch District.—The Aurora lead mine was worked by Fred Schwarshaus during the last 6 months of 1956.

Canyon Creek District.—Gold ore was produced from the Empire mine, which was acquired early in 1956 by Montana Mining & Milling Co.

Canyon Ferry District.—Louis Peura operated the Nick & Dick lead mine and produced development ore by sinking a 90-foot incline winze and drifting 100 feet on a sublevel.

Heddleston District.—Two mines were active. Norman Rogers Mining Co. produced lead-zinc ore from the Mike Horse mine, and a small tonnage of gold-silver ore was shipped by Tillotson Bros. from the Midnight property.

Lincoln District.—The Gold Dollar gold mine supplied the only metal production of the district during development by Jack Parks from May 1 to November 1.

Marysville District.—Montana Rainbow Mining Co. terminated operations at the Drumlummon mine. Oscar Hoveland shipped a small tonnage of gold ore from the Bald Butte mine. Louis Peura worked the dump at the Little Ox property but later abandoned the property.

Rimini District.—Silver Crescent Mining Co. shipped lead-zinc ore from the Silver Crescent mine.

Scratch Gravel District.—Production was recorded at the Ajax gold mine.

Smelter District.—Lead and zinc recovered from old slag at The Anaconda Co. fuming operation was credited to Lewis and Clark County metal-production statistics and supplied a large portion of the metal production in the county.

York District.—Gold ore was shipped from the Frontier mine.

Liberty.—The bulk of the total crude-oil output (133,808 barrels worth $315,709) came from the Whitlash field. Minor contributions were made by three smaller fields. Almost 3.0 billion cubic feet of natural gas was withdrawn from the Whitlash, Utopia, and Keith Block fields. Major construction work was completed by the Bureau of Reclamation at its Tiber Dam project. Stone was quarried by contractors for use by the Bureau of Reclamation at Upper Missouri River projects. E. C. Powell produced paving gravel.

Lincoln.—The largest vermiculite producer in the Nation was operated 7 miles northeast of Libby by the Zonolite Co. A cleaned and screened product was exfoliated for use as insulation, as an aggregate, and for other purposes. The Great Northern Railway Co. produced gravel for ballast.

Libby District.—A joint rehabilitation and development project by St. Paul Lead Co., Inc., and Merger Mines Corp. reopened the Snowshoe mine. It was estimated that enough ore was in sight for operating at least 2 years. A British syndicate mined over $1 million worth of ore in 1900. A second joint venture in the district was

undertaken by Silver Star Mines, Inc., and Oro Syndicate for development of the St. Paul lead-zinc property. Blocked-out and indicated reserves were estimated at 10,000 tons. Stripping and diamond drilling of a tungsten deposit near Libby was done by Moose Hill Mining Co.

Madison.—Small shipments to Government low-grade stockpiles were made by the Ralph Boatman operation and the John T. McCale Lost Lode mine, both manganese properties. The Strawberry tungsten mine was active part of 1956.

Three producers—Tri-State Minerals Co. (Treasure State and Keystone mines), Sierra Talc & Clay Co. (Yellowstone mine), and American Chemet Corp. (mine near Alder)—supplied the talc output of the county.

McCarthy Mountain District.—Fred Starner operated the Big Bertha mine from January to July. Gold and some silver were recovered.

Pony and South Boulder District.—Basil and Denzil Nicholsen worked the Ridgeway gold mine from June to October and milled ore in a 3-stamp mill.

Rabbit District.—Production from the Daizy No. 1 mine and from the Diamond Hitch property, both lead mines, was recorded.

Rochester District.—Blaine Jensen (lessee) operated the Calvin lead mine. The Leodora mine was active also for a brief period.

Sheridan District.—Production from the Fairview gold mine was recorded.

Tidal Wave (Twin Bridges) District.—Silver ore was shipped from the Hawkeye mine, and some gold and silver was recovered from the High-Ridge mine.

Meagher.—The only nonmetal mining in the county was production of road gravel by contractors for the Bureau of Public Roads.

Mineral.—Uranium claims east of Saltese were under development by Western Resources, Inc.

Contractors produced paving and road gravel for the Bureau of Public Roads, and county highway department crews dug pit-run road gravel. In October Finlen & Sheridan Mining Co. began development at a fluorspar deposit on Fish Creek near the Montana-Idaho border.

Cedar and Trout Creek District.—E. T. Vincent and Clay Lewis operated a gold dredge on the Calumet placer and Cron's CB&Q placer during most of 1956. Placer gold also was produced from the Stemwinder property by hydraulicking and ground sluicing.

Iron Mountain District.—E. G. Smith (lessee) resumed production from the Iron Mountain mine and continued to operate the Nite Owl mine. Ore was processed at the Nancy Lee mill.

Missoula.—Shipments were made to Government low-grade stockpiles from the Pioneer Corp. Arrowhead manganese mine.

Three commercial sand and gravel operators produced these commodities at Missoula. Paving gravel and basalt for ballast were prepared by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. and stock-car sand and granite for riprap were processed by the Northern Pacific Railway Co. The barite mine and grinding plant of the Finlen & Sheridan Mining Co. were acquired and operated by the Baroid Sales Division, National Lead Co.

Clinton (Wallace) District.—Gold-silver ore was shipped from the Charcoal mine.

Coloma District.—U & W Uranium, Inc., leased the Royal mine in midyear and developed the property by a 600- by 85-foot cut. Copper ore was shipped crude to a smelter. Further development was planned at the mine, which consisted of three patented claims and mill buildings.

Copper Cliff District.—A small shipment of lead ore from the Blacktail mine was reported.

Nine Mile District.—William Lamon sank a 20-foot incline shaft at the Nine Mile gold mine and milled some sorted pay ore from the incline in a 15-ton Gibson rod mill. Gold recovered from stream gravel at the LaChambre placer was sold in 1956.

Musselshell.—The county maintained its second-place position in quantity of coal produced in the State. Ten underground mines contributed to the total, and each produced over 2,000 tons. Republic Coal Co. Klein No. 2 mine remained the leading producer. The other major producers were the Roundup Mining Co. Roundup No. 3 mine and Mountain States Mining Co. Montana Queen mine. Two oilfields—Big Wall and Ivanhoe—produced all but 90,000 barrels of the 570,000-barrel total, valued at $1.1 million. Three other fields were active. Sandstone for riprap was quarried by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

Park.—Granite for road metal, limestone for riprap, and paving gravel were produced for county use. Eggar Construction Service and Long Construction Co. prepared structural sand and paving gravel.

New World District.—Carter-Moreland Mining Co. produced silver ore from the Irma mine.

Phillips.—Withdrawals of natural gas from the Bowdoin field, which extends into Valley County, totaled 1.9 billion cubic feet. This output (2.8 billion cubic feet less than 1955) relegated the field to fourth position in the State. Structural sand and paving gravel were prepared by Gaylord LaFonde Sand & Gravel Co., Malta. Gravel for ballast and other purposes was furnished to the Great Northern Railway Co. The United States Army Corps of Engineers used paving gravel.

Little Rockies District.—Northern Mining & Milling Co. developed the Hawkeye open-pit gold mine and constructed a 75-ton flotation mill. Concentrate containing gold and some silver was recovered. Little Rockies Mining & Development Co. continued exploration and development at the Little Ben gold mine. No stoping was done, and the ore milled originated entirely from development, which comprised 574 feet of drifting, a 165-foot crosscut, and 112 feet of raises.

Powell.—Phosphate-rock production was continued by Montana Phosphate Products Co. at its Anderson underground and strip mines near Garrison. During the latter part of the year the company ceased operating the Graveley mine; the Luke and Gimlet mines were reported inactive all year. All of the mined product was shipped to chemical-fertilizer plants at Trail and Kimberley, British Columbia. A planer with a vibrating pneumatic blade, patterned after a fixed-blade device used for continuous longwall mining of narrow seams of friable coal, was designed by Bureau of Mines engineers and test-

operated at the Montana Phosphate Products Co. mine.[11] According to the report:

> It has been proved that phosphate rock of the character encountered at the Anderson Mine can be planed; and, although sustained high production has not yet been attained, some advantages of long-face planer mining already are apparent.

George Relyea operated his phosphate mine near Garrison. Limestone was burned to quicklime by the Elliston Lime Co., 18 miles west of Helena. Western Clay Manufacturing Co. made building brick from locally mined clay. Paving gravel was prepared by the Mastodon Sand & Gravel Co. at Deer Lodge.

Nigger Hill District.—Charter Oak Mining Co. operated its Charter Oak property from June to November. A new 50-ton flotation mill was equipped with lead-zinc circuits, but there was no separation of zinc in 1956 due to lack of a market. Wolfe and Hahn operated the Flora mine in the same area. John F. Hopkins worked the Negros lead mine for 1 month and shipped 6 tons of ore with gross content of 1 ounce of gold, 55 ounces of silver, and 1,400 pounds of lead. The Golden Anchor and the Third Term gold-silver-lead operations also were active.

Pioneer District.—Gold was recovered by Montana Gold & Chemical Co. by bucketline dredging and use of hydraulic giants at the Reservoir placer, 4 miles south of Gold Creek. The company controlled approximately 10,000 acres of placer ground in the vicinity. About 35,000 cubic yards of gold-bearing gravel was washed during 2½ months of operation.

Ravalli.—National Uranium Corp. and Hypotheek Mining & Milling Co. acquired the newly discovered Lucky Joe uranium prospect south of Darby under a purchase-option agreement. Uranium mineralization was said to occur in a greenish phyllite formation as pitchblende and on footwall quartzite fractures as uranophane. The vein structure was exposed by bulldozer trenching for a distance of 500 feet.

Fluorspar was mined by S. A. Cummings and H. E. Roberts (Cummings-Roberts) at the Crystal Mountain mine near Darby. A little more than half of the output, which was almost double the 1955 total, was used at steel plants and other metallurgical installations. The bulk of the balance was shipped to the GSA stockpile. A small quantity of sand and gravel was produced by county highway crews and for the United States Forest Service.

Overwich District.—Placer gold recovered in 1955 by hydraulicking on the Hughes Creek placer was marketed in 1956.

Richland.—Production of crude oil from the Brorson field was less than in 1955, marking the second consecutive year that output declined. The field began producing in 1953 and reached a high of over 75,000 barrels the next year. The Jennison Coal Co. mined lignite near Culbertson.

Rosebud.—The county ranked sixth in the State in total value of fuels and nonmetals during 1956. Total crude-oil output, all of which came from the Sumatra field, was 1.5 million barrels worth $3.4 million. This was only slightly less than in 1955. Coal production from the Rosebud mine of Northwestern Improvement Co. resulted

[11] Work cited in footnote 7.

in the county maintaining its position as the leading coal-producing county in Montana. The Lame Deer Mining Co. Lame Deer mine also was active. Paving gravel was prepared by contractors for the Bureau of Public Roads.

Sanders.—*Eagle District.*—The Jack Waite mine (operated under a profit-sharing agreement by American Smelting and Refining Co.), was 1 of 3 Montana mines producing more than 500 tons of lead in 1956. Lead-zinc ore was milled in a 250-ton flotation mill. Operations were resumed February 1 following settlement of a strike that idled the property nearly 6 months.

Prospect Creek (Burns) District.—Montana Standard Mining Co. continued operations at the Montana Standard lead-zinc mine and hauled crude ore over the Bitterroot Divide to the Golconda custom mill in Shoshone County, Idaho. High trucking costs and a short shipping season reduced mine output. Financial arrangements were under way for construction of a 75-ton flotation mill.

Sheridan.—Gravel for various purposes was produced by county road crews, contractors, and the Great Northern Railway Co. Two strip operations and one underground mine contributed to the lignite output that placed the county in first position for production of that commodity. The strip mines were the Lagerquist Coal and the Wolf Creek, owned by Elvin C. Lagerquist (Westby), and Medicine Lake Coal Co. (Plentywood), respectively. The Acme Coal Co. (Dagmar) operated the underground mine of the same name. Initial production of 2,751 barrels of crude oil valued at $6,327 was reported from the Outlook Area field.

Silver Bow.—Gold, silver, copper, lead, and zinc production of the Summit Valley (Butte) district supplied all but $7 million of the value of mineral production in Silver Bow County. Manganese also was produced in this district, and in other areas of the county manganese, phosphate rock, and sand and gravel were mined. Shipments to Government low-grade stockpiles were made from the following manganese mines: Brilliant, Bluebird, Burlington, Cumberland, Eagle Bird, Easter, Fredonia, Great Republic, Lavino, Magna Charta, Mapleton, Minnie Jane, Nettie-Hubernic, Norwich & Plutus, Olsen Fraction, Sankey group, Silver Clift, Tzarena, and Uinta. Umont Mining, Inc., received a DMEA loan to explore the Plutus & Norwich mine. Work at the mine, which formerly was operated by the partnership of Irving & Nelson, was to include diamond drilling and 1,000 feet of drifting. Stovell Manganese Co. acquired the Tzarena mine under lease and option, also from Irving & Nelson.

The Maiden Rock mine in this county and the Canyon Creek mine (Beaverhead County) furnished phosphate rock for conversion to elemental phosphorus at the Victor Chemical Works plant at Silver Bow. Pyrite from Silver Bow County base-metal ores was used at Anaconda, Deer Lodge County, for making sulfuric acid. Paving gravel was produced by county crews. Pioneer Concrete & Fuel, Inc., Butte, prepared structural sand and paving gravel.

Summit Valley (Butte) District.—Production of gold, silver, copper, lead, and zinc totaled $111 million, a 29-percent increase over 1955 and double the 1947–54 average. In addition, the value was the third highest on record, being exceeded only in 1916 ($127 million) and 1918 ($115 million). Copper yielded 74 percent of the value; zinc, 15

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in Silver Bow County, 1947–51 (average), 1952–56, and total, 1882–1956, in terms of recoverable metals

Year	Mines producing	Material sold or treated (short tons)	Gold, lode and placer (fine ounces)	Silver, lode and placer (fine ounces)
1947–51 (average)	21	2,945,638	18,712	5,812,510
1952	21	4,425,605	16,930	5,518,197
1953	19	5,998,457	19,871	6,289,415
1954	22	4,987,849	17,395	4,663,439
1955	22	7,159,693	22,262	5,577,999
1956	21	9,394,981	31,132	6,772,380
1882–1956		[1]	2,227,345	603,668,960

Year	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
1947–51 (average)	112,608,660	27,063,360	114,131,980	$51,022,909
1952	123,118,000	32,324,000	151,936,000	65,806,893
1953	155,040,000	33,534,000	150,340,000	72,566,257
1954	118,480,000	23,032,000	107,054,000	54,498,289
1955	162,856,000	28,662,000	125,176,000	86,240,115
1956	192,584,000	29,978,000	126,750,000	111,138,462
1882–1956	[2] 7,201,425	[2] 376,285	[2] 2,186,727	3,244,776,571

[1] Data not available.
[2] Short tons.

percent; silver, 6 percent; lead, 4 percent; and gold, 1 percent. The district supplied more than half of the value of Montana mineral production. Ore output was 9.4 million tons, highest on record, due to the huge tonnages of low-grade ore from the Kelley mine and initiation of open-pit mining at the Berkeley project. About 7.9 million tons of copper ore was mined and processed; and production of lead-zinc ore totaled 1.5 million tons, including 400,000 tons of manganese ore, which yielded a lead-zinc-middling product.

The Butte Hill operations of The Anaconda Co. also contributed the bulk of the manganese ore mined in Montana. Output was consigned to the manganese mill and nodulizing plant at Anaconda. The Anaconda Co. annual report disclosed production of 90,614 tons of nodules and 44,714 tons of ferromanganese. A study of the oxidation and enrichment of the Butte manganese deposits was published.[12] Production of copper ore was curtailed in November and December, as the result of price reductions from 46 cents to 36 cents per pound of refined metal by the major producers. The curtailment was effected by reducing the work week from 6 to 5 days and by closing the Belmont mine; however, production remained above the 1955 monthly average. Production of copper ore from the new Berkeley pit totaled 1.9 million tons and production by block caving at the Kelley mine totaled 4.3 million tons. Output of high-grade copper ore, mainly from the Mountain Con mine, was 1.4 million tons. The Gagnon pit yielded 46,000 tons, and 58,000 tons was recovered from the East Colusa pit. A total of 4,413 tons of mine-water precipitate (cement copper) was recovered.

[12] Work cited in footnote 4.

Production of ore from the Berkeley pit, in the southeastern part of the district, began in December 1955. By early 1956 ore was being mined at the rate of 5,000 tons per day; in addition, 55,000 tons of waste per day was being removed, making a total of 60,000 tons handled each day. It was estimated that 185 million tons of waste eventually would be removed. The waste material averaged 250 feet in thickness, and the ore beneath was 200 feet in depth. At the end of 1956 ore production averaged 10,000 tons daily, and this rate was to be increased to 17,500 tons by mid 1957.

At the Kelley mine (Greater Butte project), production was at the capacity rate of 15,000 tons of ore daily. Measured reserve of ore was 180 million tons, containing 1 percent copper, and as much as 100 million tons more of reserves was indicated. Work was initiated on the Northwest project in 1956 to develop huge reserves of low-grade copper and zinc ores in outlying areas of the Butte Hill. Preliminary work was completed in connection with sinking of two new shafts—Ryan and Missoula. The Missoula shaft was to be an auxiliary hoisting and service shaft. Production through the main Ryan shaft was scheduled for late in 1959.

The Marget Ann gold-silver mine of Mitchell Mining Co. was active part of the year; production declined from the 1955 total.

Stillwater.—Production of chromite ore and concentrate was continued by the American Chrome Co. at the Mouat mine to fulfill requirements of the company contract with GSA. Extensive diamond drilling from the lowest mine level delineated tonnage and grade of ore at greater depth, and it was planned to sink a 3-compartment shaft 550 feet to develop this ore. A research program also was in progress to examine the practicability of a ferrochromium smelter near the mine site. The most important chromite deposits in the United States are found in Stillwater and Sweet Grass Counties. A report published in 1956 gave results of electric smelting tests of low-grade chromite concentrate from the area.[13] The report indicated that ferrochromium acceptable in regular steel-mill alloy practice could be prepared from the concentrate, which has a Cr-Fe ratio lower than generally is used by the trade.

Output from the Lake Basin field totaled 3,718 barrels of crude oil valued at $7,957. This was a little more than double the 1955 yield.

Sweet Grass.—The Long Construction Co. prepared a small quantity of paving gravel.

Independence District.—Lead ore was shipped from the Half Moon property.

Treasure.—County highway crews mined and processed gravel for paving purposes.

Yellowstone.—Recovery of crude oil from the Wolf Springs field increased from 23,000 barrels in 1955 (initial output) to 412,949 barrels valued at $879,581 in 1956. The Mosser field accounted for the balance of the total county production (422,806 barrels worth $896,831). The Great Northern Railway Co. produced gravel for railroad ballast. Four commercial operators prepared structural and paving sand and gravel.

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[13] Walsted, J. P., Electric Smelting of Low-Grade Chromite Concentrates: Bureau of Mines Rept. of Investigations 5268, 1956, 28 pp.

The first recovery of high-purity sulfur in the State from oil refinery residual gases was reported by Montana Sulphur & Chemical Co. at Billings. Plant construction, which began in the early part of the year, was completed in June. Heavy clay products were made from locally mined clay by Lovell Clay Products Co., Billings. A small quantity of sandstone for riprap was quarried by contractors for the Bureau of Reclamation.

The Mineral Industry of Nebraska

By D. H. Mullen[1]

MINERAL production in Nebraska in 1956 continued its upward trend and established a record for the ninth consecutive year. The value of all minerals produced in 1956 was $71.8 million, a 32-percent increase over 1955. Mineral fuels as a group (petroleum, natural gas, and natural-gas liquids) increased 45 percent in value of output over 1955 and represented 70 percent of the total mineral production of the State. Petroleum increased 47 percent, natural gas 11 percent, and natural-gas liquids 72 percent in value of output over 1955.

Of the nonmetallic minerals produced, cement ranked first in value, followed by sand and gravel, stone, clays, pumice, and gem stones. Gains in value of output were reported for all the nonmetallic minerals except stone, which decreased 1 percent in value. Cement production increased 8 percent in value, sand and gravel 20 percent, clays 2 percent, pumice 10 percent, and gem stones 25 percent over 1955.

TABLE 1.—Mineral production in Nebraska, 1955–56[1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	150,835	$150,835	153,137	$153,549
Gem stones	(2)	2,400	(2)	3,000
Natural gas—million cubic feet	12,515	2,553,000	13,541	2,844,000
Petroleum (crude)—thousand 42-gallon barrels	11,203	30,810,000	16,204	45,209,600
Sand and gravel	8,405,197	6,192,797	10,350,000	7,403,925
Stone	3,081,247	4,177,361	3,062,691	4,141,813
Value of items that cannot be disclosed: Cement, natural-gas liquids, and pumice	----------	11,143,474	----------	12,771,949
Total Nebraska[3]	----------	54,237,000	----------	71,776,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] The total has been adjusted to eliminate duplication in the value of raw materials used in the manufacture of cement.

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.

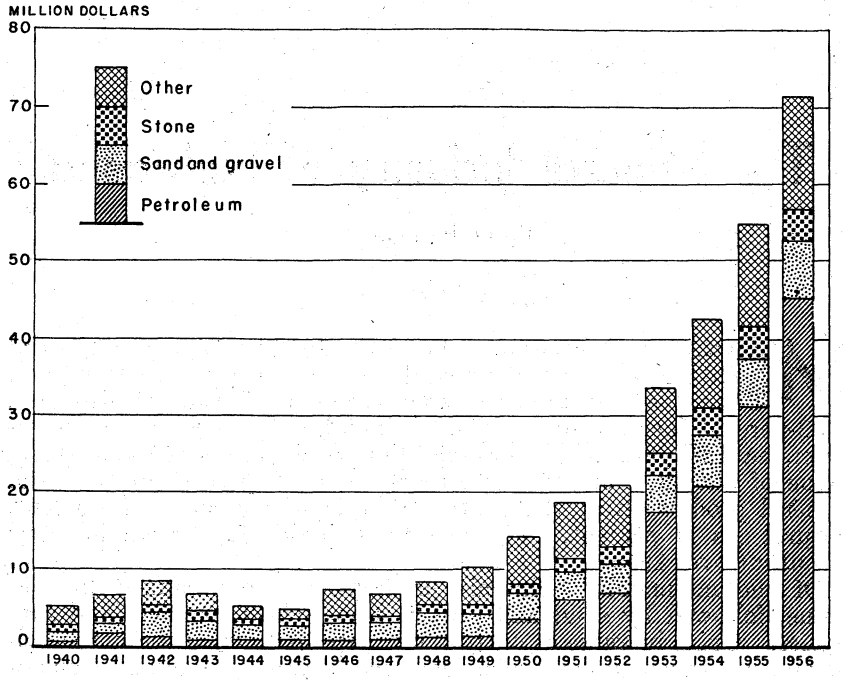

FIGURE 1.—Value of petroleum, sand and gravel, and stone, and total value of mineral production in Nebraska, 1940–56.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Natural Gas.—Natural gas was produced from oil and gas wells in Banner, Cheyenne, Deuel, and Kimball Counties. Cheyenne County continued to be the leading producer. Marketed production in 1956 was 13,500 million cubic feet; the 8-percent increase over 1955 came principally from the Huntsman and S. W. Sidney fields in Cheyenne County and the Big Springs field in Deuel County. Gas produced in Banner and Kimball Counties was repressured, flared, or otherwise wasted. One gas discovery was made when Shell Oil Co. completed its No. 1 State well in Cheyenne County 4.5 miles west of the Peetz field, the nearest gas producer.

Natural-Gas Liquids.—A cycle plant at Huntsman field in Cheyenne County processed natural gas from the Huntsman and S. W. Sidney fields. Recovery of natural gasoline, butane, and lighter fractions increased 73 percent over 1955.

Petroleum.—Production of petroleum in 1956 was 16,204 thousand barrels, a 45-percent increase over 1955. Output was reported from the following counties, listed according to rank as producers: Kimball, Cheyenne, Banner, Morrill, Richardson, Garden, and Red Willow. Garden and Red Willow Counties began producing oil in 1956. Harlan County produced a small quantity of petroleum in 1955 but none in 1956. Wells in Richardson County, the first

county to produce oil in the State, yielded about 1 percent of the total output.

Exploration and development drilling continued to be widespread in 1956. Of the 465 wildcats completed 40 were oil wells and 1 was a gas well. Footage drilled totaled 2.5 million feet, and the success ratio was 1 : 11.6. Of the 470 field-development wells, 262 were successful. Footage drilled was 2.8 million feet. Exploration was north toward the Chadron arch and east toward the Cambridge arch. A significant discovery was the No. 1 Barger well completed in Red Willow County in the Lansing-Kansas City formation of Pennsylvanian age. Previous exploration along the Cambridge arch near the Kansas State line had been encouraging, and a well in Hitchcock County was designated a discovery in 1955. The well was abandoned early in 1956, when tests failed to show sustained recovery at commercial rates. The discovery of the Barger field intensified exploration toward the Cambridge arch. A second significant discovery was the No. 1 Richards well completed in Garden County. This well was on the northeast flank of the Denver-Julesburg basin, 20 miles northeast of the area of present production. The discovery intensified exploration north and east toward the Chadron arch.

Kimball County ranked first in both exploratory and development drilling, followed by Banner, Cheyenne, Morrill, Garden, Scotts Bluff,

TABLE 2.—Wildcat and development well completions in 1956, by counties

County	Oil	Gas	Dry	Total	Footage
Wildcat:					
Arthur			2	2	6,400
Banner	8		81	89	533,800
Box Butte			8	8	28,700
Chase			4	4	20,700
Cheyenne	2	1	57	60	310,400
Custer			2	2	7,400
Dawes			4	4	14,000
Deuel			5	5	19,100
Frontier			1	1	4,300
Garden	2		12	14	51,600
Harlan			2	2	7,800
Hayes			2	2	9,200
Hitchcock			9	9	38,700
Keith			1	1	3,700
Kimball	23		144	167	1,045,700
Lincoln			1	1	4,300
McPherson			1	1	3,100
Morrill	4		36	40	184,800
Perkins			3	3	11,200
Red Willow	1		9	10	39,800
Scotts Bluff			13	13	71,100
Sioux			3	3	16,200
Eastern Nebraska			24	24	74,000
Total wildcat	40	1	424	465	2,506,000
Development:					
Banner	74		38	112	669,300
Cheyenne	41		32	73	364,300
Deuel			1	1	3,700
Frontier			1	1	4,200
Garden			5	5	17,200
Harlan	1			1	3,700
Hitchcock			1	1	4,200
Kimball	127		114	241	1,623,000
Morrill	16		6	22	112,900
Red Willow	1		1	2	7,700
Eastern Nebraska	2		9	11	34,000
Total development	262		208	470	2,844,200
Total drilling	302	1	632	935	5,350,200

and Red Willow Counties. Exploratory drilling resulted in the discovery of 23 new fields in Kimball County, 8 in Banner County, 2 in Cheyenne County, 4 in Morrill County, 2 in Garden County, and 1 in Red Willow County.

Geophysical (seismorgaph and gravimeter) activity increased from 117 crew-weeks in 1955 to 141 crew-weeks in 1956. Gravimeter work was done by Honolulu Oil Co., with 20 crew-weeks each in Garden and Morrill Counties and 5 crew-weeks in Red Willow County. Seismograph work was done by various companies in all producing counties. Most of the geophysical activity, however, was away from the producing area of the Denver-Julesburg basin and toward the Chadron arch to the north and east. Principal areas of activity in other than producing counties were in Arthur, Box Butte, Dawes, Grant, Keith, Scotts Bluff, and Sioux Counties.

The refinery at Scotts Bluff operated throughout the year. The refinery at Salem in Richardson County was shut down.

NONMETALS

Cement.—Shipments of portland and masonry cements increased 1 percent over 1955. Portland-cement shipments (types I and II) increased 2 percent and masonry-cement shipments decreased 23 percent. An increase in highway construction caused the increase in shipments of portland cement, whereas a decline in construction of dwellings caused the decreased demand for masonry cement. Production came from plants in Cass and Nuckolls Counties that were operated at 95 percent of capacity. Limestone, shale, and other materials used in portland and masonry cements were produced from quarries near the plants and from nearby deposits in Kansas. The 7 kilns in operation at the 2 plants consumed 56 million kilowatts of electricity. The bulk of the shipments went to Nebraska (79 percent), followed by Iowa (17 percent), and smaller shipments went to Kansas, Minnesota, South Dakota, Missouri, North Dakota, and Colorado. The price of portland cement in 1956 was $3.03 a barrel compared with $2.82 in 1955.

Clays.—Miscellaneous clay for the manufacture of building brick, drain tile, other heavy clay products, and portland cement were mined in seven counties. Stoneware clay produced in Cass County was used exclusively for the manufacture of art pottery and flowerpots. Production in 1956 was 2 percent above 1955.

Gem Stones.—Chalcedony, agate, jasper, and similar gem stones were recovered by individual collectors in Sioux County. The estimated value in 1956 was $3,000—an increase of 25 percent over 1955.

Perlite.—Crude perlite produced in the Western States was expanded at a plant in Omaha. The expanded product was used in prepared plasters and as lightweight aggregate in concrete.

Pumice.—Pumicite, as windblown volcanic ash, was produced from pits near Callaway in Custer County. A small quantity was marketed as mined, but the major portion was washed, dried, and sized. The principal uses were for scouring soaps and powders, for abrasives, and as an oil absorbent. Production in 1956 increased 7 percent and value 10 percent over 1955.

Sand and Gravel.—Sand and gravel was produced in 58 counties. Commercial production was reported in 54 counties and Government-

and-contractor production in 20 counties. Principal production came from the valleys of the Platte and Missouri Rivers. Other production came from the Republican River Valley and its tributaries. Sarpy County ranked first in the value of its output of sand and gravel, followed by Douglas, Dodge, Cass, Platte, and Buffalo Counties. Production in 1956 was 10,350,000 tons (an increase of 23 percent over 1955) and represented 11 percent of the value of Nebraska's mineral production. Paving and road construction used 60 percent of the output, building 39 percent, and engine and filter sand and railroad ballast 1 percent.

Government-and-contractor operators produced 12 percent of the sand and gravel used for paving and road building—7 percent of the total production of the State. Ninety-six percent of the commercial production was washed, screened, or otherwise prepared, whereas only 70 percent of the Government-and-contractor production was prepared. Most of the sand and gravel was transported by truck (67 percent) and the remainder by railroad. Seven operators—Christensen Sand & Gravel Co., Gerhold Co., Inland Construction Co., Lincoln Sand & Gravel Co., Lyman-Richey Sand & Gravel Corp., Albert H. Niedfelt, contractor, and Western Sand & Gravel Co.—produced 51 percent of the State's output.

TABLE 3.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Class of operation and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building	1,402,906	$998,755	$0.71	3,295,000	$2,311,100	$0.70
Paving	1,037,660	629,775	.61	1,948,000	1,373,075	.70
Engine	84,840	49,026	.58	6,500	4,875	.75
Filter				1,000	750	.75
Railroad ballast	17,478	5,707	.33	96,000	72,000	.75
Other	10,738	1,900	.18	7,000	5,250	.75
Gravel:						
Building	1,701,460	1,296,874	.76	714,500	561,625	.79
Paving	3,547,557	2,919,942	.82	3,524,000	2,591,375	.74
Other	45,678	56,917	1.25	29,000	22,875	.79
Total commercial sand and gravel	7,848,317	5,958,896	.76	9,621,000	6,942,925	.72
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	7,032	2,979	.42			
Paving	160,242	40,045	.25	137,500	76,000	.55
Gravel: Paving	389,606	190,877	.49	591,500	385,000	.65
Total Government-and-contractor sand and gravel	556,880	233,901	.42	729,000	461,000	.63
Grand total	8,405,197	6,192,797	.74	10,350,000	7,403,925	.72

Stone.—Dimension limestone, crushed limestone, and crushed sandstone—produced in 9 counties—comprised 6 percent of the value of the State's mineral production. Dimension limestone (rough construction stone and rubble) was produced in Cass, Lancaster, and

Sarpy Counties. The output was 70 percent below 1955. Crushed limestone used for riprap, concrete aggregate and road construction, agriculture, manufacture of cement, and other purposes was produced in Cass, Gage, Lancaster, Nemaha, Pawnee, Sarpy, and Seward Counties. Cass County was the leading producer followed by Pawnee, Sarpy, and Nemaha Counties. The quantity produced in 1956 was approximately the same as in 1955.

Crushed sandstone used for riprap was produced in Franklin County. The quantity produced in 1956 was 40 percent below 1955. Total output of all stone in 1956 was 3.1 million tons, a 1-percent decrease compared with 1955. Leading producers of stone in 1956 were Ash Grove Lime & Portland Cement Co., Hopper Bros. Quarries, Geroge W. Kerford Quarry Co., Nelson Quarries, Inc., and Olson Quarries, Inc.

Talc.—Crude talc from deposits in California and Montana was ground at a plant at Grand Island. The ground product was used in ceramics, paint (as a filler), paper, textiles, and toilet preparations.

Vermiculite.—Crude vermiculite from Montana was exfoliated at a plant at Omaha for use as insulation and lightweight aggregate.

REVIEW BY COUNTIES

Adams.—Western Brick & Supply Co. produced miscellaneous clay for manufacturing building brick and other heavy clay products at Hastings. L. J. Vontz produced paving gravel. Paving sand and gravel was produced for the State highway department, the Adams County Highway Department, and the city of Hastings by Robert Hohlfeldt, Ed Lilley, and Lippincott Construction Co. The county ranked fourth in the production of clay.

Banner.—Banner County ranked third in Nebraska in value of petroleum production and fourth in value of mineral output. Petroleum came from 16 fields, of which 8 were discovered in 1956. Principal producing fields were the Harrisburg, Olsen, Vedene, Lovercheck, Vowers, Petroleum-State, and Downer. The county highway department produced paving gravel.

TABLE 4.—Value of mineral production in Nebraska, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Adams	$147,842	$112,885	Sand and gravel, clays.
Banner	(2)	(2)	Petroleum, sand and gravel.
Boone	14,826	(2)	Sand and gravel.
Box Butte	----	2,000	Do.
Boyd	4,000	11,000	Do.
Brown	23,526	40,750	Do.
Buffalo	142,386	326,750	Do.
Butler	14,495	39,500	Do.
Cass	10,480,619	11,006,580	Cement, stone, sand and gravel, clays.
Cedar	47,708	89,500	Sand and gravel.
Cheyenne	(2)	(2)	Petroleum, natural-gas liquids.
Clay	57,892	101,375	Sand and gravel.
Colfax	48,881	75,400	Do.
Cuming	123,870	99,250	Do.
Custer	(2)	(2)	Pumice.
Dawes	----	200	Clays.
Dawson	137,240	214,250	Sand and gravel.
Deuel	(2)	----	

See footnotes at end of table.

TABLE 4.—Value of mineral production in Nebraska, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Dixon	$12,509	$18,250	Sand and gravel.
Dodge	524,717	639,750	Do.
Douglas	1,083,508	895,287	Sand and gravel, clays.
Dundy	8,971	12,000	Sand and gravel.
Fillmore	45,515	21,000	Do.
Franklin	40,554	81,275	Sand and gravel, stone.
Frontier	173	----	
Furnas	66,716	(2)	Sand and gravel.
Gage	85,869	91,638	Sand and gravel, stone.
Garden	----	(2)	Petroleum.
Garfield	2,288	----	
Gosper	5,042	----	
Hall	139,791	255,000	Sand and gravel.
Hamilton	50,487	51,250	Do.
Harlan	(2)	61,000	Do.
Hayes	14,379	16,750	Do.
Hitchcock	24,276	39,250	Do.
Holt	54,009	64,000	Do.
Howard	----	14,250	Do.
Jefferson	162,817	208,355	Sand and gravel, clays.
Kearney	(2)	(2)	Sand and gravel.
Keith	14,077	75,000	Do.
Kimball	(2)	(2)	Petroleum, sand and gravel.
Knox	7,500	50,250	Sand and gravel.
Lancaster	202,204	240,808	Stone, clays.
Lincoln	5,590	17,250	Sand and gravel.
Loup	15,006	62,625	Do.
Madison	21,594	95,625	Do.
Merrick	52,890	9,000	Do.
Morrill	(2)	(2)	Petroleum, sand and gravel.
Nance	2,793	----	
Nemaha	(2)	439,617	Stone.
Nuckolls	(2)	(2)	Cement, sand and gravel.
Otoe	12,575	7,646	Clays.
Pawnee	566,038	534,304	Stone.
Perkins	8,067	24,250	Sand and gravel.
Phelps	73,286	----	
Pierce	82,950	(2)	Sand and gravel.
Platte	315,747	346,750	Do.
Polk	----	40,500	Do.
Red Willow	114,773	87,629	Sand and gravel, petroleum.
Richardson	824,376	648,841	Petroleum, stone, sand and gravel.
Saline	69,024	65,500	Sand and gravel.
Sarpy	347,666	1,326,314	Sand and gravel, stone.
Saunders	68,903	(2)	Sand and gravel.
Scotts Bluff	55,864	96,000	Do.
Seward	(2)	361,000	Sand and gravel, stone.
Sioux	3,600	(2)	Sand and gravel, gem stones.
Stanton	51,325	(2)	Sand and gravel.
Thayer	(2)	(2)	Do.
Thurston	----	(2)	Do.
Valley	143,537	38,750	Do.
Webster	5,001	20,500	Do.
York	24,450	(2)	Do.
Undistributed [3]	38,376,125	53,350,582	
Total [4]	54,237,000	71,776,000	

[1] The following counties are not listed because no production was reported: Antelope, Arthur, Blaine, Burt, Chase, Cherry, Dakota, Grant, Greeley, Hooker, Johnson, Keya Paha, Logan, McPherson, Rock, Sheridan, Sherman, Thomas, Washington, Wayne, and Wheeler.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[3] Includes petroleum, cement, sand and gravel, natural gas, natural-gas liquids, stone, pumice, and gem stones not assigned to specific counties and values indicated by footnote 2.

[4] Total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement.

Buffalo.—Building and paving sand and gravel and well-packing gravel were produced by Bruner Bros., Harry Johnson, Paul Sawyer Sand & Gravel Co., Carl Whitney, and Whitney Sand & Gravel Co. The county highway department produced paving gravel. The county ranked sixth in the State in the value of sand and gravel production.

Cass.—Cass County ranked third in the State in the value of mineral production—first in cement and stone, second in clays, and fourth in sand and gravel. Ash Grove Lime & Portland Cement Co. produced types I and II portland cement and masonry cement at its plant at Louisville. Portland cement was used as a base for manufacturing masonry cement. The company produced limestone and shale from deposits near the plant. Kahler Pottery Co., Inc., produced stoneware clay for art pottery and flowerpots. Crushed limestone for riprap, concrete aggregate and roadstone, agriculture, filler, and other uses was produced by Cass Co.-Contractors; Chicago, Burlington & Quincy Railroad Co.; Kelly Bros. & Co.; George W. Kerford Quarry Co.; Olson Quarries, Inc.; United Mineral Products Co.; and Western Limestone Products Co., Inc. Kelly Bros. & Co. produced limestone rubble. Cunningham-Kiewit Co. and Eugene Luhr & Co. produced riprap for the United States Army Corps of Engineers. Building and paving sand and paving gravel were produced by Lyman-Richey Sand & Gravel Corp., at plants 5 and 6, and by Western Sand & Gravel Co., at its Cedar Creek and South Bend plants.

Cheyenne.—The county produced petroleum, natural gas, and natural-gas liquids and ranked second in the value of mineral production. Petroleum was produced in 47 fields, of which 2 were discovered in 1956. Principal producing fields were Maley, Dorman, Doran, Cook, Juelfs, and Rudolph. Natural gas was from the S. W. Sidney, Sunol, and Shell State fields; the last named field was discovered in 1956. Natural gas from oil wells in the Huntsman field was processed at the natural-gasoline plant of the Ohio Oil Co. to recover natural gasoline, butane, and other liquid-petroleum gases. Natural gas from other oilfields was repressured or flared.

Clay.—The Deweese Sand & Gravel Co. produced building sand and building and paving gravel. George K. Werner produced paving gravel for the State highway and county highway departments.

Custer.—LaRue-Axtell Pumice Co. produced pumicite from pits near Callaway for cleansing and scouring compounds and soaps, abrasives, and oil absorption. Production increased 7 percent and value 10 percent over 1955.

Dawson.—Sand and gravel for building, paving, railroad ballast, and well packing was produced by R. E. Davis, Cleo Hunt, C. Kirkpatrick & Son, Harold E. Kirkpatrick, and Overton Sand Co. The county ranked ninth in the State in the production of sand and gravel.

Deuel.—Natural gas was produced from wells in the Big Springs field. The county ranked second in the State in output of marketed natural gas.

Dodge.—Sand and gravel for building and paving was produced by Christensen Sand & Gravel Co., Lincoln Sand & Gravel Co., and Lux Sand & Gravel Co. The county ranked third in the State in the value of sand and gravel produced.

Douglas.—Douglas County ranked second in the State in the value of sand and gravel produced, fifth in the value of clays produced, and eighth in the value of mineral production. Building and paving sand, engine sand, railroad ballast, and building and paving gravel were produced by Acme Sand & Gravel Co., Hartford Sand & Gravel Co., Lyman-Richey Sand & Gravel Corp. (operating plants 9 and 11), and

J. W. McCann Co. Omaha Brick Works produced miscellaneous clay for manufacturing building brick and other heavy clay products. Western Mineral Products Co. expanded perlite from deposits in the Western States and exfoliated vermiculite from Montana deposits at plants in Omaha. The expanded perlite was used as a lightweight aggregate in plaster and concrete. Exfoliated vermiculite was used as loose-fill insulation and lightweight aggregate.

Franklin.—Bushman Construction Co. produced crushed sandstone for use as riprap. Amman Sand & Gravel Contractors and Bladen Sand & Gravel Co. produced building sand and paving gravel.

Garden.—Petroleum was produced for the first time in Garden County when the Richards and McCord fields were discovered in 1956. The fields are 20 miles northeast of existing producing areas, on the northeast flank of the Denver-Julesburg basin. Production was from cretaceous sandstones at a depth of about 3,200 feet; however, the gravity of the oil was 27.5°—considerably lower than that of other Denver-Julesburg basin oil. Although the two fields did not produce a large quantity of oil in 1956 (the county ranked sixth in the State in petroleum production), the discoveries extended the Denver-Julesburg basin 20 miles northeast and provided the incentive for more active exploration toward the Chadron arch.

Hall.—Building and paving sand and gravel, engine sand, and gravel for well packing were produced by Armour Construction Co.; East Ashton Sand & Gravel; H. & M. Equipment Co. (two plants); Albert H. Niedfelt, contractor; Riverside Sand & Gravel Co.; and Third City Sand Co. Lilley Sand & Gravel produced paving gravel for the county highway department. The county ranked eighth in the State in the value of sand and gravel output. The Sierra Talc & Clay Co. operated its grinding plant at Grand Island. Crude talc came from mines in Montana and California. The ground product was used in ceramics, in toilet preparations, and as a filler in paint, paper, and textiles. A fluid-energy mill was installed in 1956. Shipments increased 24 percent in quantity and 40 percent in value over 1955.

Harlan.—Petroleum was produced from 3 fields (1 well in each field) in Harlan County in 1955, but no production was reported in 1956. Exploratory drilling in 1956 was unsuccessful. One successful development well was completed in the Bantam field. Olson Gravel Co. produced building and paving gravel and gravel for well packing.

Jefferson.—Endicott Clay Products Co. and Western Brick & Supply Co. produced miscellaneous clay for manufacturing building brick and other heavy clay products. The county ranked third in the State in the value of clay production. Building and paving sand and gravel and gravel for well packing were produced by Consolidated Sand & Gravel Co., Steele Bros., Wagner & Roelf, and R. M. Weblemoe Co.

Kimball.—Kimball County was the leading producer of petroleum in the State. Production came from 70 fields, of which 23 were discovered in 1956. Major producing fields were Travis, Kimball, Long, Torgeson, Enders, and Sloss. Production increased 55 percent over 1955. Exploration and development drilling were widespread, and the county ranked first in number of wells completed. Natural gas

from oil wells was repressured or flared. Wilson Bros. Ready Mix produced building sand.

Lancaster.—Yankee Hill Brick Manufacturing Co. produced miscellaneous clay for manufacturing building brick and other clay products. Production in 1956 was 14 percent greater than in 1955. The county was the leading clay producer in the State. Schwarck Quarries, Inc., produced limestone rubble; limestone for riprap, concrete aggregate, and road construction; and agricultural lime. The county highway department mined crushed limestone for riprap and road construction.

Morrill.—Production of petroleum in Morrill County in 1956 increased more than twentyfold over 1955. The bulk of the output came from the Olsen field that extends into both Morrill and Banner Counties. Successful wildcat drilling resulted in the discovery of 4 new fields, making 6 producing fields in the county. The county ranked fourth in the State in the value of petroleum produced. Building and paving sand and engine sand were produced by Dolson Gravel Co. and Lyman-Richey Sand & Gravel Corp. (plant 23).

Nemaha.—Crushed limestone for riprap, concrete aggregate and roadstone, and agriculture was produced by Harmon Gravel Co., Heebner Quarries (Heidzig and Kyle quarries), and Nelson Quarries, Inc., Bower Construction Co., Costa Co., Inc., Eugene Luhr & Co., and Massman Construction Co. produced riprap for the United States Army Corps of Engineers.

Nuckolls.—The Ideal Cement Co., Nebraska Division, produced types I and II portland and masonry cements at its plant at Superior. Portland-cement clinker was used in manufacturing masonry cement. Limestone used at the plant was mined by the company at a quarry in Jewell County, Kans. C. F. Bondegard produced paving gravel and George K. Werner produced paving gravel for the county highway department.

Pawnee.—Pawnee County ranked second in the State in the value of crushed-stone production. Hopper Bros. Quarries produced crushed limestone for concrete aggregate and road construction and for agriculture.

Platte.—Ace Sand & Gravel Co., Albers & Anderson, Gerhold Co., and Lyman-Richey Sand & Gravel Corp. (plant 15) produced building and paving sand and paving gravel. The county ranked fifth in the State in the value of sand and gravel produced.

Red Willow.—Red Willow County entered the ranks of oil-producing counties when the No. 1 Barger well was completed early in 1956. The well produced 198 barrels a day on pump from the Lansing-Kansas City formation from perforations at 3,856 to 3,864 feet. This was the first substantial discovery on the Cambridge arch in southern Nebraska. A second well in the field (the No. 46–6 Stephens) also was completed and produced 194 barrels of oil a day on pump. Davidson-Merritt Sand & Gravel Co., Clarence A. Gillen, and Midwest Sand & Gravel Co. produced building and paving sand and gravel and filter sand.

Richardson.—Crushed limestone for riprap was produced by Costa Co., Inc., for the United States Army Corps of Engineers. The county highway department produced paving gravel. Petroleum

output came from four fields. The Searll Petroleum Corp. refinery at Salem was shut down in 1956.

Sarpy.—The county ranked first in the value of sand and gravel produced and fourth in the value of stone output. Lyman-Richey Sand & Gravel Corp. (plants 2, 7, 12, and 13), Olson Quarries, Inc., and Richfield Sand & Gravel Co. produced building and paving sand and gravel and engine sand from pits in the valleys of the Platte and Missouri Rivers. The board of county commissioners produced paving sand. General Rock, Inc., and Meadow Rock Co. produced dimension limestone, which was marketed as rough construction stone and rubble. Crushed limestone for riprap, concrete aggregate and road construction, and agriculture was produced by General Rock, Inc., Meadow Rock Co., and Stone Products Co.

Scotts Bluff.—The skimming and cracking plant of the Nebraska Consumers Cooperative Refinery Association at Scottsbluff operated throughout 1956. Crude oil came from eastern Wyoming fields and the Harrisburg field in Banner County. Building and paving sand and gravel was purchased by Albert H. Niedfelt, contractor; Platte Valley Cement Tile Manufacturing Co.; and Trettenero Sand & Gravel.

Seward.—Inland Construction Co. produced paving sand and gravel. Greenhorn Lime Products, Inc., produced agricultural limestone.

The Mineral Industry of Nevada

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Nevada Bureau of Mines.

By L. E. Davis,[1] E. J. Matson,[1] G. C. Branner,[1] and R. Y. Ashizawa[2]

ALL MINERALS produced in Nevada rose over 10 percent in value, exceeding the 1955 value by $13 million. Copper, tungsten, and manganese mines continued to supply the minerals that represented a large percentage of this value; but, in all, each of 15 major mineral commodities (9 metal and 6 nonmetal), was the basis for a million-dollar industry in 1956.

Most of the increase in quantity and value of the production over 1955 was attributed to the relatively high unit prices for most metals throughout the year. The quantity of copper produced was a near record, with a higher value than had been attained in any previous year for the metal in Nevada. The yield of tungsten concentrate declined from the previous year and reflected curtailment of Government purchases in the last half of the year. The output of manganese ore and concentrate continued large; in consequence, Nevada regained first place nationally in both tonnage and value in 1956.

A high percentage of the gold and silver output was accounted for as byproduct recovery through increased activity at copper, lead, and zinc mines in Lincoln and White Pine Counties. The quantity of gold recovered from those operations almost offset the decline in placer-gold production, as Nevada's leading 1955 placer mine did not operate in 1956. Increased silver production in 1956 was aided by reactivation of the Mohawk mine and Bruhi mill in the Silver Peak area, Esmeralda County, during the latter half of the year.

The greatly increased yield of iron ore in 1956 resulted from increased demand for high-grade ore in Japan. The high lead and zinc production for 1956 was due principally to stepped-up activity in the Pioche district, Lincoln County, and the shipment from Clark County of major tonnages of oxidized zinc ore (held in a Government stockpile since World War II) and of lead residue derived from manganese ore mined in the county.

Nevada mercury production, largely the yield of one mine and second only to California nationally, increased in quantity in 1956, despite a lower average unit value. Uranium activity continued high. During the year nine mining companies shipped ore to concentrators outside the State.

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TABLE 1.—Mineral production in Nevada, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite	113,694	$708,804	178,440	$1,066,930
Clays	6,155	13,385	13,960	31,806
Copper (recoverable content of ores, etc.)	78,925	58,878,050	82,883	70,450,550
Gem stones	[2]	[3]	[2]	50,000
Gold (recoverable content of ores, etc.) fine ounces	72,913	2,551,955	72,646	2,542,610
Gypsum	836,744	2,835,922	790,356	2,700,708
Iron ore (usable) long tons, gross weight	324,602	[4] 1,667,098	916,592	[4] 2,498,374
Lead (recoverable content of ores, etc.)	3,291	980,718	6,384	2,004,576
Manganese ore (35 percent or more Mn) gross weight [5]	101,469	[3]	121,482	[3]
Mercury 76-pound flasks	5,750	1,669,512	5,859	1,522,871
Petroleum (crude) thousand 42-gallon barrels	64	110,000	64	111,000
Pumice	[3]	[3]	11,534	34,516
Sand and gravel	3,580,260	3,762,384	4,686,513	4,568,693
Silver (recoverable content of ores, etc.) fine ounces	845,397	765,127	1,220,473	1,104,590
Stone	1,611,942	2,608,900	1,401,169	2,280,778
Talc and soapstone	10,732	[6] 78,842	10,540	98,506
Tungsten concentrate 60-percent WO_3 basis	6,155	22,750,662	5,400	19,263,193
Zinc (recoverable content of ores, etc.)	2,670	656,820	7,488	2,051,712
Value of items that cannot be disclosed: Antimony ore and concentrate (1956), brucite (1956), diatomite, fluorspar, lime, magnesite, calcareous marl, molybdenum concentrates (content), perlite, salt, sulfur ore, uranium ore (1956), and values indicated in footnote 3	----------	13,751,734	----------	14,403,557
Total Nevada [7]	----------	113,220,000	----------	126,233,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing company confidential data.
[4] 1955 value based on average value at the railhead and 1956 value based on average value f. o. b. mine.
[5] Shipments to Government low-grade depots and custom mills not included, but quantity and value for this material are as follows: 1955—manganese ore, 3,213 short tons, $262,142, and low-grade manganese ore, 1,254 short tons, $50,278; 1956—manganese ore, 612 short tons, $39,411, and low-grade manganese ore, 3,142 short tons, $140,270.
[6] Revised figure. Supersedes preliminary figure given in commodity chapter.
[7] Total has been adjusted to eliminate duplicating the value of stone.

TABLE 2.—Average unit value of selected mineral commodities, 1947–51 (average) and 1952–56 [1]

Commodity	1947–51 (average)	1952	1953	1954	1955	1956
Copper cents per pound	21.5	24.2	28.7	29.5	37.3	42.5
Gold dollars per fine ounce	35.00	35.00	35.00	35.00	35.00	35.00
Iron ore (average value at mine) dollars per long ton	4.46	6.09	6.76	6.99	7.12	7.75
Lead cents per pound	15.92	16.1	13.1	13.7	14.9	15.7
Mercury dollars per 76-pound flask	106.22	199.10	193.03	264.39	290.35	259.92
Silver cents per fine ounce	90.5	90.5+	90.5+	90.5+	90.5+	90.5+
Tungsten concentrate dollars per short-ton unit WO_3	33.07	63.44	62.46	62.61	61.79	57.90
Zinc cents per pound	13.8	16.6	11.5	10.8	12.3	13.7

[1] Prices are discussed in detail in the commodity chapters of vol. I, Minerals Yearbook.

Although most of the nonmetals produced in Nevada in 1956 increased in value, those more or less closely associated with home construction declined from 1955. This applied particularly to gypsum and lime, although the unit value of both commodities advanced slightly. The increased production of sand and gravel over 1955 was

due principally to the quantity of paving sand prepared for use at military bases in Churchill and Washoe Counties, and to the large tonnage of sand and gravel produced for railroad ballast in Lincoln County. The decline in quantity of stone quarried in 1956 was related directly to completion of a major municipal project for Las Vegas, Clark County, begun in 1955, which in that year required a very large tonnage of crushed granite.

The slightly lower quantity of diatomite mined in 1956 resulted in part from a higher market price that adversely affected about 60 percent of the sales. The marked increase in barite output over 1955 was accounted for by greater out-of-State demand for the mineral as a constituent in drilling fluids and the requirements of a California chemical plant that used the crude barite as a basis in producing various barium compounds.

The demand for export, and by eastern magnesia-refractory manufacturers, caused a slight increase in the tonnage of magnesite and brucite mined in 1956. Although fluorspar production was greater both in tonnage and value compared with 1955, the known deposits suitable for an Acid-grade product were nearing depletion at the end of the year.

The yield of petroleum was substantially the same as in 1955, as exploration continued with little success.

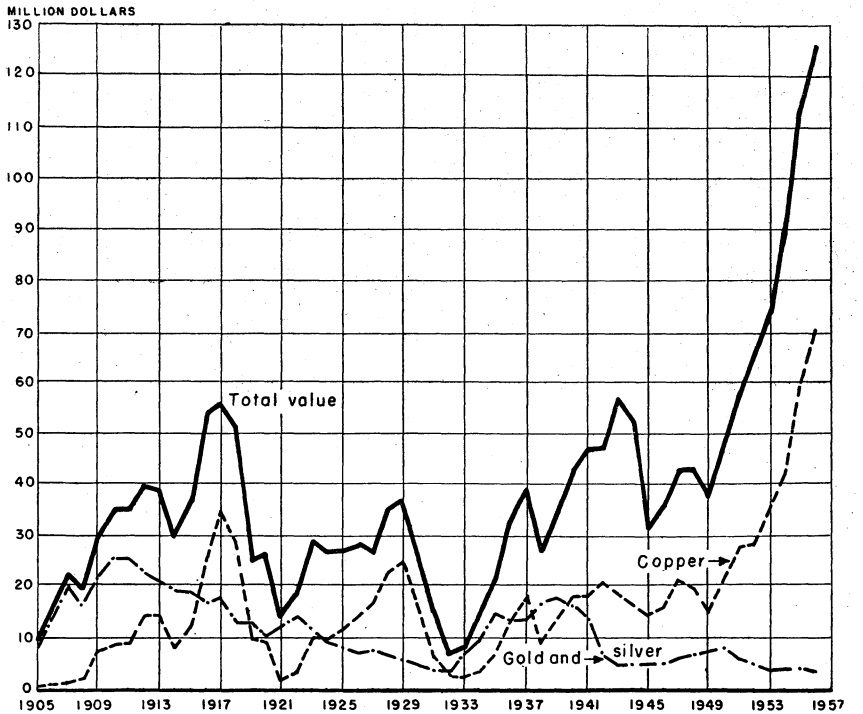

FIGURE 1.—Value of gold and silver, copper, and total value of mineral production in Nevada, 1905–56.

A comparatively small portion of the mineral production was consumed in the State because of limited industrial activity and a relatively small population.

Copper precipitate, concentrate, and some copper ore were shipped to out-of-State smelters. Nevada's only smelter, in White Pine County, received copper concentrate from the Kennecott mill and copper, gold and silver custom ores for fluxing on a custom basis from various mining districts throughout the State. The blister copper was shipped to eastern refineries. Tungsten ores were custom treated by mills in several counties and the concentrate sold to the Government for stockpiling or shipped to eastern consumers. Manganese

TABLE 3.—Defense Minerals Exploration Administration contracts active during 1956

County and contractor	Property	Commodity	Contract		
			Date	Total amount	Government participation (percent)
ELKO					
Bounty & Sons	Monarch	Tungsten	May 23, 1955	$6,500	75
ESMERALDA					
Nelson, Nelson & Clair	4 Aces	Lead, zinc	Mar. 30, 1955	8,436	50
HUMBOLDT					
Apollo Mines, Inc.	Saddle	Tungsten	Sept. 14, 1955	14,520	75
TNT, Inc.	Mountain Queen.	do.	Apr. 21, 1955	23,003	75
LANDER					
Petersen, Lowe, Bush & Campbell.	Lost Chance	Manganese	Apr. 28, 1955	10,155	75
LINCOLN					
Combined Metals Reduction Co.	Black Prince	Lead, zinc	Mar. 2, 1955	98,200	50
Comet Mines, Inc.	Comet	do.	Apr. 16, 1952	190,000	50
Consolidated Uranium Mines, Inc.	Schofield	Tungsten	June 24, 1954	77,035	75
Milbank & Jones	Bristol	Copper-lead-zinc.	Aug. 13, 1956	82,250	50
Raymond Combined Mines Co.	Prince Henry	Lead, zinc	Oct. 29, 1952	108,466	50
Wah Chang Mining Corp.	Lincoln	Tungsten	Mar. 17, 1955	76,300	75
Yuba Dike Mines, Inc.	Yuba Dike	Lead, zinc	May 17, 1955	21,750	50
MINERAL					
Nevada Scheelite Corp.	Leonard	Tungsten	June 12, 1956	68,800	75
NYE					
The Climax Tunsten Co.	Climax	do.	Oct. 30, 1956	66,320	75
El Capitan Mining Co.	El Capitan	do.	Apr. 25, 1955	41,190	75
PERSHING					
C. A. Coppin	Redbird	Mercury	July 5, 1955	31,310	75
Cordero Mining Co.	Stormy Fraction.	Tungsten	July 23, 1956	24,120	75
WHITE PINE					
Helmar Mining & Milling Co., Inc.	Teresa	Tungsten	Sept. 12, 1955	24,900	75
M. I. A. Mines, Inc.	Minerva	do.	Jan. 27, 1953	171,400	75
Mount Wheeler Mines, Inc.	Mount Wheeler.	Lead, zinc	Mar. 15, 1955	303,200	50
Robert E. Salvi	Valley View	Tungsten	Nov. 2, 1955	16,400	75

ores were processed in the State or shipped to Government stockpiles.

Gold and silver producers shipped bullion directly to the United States Mint or consigned ores and concentrates to smelters. Lead and zinc ores and concentrates, without exception, were shipped to smelters outside of the State. Mercury producers sold directly to consumers and distributors most of whom were outside of Nevada. Although noteworthy tonnages of iron ore were shipped to eastern furances, most of the production was consigned to California brokers for export.

TABLE 4.—Contracts for purchase of minerals and metals under the Defense Production Act, as of Dec. 31, 1956

Contractor	County	Commodity	Contingent purchase commitment (short tons)	Financing	
				Amount	Type
Titanium Metals Corp. of America.	Clark	Titanium-sponge metal.	1,500	$15,000,000	Advance.
Manganese, Inc.	do	Manganese nodules	[1] 83,0000		

Contractor	Tax amortization (percent)	Approximate term of contract (years)	Date production starts	Commitment purchase price
Titanium Metals Corp. of America	90	5	May 1, 1952	$5.00 or market a pound.[2]
Manganese, Inc.		9	Jan. 1, 1952	$1.50 a long ton unit of contained Mn.[3]

[1] Long tons.
[2] Sponge metal. Contract has clause to allow for differential between ingot and sponge purchased.
[3] Includes escalator clause.

Many producers disposed of nonmetals output at grinding plants in California; but some commodities (such as brucite, clays, diatomite, limestone, magnesite and perlite) were consumed or further processed in the State. A substantial tonnage of crude gypsum was converted to the finished product in Nevada. Some producers of marl or sulfur ore sold directly to farmers after crushing the crude material.

Government Participation.—Interest under the Defense Minerals Exploration Administration (DMEA) program was high during 1956. Twenty-one projects in 9 counties were active during all or part of the year. Twelve projects were for tungsten, 6 for lead-zinc, and 1 each for copper, manganese, and mercury. Bureau of Mines and Geological Survey teams, with headquarters at Reno, provided technical assistance and administered the program.

Two production contracts (1 each for manganese and titanium) negotiated by the Defense Materials Procurement Agency in 1952 were in effect during the entire year. One incentive contract for copper terminated in March 1956. The Government did not maintain General Services Administration (GSA) purchase depots in Nevada during the year. However, shipments of tungsten concentrate, manganese ores and concentrates, and low-grade manganese ores were made to GSA and stockpiled at out-of-State depots.

Employment and Injuries.—Employment in the mineral industries increased for the sixth consecutive year, and the total disabling in-

juries were the lowest recorded for the 6-year period. The average weekly earnings per employee were the highest and the average number of hours worked per man per week the shortest since the end of World War II. In all, 7,830 employees worked a 40-hour week in 1956, with an average weekly earning per employee of $93.60.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—A small quantity of antimony concentrate was shipped to a Texas smelter in 1956. It was recovered from ore mined in Pershing County several years previously. A small tonnage of ore was mined in Nye County and shipped to a mill in Lander County but was not processed. Several hundred tons of antimonial-lead ore from Mineral County was shipped to smelters in California and Utah. Smelter returns for the year showed that several tons of recoverable antimony metal was contained in base-metal ores and concentrates shipped from Nevada mines to smelters outside of the State. Interest in straight antimony ore mining remained low, owing to lack of nearby smelting facilities.

Cadmium.—Zinc concentrate produced from ores of the Pioche area (Lincoln County) contained an appreciable quantity of recoverable cadmium. The tonnage of cadmium recovered at zinc plants outside the State was undetermined, but was estimated to have been higher

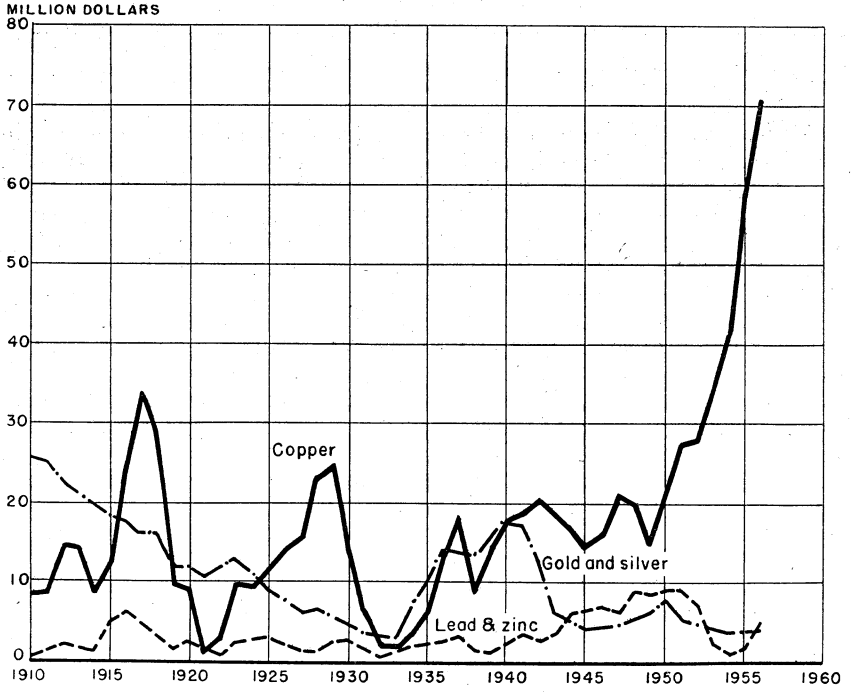

FIGURE 2.—Value of mine production of gold and silver, copper, and lead and zinc in Nevada, 1910–56.

than in 1955. The greater tonnage of zinc concentrate treated at Utah smelters accounted for the increased output of cadmium.

Copper.—Nevada copper production increased 5 percent above 1955 and was within 1 percent of the alltime high of 1942. The yield reflected the continued high unit price during the first half of the year. The copper mines of White Pine County contributed 60 percent of the State total, with Kennecott Copper Corp., Nevada Mines Division, in the Robinson district, the major producer. Kennecott's operations were confined to the Kimbley, Liberty and Veteran pits and the Minnesota-Hi underground ore body. The Minnesota-Hi ore, above and within the projected cave area of the Deep Ruth ore body, will be mined before deeper operations are begun. Consolidated Coppermines Corp., in the Robinson district adjoining Kennecott mining operations, was the State's third-ranking producer. Most of the company-mined ore was obtained from the Tripp pit, a consolidation of the Morris and Brooks pits.

The Anaconda Co. operations at the Yerington copper mine (Lyon County) continued throughout the year and maintained a close second in State production. The mined oxide ore was acid leached and the copper precipitated on iron scrap. The precipitate was shipped to the company smelter and refinery in Montana. Additional exploration by drilling was carried on during the year, which resulted in increasing the Yerington-ore reserves.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1859–1956, in terms of recoverable metals [1]

Year	Mines producing [2]		Material sold or treated [3] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	238	29	6,926,022	126,095	$4,413,339	1,497,339	$1,355,153
1952	114	11	7,313,697	117,203	4,102,105	941,195	851,829
1953	125	9	8,027,402	101,799	3,562,965	697,086	630,898
1954	119	17	9,843,202	79,067	2,767,345	560,182	506,993
1955	134	10	10,760,337	72,913	2,551,955	845,397	765,127
1956	132	5	12,300,484	72,646	2,542,610	1,220,473	1,104,590
1904–56 [4]	----------	----------	[5]	14,764,230	364,767,153	312,941,890	214,203,582
1859–1956 [4]	----------	----------	[5]	26,591,106	609,250,386	601,354,739	551,361,805

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	48,389	$20,933,052	8,824	$2,876,744	19,350	$5,411,714	$34,900,001
1952	57,537	27,847,908	6,790	2,186,380	15,357	5,098,524	40,086,746
1953	61,850	35,501,900	4,371	1,145,202	5,812	1,336,760	42,177,725
1954	70,217	41,428,030	3,041	833,234	1,035	223,560	45,759,162
1955	78,925	58,878,050	3,291	980,718	2,670	656,820	63,832,670
1956	82,883	70,450,550	6,384	2,004,576	7,488	2,051,712	78,154,038
1904–56 [4]	2,374,100	843,828,592	377,386	58,694,783	476,600	91,914,460	1,573,408,570
1859–1956 [4]	2,376,026	844,475,220	615,177	81,331,345	476,600	91,914,460	2,178,333,216

[1] Includes recoverable metal content of gravel, washed (placer operations); ore milled; old tailing or slimes re-treated; and ore, old tailing, and slag shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-grader," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] From 1904 when first satisfactory annual canvass of mine production was made to 1956, inclusive.
[5] Data not available.

Most of the remaining production came from: The Bristol mine, Jack Rabbit district, Lincoln County; the Copper Canyon and Copper Basin mines, Battle Mountain district, Lander County; and the Marshall (Nevada-Bellvue) mine, Contact district, Elko County.

Gold.—The quantity of lode gold produced in 1956 increased approximately 9 percent over 1955, owing largely to byproduct recovery from the ores of Nevada's copper mines. The Goldacres open pit in the Bullion district (Lander County) was the only large, straight-gold-mining operation in Nevada during the year. There were 132 lode mines in 16 counties that contributed to the State gold produc-

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals

County	Mines producing[1]		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Churchill	3		19	$665	2,631	$2,381
Clark	11		74	2,590	23,586	21,347
Douglas	(2)		(3)	(3)	(3)	(3)
Elko	10		186	6,510	69,632	63,021
Esmeralda	4	1	[4] 253	[4] 8,855	[4] 87,876	[4] 79,533
Eureka	5	1	3,130	109,550	139,204	125,987
Humboldt	5		134	4,690	5,454	4,936
Lander	16		19,482	681,870	54,550	49,371
Lincoln	10		1,447	50,645	388,886	351,961
Lyon	5	(2)	[5] 1	[5] 35	[5] 182	[5] 165
Mineral	6		296	10,360	36,514	33,047
Nye	16	(2)	[5] 461	[5] 16,135	[5] 28,228	[5] 25,548
Pershing	6	3	[4] 88	[4] 3,080	[4] 2,898	[4] 2,622
Storey	1		(3)	(3)	(3)	(3)
Washoe	3		56	1,960	682	617
White Pine	28	(2)	[5] 45,920	[5] 1,607,200	[5] 373,444	[5] 337,986
Undistributed [3 5]	3	(2)	1,099	38,465	6,706	6,068
Total	132	5	72,646	2,542,610	1,220,473	1,104,590

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Churchill			54,400	$8,541	700	$96	$11,683
Clark	29,000	$12,325	5,926,100	930,398	3,238,300	443,647	1,410,307
Douglas							(3)
Elko	609,000	258,825	661,700	103,887	238,300	32,647	464,890
Esmeralda	5,000	2,125	18,100	2,842	3,400	466	[4] 93,821
Eureka	168,800	71,740	1,977,000	310,389	281,200	38,524	656,190
Humboldt	204,300	86,828	1,600	251	6,600	904	97,609
Lander	928,900	394,783	33,500	5,259	2,800	384	1,131,667
Lincoln	1,074,600	456,705	3,800,000	596,600	11,104,500	1,521,317	2,977,228
Lyon	62,435,200	26,534,960	9,000	1,413	8,600	1,178	[6] 26,537,751
Mineral	15,500	6,587	84,400	13,251	1,500	206	63,451
Nye	5,600	2,380	25,100	3,941	6,200	849	[5] 48,853
Pershing	2,500	1,062	2,000	314	1,200	164	[4] 7,242
Storey							(3)
Washoe	10,600	4,505	15,600	2,449	3,600	493	10,024
White Pine	100,276,200	42,617,385	157,800	24,774	79,100	10,837	[6] 44,598,182
Undistributed [3 5]	800	340	1,700	267			45,140
Total	165,766,000	70,450,550	12,768,000	2,004,576	14,976,000	2,051,712	78,154,038

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] From property not classified as a mine.
[3] Douglas County and Storey County lode combined with "Undistributed" to avoid disclosing individual company confidential data.
[4] Esmeralda County placer combined with Pershing County to avoid disclosing of individual company confidential data.
[5] Lyon County, Nye County, and White Pine County placer combined with "Undistributed" to avoid disclosing individual company confidential data.
[6] Exclusive of placer output, which is included with "Undistributed."

tion, chiefly as a byproduct from ores treated primarily for recovering other metals. The lead ores of Eureka County and the lead-zinc ores of Lincoln County yielded noteworthy quantities of gold.

Only 350 fine ounces of placer gold was recovered in 1956, chiefly because the Natomas Co. did not reactivate its dredging operation in Lander County. Small-scale hand operations in Lander County supplied about 35 percent of the total placer gold recovered; small quantities came from Esmeralda, Eureka, Pershing, and White Pine Counties.

Of the 5 placer mines active during the year, 3 used small-scale hand methods, 1 was a nonfloat washing plant, and 1 a drift mine.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	6,298	106,938	7,127	425	466
February	3,849	71,549	5,312	336	423
March	4,798	64,280	6,694	348	664
April	7,376	70,011	7,971	419	574
May	7,117	76,530	7,905	522	657
June	6,104	93,280	6,718	459	676
July	5,868	106,650	6,446	661	656
August	6,805	120,800	7,137	701	687
September	6,289	123,713	6,761	577	529
October	6,135	135,451	7,130	677	624
November	5,609	129,615	6,871	768	704
December	6,398	121,656	6,811	491	828
Total	72,646	1,220,473	82,883	6,384	7,488

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	33	147,420	19,130	8,129	2,000	600	----------
Dry gold-silver	12	6,514	1,002	54,513	178,000	1,000	----------
Dry silver	23	18,068	103	127,056	17,500	36,100	16,400
Total	68	172,002	20,235	189,698	197,500	37,700	16,400
Copper	65	12,014,339	47,471	612,372	165,416,400	413,900	362,300
Copper-lead-zinc	1	55	1	1,526	7,700	28,100	10,600
Lead	28	8,046	3,335	196,472	14,300	2,893,700	161,800
Lead-zinc	12	84,870	1,135	197,394	114,500	3,518,600	10,861,400
Zinc	4	9,784	1	22,245	15,400	480,300	3,535,600
Total	110	12,117,094	51,943	1,030,009	165,568,300	7,334,600	14,931,700
Other "lode" material:							
Old tailings [2 3]	4	56	47	109	----------	----------	----------
Lead residue	1	11,329	13	596	200	5,395,700	27,200
Zinc residue	1	3	58	7	----------	----------	700
Total	6	11,388	118	712	200	5,395,700	27,900
Total "lode" material	184	12,300,484	72,296	1,220,419	165,766,000	12,768,000	14,976,000
Gravel (placer operations)	5	[4]	350	54	----------	----------	----------
Total, all sources	189	----------	72,646	1,220,473	165,766,000	12,768,000	14,976,000

[1] Details will not necessarily add to totals because some mines produce more than 1 class of material.
[2] Metal recovered, by class of old tailing, as follows: Gold, 56 tons—35 ounces gold, 80 ounces silver.
[3] Includes material from mercury-retort residue and tungsten-mill cleanup.
[4] 11,817 cubic yards.

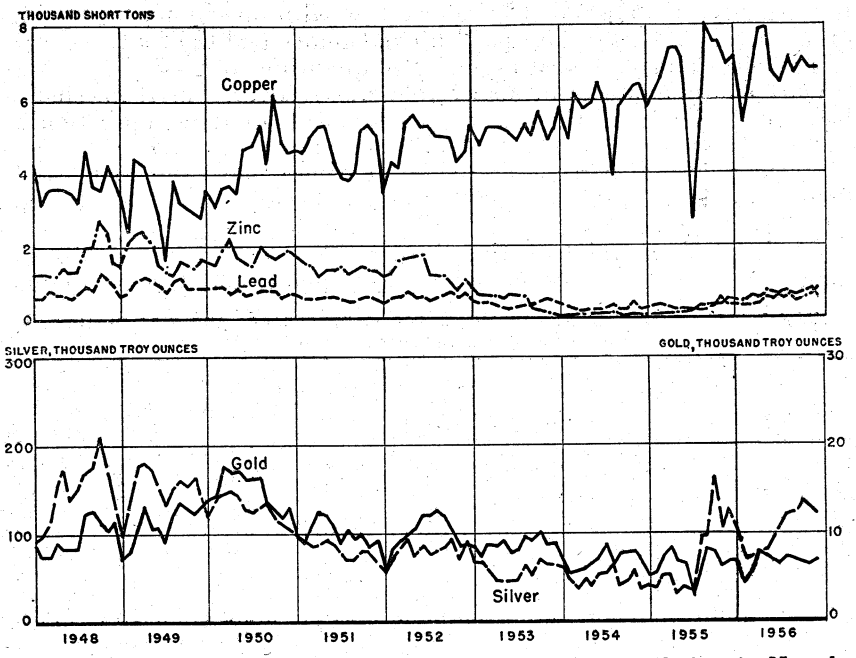

FIGURE 3.—Mine production of gold, silver, copper, lead, and zinc, in Nevada 1948–56, by months, in terms of recoverable metals.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Material shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	11	42	56	33		
Dry silver	198	59	31,741	95	422	1,914
Copper and copper precipitates [1]	288,778	40,953	156,574	161,044,748	25,943	
Lead	3,433	649	113,843	37,666	2,988,067	280,778
Zinc	9,975	479	66,308	61,819	439,153	10,770,841
Cement copper	1			120	2	
Total: 1956	302,396	42,182	368,522	161,144,481	3,453,587	11,053,533
1955	271,237	38,870	178,935	157,337,562	1,084,390	3,475,128
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold:						
Crude ore	109	313	260	2,036	929	
Old tailings	1	23	76	64	20	
Dry gold-silver: Crude ore	6,514	1,002	55,738	181,746	1,482	76
Dry silver: Crude ore	2,068	27	33,762	19,975	36,345	18,913
Copper: Crude ore	128,892	6,518	470,944	10,285,186	413,200	459,309
Copper-lead-zinc: Crude ore	55	1	1,526	9,024	28,581	13,475
Lead:						
Crude ore	7,821	3,333	196,152	19,257	2,984,332	210,364
Residue	11,329	13	596	225	5,513,976	34,389
Lead-zinc: Crude ore	1,606	9	17,614	29,277	177,109	146,433
Zinc:						
Crude ore	9,784	1	24,542	29,768	531,811	3,679,557
Residue	3	58	7			914
Total: 1956	168,182	11,298	801,217	10,576,558	9,687,785	4,563,430
1955	132,925	7,162	305,007	4,283,180	5,721,070	2,561,601

[1] Combined to avoid disclosing individual company confidential data.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For material treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Churchill	45	7	27	1	2	112		600	
Clark	53	1	1	17	34	81	100	1,100	
Esmeralda	Cleanup	17	62,276						
Humboldt	300	6	4						
Lander	146,340	17,698	1,110	1,692	709	17,831	277,800	14,300	
Lincoln	83,229			13,392	1,126	179,795	92,600	3,343,100	10,742,200
Lyon	[2]			[2]			[2]		
Mineral	16,000			198	59	31,223		400	1,500
Nye	408	145	70	8		202		7,000	
Pershing	17	19	16						
Washoe	180	50	16						
White Pine	[2] 11,878,285			[2] 287,086	40,244	133,193	[2] 155,286,000		
Undistributed [3]	7,445	873	6,602	2	8	17		2,200	1,700
Total: 1956	12,132,302	18,816	70,122	302,396	42,182	362,454	155,656,500	3,368,700	10,745,400
1955	10,627,412	20,121	365,829	271,237	38,870	175,305	153,642,100	1,062,500	3,376,100
BY CLASSES OF MATERIAL TREATED									
Dry gold:									
Crude ore	147,311	18,783	7,819	10	34	50			
Old tailings [4]	55	16	27	1	8	6			
Dry silver: Crude ore	16,000	17	62,276	198	59	31,223		400	1,500
Copper: Crude ore	11,885,447			288,779	40,953	151,024	155,563,900	14,300	
Lead: Crude ore	225			11	2	337		10,000	
Lead-zinc: Crude ore	83,264			13,397	1,126	179,814	92,600	3,344,000	10,743,900
Total: 1956	12,132,302	18,816	70,122	302,396	42,182	362,454	155,656,500	3,368,700	10,745,400
BY CLASSES OF CONCENTATE SHIPPED TO SMELTERS [1]									
Dry gold				11	42	56			
Dry silver				198	59	31,223		400	1,500
Copper and copper precipitates [5]				288,778	40,953	151,024	155,563,800	14,300	
Lead				3,433	649	113,843	32,000	2,936,800	221,700
Zinc				9,975	479	66,308	60,600	417,200	10,522,200
Cement copper				1			100		
Total: 1956				302,396	42,182	362,454	155,656,500	3,368,700	10,745,400

See footnotes at end of table.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Churchill	72	10	2,492		53,800	700
Clark	20,994	39	23,504	28,900	5,924,100	3,236,600
Elko	17,651	186	69,632	609,000	661,700	238,300
Esmeralda	712	236	25,600	5,000	18,100	3,400
Eureka	6,737	3,064	139,199	168,800	1,977,000	281,200
Humboldt	5,343	128	5,450	204,300	1,600	6,600
Lander	17,586	1,075	35,609	651,100	19,200	2,800
Lincoln	11,562	321	209,091	982,000	456,900	362,300
Lyon	(2)	(2)	(2)	(2)	(2)	(2)
Mineral	911	237	5,291	15,500	84,000	
Nye	927	316	27,956	5,600	18,100	6,200
Pershing	47	1	2,871	2,500	2,000	1,200
Washoe	247	6	666	10,600	15,600	3,600
White Pine	[2] 85,344	[2] 5,677	[2] 240,433	[2] 7,425,400	[2] 166,800	[2] 87,700
Undistributed	49	2	49	800	400	
Total: 1956	168,182	11,298	787,843	10,109,500	9,399,300	4,230,600
1955	132,925	7,154	303,380	4,207,900	5,519,500	1,963,900
BY CLASSES OF MATERIAL						
Dry gold:						
Crude ore	109	313	260	2,000	600	
Old tailings	1	23	76			
Dry gold-silver: Crude ore	6,514	1,002	54,513	178,000	1,000	
Dry silver: Crude ore	2,068	27	33,557	17,500	35,700	14,900
Copper: Crude ore	128,892	6,518	461,348	9,852,500	399,600	362,300
Copper-lead-zinc: Crude ore	55	1	1,526	7,700	28,100	10,600
Lead:						
Crude ore	7,821	3,333	196,135	14,300	2,883,700	161,800
Residue	11,329	13	596	200	5,395,700	27,200
Lead-zinc: Crude ore	1,606	9	17,580	21,900	174,600	117,500
Zinc:						
Crude ore	9,784	1	22,245	15,400	480,300	3,535,600
Residue	3	58	7			700
Total: 1956	168,182	11,298	787,843	10,109,500	9,399,300	4,230,600

[1] Excludes concentrate treated only by amalgamation and/or cyanidation.
[2] Lyon County combined with White Pine County to avoid disclosing of individual company confidential data.
[3] Includes Douglas County, Storey County, and counties indicated by footnote 2.
[4] Includes material from tungsten mill cleanup and secondary mercury.
[5] Combined to avoid disclosing individual company confidential data.

TABLE 11.—Gold and silver produced at placer mines, 1947–51 (average) and 1952–56, in fine ounces, in terms of recoverable metals

Year	Material handled (cubic yards)	Gold (fine ounces)	Silver (fine ounces)	Total value	Average gold value per cubic yard
1947–51 (average)	2,927,988	18,002	5,939	$635,431	$0.244
1952	5,625,620	33,079	11,011	1,167,730	.206
1953	2,670,110	16,310	2,412	573,033	.214
1954	3,014,130	17,246	2,475	605,850	.200
1955	685,802	6,768	883	237,679	.345
1956	11,817	350	54	12,299	.895

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed in terms of recoverable metals

Type of material processed, and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation and cyanidation:					
Ore	18,800	70,095			
Old tailings	12	4			
Mercury-retort residue	4	23			
Total recoverable in bullion	18,816	70,122			
Concentration and smelting of concentrates:					
Ore [1]	42,182	362,454	155,656,500	3,368,700	10,745,400
Direct smelting:					
Ore	11,204	787,164	10,109,300	4,003,600	4,202,700
Old tailings	23	76			
Lead residue	13	596	200	5,395,700	27,200
Zinc residue	58	7			700
Total	11,298	787,843	10,109,500	9,399,300	4,230,600
Placer	350	54			
Grand total	72,646	1,220,473	165,766,000	12,768,000	14,976,000

[1] Includes concentrate from tungsten-mill cleanup.

Iron Ore.—Nevada's 1956 iron-ore production increased 120 percent over the preceding year, and shipments rose nearly 200 percent. Stocks of ore on hand at the beginning of the year were almost depleted. Seven companies operated open pit mines in 6 counties and produced nearly 900,000 tons of iron ore which averaged more than 58 percent iron. The increased production was due to the greater demand for high-grade ore in Japan, although important tonnages were shipped to eastern furnaces and California steel plants. Less than 1 percent of the Nevada iron-ore output was home-consumed in preparing dead-burned magnesia. One company, with open-pit operations in the Pinenut Mountains (Douglas County) and the Paradise Range (Nye County), produced approximately half of the State's iron ore in 1956. Mines in Pershing, Churchill, Eureka, and Humboldt Counties supplied the remainder.

Iron and Steel Scrap.—Several thousand tons of ferrous scrap, in the form of shredded detinned cans, were shipped to cement-copper producers in Lyon and White Pine Counties from the San Francisco and Los Angeles areas of California. Approximately equal tonnages of iron and steel scrap were shipped to California scrap dealers and brokers during the year. The principal sources of Nevada scrap were the several military bases in the State. Reno (Washoe County) and Las Vegas (Clark County) each had 3 collecting agencies, Winnemucca (Humboldt County) had 1.

Lead.—The quantity of lead produced in 1956 was more than 90 percent above that in 1955 and the highest since 1952. The increase resulted from the higher average unit price for the metal throughout the year. Clark County continued to be Nevada's leading producer, largely from lead residue derived from the treatment of manganese ores mined in the Las Vegas district. Lincoln County production was highlighted by the increased activity of Combined Metals Reduc-

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals [1]

County and district	Mines producing [2]		Lode material (short tons)	Gold (fine ounces)			Silver lode and placer [3] (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Churchill County: East Gate	1		35	6		6	26				$234
Clark County:											
Gold Butte	2		97	3		3	11	4,000			1,815
Goodsprings (Yellow Pine)	4		9,562	1		1	22,807	24,600	527,600	3,205,700	553,145
Las Vegas	1		11,329	13		13	596	200	5,395,700	27,200	851,931
Elko County:											
Delano	1		2,406	13		13	44,387	5,000	522,200	153,800	145,809
Railroad (Bullion)	1		1,368	7		7	13,920	20,300	124,300	82,100	52,234
Esmeralda County:											
Hornsilver		(4)			16	16	5				564
Railroad Springs	(4)		30					4,800			2,040
Silver Peak	1		539	17		17	87,160			1,400	79,671
Eureka County:											
Lone Mountain	1		376				427		11,200	281,200	40,668
Lynn		1			66	66	5				2,315
Maggie Creek	1		2,242	14		14	462	162,400			69,928
Humboldt County: Awakening	1		300	6		6	4				214
Lander County: Battle Mountain	10		24,704	1,762		1,762	53,084	925,700	33,500	2,800	508,780
Lincoln County:											
Groom	1		156	1		1	764	400	66,300		11,305
Pioche	5		83,310	1,128		1,128	180,347	92,600	3,344,500	10,742,200	2,238,827
Lyon County:											
Pine Grove	1		19				8	100			50
Wellington	1		95	1		1	154	1,400	9,000	8,600	3,361
Yerington	2	(4)	4,381,507		(5)	(5)	[6] 20	62,432,100			[6] 26,533,660
Mineral County: Acme	1		2				3	400			173
Nye County:											
Bellehelen	1		15				1	700			298
San Antone	1		96	1		1	872	1,200	8,300	700	2,733
Tonopah	1		650	290		290	25,909				33,599
Twin River (Millett)	1		13				63		4,300	5,000	1,417
Union	1		24				60	2,500			1,117

Pershing County: Willow Creek		1			18	18	3				633
Washoe County: Peavine	1		43	5		5	207	6,500			3,124
White Pine County:											
Cherry Creek	3		12	2		2	73				136
Duck Creek	2		2				3		900		144
Robinson	14		7,581,532	45,911		45,911	364,731	100,260,100	200	59,100	44,555,655
Ward	1		60	3		3	1,643	1,800	16,200		4,900
White Pine	5		259	3		3	3,740	12,100	138,700	20,000	33,148
Undistributed [7]	66	3	199,701	23,109	250	23,359	418,978	1,807,100	2,565,100	386,200	2,420,410
Total Nevada	132	5	12,300,484	72,296	350	72,646	1,220,473	165,766,000	12,768,000	14,976,000	78,154,038

[1] Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts are listed in footnote and their output grouped as "Undistributed."

[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

[3] Source of silver as follows: 1,220,419 ounces from lode mines and 54 ounces from placers.

[4] From property not classed as a mine.

[5] Included with "Undistributed" to avoid disclosing individual company confidential data.

[6] Exclusive of placer output which is included with "Undistributed."

[7] Includes the following: Chalk Mountain, Holy Cross, and West Gate in Churchill County; Charleston Mountain, Eldorado Canyon, Gass Peak, and Searchlight in Clark County; Gardnerville in Douglas County; Contact, Dolly Varden, Island Mountain, Loray, Mud Springs, and Ruby Range in Elko County; Goldfield, Klondyke, and Lida in Esmeralda County; Eureka and Newark in Eureka County; Battle Mountain, Golconda, National, Potosi, and Varyville in Humboldt County; Aspen, Beowawe, Birch Creek, Bullion, and Spencer's Hot Springs in Lander County; Atlanta, Ferguson, and Jack Rabbit in Lincoln County; Candelaria, Santa Fe, and Silver Star in Mineral County; Bruner, Clifford, Jackson, Lodi (Mammoth), Manhattan, Morey, Quartz Mountain, and Reveille in Nye County; Humboldt, Rabbit Hole, Scossa, Seven Troughs, Sierra (Sunshine), Star, Table Mountain, and, Unionville (Buena Vista) in Pershing County, Comstock in Storey County; Galena Olinghouse (White Horse), and Pyramid in Washoe County; Aurum, Bald Mountain (Ruby Mountain), Newark, and Osceola in White Pine County, and counties indicated by footnotes 5 and 6.

tion Co. in the Pioche district, and of Bristol Silver Mines Co. in the Jack Rabbit district. Eureka County had an important lead output from the mines in the Eureka and Lone Mountain districts. Production from the Bullion and Delano districts (Elko County) was noteworthy. The remaining output was derived from various small mines in 10 counties, the largest contribution was from White Pine County.

Manganese.—Outputs of manganese ore, nodules, electrolytic manganese dioxide, and low-grade manganese ore were considerably greater in 1956 than in the preceding year, principally from deposits in Clark, Lincoln, and White Pine Counties. Two operators in White Pine County and one in Lincoln County shipped ore to the GSA government Butte (Mont.) Purchase Depot. The Lincoln County operator also shipped ore to a Government stockpile under the carlot program and sold low-grade material to a Clark County plant that produced electrolytic battery-active manganese dioxide. This plant also received manganese ores mined in Montana and Mexico. The product was utilized as a depolarizer in dry batteries, including heavy-duty cold weather and hot-weather military batteries. Nevada's leading individual producer mined ore at its Clark County open pit in the hills bordering Lake Mead between the Muddy and El Dorado Ranges. The ore was concentrated at the company mill and the concentrate nodulized for shipment under DPA contract listed in table 4. White Pine County had two producers during the year, and both shipped to the GSA (Butte, Mont.) Purchase Depot. One of these operators mined by underground methods at the upper end of Robinson Canyon south of Ely, Nev., and shipped ore that averaged 42 percent Mn. The other operated open-pit and underground mines near Ruth, Robinson district, and shipped low-grade ore to a Government purchase depot. The only contract under DMEA terminated during the year, and there was no new activity in exploration and development of manganese deposits.

TABLE 14.—Mercury production by methods of recovery

Year	Direct furnaced		Retorted		Unclassified; [1] 76-pound flasks	Total		Operating mines
	Ore (short tons)	76-pound flasks	Ore (short tons)	76-pound flasks		76-pound flasks	Value [2]	
1947-51 (average)	12,770	2,250	168	16	1	2,267	$219,606	6
1952						3,523	701,429	9
1953	81,921	11,444	2,248	305	2	3,254	628,120	12
1954						4,974	1,315,076	21
1955	73,538	10,763	5,882	834	12	5,750	1,669,512	33
1956						5,859	1,522,871	51

[1] Includes mercury recovered from miscellaneous dump material.
[2] Value calculated at average price at New York.

Mercury.—Nevada's mercury production increased in 1956. Shipments were only slightly above production; thus stocks were not affected appreciably. Although 8 counties contributed to Nevada's total production, Humboldt and Pershing furnished over 97 percent of the output, and credit for most of the yield went to the Cordero Mining Co. Cordero mine near McDermitt (Humboldt County), the

Nation's largest individual producer. Only 6 operators produced over 50 flasks each during the year, although there were 55 producers at 51 operations—an increase of more than 50 percent over 1955. Despite the interest in this commodity, there was only one mercury-ore exploration contract in effect under DMEA and this was continued from the previous year. Activity in construction and assessment work was carried on at mercury properties in Esmeralda and Mineral Counties but no production was reported.

Molybdenum.—All of Nevada's molybdenum production was as a byproduct molybdenite concentrate from the McGill copper concentrator in White Pine County. Recovery was from the copper-porphyry ores mined in the Robinson district by the two major copper companies operating in that area. The entire molybdenite production was sold outside the State. The output was greater than in 1955 as a result of the increased tonnage of copper ore mined and treated at the concentrator. Also the molybdenum content of the ore mined was slightly higher than in 1955.

Silver.—The total quantity of silver recovered increased nearly 45 percent over 1955 and was derived primarily as a byproduct of copper-, lead-, and zinc-mining throughout the State. Sixteen counties contributed to Nevada's total silver yield, but most was from the lead-zinc ores mined by the Combined Metals Reduction Co. in the Pioche district and the copper ore mined by Bristol Silver Mines Co. in the Jack Rabbit district (Lincoln County). Important quantities of silver were recovered from the porphyry-copper ores of the Robinson district (White Pine County), and the lead ores of the Eureka district (Eureka County). Esmeralda County dropped to fourth position in Nevada silver output because the Mohawk mine and Bruhi mill, which worked straight silver ore, were not reactivated under new management until the latter half of the year. Smaller quantities of silver were recovered from lead ores mined in Elko County, oxidized zinc ores that had been stockpiled at Jean, lead-zinc ore mined in the Goodsprings district, and lead residue from treated manganese ores of the Henderson area—all in Clark County. The quantity of silver produced as a coproduct of gold at placer mines was insignificant.

Titanium.—Titanium Metals Corp. of America was the Nation's leading producer of titanium metal in 1956 at its plant at Henderson, Clark County. During the year, TMCA obtained a 15-year lease on the Henderson-plant property of Pioche Manganese Co., which included water, power, and utility rights, in addition to a 75-acre area. The company announced plans that would expand the sponge-metal production 50 percent and titanium-ingot output nearly 100 percent in 1957. TMCA announced two reductions in the prices of its mill products in 1956, attributed to cost improvements achieved by volume production and technological advances, particularly in vacuum melting, utilization of scrap, and continuous rolling of sheet and strip. In December 1956 over 700 people were employed at TMCA's Henderson facilities. Rutile consumed at the plant was from other States and foreign sources.

In September the Bureau of Mines Electrometallurgical Experiment Station at Boulder City completed a contract with Wah Chang Corp. on development of an improved Kroll process for producing

titanium-sponge metal. Research at Boulder City continued, under a Bureau agreement with GSA, to develop processes for producing titanium tetrachloride from abundant titanium-bearing material, including slag. The Bureau also had a contract with GSA to analyze all titanium sponge submitted by producers to determine whether or not the metal met Government purchase specifications.

Tungsten.—Nevada mines furnished over one-third of the Nation's tungsten-concentrate production in 1956. Shipments (in short-ton units of WO_3) were 12 percent below those in 1955, with less than 1

TABLE 15A.—Tungsten concentrate produced from ores in 1956, by counties

County	Producing mines and prospects	Ore [1]			Concentrate produced [1] (pounds)	Contained WO_3 [1] units
		Mined (short tons)	To mills (short tons)	Milled [2] (short tons)		
Churchill	12	1,507	1,507	1,531	19,187	613
Clark	1	(3)	(3)	(3)	(3)	(3)
Douglas	13	510	510	[4] 2,373	[4] 43,976	[4] 1,411
Elko	7	2,176	2,176	777	8,248	272
Esmeralda	3	347	347	347	2,908	98
Humboldt	7	290,550	290,550	292,584	3,703,610	125,107
Lander	4	13,256	13,256	13,239	149,612	4,998
Lincoln	1	(3)	(3)	(3)	(3)	(3)
Lyon	3	152	152	126	1,920	60
Mineral	19	79,410	[5] 79,410	[5] 76,393	1,344,862	42,060
Nye	27	23,134	23,161	25,879	720,379	22,431
Pershing	28	230,204	[5] 230,436	[5] 229,545	2,008,940	71,031
White Pine	14	15,639	15,639	14,607	180,567	6,000
Undistributed	----------	260,309	252,038	251,908	1,722,509	53,755
Total	139	917,194	909,182	909,309	9,906,718	327,836

TABLE 15B.—Production and shipments of tungsten concentrate in 1956 credited to Nevada counties in which ore was mined

County	Concentrate				
	Produced [1]		Shipped		
	Pounds	Units	Pounds	Contained WO_3 units	Value [6]
Churchill	19,064	610	19,064	610	36,897
Douglas	5,927	196	5,927	196	11,952
Elko	45,101	1,434	45,101	1,434	80,743
Esmeralda	2,908	98	2,908	98	6,165
Humboldt	3,656,142	123,606	3,488,142	118,163	7,069,390
Lander	149,850	5,006	149,850	5,006	292,930
Lyon	2,190	69	2,190	69	3,898
Mineral	1,387,466	43,380	1,392,062	45,116	2,725,393
Nye	681,394	21,232	710,594	22,105	1,352,276
Pershing	2,023,837	71,504	1,874,570	66,595	3,978,580
White Pine	192,307	6,368	193,856	6,420	374,665
Undistributed [7]	1,723,910	53,800	1,864,130	58,217	3,330,304
Total	9,890,096	327,303	9,748,394	324,029	19,263,193

[1] Partly estimated.
[2] Ore actually milled in county, including material from other counties and States.
[3] Included with "Undistributed" to avoid disclosing individual company confidential data.
[4] Includes material from California mines.
[5] Includes small quantities of tailing.
[6] Based on values reported by GSA, San Francisco, Calif.
[7] Includes Clark and Lincoln Counties.

percent of total production going to private industry. The number of producing mines declined 14 percent and reflected the closing of many borderline mining operations. Funds available for purchasing concentrate under the original purchase program by Government were exhausted in September 1956. Additional funds were available in October at a reduced unit price to the major producers, who greatly curtailed their operations by the end of the year. Five counties yielded over 95 percent of the State production, and 6 mines produced nearly 90 percent of the recovered tungsten concentrate. These were: The Riley and Getchell mines, Humboldt County; the Lincoln mine, Lincoln County; the Leonard mine, Mineral County; the Victory mine, Nye County; and the Tungsten mine, Pershing County. Activity in tungsten exploration under the DMEA program continued high; 12 projects were in effect in Nevada during the year.

Uranium.—Uranium activity continued to be high in 1956. Nine mining companies shipped ore to concentrators in Utah and Colorado during the year. Operations in the Reese River district (Lander County) and the Pyramid and Red Rock districts (Washoe County) produced more consistently. Available production figures for the first half of 1956 showed uranium-ore shipments by four operators, one each in Lander, Lincoln, Lyon, and Washoe Counties. The tonnage shipped to out-of-State processing plants during this period was substantially greater than the shipments in the latter half of 1955.

Zinc.—Renewed and expanded activity in the Pioche area of Lincoln County by Combined Metals Reduction Co., which shipped zinc concentrate, was the chief factor in the increased zinc production in Nevada in 1956. The increase was approximately 180 percent over 1955 and resulted from the favorable average unit price for the metal throughout the year. Shipments of oxidized zinc ore from the Government stockpile at Jean, Clark County, to a smelter-fuming plant added greatly to the State zinc production. This ore was mined before July 1944 from the Goodsprings (Yellow Pine) district in the same county. Some zinc production was obtained at smelter-fuming plants from the zinc and lead ores mined in the Lone Mountain district, Eureka County; Delano and Railroad districts, Elko County; White Pine district, White Pine County; Wellington district, Lyon County; and Golconda district, Humboldt County.

NONMETALS

Barite.—In 1956 the production of crude and ground barite increased by 275 and 328 percent, respectively. The chief reason for this increase was the greater demand for the ground mineral for use in drilling mud in the Gulf States and on the west coast. Three counties contributed Nevada's entire production. Mineral County production, however, about equaled that mined during the preceding year. All crude barite produced in Elko County was shipped to grinding plants in California. Nevada's major producer, in Lander County, operated the State's only grinding plant and shipped ground barite to consumers on the west coast. This company consigned crushed material to its grinding plants in Louisiana and Texas. Another company operated two properties in Lander County and shipped crude ore to its plant in California for use in manufacturing barium chemicals.

Brucite.—The Gabbs area (Nye County) was the source of all brucite produced in Nevada in 1956. Basic, Inc., treated the mined mineral by heavy-medium separation. Except for small tonnage sold to California consumers, the upgraded product was shipped to the company plant in Ohio and used in manufacturing magnesia grain refractory for use in basic-steel furnace bottoms. The Standard Slag Co. mined a magnesite deposit containing brucite in the same area but did not separate the two minerals.

Clays.—Clay production during 1956 increased over 100 percent. The demand for fire clay and miscellaneous clay for use in heavy clay products increased appreciably. Las Vegas Brick & Tile Manufacturing Co., a new plant in 1956, mined an important tonnage of miscellaneous clay near Whitney (Clark County) for its own use. Reno Press Brick Co. (Washoe County) increased its production of both miscellaneous and fire clays owing to greater demand for its products. A small tonnage of fire clay was mined near Ely (White Pine County) and used at the furnaces of the McGill smelter, Kennecott Copper Corp. Industrial Minerals & Chemicals Co. produced a much higher tonnage of fuller's earth from Lyon County in 1956 than in the previous year. The material was shipped to the company plant in California and prepared for special pharmaceutical uses. L. R. Moretti mined small tonnages of bentonitic clay in Clark and Nye Counties, which were processed at a California plant for use as filler.

Diatomite.—Nevada production in 1956 was confined to one pit each in Churchill, Esmeralda, and Storey Counties. The total yield remained about equal to that in the preceding year, although the demand by paper, paint, and insecticide manufacturers had increased. This demand, in turn, caused a slight rise in the market value of the finished product per ton. Nearly all Nevada production was shipped to consumers outside the State.

Fluorspar.—Production of fluorspar in 1956 was only slightly above that in the preceding year. Most of Nevada's fluorspar production came from the Broken Hills area, Mineral County. The crude ore was treated at a flotation plant near Fallon (Churchill County), as was a small tonnage mined in Lander County. A few tons of tailing containing fluorspar from a tungsten operation in Lincoln County was also shipped to this flotation plant for treatment. The Acid-grade fluorspar recovered at the Fallon plant was shipped to a chemical plant in California, where it was converted to hydrofluoric acid and aluminum fluoride for use in the potlines of an aluminum producer in the Pacific Northwest. Several Nevada fluorspar deposits were approaching depletion at the year end. An operator in the Bare Mountains near Beatty (Nye County) mined nearly 5,000 tons of crude, Metallurgical-grade fluorspar and shipped the entire output to California steel plants.

Gem Stones.—Although a number of gem minerals (including agate, opal, and quartz crystals) were found in several Nevada counties, the principal production consisted of rhodonite, turquois, and obsidian. The rhodonite and some opalite were mined by a collector in Lander County. Important quantities of turquois were produced in Esmeralda, Lander, and Mineral Counties by various collectors. More than 1 ton of obsidian was obtained by three producers, most of it

came from Mineral County. One collector gathered several thousand pounds of petrified wood in Nevada during the year. Of special interest was the unconfirmed report that 200 pounds of howardite, a meteorite consisting of silicates of iron and magnesium, had been found in Esmeralda County by an Arizona collector.

Gypsum.—Gypsum production declined slightly in 1956 owing to lower demand caused by a decrease in small-home construction. In Clark County, Pabco Products, Inc., crushed gypsum at its White Eagle Pit near Henderson and shipped the product to a company-owned wallboard plant in southern California. The Blue Diamond Corp. calcined crude mineral from the Blue Diamond Pit; some of it was sold for use in industrial molding and in base-coat, perlite, and molding plasters. The company used the remaining calcined material in manufacturing gypsum lath and wallboard. Nevada Natural Gas Pipe Line Co. completed a pipeline to the calcining plant, and in May conversion was made from oil to gas firing. Blue Diamond Corp. also shipped crude gypsum to out-of-State cement plants for use as a retarder and sold a small tonnage for agricultural use. In Pershing County, United States Gypsum Co. mined gypsum at its Empire quarry and prepared the crude mineral at the company mill and calcining plant near the quarry in Washoe County. The calcined material was used for plaster and wallboard.

Lime.—The total lime production declined from the peak year 1955. Demand for the hydrated product remained substantially the same as in the preceding year, and the output was only a few hundred tons less. Most of the production was utilized by the building trades as a finishing lime and, except for a moderate tonnage used locally, was shipped to consumers outside the State. The decline in quicklime production during the year was due partly to increased substitution of magnesia and cement plasters for lime plasters and to decreased utilization in insecticides. Most of Nevada quicklime output was consigned to metallurgical plants in California; smaller tonnages were shipped to water-treatment and paper-pulp plants outside the State. All Nevada production was furnished by 2 operations in Clark County and 1 in White Pine. The latter's output met the requirements of the company-owned ore concentrator and smelter.

Magnesite.—Basic, Inc., and Standard Slag Co. worked deposits near Gabbs (Nye County) that were the source of all Nevada's magnesite in 1956. Except for a small tonnage of crude material sold by Basic, Inc., the magnesite mined by these companies was fired to produce caustic-calcined magnesia and refractory magnesia. The caustic-calcined product was utilized for manufacturing oxychloride and oxysulfate cements, in fertilizers, and in the treatment of metal ores. The refractory product was consumed in manufacturing refractory brick and shapes used principally by the metallurgical industry. A moderate quantity of the magnesia was shipped for export.

Marl, Calcareous.—Nevada's small production of calcareous marl was limited to the output of an open-pit operation in Washoe County in 1956. Both production and demand have remained about the same for the past several years. The raw material was shipped to California plants, where it was processed for use as a filler in poultry grits and livestock foods.

Perlite.—Crude-perlite production in Nevada in 1956, which was slightly lower than in 1955, was confined to Lincoln and Pershing Counties. Virtually all the Pershing County crude was expanded at the producer's mill in Washoe County; small tonnages were shipped to California and New York. The expanded material was used in manufacturing plasterboard. A Clark County processing plant used crude perlite from San Bernardino County, Calif., for plaster aggregate. The crude perlite mined in Lincoln County was shipped to out-of-State expansion plants. Production decline was due to the competition of substitutes for plaster. However, this was partly offset by increased use of the expanded perlite in plasterboard.

Pumice and Volcanic Cinder.—Only a token tonnage of pumice was quarried in Nevada in 1956. Pumice was produced in Churchill County and the material utilized as aggregate in the county. In Mineral County pumice was mined near Mina for use as concrete aggregate. Volcanic cinder was quarried near Lathrop Wells Junction (Nye County) and used as aggregate at a block plant near Las Vegas (Clark County). The Nevada Highway Department also quarried volcanic cinder in Nye County, using the material in surfacing roads and as an aggregate in building highway structures.

Salt.—One producer in Churchill County supplied all Nevada salt output in 1956. The salt was recovered by solar evaporation and surface-mining a dry lake bed. Output, considerably below that of 1955, was utilized locally in curing hides and feeding livestock.

Sand and Gravel.—An appreciably greater tonnage of sand and gravel was produced in Nevada in 1956 as compared with 1955. However, the value per ton decreased, because less tonnage was washed. A large quantity of paving sand, prepared by a contractor in Churchill County for the military forces, was used in constructing and maintaining airbase runways. In Lincoln County a contractor for the Union Pacific Railroad produced a large tonnage of sand and gravel for railroad ballast. The requirements of construction projects in the major centers of industrial activity, in Clark and Washoe Counties, made these areas the source of most sand and gravel production. Important road-construction projects in Elko, Lincoln, and Nye Counties increased the output in 1956. Storey County had no recorded sand and gravel production during the year. The Nevada Highway Department and contractors produced sand and gravel for highway use in the remaining 16 counties.

Stone.—The decline in stone production during 1956 was due to the completion (or near completion) of several major projects begun in 1955. The sharp drop in the output of crushed granite was directly related to completion of new water and sewage systems for Las Vegas (Clark County). The decreased output of crushed miscellaneous stone in Lincoln County was explained by near completion of a contract to supply the Union Pacific Railroad near Caliente with the material used for railroad ballast and riprap. The demand for crushed sandstone in Clark County for roofing granules dropped because of a decline in new home construction. The quantity of dimension stone produced for flagging in Clark, Humboldt, and White Pine Counties decreased for the same reason.

TABLE 16.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Glass	(1)	(1)	(1)	(1)	(1)	(1)
Molding	84,286	$249,327	$2.96	46,409	$87,142	$1.88
Building	288,899	332,456	1.15	(1)	(1)	(1)
Paving	(1)	(1)	(1)	(1)	(1)	(1)
Engine	600	250	.42	115	200	1.74
Other	(1)	(1)	(1)	121,377	168,387	1.39
Gravel:						
Building	293,134	363,151	1.24	226,004	312,264	1.38
Paving	757,805	651,010	.86	709,761	415,846	.59
Railroad ballast				(1)	(1)	(1)
Other	68	50	.74	51,016	103,040	2.02
Undistributed sand and gravel	298,005	939,810	3.15	595,787	912,334	1.53
Total sand and gravel	1,722,797	2,536,054	1.47	1,750,469	1,999,213	1.14
GOVERNMENT-AND-CONTRACTOR OPERATION [2]						
Sand:						
Building				10,015	18,143	1.81
Paving	40,318	21,451	.53	28,347	42,009	1.48
Total	40,318	21,451	.53	38,362	60,152	1.57
Gravel:						
Building	129,228	36,922	.29	144,162	78,537	.54
Paving	1,687,917	1,167,957	.69	2,753,520	2,430,791	.88
Total	1,817,145	1,204,879	.66	2,897,682	2,509,328	.87
Total sand and gravel	1,857,463	1,226,330	.66	2,936,044	2,569,480	.88
ALL OPERATIONS						
Sand	712,108	1,543,294	2.17	731,841	1,217,814	1.66
Gravel	2,868,152	2,219,090	.77	3,954,672	3,350,879	.85
Grand total	3,580,260	3,762,384	1.05	4,686,513	4,568,693	.97

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes figures for State, counties, municipalities, and other Government agencies.

TABLE 17.—Stone, commercial and Government-and-contractor, sold or used by producers in 1955–56, by uses [1]

Use	1955		1956	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Sawed stone and cut blocks—cubic feet	72,320	$107,374	23,501	$37,420
Approximate equivalent in short tons	6,149		1,833	
Flagging—cubic feet	9,410	14,930	11,487	20,025
Approximate equivalent in short tons	734		896	
Total dimension stone (quantities approximate, in short tons)	6,883	122,304	2,729	57,445
Crushed and broken stone—short tons	1,605,059	2,486,596	1,398,440	2,223,333
Grand total (quantities approximate, in short tons)	1,611,942	2,608,900	1,401,169	2,280,778

[1] Includes basalt, granite, limestone, marble, sandstone, and miscellaneous stone.

Sulfur.—Nevada's sulfur production in 1956 came from open pits in the low hills on the northwest slope of the Kamma Mountains (Humboldt County). Two companies mined ore at these pits during the year—approximately 6 months each. Production was more than five times the tonnage mined in 1955. The mined ore contained 25 to 35 percent sulfur. The material was crushed, bagged, and shipped to neighboring States for use as a soil aid. At the year's end, one company was constructing a plant at Sulphur, Nev., to house crushing and bagging equipment and permit increased shipments.

Talc and Soapstone.—The deposits in Esmeralda County were the source of all of the talc and soapstone in 1956. The one producer of soapstone was near Goldfield. Most of the talc output was from deposits near Dyer, worked by several operators. Total production declined in 1956 owing to decreased use as filler in insecticides, paint, and paper. An increased tonnage was sold for use as asphalt filler and in ceramics. The demand for most other uses remained about equal to that in 1955. Most of the Nevada production was shipped to grinding plants in California.

MINERAL FUELS

Oil production in Nevada in 1956 was substantially the same as in 1955, all production being derived from the three Shell Oil Co. wells near Eagle Springs in the Railroad Valley, eastern Nye County. Six exploratory tests were drilled during the year, but all were dry. Extensive Federal acreage was surrendered by major and independent oil companies. Seismograph activity declined sharply with respect to 1955, but the number of gravimetric investigations increased. At the end of the year there was continued interest in the oil-production possibilities of the Ardon Dome area of Clark County and the Preston-Lund area of White Pine County.

There was no activity in 1956 on the proposed natural-gas pipeline between Mountain Home (Idaho) and the San Francisco Bay area of California. The proposal placed the pipeline through Reno (Washoe County).

REVIEW BY COUNTIES

All 17 counties in Nevada contributed to its total mineral production; however, over 80 percent of the value came from 5 counties—namely, White Pine, Lyon, Clark, Humboldt, and Lincoln, in the order named. White Pine County led the State in the value of copper and gold production. Lyon County was second, due chiefly to its copper output. Clark County was third because of the quantity of manganese ore and lead produced and its output of nonmetallic minerals and commodities, chiefly gypsum, lime, sand and gravel, and stone. Humboldt County led all other counties in the number of flasks of mercury recovered and in the tonnage of tungsten concentrate produced. Lincoln County, which ranked fifth, supplied larger quantities of silver and zinc than any other county and contributed considerable copper, lead, manganese, and tungsten. Nye County continued to be the only source of Nevada's crude-petroleum production.

TABLE 18.—Value of mineral production in Nevada, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Churchill	$558,508	$592,885	Iron ore, sand and gravel, diatomite, tungsten, lead, silver, pumice, mercury, salt, gold, zinc.
Clark	15,212,172	15,761,421	Manganese ore, lime, sand and gravel, gypsum, stone, lead, zinc, silver, copper, clays, tungsten, gold.
Douglas	120,037	704,757	Iron ore, sand and gravel, tungsten, stone, gold, silver.
Elko	952,068	1,125,591	Sand and gravel, copper, barite, lead, tungsten, silver, zinc, gold, stone, mercury.
Esmeralda	[1] 872,968	818,989	Diatomite, talc and soapstone, silver, sand and gravel, gem stones, gold, tungsten, lead, copper, zinc.
Eureka	761,609	1,158,119	Lead, iron ore, sand and gravel, silver, gold, stone, copper, zinc, barite.
Humboldt	[2] 10,133,719	9,127,636	Tungsten, mercury, iron ore, sand and gravel, copper, stone, sulfur ore, silver, gold, zinc, lead, gem stones.
Lander	[2] 2,301,104	[3] 2,337,834	Barite, gold, copper, tungsten, sand and gravel, silver, uranium, gem stones, mercury, lead, fluorspar, zinc.
Lincoln	[2] 5,440,890	[2 3] 7,196,573	Tungsten, zinc, lead, copper, manganese ore, silver, perlite, sand and gravel, stone, gold, fluorspar, mercury, uranium, gem stones.
Lyon	25,386,961	[3] 26,574,890	Copper, sand and gravel, clays, gold, tungsten, lead, zinc, silver, uranium.
Mineral	4,051,082	3,520,881	Tungsten, fluorspar, barite, silver, sand and gravel, stone, lead, gold, copper, zinc, gem stones, pumice.
Nye	3,159,865	3,104,468	Tungsten, magnesite, iron ore, sand and gravel, brucite, petroleum, fluorspar, volcanic cinder, silver, gold, mercury, clays, lead, copper, zinc.
Ormsby	4,945	50,927	Sand and gravel.
Pershing	6,483,802	5,982,014	Tungsten, gypsum, iron ore, mercury, sand and gravel, perlite, antimony, silver, gold, copper, lead, zinc.
Storey	1,120,054	1,236,530	Diatomite, gold, silver.
Washoe	663,272	[3] 830,853	Sand and gravel, stone, marl, clays, copper, lead, gold, uranium, silver, zinc.
White Pine	[2] 35,967,091	[2] 46,068,703	Copper, gold, lime, stone, tungsten, silver, molybdenum, sand and gravel, manganese ore, lead, zinc, clays.
Undistributed [4]	29,604	39,765	
Total	[1] 113,219,751	126,232,836	

[1] Revised figure.
[2] Excludes value of manganese and low-grade manganese ores sold and blended at Government low-grade stockpiles for future beneficiation.
[3] Includes value of uranium shipments during period January through June, 1956.
[4] Includes gem stone, mercury, tungsten, gold, copper, lead, and silver not listed by countries as data are not available.

Churchill.—Iron ore was the leading mineral produced in Churchill County during 1956. The Minerals Materials Co. operated the Buena Vista open-pit mine in the Buena Vista district and shipped 85,457 long tons of magnetite averaging 58 percent iron. The ore was destined largely for export to Japan. Sand and gravel continued to be an important commodity in the county, and total output increased over 4 percent above that in 1955. George E. Miller prepared paving sand from deposits southeast of Fallon, using a portable plant. The United States Army Corps of Engineers and the Nevada Highway Department and its contractors produced sand and gravel for highway construction and repair at various localities in the county.

Diatomite was produced by the Aquafil Co. at its Chick Bed open-pit mine near Fallon. The material was transported to the company mill at Fernley in Lyon County for grinding and reshipped to chemical plants.

Tungsten-ore production in Churchill County dropped 47 percent from the previous year due to the closing of marginal operations and curtailment of the Government purchase program. Fifteen operators at 12 mines in the county produced ore during the year. The major yield came from the *Sand Springs* district southeast of Fallon. The

leading producers were: Churchill Tungsten Mining Co., Red Top and Red Ant mines group; G. Fisk and E. Reafs, Iron Man mine; and J. R. Young, Crystal mine. Only minor operations were conducted elsewhere. All ore was shipped to custom mills in adjacent counties of California except that of the Churchill Tungsten Mining Co., which operated its own mill at the mine site.

A small tonnage of lead ore was mined in the *Chalk Mountain* district at the Big Ben mine 16 miles west of Eastgate. This mine produced the only zinc in the county as a byproduct of lead-ore recovery. A smaller amount of lead ore was produced at the Camp Terrell group of claims in the *Holy Cross* district, 26 miles south of Fallon. The ore from these mines was also the source of most of the county output of recoverable silver and gold.

Pumice was produced by the Fallon Concrete Products Co. near Fallon for its own use as concrete aggregate, and none was sold commercially. A small quantity of mercury ore was mined and retorted at the Red Bird group of claims in Shoshone Canyon by Lloyd Shaw. The Leslie Salt Co. produced evaporated salt from the Fallon Development Co. dry-lake deposits near Fallon. The entire output was used locally.

Clark.—Clark County was again the leading producer of manganese ore in Nevada and the Nation. The chief source of the ore was the Three Kids mine of Manganese, Inc., 6 miles northeast of Henderson. The ore was treated at the company concentrating and nodulizing plant at Henderson and shipped under Government contract. The American Potash & Chemical Corp. produced synthetic Battery-grade manganese at its Henderson plant from ores purchased in Lincoln County and also from Arizona, Montana, and Mexico.

The United States Lime Products Corp. operated two plants in Clark County and was the State's largest lime producer. Its plant at Henderson, equipped with 4 rotary kilns and 1 continuous hydrator, had an annual capacity of 72,600 short tons. The plant produced lime products, largely for out-of-State steel, chemical, metallurgical, and construction industries. The other company plant at Sloan, which was equipped with 2 rotary kilns and 1 batch hydrator, has a rated annual capacity of 39,600 short tons. It supplied lime products to the previously mentioned industries and furnished dolomitic limestone both to the steel industry and to the Henderson plant for further processing.

Clark County was the foremost sand and gravel producer in Nevada and supplied over a third of the State total. In the Overton area glass sand was produced by Hunt Foods, Inc., and United States Silica Corp., and molding sand was prepared by Fred L. Morledge at the Red Gorge pit and the Moapa Placer claims and by Snoreen & Son at their Kaolin Wash pit.

Structural sand and gravel was produced by Atlas Ready Mix Concrete, Las Vegas Building Materials, Inc., Stocks Mill & Supply Co., and Gornowich Sand & Gravel Co., Well Cargo, Inc., Wells Stewart, and Gibbons & Reed Co. in the Las Vegas-Whitney area. Sand and gravel for roadwork was also produced by the city of Las Vegas, Clark County Engineering Department, Nevada Highway Department, United States Bureau of Public Roads, and the Lake Mead National Recreation Area at various localities throughout the county.

Production of crude and calcined gypsum was slightly below that in 1955. The Blue Diamond Corp. worked its open-pit and underground gypsum mine 28 miles southwest of Las Vegas. The company calcined gypsum and operated a plaster mill and gypsum lath and wallboard plant near the mine. Some crude gypsum was sold as cement retarder and for agricultural purposes. The company converted from oil- to gas-fired kilns in May 1956. Production over that needed for operating the Blue Diamond plant was shipped to plants in California. Pabco Products, Inc., mined gypsum at its White Eagle pit 8 miles north of Henderson and shipped the entire production to its wallboard plant at Southgate, Calif.

The overall production of stone in Clark County decreased 12 percent from 1955 owing primarily to a sharp drop in the output of crushed granite. This decline was attributed to completion of new water and sewage systems for the city of Las Vegas. Production of crushed sandstone for use as roofing granules decreased slightly owing to a lower demand in building materials; the same was true of dimensional stone produced for flagging.

The output of crushed limestone increased slightly from the preceding year. The United States Lime Products Corp. operated the Apex limestone quarry and crushing plant 18 miles southeast of Mesquite and its quarry at Sloan 18 miles south of Las Vegas, and produced crushed limestone for metallurgical flux, refractories, and lime. The Diamond Gold Mining Co., with quarries 7½ miles north of Goodsprings, produced roofing granules at the company mill at Jean, Nev. The city of Las Vegas, the Lake Mead National Recreation Area and its contractors, and the Nevada Highway Department contractors produced miscellaneous stone for fill, concrete, and road metal at numerous locations in the county.

The lead residue, obtained from treating manganese ores from the Three Kids mine by Manganese, Inc., near Henderson, continued to be the chief source of lead in the county. The residue also contained some gold, silver, copper, and zinc, which were recovered at a Utah smelter. Several thousand tons of oxidized zinc ore, previously mined in the *Goodsprings* (Yellow Pine) district and stockpiled at Jean by the Government, was treated at a Utah smelter in 1956. The material yielded most of the zinc and silver and noteworthy percentages of the lead and copper credited to the county. In the same district smaller tonnages of direct-smelting copper ore (shipped from the Copper Chief mine "dump" and the "99" mine) and lead and lead-zinc ores (from the Maiden Rock and Bell mines) contained modest quantities of recoverable copper, lead, zinc and silver.

Two cars of copper ore containing silver was produced from the Lakeside mine in the *Gold Butte* district. Test shipments of lead-zinc and zinc ores were made from the Charleston Mountain and Gass Peak areas and the *Eldorado Canyon* district. A few tons of direct smelting copper ore were shipped from the *Bunkerville* and *Eldorado Canyon* districts. The small gold output in the *Searchlight* district was from cleanup operations at various mills.

Some miscellaneous clay was mined by the Las Vegas Brick & Tile Manufacturing Co., a new operation in 1956, from the El Dorado pit near Las Vegas, for use in manufacturing heavy clay products.

A small quantity of tungsten concentrate was produced from the Silver Lead mine near Mesquite and sold to out-of-State buyers.

Douglas.—Iron ore had the highest total value of all minerals produced in the county in 1956. The Standard Slag Co. operated the Minnesota open-pit mine in the *Buckskin* district 14 miles northwest of Yerington, Nev., and shipped 275,788 long tons of magnetite averaging 58 percent iron. The ore was destined largely for export to Japan.

The Nevada Highway Department produced considerable tonnages of paving sand and gravel at various localities in the county for use in road construction and maintenance. Douglas County and its contractor also produced crushed granite for use in surfacing roads.

Tungsten-ore output dropped 85 percent from 1955, chiefly because several marginal properties could not be operated under prevailing conditions. Most of the tungsten in the county came from the *Pine Nut* district. The chief producer was the Metallurgical Development Co., which operated the Owl, Romona, Scheelite, Tungstate, and Cosmo mines. The company also operated a mill 12 miles southeast of Gardnerville, accepted ore for custom milling, and marketed all of the tungsten concentrates produced in the county. Several other operators produced tungsten ore in the county, but the outputs were minor, varying from 2 to 20 short-ton units of WO_3. A small quantity of gold and silver was obtained from a rod mill cleanup at the Metallurgical Development Co. mill.

Elko.—The value of sand and gravel produced in 1956 increased over 8 percent, but the tonnage decreased 15 percent. This higher value was attributed to local fluctuations in production costs and quality of the material produced. Gibbons & Reed Co. and Morrison-Knudsen Co., Inc., produced paving gravel near Carlin and Wells. Alden A. Dumas prepared a small tonnage of roofing granules from miscellaneous stone quarried at an open pit south of Wendover Junction. The Nevada Highway Department, Elko County, the cities of Elko and Wells, the town of Carlin, and the Federal Forest Service produced sand and gravel at various locations in the county for road construction and maintenance. Nevada Highway Department contractors also produced a small quantity of miscellaneous stone for fill in highway construction.

In the production of base-metal ores the county ranked fifth in copper and fourth in lead and zinc. Most of the copper-ore output, which yielded considerable byproduct silver, came from the Marshall (Nevada-Bellvue) mine and from various mine dumps in the *Contact* district. Other producers of copper ore, containing silver, in the same district, were the Boston and Clark mines. The Delno mine in the *Delano* district was the county's chief producer of lead, zinc, and silver, in addition to some copper and gold, from lead ore smelted. Direct-smelting lead-zinc ore from the Aladdin mine in the *Railroad* district 30 miles southwest of Elko, also yielded important quantities of lead, zinc, copper, silver, and gold.

Barite production in Elko County came principally from the Rossi mine of the Baroid Division, National Lead Co., near Dunphy. The mine stock at the end of the year was appreciably larger than in 1955. All shipments from company operations were made to its plants in Merced (Calif.) and Corpus Christi and Houston (Tex.). Other barite production was by Odis Graves (from his property near Carlin)

and by Jensen Bros. & Steele (from their property near Wells). Both producers shipped to brokers and grinders in the San Francisco Bay area.

Tungsten-ore output in Elko County decreased over 44 percent from 1955. Eight properties that produced in 1955 were not operated in 1956. This was due largely to the remoteness of custom mills from these relatively small tungsten deposits. The Ruby Valley area had the largest output, and the leading producers were George F. Ogilvie and Lowell Thompson, who worked the Star mine. Smaller yields of tungsten came from V. H. Madden's Coon Creek mine in the *Jarbridge* district and from George H. Stevens' New Chance mine in the same district. The Ruby Range, Kinsley, and Mountain City areas each contributed small quantities to the county total. Exploration for tungsten ore under a DMEA loan was continued at the Monarch mine in the Spruce Mountain area, 50 miles south of Wells, by John Boundy & Sons. The county mercury output was 1 flask, retorted by G. C. Staggs during exploration of his Horse Mountain claims 90 miles northeast of Tonopah.

Esmeralda.—Only three Nevada counties produced diatomite during the year; of these, Esmeralda County was first in total output. The Dicalite Division, Great Lakes Carbon Corp., worked its open-pit deposit near Basalt. The company maintained a plant for crushing, drying, and air separation at the pit site. Most of the diatomite was used for filler in paper, paint, and insecticides. The tonnage produced declined slightly, although the value per ton was above that in 1955 due to the demand for a higher quality product.

The active talc and soapstone deposits of the State during 1956 were in southwestern Esmeralda County near the California-Nevada border. Most of the talc output was mined in the Sylvania area southwest of Lida, where the leading producers were: Leonard Shellenbarger, who worked the Oversight and Crystal Butte mines; Sierra Talc & Clay Co., from the Oasis, Reed, Rose and Amelia mines; and Archie Brady, from the White King mine. H. W. Stewart operated the Hideout and Lone Springs mines and was the only soapstone producer. In the Palmetto area west of Lida the Grandview Mining Corp. Wellington mine produced talc, and R. L. Knight produced talc from the Sundown mine, which was leased from Huntley Industrial Minerals, Inc. The combined production of talc and soapstone was only slightly below that in 1955, and a high percentage of the output was shipped to California grinders.

Silver production from Esmeralda County ores dropped 75 percent from 1955, owing largely to suspended operations from January through June 1956 at the Mohawk mine and mill (in the Silver Peak area), formerly operated by Bruhi Mining Co. The mine was reopened under new management in July. The direct-smelting silver ore shipped contained some recoverable zinc, and silver bullion from the cyanide mill cleanup contained a few ounces of gold. The Florence mine in the *Goldfield* district, worked by H. Carlson and Charles Cecchini and formerly operated by Newmont Mining Corp., produced most of the gold credited to the county, plus some copper and silver, from gold fluxing ore shipped to a Nevada copper smelter.

The Nevada Highway Department prepared gravel for paving

from various localities in the county. The tonnage produced was over five times that in the previous year and at a slightly higher unit value.

R. J. Frank and James Klapper leased the Lone Mountain Turquoise mine in the *Lone Mountain* district, and produced high-grade turquoise. The material was prepared for commercial sale as gem stone at the American Gem Co. shop in Tonopah, Nev.

The county tungsten ores yielded only 98 short ton units of WO_3 in 1956, compared with 163 units in 1955. The largest producer was the Lutah Uranium & Oil Co., which operated the Black Horse mine near Basalt. Other producers of tungsten concentrate were: Wisdom and Mani, who worked the Bright Stars group of claims near Dyer; and Don Clair, who operated the Four Aces mine in the *Sylvania* district, where a DMEA tungsten-exploration project was continued. The concentrate was disposed of to ore buyers. Direct-smelting lead ore from the Thanksgiving mine in the *Klondyke* district and the Leadville Canyon mine near Dyer yielded some zinc, silver, and gold, in addition to the lead. Thirty tons of copper ore, containing 4,928 pounds of copper, from the Copper King mine dump, in the *Railroad Springs* district, was shipped to a smelter.

Eureka.—The county was third in the value of the lead, silver, gold, and zinc produced in the State and seventh in copper. The Consolidated Eureka (Diamond-Excelsior) mine of the Consolidated Eureka Mining Co. in the *Eureka* district was the leading producer of lead, silver, and gold in the county from direct-smelting lead ore. The Mountain View Extension mine, operated by John Cardinelli and Tony Frank in the Lone Mountain area, by virtue of oxidized zinc ore shipped to a Utah smelter-fuming plant produced the only zinc credited to the county, was the only other producer of lead, and ranked second in silver production. The principal copper output, along with some silver and gold, was from the direct-smelting copper ore shipped from the Copper King mine operated by the Copper King Co. in the *Maggie Creek* district. Copper and a small quantity of silver and gold were produced at smelters from copper ore mined by the Standard Copper Corp. from the Flossie D. and Gossan claims, in the *Newark* district 8 miles northeast of Eureka. Some gold and a minor quantity of the coproduct silver were recovered from the small-scale stream-gravel placer operation of V. C. Fraizer on his Bull Dog claims in the *Lynn* district near Leadville.

The Simplot Iron Mines, Inc., shipped over 74,000 tons of hematite ore to the west coast for export from its Modarelli open-pit mine in the Amarilla area 16 miles south of Palisade. Almost 54,000 tons came from stocks mined previously; the remainder was newly mined ore. Eureka County and the Nevada Highway Department produced over twice as much sand and gravel in 1956 as in 1955, for use in road construction and maintenance at various localities in the county. The unit value was almost twice that in 1955. Over 54,000 tons of miscellaneous stone was produced by Archie L. Till under contract with the Southern Pacific Railroad Co. for road ballast, by utilizing a portable crushing plant. The only barite quarried in the county came from the Russell & Nichols deposit near Beowawe. The product was shipped to a California grinding plant.

Humboldt.—Humboldt County again led the State in tungsten-concentrate production, yielding almost one-third of the total output in 1956. Compared with 1955 production dropped almost 8 percent, as 10 fewer tungsten properties were mined in 1956. The southeastern portion of the county, extending from the Osgood Mountains north of the Humboldt River to the Sonoma Range south of the Humboldt River, was the main source of this supply. The leading producers were the Getchell Mines, Inc., Getchell group of mines and the Union Carbide Nuclear Co. Riley mine, both in the *Potosi* district of the Osgood Mountains. The Getchell Mines, Inc., processed 203,000 tons of ore from its own properties, milled 77,500 tons of ore from the Riley mine under contract, and treated tungsten ores purchased from other producers in the area. The Getchell mill treated most of the county tungsten-ore production; a relatively small tonnage was purchased by ore buyers.

In the same general area, T. N. T., Inc., worked the Mountain Queen claims and continued tungsten-ore exploratory work under a DMEA contract. R. B. Spitzer operated the Valley View open-pit mine near Golconda. Tungsten ore from both properties was shipped to the Getchell mill for processing. In the north-central part of the county, 11 miles south of Denio, Vernon Cannon operated the Defense mine and shipped tungsten concentrate produced from ore treated at the Ashdown mill. Apollo Mines, Inc., conducted exploratory work for tungsten ore at the Saddle mine, 3 miles north of Sentinel Peak.

The *McDermitt* district in the northeastern portion of the county was the principal mercury-producing area in the county and State. The Cordero Mining Co., operator of the Cordero mine in this area, was the Nation's leading mercury producer. The ore from this mine was treated in the company reduction plant at the mine site, where it was crushed and passed through a 100-ton-per-day Herreschoff furnace.

A small quantity of mercury was also produced in the *National* district, 12 miles southeast of McDermitt, at the Buckskin Peak mine operated by the Paradise Quicksilver Co. The Cahill mine, in the Poverty Peak area of the *Paradise Valley* district, operated by the Belco Petroleum Co., produced mercury. The company also leased the Hapgood and Turillas mercury mines in the same area and did extensive exploration and development work on its holdings.

In the *Bottle Creek* district, 55 miles northwest of Winnemucca, mercury was produced by The Triangle Mines from the B & B prospect. This company was arranging a consolidation of the Blue Can, Niebuhr, Red Ore, White Peaks, and Birthday (Wootan) properties in the same district, with considerable development work involved.

Out of six counties in Nevada that produced iron ore, Humboldt County ranked fourth. This production, all from the *Jackson Creek* district north of Jungo, was almost 49 percent more in quantity and over 15 percent more in value than in 1955. The ore was magnetite and came mostly from the De Long (Iron King) open-pit mine operated by the A & B Mining Co. The other producer in the same area was the Humboldt Metals Co., which worked some open pits on the Black Jack and Red Bird groups of claims. The ore produced in the area was shipped to eastern furnaces.

The city of Winnemucca, the United States Forest Service, Humboldt County, and the Nevada Highway Department produced sand and gravel at various localities throughout the county for use in road construction and maintenance. The quantity used was 10 percent less than in 1955, but the value was 26 percent greater. Wegman Bros., contractors, quarried sandstone west of Denio. The stone was dressed and palleted at the Pacific Stone, Inc., mill near Winnemucca. Production in 1956 was only 22 percent that in 1955.

The Peterson sulfur pit (erroneously called the Vitallo mine after the brand name of its product), 2 miles east of Sulphur, was worked the first half of 1956 by its owners, Sulphur Products, Inc., and in the latter part by Nevada Soilaid, Inc. Six times more sulfur ore was produced in 1956 than in 1955. The entire output was put through the company crushing plant at Sulphur, graded to a product containing 25 to 35 percent sulfur, and shipped as a soil aid.

Most of the copper, silver, gold, zinc and lead production credited to the county in 1956 was from dump material shipped by H. B. Hullinger to a Utah smelter from various sites, including the Blue Hill mine, in the Golconda area. Some copper, silver, and gold were recovered from direct-smelting gold-silver and copper ores produced in the *Battle Mountain* district from the Morning Glory, Morning Star, and New Sunday mines. Zinc residue from milling operations at the Getchell Mine, Inc., mill in the *Potosi* district, treated at a smelter, yielded gold, copper, and silver. A few pounds of fire opal was obtained by G. Keith Hodson from the Rainbow Ridge mine in the Virgin Valley area.

Lander.—Lander County ranked first in statewide crude-barite production and yielded over 72 percent more than in 1955. The largest output in the county and State was by the Magnet Cove Barium Corp., which operated open pits at its Greystone group and adjacent claims about 37 miles southeast of Battle Mountain. The quarried material was crushed and ground at the company plant at Battle Mountain. Most of the production was shipped to the corporation plants on the gulf coast as an additive to drilling mud. Barium Products, Ltd., operated the Argenta, Bateman Canyon, and Mountain Springs open-pit mines south of Battle Mountain. Shipments were to the company-owned plant at Modesto, Calif.

Additional barite was produced in the Battle Mountain area by Paul R. Sloan, who worked the White Rock group of claims near Beowawe; Alfred Shelton, from the Second Chance open-pit mine; and Andrew J. Shelton from the Shelton Barite No. 1 open pit. The entire output from the minor producers was shipped to grinding mills in California.

Although gold production in the county decreased almost 28 percent below that in 1955, it still ranked second in State output. This decrease was due largely to discontinuance of placer-gold mining. All of the gold in Lander County was derived from lode mines, and most of it came from the *Bullion* and *Battle Mountain* districts. The principal producer was the Goldacres open-pit mine in the *Bullion* district, operated in conjunction with a cyanide plant by The London Extension Mining Co. Silver was a coproduct of this operation. Copper, gold, and gold-silver ores from mines and mine dumps in the *Battle Mountain* district were the source of over 99 percent of the

copper, 95 percent of the silver, all of the lead and zinc, and about 9 percent of the gold credited to the county in 1956. A large percentage of the gold, silver, copper, and lead production was from the Copper Canyon mine and the various Copper Basin claims worked by the Battle Mountain Copper Co. and numerous lessees. The Battle Mountain Copper Co. operated a mill and shipped copper concentrate to smelters, while most of the lessees shipped direct-smelting ore. The zinc was recovered from silver ore, from the Galena mine dump, shipped to a smelter fuming plant.

Production of tungsten concentrate in the county decreased 35 percent below 1955. The chief producer was the Linka mine and mill in the Big Smokey Valley area near Spencer Hot Springs, operated by Consolidated Uranium Mines, Inc. Gale G. Peer worked the Conquest mine in the same area. Production from other sources in the county was small, varying from 1 to 12 units of WO_3 each, for the entire year. The United States Forest Service, Lander County, and the Nevada Highway Department produced sand and gravel at various localities for road construction and maintenance. The total output was 13 times that of 1955. Gem-stone production decreased to one-third of the value of 1955 production. Clifford C. Zarley mined 4,000 pounds of rhodonite in the *Battle Mountain* district and 200 pounds of opalite in the *Ivanhoe* district used for semiprecious-stone settings. Turquois was mined in the *Cortez* district by Waddel and Ward and also in the *Battle Mountain* district by T. E. Sabin. The Apex Uranium, Inc., operated the Diamond and Early Day groups of claims in the Reese River area 3 miles south of Austin. Uranium ore was shipped to concentrating plants in Utah and Colorado during the year. All of the mercury produced in the county in 1956 came from the McCoy mine in the *Wild Horse* district 32 miles northwest of Austin. The property was operated by the United Mercury Corp. from January through May. Keller Bros. mined fluorspar at the Iowa mine 37 miles northeast of Austin and shipped the ore to the Kaiser Aluminum & Chemical Corp. flotation plant in Fallon for treatment. W. L. Peterson et al. explored for manganese under a DMEA contract at the Last Chance mine, 36 miles northwest of Austin.

Lincoln.—Although the production of tungsten concentrate was down 7 percent from 1955, this county again ranked third in output of that material. This was due to the efforts of the Wah Chang Mining Corp. at its Lincoln mine in the *Tem Piute* district, where exploratory work was also continued under the DMEA program. The Lincoln Mine Division of the corporation shipped tungsten-bearing material to the Salt Lake Tungsten Co. in Utah and to Union Carbide Nuclear Co. in California for chemical treatment. The corporation also consigned concentrate requiring further treatment to Wah Chang Corp. at Glen Cove, N. Y., and sold tungsten concentrate that met Government specifications to GSA. A 750-ton-per-day gravity and flotation mill was operated adjacent to the mine.

A small tonnage of fluorspar resulting from the mill processing of tungsten ore was shipped to the Kaiser Aluminum & Chemical Corp. flotation plant at Fallon (Churchill County) for testing to determine the possibility of processing to Acid-grade spar. Consolidated Uranium Mines, Inc., conducted exploratory work for tungsten ore

at the Schofield mine in the *Tem Piute* district, under a DMEA contract.

Lincoln was Nevada's leading county for producing recoverable zinc and silver, ranking second in lead and fourth in gold. Most of this output came from ore mined in the Bristol Mountain Range. The operation of Combined Metals Reduction Co. in the *Pioche* district was the principal source of zinc, lead, and gold in the county, as well as substantial quantities of silver and copper. The company mined the Pioche No. 1 and No. 2 ore bodies in its Caselton mine and the ore of Raymond-Combined Mines, Inc., under an agreement with the latter. The company also continued to explore for lead and zinc ore under two separate DMEA contracts. One of these was at its Black Prince mine, the other was a joint venture with Raymond-Combined Mines, Inc., which was conducted on the lower levels of the Caselton mine. The lead-zinc ores mined at all operations were treated at the company Caselton mill, and the recovered zinc and lead concentrates were shipped to smelters in Montana and Utah, respectively.

The Yuba Dike mine, in the same area, operated by Yuba Dike Mines, Inc. (John A. Hedman), produced lead-zinc ore containing silver and gold, which was shipped to a Utah smelter. Exploratory work under a DMEA contract was done by the company at this mine.

The Bristol mine of Bristol Silver Mines Co., in the *Jack Rabbit* district, 10 miles north of the *Pioche* district, was the county's leading producer of copper and silver, derived from direct-smelting ore which also contained substantial quantities of recoverable lead and zinc and some gold. The ore was treated at a Utah smelter-fuming plant. A DMEA exploratory project for copper, lead, and zinc was in progress at this mine during the year, under the direction of lessees.

The Comet mine, in the *Comet* district 9 miles southwest of Pioche was also explored for lead and zinc ore under a DMEA contract with Comet Mines, Inc.

Direct-smelting lead ore containing copper, silver, and gold was shipped to a Utah smelter by Dan Sheahan from the Groom mine in the *Groom* district. Silver and gold were recovered from mine-dump ore shipped from the *Atlanta* district to a Nevada copper smelter for use as a flux.

All of Lincoln County's manganese-ore output in 1956 was made by Combined Metals Reduction Co. and mined at the Southpaw mine near Hiko. Ore from this mine was consigned, both to an electrolytic manganese dioxide plant at Henderson, Nev., and to Government stockpiles.

Crude perlite was quarried by this company at the Hollinger property 17 miles northeast of Pioche and sized at the Caselton plant. The Delamar Perlite Co. produced perlite at its Mackie open pit near Delamar. All of Lincoln County's perlite production was shipped to out-of-State expanding plants.

Morrison-Knudsen Co., under contract with the Union Pacific Railroad Co., produced sand and gravel, and crushed miscellaneous stone near Caliente for use as railroad ballast. The city of Caliente and the Nevada Highway Department and its contractor, prepared nearly 147,000 tons of paving sand and gravel and produced over

1,500 tons of crushed miscellaneous stone for use in road construction and repair.

The Western Mercury & Uranium Corp. retorted a few flasks of mercury from ore mined in 1955 at the Andies property in the *Tem Piute* district. In May 1956 this property was leased to the Mullen-Buckley Uranium Corp. of Los Angeles, Calif. The latter conducted exploratory operations for the remainder of the year.

Lester E. Lee worked the White Cloud claim, 1½ miles northeast of Panaca and shipped a small tonnage of uranium ore to a concentrating plant in Utah. A small quantity of gemstone material, consisting of agate and blue quartz, was collected by G. E. Johnston near Alamo.

Lyon.—Lyon County was Nevada's second ranking copper producer principally due to The Anaconda Co. open-pit mining and acid-leaching operations in the *Yerington* district. Cement copper was produced and shipped to the company smelter at Anaconda, Mont. Copper ore, containing a small quantity of silver, from the Mason mine and various mine dumps in this district, was shipped to a Utah smelter.

The Jack Pot mine, in the *Wellington* district, was the chief source of silver and the sole producer of lead and zinc from lead-zinc ore, which was shipped to a California smelter-fuming plant. Gold recovered during a cleanup at a placer operation on the Adam-Rice claims by Apex Mining Co., in the *Yerington* district, was virtually the county's entire output of that metal in 1956.

The Carson Ready-Mix Concrete Co. prepared gravel for use as a concrete aggregate, near Dayton. The Nevada Highway Department and its contractors produced sand and gravel at various localities in the county for road construction and repair. The total tonnage of sand and gravel used in the county was about 75 percent less than in 1955, and the unit value was 25 percent higher. Fuller's earth was produced at the Jupiter mine north of Weeks by the Industrial Minerals & Chemical Co. and shipped to California for pharmaceutical use.

Tungsten production in Lyon County was about 30 percent less than that of 1955. Three mines were in operation northwest of Fort Churchill. The largest yield was from the Rainbow group of claims operated by Gene Bailey, with the Blue Star and Tungsten Flat mines, both operated by Jim Cushman, second and third. The low-grade tungsten concentrate produced at these mines was sold to ore buyers for further beneficiation. Baker-Hazard Mines, Inc., worked the River Road group of claims 37 miles southwest of Hawthorne and made a small shipment of uranium ore to a Utah concentrator.

Mineral.—The county was the fourth-ranking producer of tungsten concentrate in Nevada in 1956. Although more than 45,000 short-ton units of WO_3 were produced from ore mined in the county, this was 17 percent less than in 1955. Nevada Scheelite Corp., subsidiary of Kenametal, Inc., operated a mine and mill in the *Rawhide* district, was Mineral County's leading producer of tungsten concentrate, and was the State's fourth largest. The company also milled ores and purchased tungsten ores and concentrates from other producers. A DMEA exploration project was begun at this mine in June 1956.

The second largest yield of tungsten concentrate was recovered from ore mined by Minada Corp. at the Silver Dyke mine in the

Silver Star district 20 miles southwest of Mina. The company also operated a mill at Sodaville that beneficiated tungsten ores.

Other mines that produced tungsten ore were the Eagle Tungsten mine, in the *Sante Fe* district east of Luning; Cedar Chest mine, near Mina; the Lindsay and Gun Metal mines, in the *Pilot Mountains* district east of Mina, operated by Consolidated Uranium Mines of Nevada; the Old Gentry mine, near Hawthorne; and the Don Clair mine, in the *Rawhide* district.

The Kaiser Aluminum & Chemical Corp. mined fluorspar at the Kaiser mine in the *Broken Hills* district 22 miles northwest of Gabbs and floated the material in its plant at Fallon, Churchill County, to produce an Acid-grade fluorspar. James Grousl & Associates shipped some fluorspar from the Spardome mine near Gabbs, to the Kaiser mine at Fallon. Macco Corp. operated the Noquez Barium property near Basalt and shipped barite to its grinding plant at Rosamond, Calif.

Ores of the *Candelaria* district yielded most of the silver, gold, lead, and zinc credited to the county. The Argentum Mining Co. of Nevada was the principal producer of silver and the only producer of zinc in the county during 1956. The silver concentrate was produced from mine dump ore, including the Northern Belle mine, treated in the company 300-ton-per-day flotation plant at Columbus Marsh and was reduced at a California smelter-fuming plant and a Nevada copper smelter. The principal source of lead and gold credited to the county was the New Potosi mine in the same district, operated by G. A. Peterson & H. Hunter. The lead ore from this mine was shipped for direct smelting in California and Utah and contained considerable silver, in addition to a substantial quantity of recoverable antimony. The county's minor copper production was largely from direct smelting copper ore, which also contained silver and gold, shipped to Utah from the Hercules mine in the *Sante Fe* district.

Copper was also recovered at an Nevada copper smelter from copper ore, containing silver, mined at the Last Chance mine in the *Silver Star* district, and the Linda Vista mine in the *Acme* district 5 miles northeast of Thorne. George E. Miller quarried gravel near Hawthorne for paving purposes. The Nevada Highway Department produced gravel and miscellaneous stone for use in road construction and maintenance in the county. Sonora Marble Aggregates Co. quarried a few tons of marble southwest of Luning. The crushed product, called "Neva Chips," was sold for terrazzo. Several hundred pounds of obsidian of gemstone variety was collected by Clifford C. Zarley in the Fish Lake area and by Jay Wilson southwest of Basalt near Montgomery Pass. A few pounds of turquois was obtained by G. K. Hodson at different points in the county. C. W. Cooper quarried a small tonnage of pumice near Sodaville for use as concrete aggregate.

Nye.—Nye County mines produced tungsten ore which yielded over 22,000 short-ton units of WO_3, or about 23 percent less than in 1955. Although there were 27 tungsten operations compared with 42 during the preceding year, the county maintained its ranking as the fifth largest producer in the State. Most of the tungsten-ore output came from the *Lodi* district near Gabbs. The largest output in this area and in the county was from the Victory mine by the Gabbs

Exploration Co., which also operated a gravity and flotation mill near the mine-site.

Another important producer in the same area was the El Capitan mine, worked by the El Capitan Mining Co. Tungsten ore from this mine was concentrated by the Yaney Milling Co. at Gabbs.

Exploration and development work for tungsten ore under a DMEA contract with the El Capitan Mining Co. was begun on El Capitan's property early in 1955 and completed in 1956.

Otherpr oducers in the same area that mined an appreciable tonnage of tungsten ore were: The Hope mine (operated by J. H. Baxter) and the White Diamond mine (operated by G. E. Walter). There was also production of tungsten ore, which yielded from 2 to 39 short-ton units of WO_3 each, at the Terrell mine 52 miles northeast of Currant; the Oak Springs mine near Oak Springs Butte; and the Gant, Centipede, and Ophir group of claims and the New Moose mine in the Twin River area southwest of Millett. Exploration work for tungsten ore, under a DMEA contract, was begun in November at the Climax mine, in the Oak Spring Butte area by A. J. Wright.)

Magnesite and brucite was produced in Nevada by two operators from deposits 2 to 4 miles east of Gabbs. Basic, Inc., quarried magnesite and brucite from the Betty O'Neal pit and operated a rotary kiln at its plant near Gabbs. The product was used to make refractory magnesia and oxychloride and oxysulfate cements. The crude brucite was shipped, mostly to company-owned plants outside the State, for use in manufacturing "Basifrit." A small tonnage was consigned to California chemical plants. Standard Slag Co. quarried crude magnesite from its Greenstone Extension pit and operated a calcining plant near Gabbs. The company produced caustic-calcined and refractory magnesia. Most of the calcined product was shipped to west coast ports for export. Standard Slag Co. also quarried magnesite at the leased Iron Mountain (Phelps-Stokes) open pit, a few miles north of its magnesite property. A very small percentage of this iron ore was used locally in preparing dead-burned magnesia, but most of it was shipped for export.

The United States Forest Service, the United States Army Corps of Engineers, Nye County, and the Nevada Highway Department and its contractors prepared paving sand and gravel for use in road construction and repair. Pitts were at various localities in the county. The Nevada Highway Department quarried several thousand tons of volcanic cinder in the county for road surfacing and construction, and the Cind R Lite Co. quarried similar materials at the Cinder Cone pit near Lathrop-Wells Junction for use as concrete aggregate.

Nye County continued to be the only producer of crude petroleum in 1956. Shell Oil Co. had three producing wells in the Eagle Springs Unit. About 59,000 barrels of oil was pumped during the year. No additional drilling was undertaken in 1956, but the company continued its exploration program in the county concentrating on surface and subsurface surveys.

J. Irving Crowell, Jr., mined Metallurgical-grade fluorspar at the Daisy group 5 miles east of Beatty and made shipments to steel plants in California. Also, in the same area, L. R. Moretti quarried bentonite clay at the White Caps pit and made shipments to California for pharmaceutical use.

Ores containing 1 or more of the 5 metals gold, silver, copper, lead and zinc were mined in the county on a small scale. Except for 1 operator, who shipped 650 tons of silver ore, the total individual shipments of direct-smelting ores and tailings in this category from the other 21 operations in 13 districts ranged from 1 to 162 tons during the year. The Summit King (Tonopah King) mine at Tonopah, operated by Leonard Traynor, was the leading producer of gold and silver, which was recovered from gold-silver fluxing ore shipped to a Nevada copper smelter. The Florence mine (16 miles north of Tonopah in the *San Antone* district), operated by the Rainbow Uranium Co., was the principal lead producer from direct-smelting silver ore, which also contained recoverable copper, zinc, silver, and gold, treated at a Utah smelter-fuming plant.

The Copper King group of claims 5 miles south of Ione in the *Union* district and the Copper King No. 1 claim, in the *Bellehelen* district produced small tonnages of direct-smelting copper ore that contained some silver. The Black Jack mine, in the *Twin River* district, was the source of lead-zinc ore (containing silver) that was reduced at a Utah smelter-fuming plant.

Gold ore from the Gold Metals group of claims in the *Manhattan* district was amalgamated and yielded gold and silver. There was one gold-placer operation in the county; it was limited to sluicing gravel taken from a drift mine in the *Manhattan* district several years ago.

Less than 50 flasks of mercury was produced from 4 operations in the county in 1956. The principal production was from the Redbird No. 1 open-pit mine near Round Mountain. The other producers were: The A & B mine, in the *Tybo* district; the Magee mine, in Horse Canyon, 14 miles northwest of Manhattan; and the Lime Cap mine in the *Fluorine* district east of Beatty. Most of the county mercury yield was marketed in California. A few flasks were sold to a local buyer.

Ormsby.—The only mineral produced in the county in 1956 was sand and gravel. John L. Savage Construction Co. prepared sand and gravel for concrete aggregate from pits east of Carson City. Ormsby County and the Nevada Highway Department and its contractors quarried gravel for highway construction and repair.

Pershing.—Pershing County ranked second in State tungsten production; its mines produced ore that yielded over 65,000 short-ton units of WO_3. This was about 7 percent less than in 1955. Nevada-Massachusetts Co., the State's largest individual producer of tungsten concentrates, worked the Tungsten group of mines, 8 miles northwest of Mill City, by underground and open-pit methods and contributed more than 90 percent of the total tungsten output. Company ore was treated by gravity concentration, flotation, magnetic separation, and leaching methods at its plant near the mine site, and the concentrates were shipped to Government stockpiles.

The Wolfram Co., the second-ranking producer of tungsten ore in the county, operated the following properties: The Nightingale mine, 38 miles north of Fernley; Long Lease mine, 12 miles southeast of Lovelock; and Stormy Day mine (leased for first 7 months of 1956), 16 miles south of Gerlach. The Stormy Day mine was also operated

under lease by Nev-Tah Oil & Mining Co. The ores were concentrated at the Wolfram Co. mill in Toulon.

The remaining tungsten concentrates credited to the county came from ore mined at 25 operations in the county. Those, with the most noteworthy production, were: The Holiday Extension & Joe No. 2, Coon Can and Sugar Hill mines near Lovelock, operated by Wm. Cooney & Sons; the Holiday mine 4 miles southwest of Vernon was operated by Ellis K. Farnham, who shipped ore and concentrates to a Nevada buyer; and the M. G. L. property, 16 miles northeast of Nixon. The mine was worked by numerous operators, and the Metallurgical Development Co. re-treated the mill tailings. Both the mined ore and the tailings were treated in a Douglas County custom mill. Exploration for tungsten ore under a DMEA loan was begun in July at the Stormy Fraction (Thrasher) claim, 14 miles southeast of Gerlach, by the Cordero Mining Co.

The United States Gypsum Co. produced gypsum at the Empire gypsum quarry 10 miles south of Gerlach. The quarry extends into Washoe County, where the company gypsum-processing plant is located. The company also quarried perlite from its Pearl Hill mine northwest of Lovelock. The perlite was trucked to the company crushing and sizing plant at Kodak, and the graded material was transferred to the Empire expansion plant in Washoe County.

Pershing County was the source of over one-fourth of the Nevada's iron-ore production in 1956. This yield was 45 percent more than in 1955. All of the iron ore was mined by open-pit methods and came from the *Mineral Basin* district 35 miles southeast of Lovelock. The leading producer was Dodge Construction, Inc., which shipped magnetite from the Iron Horse (Ford) group of claims and a smaller tonnage of hematite from the Thomas pit (Southern Pacific Co. lease). The ore was shipped to California ports for export. The Nevada Iron Ore Co., Inc., also mined hematite from the north end of the Thomas pit and shipped ore to domestic steel plants and to California for export.

Mercury production in Pershing County increased 138 percent above that in 1955 and came from 16 operations. The principal producer was the Miller Basin (Eureka) mine near Kennedy, operated first by Walter Low and later by the Miller Basin Mining Co. This mine supplied almost 40 percent of the county output. Other major producing operations east and southeast of Lovelock, within a radius of 25 miles were: The Nevada Mercury Co. (Lori No. 1 mine); Biggs, Noble et al. (Black Jack mine); Warner Meissner (Eastern Star Nos. 0 & 1 claims); John E. Holmstrom (Freckles mine); and by C. A. Coppin (Redbird mine). Coppin also conducted exploration for mercury ore under a DMEA loan at this property, in the *Antelope Springs* district.

Pershing County and the Nevada Highway Department quarried over 70,000 tons of gravel for use in road construction and maintenance at various localities in the county; this was about 60 percent less than in 1955. John M. & Ott F. Heizer made a shipment of antimony ore, mined 5 years previous, from the Hollywood mine 27 miles southeast of Lovelock, to a Texas smelter.

The principal silver, and only lead and zinc, output credited to the county was from a small tonnage of lead-zinc ore produced at the

De Sota mine in the *Star* district 7 miles north of Unionville, by the Boyd-Endsley Mining Co. This ore, which was shipped to a California smelter-fuming plant, also contained recoverable copper and gold.

The only copper-ore production was a small tonnage that came from the Star Point mine near Unionville. This ore also contained small quantities of silver and gold and was shipped to a Utah smelter. Most of the county gold production was from placer operations. Gold and the coproduct silver were recovered by Constant Minerals Separation Process, Inc., from alluvium washed at its plant near the Barrel Spring deposit at Rabbit Hole and by Darrell V. Cole, who washed stream gravel, using small-scale hand methods, in the Willow Creek area approximately 12 miles southeast of Mill City.

Storey.—The Eagle-Picher Co., the only producer of diatomite in Storey County, was the leading producer in the State. The company operated the Celatom open pit 8 miles southwest of Wadsworth and trucked the quarried material to its processing plant at Clark Station, 12 miles southwest of Wadsworth on Highway No. 40. The diatomaceous earth was crushed, calcined, screened, and classified at the plant and the product shipped to various customers in the United States and Canada for use in insulation, refractories, filters, and miscellaneous applications. The demand about equaled that in 1955.

The gold and silver production in the county all came from the *Comstock Lode* district east and south of Virginia City. The minor gold production was 146 percent more than in 1955, while silver output decreased 38 percent. The principal producer was the Double King Mines, Inc., which worked the Silver Hill open-pit mine and treated the ore at the Donovan stamp mill and cyanide plant at Silver City (Lyon County). A small amount of gold and silver was recovered from material gathered in old mill cleanups in the district.

Washoe.—Sand and gravel was the principal mineral produced in the county; it amounted to 87 percent of the total value of the mineral production in 1956. The tonnage was 16 percent more than in 1955. Much of the increase was due to accelerated construction activity in the vicinity of Reno, especially the building of new homes. The leading producers of sand and gravel for structural and paving uses were Smith-Peterson & Co., Isbell Construction Co. (which operated a portable plant), and Bob Williams. Earl L. Gomes produced paving gravel with a portable plant, and George E. Miller (who prepared sand for paving and structural purposes) also crushed decomposed granite for use in top soil. The United States Bureau of Public Roads, the United States Army Corps of Engineers, and the Nevada Highway Department and their contractors produced sand and gravel for road construction and repair. Washoe County crushed basalt for concrete and road metal, and the Bureau of Indian Affairs crushed miscellaneous stone for road fill.

The United States Gypsum Co. operated its Empire gypsum-processing plant 10 miles south of Gerlach on gypsum produced at the company quarry adjacent to the plant. The quarry extends into Pershing County. The company also operated a perlite-expanding plant at Empire on crude perlite produced in Pershing County.

The Double Check Products Co. quarried calcareous marl 7 miles northeast of Flanigan. The marl was ground and mixed with other

ingredients to produce poultry and livestock feeds. Reno Press Brick Co. mined fire clay and miscellaneous clay at the Faith and Geiger pits near Steamboat Springs and at the Revelation pit 6 miles east of Sparks. The clay was used in refractory brick and block, and other heavy clay products manufactured at the company plant in Reno. The tonnage of clays produced was 35 percent more than in 1955.

Copper, gold, and silver were recovered at smelters from small tonnages of copper ore produced by Julius Redelius at the Big Ledge mine (in the *Peavine* district about 20 miles northwest of Reno) and by C. H. Foreman from the Silver Bell mine (in the *Pyramid* district about 20 miles northwest of Gerlach). The Galena Hill mine (in the *Galena* district 2 miles northeast of Steamboat) operated by Constant Minerals Separation Process, Inc., produced the only lead and zinc credited to the county, which was in silver ore reduced at a California smelter-fuming plant. The ore also contained a small percentage of recoverable copper. Fred J. De Longchamps worked the Red Bluff claim in the Pyramid area 25 miles north of Sparks and shipped uranium ore to a concentrating plant in Utah.

White Pine.—White Pine County led the State in the total value of mineral production in 1956. It was again first in yields of copper, gold, and clays and second in silver and lime. It was also the only producer of molybdenum concentrate in Nevada.

The principal output of copper, silver, and gold and all the molybdenum came from ore mined in the *Robinson* district, about 6 miles northwest of Ely. Production was by the Nevada Mines Division of Kennecott Copper Corp. and the Consolidated Coppermines Corp. The Kennecott Copper Corp. operated the Kimbley, Liberty, and Veteran open pits and the Minnesota-Hi underground mine. The Consolidated Coppermines Corp. operated the Tripp open pit—a consolidation of the old Morris and Brooks pits. As the two company holdings were contiguous, portions of the Veteran and Liberty pits, on Consolidated Coppermines Corp. property, were mined by the Kennecott Copper Corp. for Coppermines' account.

The copper ores were concentrated and reduced at the McGill mill and smelter, respectively, which were owned and operated by Kennecott Copper Corp. The blister-copper product was shipped to eastern refineries. The molybdenum concentrate, a byproduct of the milling operation, was also shipped out-of-State. The McGill smelter also received fluxing ores containing copper, gold, and silver from numerous mines in Nevada, California, and Utah.

The White Pine County properties in this group included the Siegel mine (in the *Aurum* district about 40 miles northeast of McGill) and the Sunnyside mine (in the *Robinson* district), producers of silver and gold-silver ore, respectively. The main producers of lead, which also contributed several hundred ounces of silver and some copper to the State total, from lead ore shipped to a Utah smelter were: The O. B. Mining Co., Ward mine, in the *Ward* district 12 miles south of Ely; and Andrew Dowd & Fred Harris, Belmont mine, Hamilton Land Co., Grand Prize mine, and Joe Nardi, Rocco Homestead mine, all in the *White Pine* district near Hamilton.

The relatively small zinc-production was derived from zinc ore shipped to a Utah smelter-fuming plant from the Kink claim in the

Robinson district and from lead-zinc and copper-lead-zinc ores from the Crest (Lucky Larry) claims and the Great Valley mine, respectively, in the *White Pine* district. These ores also contained some recoverable gold and silver.

Exploration for lead-zinc ore under a DMEA loan was begun in March 1956 by Mount Wheeler Mines, Inc., at the Mount Wheeler mine 5 miles south of Wheeler Peak.

Cleanup operations at county placer properties in the Oceola district yielded gold and silver from deposits mined several years ago. About 6,400 short-ton units of WO_3 was contained in concentrates produced from tungsten ore mined in White Pine County during the year, which was 37 percent less than in 1955. The *Shoshone* district contributed a large percentage of this output, and the principal producers were the Everit mine and mill operated by Minerva Scheelite Mining Co. and the Minerva mine worked by M. I. A. Mines Co. Ore from the latter mine was concentrated at the Everit mill. M. I. A. Mines Co. also did exploration work for tungsten ore under the DMEA program.

In the *Tungstonia* district, Ely Uranium, Inc., operated the Antelope mine and shipped its ore to a Utah mill. Frank Roberts operated the Bay State mine in the *Newark* district, near the Eureka County line, and shipped tungsten ore to a Humboldt County mill. In the *Cherry Creek* district, another important source of tungsten ore, James E. Duval worked the Calcite No. 5 mine, and Benson & Ruggles and Twentieth Century Fuels, Inc. operated the Only Chance mine. The latter company also operated a custom mill at Cherry Creek on tungsten ores mined in that area. Exploration for tungsten ore, under the DMEA program, was undertaken at the Teresa mine in the *Tungstonia* district by Helmar Mining & Milling Co., Inc., and at the Valley View mine in the *Granite* district by Robert N. Salvi.

Limestone was quarried by Kennecott Copper Corp. near McGill for smelter flux and as a source of lime for the concentrating plant.

A small tonnage of quartzite was quarried near Baker by the Star Dust Mines, Inc., and sold as flagstone. Engine sand for the Nevada Northern Railroad and sand and gravel for aggregate in concrete and plaster were produced from a deposit in Spring Valley by Ely Sand & Gravel Co. The United States Forest Service, White Pine County, and the Nevada Highway Department and its contractors produced sand and gravel for road construction and repair at various localities in the county.

Manganese ore was mined by Manganese Mining Co. in the *Nevada* district 10 miles south of Ely and by Sam Robison at the Columbia mine in the *Robinson* district. The ore from both operations was shipped to Government stockpiles outside the State. Jeanette E. Bigger produced fire clay from the McDonough pit in Mosier Canyon east of Ely for local use in furnace mortar.

The Mineral Industry of New Hampshire

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the New Hampshire State Planning and Development Commission.

By Joseph Krickich [1] and Mary E. Otte [2]

NEW HAMPSHIRE produced minerals in 1956 exceeding $3 million in value, a 32-percent increase over 1955. Substantial gains in the total value of stone, sand and gravel, and clays were enough to boost the State's total value above the $3 million mark, despite decreases in the value of mica, feldspar, beryllium, abrasives, and gem stones. Although sand and gravel continued for the third straight year to be the principal mineral product, the stone industry increased the most in 1956. This gain was due primarily to increased production of crushed miscellaneous stone for use as concrete aggregate and roadstone at the Portsmouth Air Base in Rockingham County. Mineral production was reported from every county; Merrimack, Rockingham, and Cheshire Counties, in order of decreasing value, were the centers of greatest mineral activity.

TABLE 1.—Mineral production in New Hampshire, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate	20	$11,975	(3)	(3)
Clays	35,184	35,184	36,320	$47,040
Gem stones—pounds	(3)	5,000	(3)	500
Mica	33	203,693	330	187,619
Peat	45	(3)	320	(3)
Sand and gravel	2,432,146	1,592,580	3,862,479	1,822,230
Value of items that cannot be disclosed: Abrasive stones, columbium-tantalum (1955), feldspar, stone, and values indicated by footnote 2		756,504		1,378,492
Total New Hampshire		2,605,000		3,436,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Quantity not recorded.

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REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasives (Scythestones).—Sales of scythestones (a quartz-mica schist) in 1956 declined slightly compared with 1955. Norton Pike Co. continued to be the only supplier of abrasive stone in New Hampshire. Sales were made from a stockpile of material produced in 1945 from the company quarry at Piedmont, Grafton County. The quarry has been closed since 1953.

Clays.—During 1956 production of clay increased 3 percent in tonnage and 34 percent in value. The output came from 4 operations; 1 each in Grafton and Strafford Counties and 2 in Rockingham County. Only miscellaneous clay was produced and utilized in manufacturing heavy clay products.

Feldspar.—Production of feldspar decreased sharply in 1956, compared with 1955. The decline primarily resulted from lowered demand for ground feldspar in manufacturing pottery, soap, and abrasives. Three companies reported production of feldspar from 4 operations—1 each in Cheshire and Sullivan Counties and 2 in Grafton County.

Gem Stones.—The production of gem stones during 1956 was limited to a crude topaz stone and other miscellaneous stones.

Gypsum.—Crude gypsum imported from New York was processed by the National Gypsum Co. at Portsmouth (Rockingham County) for manufacturing building materials.

Mica.—The production of sheet and scrap mica increased over 1955, but total valuation declined. The large increase in tonnage was due to greater sales of scrap mica to industry. Sales of full-trim mica to the Government through the GSA, Franklin, Merrimack County (N. H.) and Spruce Pine (N. C.) Purchase Depots decreased in 1956, causing the total mica value to decline slightly. Industry purchased punch, hand-cobbed, full-trimmed, scrap, and other mica, while in 1955 industry purchased only punch, hand-cobbed, half-trim, and scrap mica. The Government purchased only hand-cobbed and full-trim mica. The average price of sheet mica sold to industry increased, while the average price of sheet mica sold through GSA declined as compared with 1955. Ground mica was produced in Merrimack County and used in manufacturing paint, rubber, wallpaper, and plastics.

Sand and Gravel.—The sand and gravel industry ranked first in tonnage and value of total output in New Hampshire in 1956, contributing over half of the State's total value. During the year the tonnage of sand and gravel increased 59 percent, but the value increased 14 percent compared with 1955. Increased road repair and paving by the New Hampshire Department of Public Works and Highways was the major factor in the increased production of sand and gravel. Production of paving gravel increased considerably, but slight increases were reported for filter sand, sand as railroad ballast, and other sand, plus increased output of gravel for other uses. The production of sand for paving, structural purposes, and engines, as well as structural and railroad ballast gravel, declined during the year. Government-and-contractor output of sand and gravel in 1956 was reported in every

county, while commercial producers were active in all but Carroll and Sullivan Counties.

Stone.—Stone production continued to rank as the second most important mineral industry in New Hampshire in 1956. The production of crushed stone as concrete aggregate and roadstone increased sharply owing to increased road and airbase construction. Stone was produced in Rockingham, Merrimack, Grafton, Hillsboro, Carroll, and Coos Counties, in order of decreasing value, during the year. Dimension granite was produced as rough construction stone, rubble, dressed architectural stone, dressed monumental stone, and curbing and flagging stone. Dimension quartz was sold for use as rough architectural stone. Some granite was crushed for riprap and concrete aggregate, but the bulk of the State's crushed-stone production was miscellaneous stone used as concrete aggregate and roadstone.

METALS

Beryllium.—Production of beryl in New Hampshire in 1956 was centered in Cheshire, Grafton, Rockingham, and Sullivan Counties, with most of the output coming from Grafton County. The Government purchased all beryl sold in 1956 through the GSA Franklin (N.H.) Purchase Depot.

Columbium-Tantalum.—No sales of columbite-tantalite produced in New Hampshire in 1956 were reported.

MINERAL FUELS

Peat.—Production of peat in 1956 in New Hampshire increased sharply compared with 1955. This output, which was produced in Belknap County, was used for soil-improvement purposes.

TABLE 2.—Value of mineral production in New Hampshire, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Belknap	(1)	(1)	Sand and gravel, peat, mica.
Carroll	(1)	$22,311	Sand and gravel, stone.
Cheshire	$298,384	442,861	Sand and gravel, mica, feldspar, beryl.
Coos	8,369	10,450	Sand and gravel, stone, gem stones.
Grafton	443,341	330,603	Sand and gravel, feldspar, mica, clays, stone, beryl, abrasives.
Hillsboro	(1)	(1)	Sand and gravel, stone.
Merrimack	(1)	(1)	Do.
Rockingham	(1)	(1)	Stone, sand and gravel, clays, beryl.
Strafford	(1)	(1)	Sand and gravel, clays.
Sullivan	(1)	(1)	Feldspar, sand and gravel, mica, beryl.
Undistributed [2]	1,854,842	2,629,656	
Total	2,605,000	3,436,000	

[1] Value included with "Undistributed."
[2] Includes counties whose value must be concealed for particular years, as indicated by footnote 1, and a quantity unspecified by county.

REVIEW BY COUNTIES

Belknap.—Tilton Sand & Gravel, Inc., operated a pit and fixed plant at Tilton, producing sand and gravel for building and road construction. The plant was idle during the winter months. The New Hampshire State Highway Department produced sand and gravel and purchased a quantity produced under contract for paving material.

Perkins Peat Bog, the only producer of peat in the State, recovered reed-sedge peat from a bog near Center Barnstead.

Patrick Dufour produced mica from the Tyeh and Keys mine near Lakeport and sold full-trim sheet mica to the GSA Spruce Pine (N. C.) Purchase Depot.

Carroll.—Sand and gravel was produced by New Hampshire Highway Department for paving material.

Cesare Trusiani reclaimed a small quantity of quartz from the Chandler quarry near Chatham, selling the stone as rough architectural blocks. Crushed granite for riprap was produced under contract for the New Hampshire Department of Public Works and Highways from quarries in Carroll County.

Cheshire.—Keene Sand & Gravel, Inc., operated a pit and fixed plant at Swanzey, producing washed sand and gravel for paving and road material, sand for filter use, and a quantity of unwashed sand for miscellaneous uses. Warren H. Plimpton produced bank-run sand and gravel for the town of Dublin and unwashed sand and gravel for use by industry as paving and road material. Washed sand and gravel for building purposes and paving gravel was produced by Cold River Sand & Gravel Corp. from a pit and fixed plant near Walpole.

In terms of total value, Cheshire County was the leading mica-producing county in the State in 1956. Strafford Mines, Inc., operated mines near Alstead; and Otto K. Lassmann produced hand-cobbed mica at the French mine near Gilsum, and sold it to the GSA operated Government Franklin (Merrimack County, N. H.) Purchase Depot. In addition, Otto K. Lassmann prepared and sold sheet mica to industry.

Golding-Keene Co. produced crude potash-type feldspar at the Colony mine near Alstead, and ground the feldspar at the local company-owned grinding plant.

Production of beryl was reported by Golding-Keene Co. from the Colony mine and Otto K. Lassmann from French mine, both at Alstead; and John L. Maderic, Clarke mine, near Gilsum. The entire output of beryl was sold to the GSA Franklin (N. H.) Purchase Depot.

Coos.—Lessard Sand & Gravel Co. (Gorham) produced a quantity of washed sand, and Clyde B. Gray produced washed gravel for paving and road structure. Fred Corrigan recovered a small quantity of unwashed paving and road sand from a pit near Randolph. Maine Central Railroad Co. produced gravel for railroad ballast from a pit near Colebrook.

Crushed granite for riprap was produced under contract for the New Hampshire Department of Public Works and Highways.

Gem material of the topaz variety was mined by Orman McAllister near Baldface Mountain, north of North Chatham. This producer reported that interest in the collection of gem stones by rock hounds is increasing, and he will have a few locations of his own in 1957.

Grafton.—Producers of sand and gravel in 1956 were Littleton Sand & Gravel Co., Inc., Littleton; Campton Sand & Gravel Co., West Campton; D. & L. Manufacturing Corp.; and K. Curran. The output was principally for paving material, while a quantity of sand was produced for structural purposes. The New Hampshire State High-

way Department produced, as well as purchased, a quantity of sand and gravel for paving material.

Whitehall Co., Inc., operated the Ruggles open-pit mine near Grafton, producing crude potash-type feldspar for the parent company—The Oxford Soap Co., Manchester, Conn. Crude potash-type feldspar also was mined by Golding-Keene Co. from the Lot No. 10 mine near Canaan, and shipped to the company-owned grinding plants at Alstead, N. H., and Trenton, N. J.

Mica was mined from 17 underground and open-pit mines operated by 16 companies in 1956. Sales of mica consisted primarily of hand-cobbed and full-trim sheet mica of which a large quantity was sold to the Government through the GSA (Spruce Pine, N. C., and Franklin, N. H.) Purchase Depots. Two of the companies also sold hand-cobbed, full-trim, punch mica to industry. A small quantity of scrap mica was produced. The 10 leading producers of mica in Grafton County in 1956 were:

Company:	*Mine*	*Location*
Bernice and John L. Maderic	Keys	Rumney.
Do	New	Do.
Whitehall Co., Inc	Ruggles	Grafton.
Donald E. Esty	Donald Esty	Hebron.
Charles E. Dufour	Baer-Prospect	Orange.
Do	Hoyt Hill	Do.
Ashley Mining Corp	Keyes	Do.
Henry C. Robinson	Crystal	Campton.
H. C. Bowles	Atwood	West Rumney.
Do	Bowles Prospect	Groton.
Do	Keyes	Orange.
Do	Nate Coffin Ledge	Rumney.
Leonard A. Guraldi & Son	Good Old Larry	Grafton.
W. D. Wood, Inc	Ruggles	Do.
Do	Hoyt Hill	Orange.
Larry Eaton	Larry Eaton	Groton.

Densmore Brick Co. (Lebanon) produced miscellaneous clay from an open-pit mine for manufacturing building brick.

Crushed granite for riprap, concrete aggregate, and roadstone was produced under contract for the New Hampshire Department of Public Works and Highways.

Grafton County continued to lead in beryl production in 1956. Four producers reported output of beryl: John L. Maderic operated the Plume mine, North Groton; Whitehall Co., Inc., Ruggles mine, Grafton; Edward Albert, Albert mine, Groton; and Martha B. Tibbetts, Groton. All beryl was sold to the Government Franklin (N. H.) Purchase Depot.

Norton Pike Co. (Littleton) continued to sell scythestones from its stockpile, since the Pike quarry was closed permanently as of January 1953.

Hillsboro.—Robie Construction Co., Inc. (Manchester) and The Harris Construction Co., Inc. (Peterborough) recovered sand and gravel for structural and paving material. The Manchester Department of Highways (Manchester) and the New Hampshire State Highway Department reported production of sand and gravel for paving purposes.

Granite crushed for riprap, concrete aggregate, and roadstone was produced under contract for the New Hampshire Department of Public Works and Highways.

Merrimack.—Merrimack County was the leading mineral-producing county in the State in 1956, supplying 36 percent of the total value of mineral output. It also led in the production of sand and gravel. Sand and gravel was recovered from a pit and prepared at a fixed plant at Hooksett by Manchester Sand, Gravel & Cement Co., Inc. The major part of the production was sold for building and paving material and small quantities were sold for engine sand, filter sand, and railroad ballast. The New Hampshire Department of Public Works and Highways reported a large output of sand and gravel recovered by the construction and maintenance crews for paving material, as well as purchased quantities of sand and gravel produced under contract. The commissioner of public works, Concord, reported production of paving and road sand and gravel for local use.

The John Swenson Granite Co., Inc., operated the Swenson Gray quarry and crusher at Concord and produced dimension granite for rough construction, rubble, dressed architectural stone, monumental stone, and curbing and a small quantity crushed for use as concrete aggregate, roadstone, and screenings.

Concord Mica Corp. (Penacock) ground crude and factory scrap mica for manufacturing paint, rubber, wallpaper, and plastics.

The Government, through the GSA Franklin (N. H.) Purchase Depot bought hand-cobbed and full-trim mica, as well as beryl. Beryl and mica produced in Cheshire, Grafton, Rockingham, and Sullivan Counties was purchased by the Government for stockpiling.

Rockingham.—More stone was produced in Rockingham County than in any other county in the State in 1956 and increased in comparison with 1955. Morrison-Knudsen Co., Inc., and Landers & Griffin, Inc., continued to operate the Iafolla quarry at Portsmouth, which was leased from the John Iafolla Estate. Output consisted of miscellaneous stone crushed for concrete aggregate, roadstone, and screenings. Granite was produced under contract for the New Hampshire Department of Public Works and Highways and crushed for riprap, concrete aggregate, and roadstone.

From an open pit at Exeter, L. Chester & Clayton W. Simpson produced sand for building sand and gravel for fill and cement manufacture. Merle Simes (Kingston) sold a small tonnage of building sand. The New Hampshire State Highway Department also reported producing sand and gravel for paving material.

Miscellaneous clay was mined from open-pit mines by Eno Bros. Brick Co. (Exeter) and W. S. Goodrich, Inc. (Epping), for the manufacture of heavy clay products.

Phillip Morrill operated various beryl mines near Derry and sold the production to Government Franklin (N. H.) Purchase Depot.

National Gypsum Co. transported crude gypsum from the Clarence Center (N. Y.) mine to its mill at Portsmouth, N. H., for processing. The processed material was marketed mainly for building materials.

Strafford.—Sand and gravel was produced by Dover Sand & Gravel, Inc., Dover; Kenneth Allen, Rochester; and James S. Pike, Lee.

Output was utilized principally for building sand and gravel, and paving and road gravel.

Strafford County was the leading clay-producing county in the State in 1956. New England Brick Co. recovered miscellaneous clay from an open-pit mine near Rochester, for manufacturing heavy clay products.

Sullivan.—Crude potash-type feldspar was mined by J. F. Morton, Inc., from an underground mine north of Alstead in Sullivan County and trucked to the company-owned grinding plant at Cold River. This company discontinued operation in September 1956 and sold out to Foote Mineral Co. (Philadelphia, Pa.) in December of the same year.

A small quantity of sand and gravel for paving was produced by the New Hampshire State Highway Department.

Smith Mica Co. operated the Upper Smith mine near Claremont, and Martha B. Tibbetts, the Crystal and Fellows mines near Springfield, producing hand-cobbed and full-trim sheet mica for sale under the Government Purchase program to the GSA Franklin (N. H.) Purchase Depot.

Elmer B. Rowley and Smith Mica Co. mined beryl from the Beryl Mountain mine (Acworth) and the Upper Smith mine (Claremont) respectively. Both companies sold the beryl through the GSA Franklin (N. H.) Purchase Depot.

The Mineral Industry of New Jersey

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior and the New Jersey Division of Planning and Development, Bureau of Geology and Topography.

By Joseph Krickich [1] and Geraldine C. Slaypoh [2]

NEW JERSEY mineral production exceeded $64 million in value, an increase of 12 percent compared with 1955. This rise was due to the increased valuation of stone, sand and gravel, and iron ore, the leading mineral commodities in the State. These minerals furnished 87 percent of the State's total value. The output of zinc and manganiferous residuum declined sharply because of an 8-month shutdown at the Sterling Hill mine. Mineral production was reported from all counties; Morris, Somerset, Cumberland, Passaic, and Sussex Counties, in decreasing order of value, were the centers of greatest mineral activity. Mineral output from these counties supplied 71 percent of the State's total mineral value.

TABLE 1.—Mineral production in New Jersey, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	644,192	$1,561,994	[2] 651,080	[2] $2,213,965
Gem stones pounds	10	16	([3])	100
Iron ore (usable) long tons gross weight	759,550	13,633,370	911,535	16,841,752
Manganiferous residuum gross weight	213,370	([4])	130,129	([4])
Peat	26,358	229,065	([4])	([4])
Sand and gravel	11,152,552	16,424,417	11,194,412	18,238,745
Stone	[5] 8,357,599	[5] 17,527,890	9,012,323	20,825,024
Sulfur, recovered elemental long tons	7,404	243,984	8,972	291,413
Zinc (recoverable content of ores, etc.) [6]	11,643	2,863,945	4,667	1,259,530
Value of items that cannot be disclosed: Ball clay (1956), lime, magnesium compounds, marble (1955), marl (greensand), and value indicated by footnote 4. Excludes limestone used in manufacturing lime (1955–56)	----------	5,010,313	----------	4,608,856
Total New Jersey	----------	57,495,000	----------	64,279,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes ball clay.
[3] Quantity not recorded.
[4] Figure withheld to avoid disclosing individual company confidential data.
[5] Excludes marble.
[6] Recoverable zinc valued at the yearly average price of Prime Western slab zinc, East St. Louis market. Represents value established after transportation, smelting, and manufacturing charges have been added to the value of ore at mine.

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REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—In comparison with 1955, production of crude iron ore and shipments of usable ore in New Jersey increased 26 and 20 percent, respectively. Of the total crude ore mined, 93 percent was concentrated before shipment, and the remainder was shipped as direct ore. The average price of New Jersey's iron ore rose from $17.95 in 1955 to $18.48 in 1956. Four underground mines were active—3 in Morris County and 1 in Warren County. Warren Foundry & Pipe Corp., at the Mount Hope mine in Morris County, changed the firm's name to Shahmoon Industries, Inc., on May 10, 1956.

TABLE 2.—Production and shipments of iron ore, 1947–51 (average) and 1952–56, by uses, in long tons

Year	Number of mines	Crude ore mined	Shipments of usable ore						
			Direct shipping ore	Concentrates for pig iron	Cement	Paint	Miscellaneous	Total shipments	Value
1947–51 (average)	4	994,918	141,676	364,804	11,589	301	1,607	519,977	$5,072,146
1952	5	1,318,599	166,962	505,136	13,272	96	--------	685,466	6,760,467
1953	5	1,558,384	177,475	633,128	5,302	--------	--------	815,905	10,114,970
1954	5	1,025,057	18,584	456,379	1,229	--------	--------	476,192	6,621,881
1955	4	1,455,891	164,238	595,312	--------	--------	--------	759,550	13,633,370
1956	4	1,831,391	144,663	766,791	--------	81	--------	911,535	16,841,752

Magnesium Compounds.—Refractory magnesia was produced from dolomite and raw sea water by Northwest Magnesite Co., Cape May County. Johns-Manville Corp. (Somerset County), and J. T. Baker Chemical Co. (Warren County) produced various refined magnesium compounds from purchased dolomite and magnesium compounds. Johns-Manville Corp. discontinued the manufacture of precipitated magnesium carbonate in May 1956. To avoid duplicating output data, only the magnesia produced from sea water is included in the mineral output of the State.

Manganiferous Residuum.—Manganiferous residuum was obtained as a byproduct in the process of recovering zinc from a manganiferous zinc ore mined in Sussex County.

Zinc.—Output of zinc in New Jersey continued to decline in 1956. Production decreased substantially compared with 1955 owing to the shutdown of the New Jersey Zinc Co. Sterling Hill mine, Sussex County (the only producing zinc mine in the State), during the first 8 months of the year. A shutdown resulted in August 1955 when the company and the mine employees, members of the United Mine Workers, failed to reach an agreement during contract negotiations. The mine reopened on September 4, 1956, when the labor dispute was settled.

TABLE 3.—Mine production of recoverable zinc, 1947–51 (average) and 1952–56

Year	Short tons	Year	Short tons
1947–51 (average)	64,427	1954	37,416
1952	59,190	1955	11,643
1953	45,700	1956	4,667

NONMETALS

Clays.—Production and value of clays in New Jersey increased, compared with 1955. The increased valuation was due to use of the market value of a large proportion of the prepared clay sold or used in 1956 rather than the value of the crude clay at the pit or mine; in most instances the latter was used in 1955. There were 21 open-pit operations in 10 counties. The leading clay-producing counties during the year were Middlesex, Cumberland, Warren, and Somerset, in order of decreasing value. The varieties of clays recovered from New Jersey's pits were ball, fire, and miscellaneous.

Most of the fire-clay output was used for refractories and heavy clay products. Ball clay was employed exclusively for refractories. The principal use of miscellaneous clay was in manufacturing heavy clay products, such as building brick, paving brick, draintile, sewer pipe, and kindred products.

Gem Stones.—A quantity of crude gem stones was recovered from unspecified places in New Jersey through the efforts of several amateur gem collectors.

Gypsum.—National Gypsum Co. and Barrett Division, Allied Chemical & Dye Corp., calcined gypsum and manufactured finished gypsum building products at plants in New Jersey. Barrett Division, Allied Chemical & Dye Corp. acquired the operations of the Newark Plaster Co. on February 1, 1956. Crude gypsum was calcined in kettles at Allied Chemical's Newark plant (Essex County) and transferred to its South Kearny plant (Hudson County) to be made into finished building products. In August 1956 National Gypsum Co. officials announced completion of the company's new multimillion-dollar gypsum-processing plant at Burlington, Burlington County.[3] The original plans for this plant included a wharf and a dock to receive raw gypsum from Nova Scotia. The plant was expected to consume 350,000 tons of raw material annually.[4]

Lime.—Limestone Products Corp. of America, Sussex County, was the only active producer of hydrated lime in New Jersey during 1956. The output was used for building, agricultural, chemical, and industrial purposes. Peapack Limestone Quarry, Inc., Somerset County, was idle during the year.

Marl, Greensand.—Production of greensand marl in New Jersey in 1956 was limited to 1 operation compared with 3 in 1955. Inversand Co. produced refined greensand marl from an open pit in Gloucester County for use in water softening.

Perlite.—Four plants in Middlesex, Passaic, Somerset, and Union Counties expanded crude perlite shipped from Southwestern United

[3] Pit and Quarry, vol. 49, No. 2, August 1956, p. 48.
[4] Pit and Quarry, vol. 48, No. 7, January 1956, p. 23

States. The expanded perlite was used primarily for plaster aggregate, concrete aggregate, and pipe insulation.

Pigments.—Black, brown, red, and yellow iron oxide pigments were manufactured in New Jersey at plants in Essex, Mercer, and Middlesex Counties.

Sand and Gravel.—Production of sand and gravel increased slightly compared with 1955; value rose 11 percent owing to increased valuation of raw material. The average price of sand and gravel produced by commercial and by Government-and-contract operations rose from $1.52 and $0.48, respectively, to $1.63 in 1955 and $1.08 in 1956. Output of sand and gravel was reported from all counties except Hunterdon and Somerset. Ninety percent of the sand and gravel produced in the State during the year was washed, screened, or otherwise prepared. Most of the sand output was utilized for building, molding, and paving. Gravel was used principally for building and paving. The chief sand and gravel producing counties, in order of decreasing output, were Cumberland, Morris, Middlesex, and Bergen. Sand was ground and used principally for filler and foundry purposes in Cumberland, Middlesex, and Ocean Counties. Ground sand also was used in abrasive, enamel, glass, pottery, porcelain, and tile manufacture. The output of Government-and-contractor sand and gravel was limited to Camden and Mercer Counties and furnished less than 1 percent of the State's total production.

TABLE 4.—Sand and gravel sold or used by producers, 1955–56, by classes of operation and uses

Uses	1955		1956	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand:				
Glass	901,096	$2,152,264	(1)	(1)
Molding	1,493,294	3,682,833	1,766,525	$4,464,229
Structural	3,219,280	3,035,794	3,784,795	3,726,538
Paving	1,722,616	1,455,233	1,235,148	1,069,432
Grinding and polishing			15,172	57,911
Blast	120,610	411,446	81,386	335,176
Fire or furnace	20,605	38,417	13,449	24,552
Railroad Ballast			(1)	(1)
Other [2]	541,133	1,496,894	568,031	1,753,728
Gravel:				
Structural	1,597,621	2,684,510	1,569,084	2,886,765
Paving	932,978	1,056,621	1,099,616	1,337,494
Railroad Ballast	(1)	(1)		
Other	56,007	67,261	34,669	82,506
Undistributed [3]	69,087	113,209	954,573	2,422,518
Total	10,674,327	16,194,482	11,122,448	18,160,849
GOVERNMENT-AND-CONTRACTOR OPERATIONS				
Sand:				
Paving	430,475	206,950	13,410	24,138
Gravel:				
Structural			5,604	1,961
Paving	47,750	22,985	52,950	51,797
Total	478,225	229,935	71,964	77,896
Grand total	11,152,552	16,424,417	11,194,412	18,238,745

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes ground sand.
[3] Includes engine and filter sand, and those uses indicated by footnote 1.

Stone.—In terms of value, stone was New Jersey's leading mineral commodity in 1956, contributing 32 percent of the State's total value of mineral production. Basalt, granite, limestone, miscellaneous stone, and marble, in order of decreasing output, were quarried and crushed during the year. A small quantity of dimension sandstone and dimension miscellaneous stone for use in rough construction also was reported. Most of the output of crushed stone was used for concrete aggregate and roadstone. Crushed and broken stone used as riprap flux, agricultural stone, terrazzo, and other purposes also was produced. The leading stone-producing counties were Somerset and Passaic. A small tonnage of crushed miscellaneous stone was produced in Morris County under Government contract. Oystershell was ground in Gloucester County for use as poultry grit. Four companies produced roofing granules at plants in Bergen, Passaic, and Somerset Counties.

TABLE 5.—Stone sold or used by producers, 1955–56, by uses

Uses	1955		1956	
	Short tons	Value	Short tons	Value
Crushed and broken stone:				
Riprap	913,310	$1,779,270	251,452	$495,418
Crushed stone	6,970,022	13,924,487	8,129,176	17,844,777
Agricultural	126,696	435,076	(1)	(1)
Other	[2] 347,571	[2] 1,389,057	[3] 631,695	[3] 2,484,829
Total	8,357,599	17,527,890	9,012,323	20,825,024

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Includes fluxing stone and miscellaneous other uses.
[3] Includes dimension stone for rough construction, fluxing stone, crushed marble for terrazzo, oystershell for poultry grit, and miscellaneous other uses.

Sulfur.—Brimstone and flotation sulfur paste were recovered as byproducts in the liquid purification of gas in New Jersey in 1956. Two companies were active during the year in Gloucester, Camden, and Hudson Counties.

Vermiculite.—Imported crude vermiculite was processed at exfoliating plants in Hudson, Essex, and Mercer Counties. Most of the output was used as insulation, concrete aggregate, and plaster aggregate.

MINERAL FUELS

Peat.—Reed-sedge peat used for soil improvement and mixed fertilizers was recovered in Sussex County in 1956.

REVIEW BY COUNTIES

Atlantic.—Sand and gravel was produced in Atlantic County in 1956 by Taggert Brimfield Co., Cedar Lake; Tri-State Sand Co., Buena; Somers Point Sand & Gravel Co., Somers Point; Absecon Island Sand Co., Oceanville; and Dominic Macrie, Folsom. The output was used for building purposes and as molding sand.

Bergen.—Bergen County pits yielded sand and gravel, which was used for structural and paving purposes. Active producers were: Samuel Braen & Co., Mahwah; Braen Sand & Gravel Co., Wyckoff;

McKee Bros., Inc., Ramsey; and Ferdinand and Michael DiMaggio, Paramus. Alluvial clays for heavy clay products were produced by Tri-County Brick Corp. at Moonachie near Carlstadt. Hackensack Brick Co. did not operate during 1956. Artificially colored roofing granules were produced by the Flintkote Co. (East Rutherford).

TABLE 6.—Value of mineral production in New Jersey, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Atlantic	$118,507	$114,374	Sand and gravel.
Bergen	1,350,537	1,340,096	Sand and gravel, clays.
Burlington	1,179,747	770,570	Do.
Camden	900,770	1,138,600	Sand and gravel, clays, recoverable sulfur, stone.
Cape May	2,518,600	(1)	Magnesium compounds, sand and gravel.
Cumberland	6,821,922	7,752,781	Sand and gravel, clays.
Essex	(1)	(1)	Stone, sand and gravel.
Gloucester	641,891	770,674	Sand and gravel, recoverable sulfur, greensand marl, stone.
Hudson	87,650	87,703	Sand and gravel, recoverable sulfur.
Hunterdon	840,683	(1)	Stone.
Mercer	966,594	(1)	Stone, sand and gravel.
Middlesex	2,539,162	3,117,700	Clays, sand and gravel.
Monmouth	917,866	943,705	Sand and gravel, clays.
Morris	14,447,638	17,677,009	Iron ore, sand and gravel, stone, clays.
Ocean	844,527	568,413	Sand and gravel.
Passaic	4,475,389	5,731,188	Stone, sand and gravel, clays.
Salem	(1)	2,543	Sand and gravel.
Somerset	7,367,406	9,280,290	Stone, clays.
Sussex	7,194,728	5,024,660	Stone, zinc, manganiferous residuum, lime, peat, sand and gravel.
Union	1,269,727	989,025	Stone, sand and gravel.
Warren	2,320,001	(1)	Iron ore, sand and gravel, stone, clays.
Undistributed [2]	691,629	8,970,054	
Total	57,495,000	64,279,000	

[1] Value included with "Undistributed."
[2] Includes counties whose value must be concealed for particular years as indicated by footnote 1 and a quantity unspecified by county.

Burlington.—Molding and paving sand and structural sand and gravel were produced in Burlington County in 1956. Producers were Amico Sand & Gravel Co. (River Road and Norman Avenue), Riverside; George F. Pettinos, Inc., Mount Holly; Lockhart, Inc., East Riverton; and H. R. Sherman, Burlington. Heavy clay products were manufactured from clay mined by Church Brick Co. and Graham Brick Manufacturing Co. at Fieldsboro and Maple Shade, respectively. National Gypsum Co. manufactured calcined gypsum and finished gypsum building products from crude material imported from Nova Scotia at its new multi-million-dollar Burlington plant. Compared with 1955, no greensand marl was produced in Burlington County in 1956. The Permutit Co. reported the permanent shutdown of its greensand-marl operation near Birmingham. Zeolite Chemical Co. (Medford) did not produce greensand marl during the year.

Camden.—Bridgeton Sand Co. (Williamstown Junction), produced glass, molding, and miscellaneous sands. Sand and gravel for building, paving (including asphalt sand), and miscellaneous uses and molding sand were produced in Camden County by: Russell H. Ward, Inc., Palmyra; Taggart Brimfield Co., Hammonton; George F. Pettinos, Inc., Grenloch; Reading Sand Co., Penbryn; Pine Valley Sand & Gravel Co., Inc., Berlin; and Atco Sand Co., Berlin. The construction and maintenance crews of the Camden County Highway Department produced unprepared structural and paving gravel. The Alliance Clay Products Co., at an open-pit mine near Winslow

Junction, produced miscellaneous clay used in manufacturing heavy clay products. Flotation sulfur paste was recovered as a byproduct by the Thylox process from gases by Public Service Electric & Gas Co. at its Camden coke plant. Russell H. Ward, Inc. (Palmyra), quarried and sold crushed and broken miscellaneous stone for use as concrete aggregate, road material, and screenings.

Cape May.—Northwest Magnesite Co. recovered refractory magnesia from seawater and dolomite at its Cape May plant. Building and paving sand and gravel and sand for other uses was recovered by Menantico-Tuckahoe, Tuckahoe; John F. Gandy, Ocean View; and Courtland Sand & Gravel Co., Cape May Court House.

Cumberland.—Cumberland County was the leading sand and gravel producing county in New Jersey and ranked second in value of output of clays. The sand and gravel was used as foundry, glass, blast, engine, and filter sand, and as structural and paving material. Producers were: Armstrong Cork Co., Brunetti Bros., and Diamond Sand & Stone Co., all of Vineland; Daniel Goff Co., Inc., Menantico-Tuckahoe, National Pulverizing Co., New Jersey Silica Sand Co., Pennsylvania Glass Sand Corp., and George F. Pettinos, Inc., all of Millville; Jesse S. Morie & Son, Inc., Mauricetown; George F. Pettinos, Inc., Manumuskin; South Jersey Sand Co., Newport and Dividing Creek; Whitehead Bros. Co., Dividing Creek; Millville Silica Sand & Gravel Co., Inc., Port Elizabeth; and Menantico-Tuckahoe, Tuckahoe. The production of ground sand used as foundry, abrasive and filler sand and for enamel, glass, pottery, porcelain, and tile manufacture and other miscellaneous uses was also reported. Producers were National Pulverizing Co., Pennsylvania Glass Sand Corp. and South Jersey Sand Co. The Daniel Goff Co., Inc., open-pit mine near Millville produced fire clay for refractory mortar, foundries, and steel works. J. Dallas Castor discontinued grinding oystershell in 1956.

Essex.—Orange Quarry Co., West Orange, quarried and crushed traprock, which was used as riprap, concrete aggregate, and roadstone. The company also produced a small quantity of paving and road sand and sand used in bridges and culverts. Barrett Division, Allied Chemical & Dye Corp., acquired the Newark plant of Newark Plaster Co. on February 1, 1956. The company produced calcined gypsum and transferred the output to its Hudson County plant, where it was processed into finished building material. Vermiculite Industrial Corp. imported crude material from South Africa and exfoliated vermiculite at its plant near Newark during the year. E. I. du Pont de Nemours Co., Inc., manufactured a small quantity of hydrated ferric oxide pigments at its plant near Newark.

Gloucester.—Sand and gravel was produced in Gloucester County by L. R. Curtis, Bridgeport; Downer Silica Co., Downer; F. R. Warner, Inc., Bridgeport; and Wenonah Sand & Gravel Co., Mount Royal. The output consisted mainly of structural and paving sand and gravel and a quantity of furnace sand. Sulfur was recovered by the modified Baehr process at the Eagle Point plant of Freeport Sulfur Co. near Westville. Greensand marl was produced at a surface mine 2 miles from Sewell by the Inversand Co. and sold for treating water. Joseph Bauder & Sons recovered oystershell, which was ground and used for poultry grit.

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Hudson.—Thomas Henry Material, Inc. (West New York), produced sand and gravel for building and paving purposes. The Harrison Gas Works of Public Service Electric & Gas Co. operated during 1956 and recovered flotation sulfur paste as a byproduct of gas production. The Seaboard plant of the Koppers Co., Inc., produced hydrogen sulfide by hot-vacuum activation at its Seaboard plant near Kearny. Barrett Division, Allied Chemical & Dye Corp., acquired the South Kearny Plant of Newark Plaster Co. on February 1, 1956, and produced building materials from gypsum calcined at its plant in Essex County. F. E. Schundler & Co., Inc., exfoliated vermiculite near South Kearny, using crude material from South Africa.

Hunterdon.—Dimension miscellaneous stone and dimension sandstone used as rough building material were quarried by the Delaware Quarries (Hunterdon). Lambertville Quarry Co. (Lambertville) and Barlow Materials Co. (Oldwick) quarried diabase (basalt) for use as riprap, concrete aggregate, road material, and railroad ballast. A dark granite was quarried by Trimmer Stone Co. (Hunterdon) for concrete, road material, and screenings. M. C. Mulligan & Son, formerly Mulligan Lime Quarry, quarried and crushed limestone used for concrete aggregate and roadstone.

Mercer.—Pennington Quarry Co. (Pennington) produced diabase for use as concrete aggregate, road material, and railroad ballast. Crosswicks Sand & Gravel Co. (Groveville) and J. B. Richardson (Trenton) produced building and paving sand and gravel during 1956. Paving sand and gravel was produced under contract for the United States Army Corps of Engineers. Zonolite Co. exfoliated vermiculite from crude material, largely from Montana, South Carolina, and partly from South Africa. Columbian Carbon Co. (Trenton) manufactured black, brown, red, and yellow iron oxide pigments in 1956.

Middlesex.—The leading clay-producing area in New Jersey was again Middlesex County. McHose Clay Co. (Fords) and Such Clay Co. (South Amboy) produced ball clay for refractory use and fire clay for stoneware, heavy clay products, and refractory use. Fire clay used for stoneware refractories and heavy clay products was produced by Crossman Co., Sayre & Fisher Brick Co., and Whitehead Bros. Co., all of Sayreville; H. C. Perrine & Son, Matawan; Quigley Co., Inc., Fords; Valentine Fire Brick Co., Woodbridge; Natco Corp., Keasbey; and Marcus S. Wright, Milltown. Natco Corp (Keasbey) also produced miscellaneous clay for heavy clay products. Structural and paving sand and gravel was produced by Crossman Co., Sayreville; Dallenbach Sand Co., Inc., and Glenn Rock Concrete Products Co., Jamesburg; Herbert Sand Co., Inc., Milltown; and Raritan River Sand Co., Nixon. Molding sand was produced by Whitehead Bros., Sayreville. South River Sand Co. (Old Bridge) produced ground sand and blast and building sand. Crossman Co. (Sayreville) had an output of furnace and engine sand. Crude perlite was processed by the Coralux Perlite Corp. of New Jersey at its plant near Metuchen from material produced in the Southwestern United States. Stabilized Pigments, Inc., manufactured red iron oxide pigments (calcined copperas) in Middlesex County at its plants near New Brunswick and Monmouth Junction.

Monmouth.—Structural and paving sand and gravel was produced in Monmouth County by Bennett Sand & Gravel Co., Inc., and Frank Z. Sindlinger, Inc., Manasquan; Hause Gravel Co., Allenwood; New

Jersey Gravel & Sand Co., Farmingdale; Joseph Scarano, Wayside; W. S. Van Hise, Belmar; Walling & Son, Hazlet; and Preston Bros. Bennett Sand & Gravel Co., Inc., and Hause Gravel Co., prepared filter sand. The output of an open-pit clay mine, which was operated by Oschwald Brick Works, Inc., near Lawrence Harbor was used in manufacturing building brick.

Morris.—Morris County continued to lead in value as a mineral-producing county of New Jersey and furnished 28 percent of the State's total value. Iron ore, the principal mineral of the county, was recovered from the Mount Hope mine, Shahmoon Industries, Inc. (formerly Warren Foundry & Pipe Corp.); Scrub Oak mine, Alan Wood Steel Co.; and Richard Ore mine, Colorado Fuel & Iron Corp. Morris County ranked second in the 19 counties producing sand and gravel. Sand and gravel, used principally for structural and paving purposes, was produced by Consolidated Stone & Sand Co., Riverdale; North Jersey Quarry Co., Netcong; Sequine-Bogert Co., Inc., Kenvil; Alan Wood Steel Co., Dover; Thomas Landi & Sons, Morristown; Pequannock Sand & Gravel Co., Pequannock; Wharton Sand & Stone Co., Montville; Morris County Land Improvement Co., Whippany, and Houdaille Construction Materials, Inc. A small quantity of sand was used as engine and ballast sand. Pompton Crushed Stone Co., Riverdale; Alan Wood Steel Co., Mine Hill; and Wharton Sand & Stone Co., Wharton, quarried and crushed granite as riprap, concrete aggregates, road material, screenings, and stone sand. Logansville Pottery Co. (Basking Ridge) produced a small quantity of miscellaneous clay for use in manufacturing flowerpots. No peat production was reported in Morris County in 1956.

Ocean.—The mineral output of Ocean County was again limited to sand and gravel. Production was reported from pits operated by Brown & Burdge, Herbertsville; Ralph Clayton & Sons, Lakewood; J. Kalsch & Son, Straffordville; Clayton's Sand & Gravel, Inc., Barnegat; and North Jersey Quarry, Lakewood. The output was used mainly as building and paving material. New Jersey Pulverizing Co. (Pinewald) produced ground sand used for abrasives, filler, and foundry purposes.

Passaic.—Passaic County ranked second among the 11 stone-producing counties in New Jersey in 1956. Passaic quarries yielded basalt and miscellaneous stone; basalt was the more important. Crushed and broken miscellaneous stone for concrete, road material, and screenings was recovered at an open quarry belonging to Passaic Crushed Stone Co. (Pompton Lakes). The basalt output in Passaic County was used principally as concrete aggregate and road material. A substantial tonnage was sold to roofing-granule producers. Stone producers consisted of Samuel Braen & Sons, Haledon and Hawthorne; Consolidated Stone-Sand Co., Montclair Heights; Great Notch Corp., Great Notch; Sowerbutt Quarries, Inc., Prospect Park; and Union Building & Construction Corp., Clifton. Sand and gravel for structural purposes was produced in Passaic County by Samuel Braen's Sons, Pequannock; and H. J. Hinchman & Son, Van Orden Sand & Gravel Co., and Van Decker Bros., Inc., Paterson. The Paterson Brick Co., Inc. (near Little Falls) mined clay at an open pit, and the output of miscellaneous clay was used in producing heavy clay products. PerAlex of New Jersey, Inc., expanded perlite from material shipped from Western United States, at its Paterson plant.

Natural roofing granules were produced by H. B. Reed Corp. (Passaic) and Great Notch Granule Co. (Great Notch).

Salem.—A limited quantity of building sand was produced by A. W. Davis Lumber Co. (Salem). Floras S. Richman (Woodstown) reported an output of paving gravel.

Somerset.—The leading stone-producing county in New Jersey was again Somerset. Crushed and broken basalt as riprap, concrete aggregate, road material, and railroad ballast was produced by Fanwood Stone Crushing Quarry Co., Westfield; and Trap Rock Co., Kingston; North Jersey Quarry Co., Bound Brook and Millington; and Somerset Crushed Stone, Inc., Bernardsville. Basalt was the only type of stone recovered from quarries within the County. At an open-pit mine New Jersey Shale Brick & Tile Corp. near Somerville produced miscellaneous clay for use in heavy clay products. Peapack Limestone Quarry, Inc. (Peapack), did not produce in 1956 but planned to resume operations in 1957. Johns-Manville Corp. expanded perlite at its Manville plant from material purchased in Western United States. The company also manufactured from dolomite precipitated magnesium carbonate for use as insulation. Central Commercial Co., (Bound Brook) produced natural and artificially-colored roofing granules.

Sussex.—In terms of value, stone was the leading mineral commodity of the six minerals recovered from the mines, pits, and quarries of Sussex County. The open quarries of Limestone Products Corp. of America (Newton) and Farber White Limestone Co. (Franklin) yielded limestone for blast-furnace flux, concrete road material, rubber filler, and soil conditioner. The Sterling Hill mine of New Jersey Zinc Co. resumed operation September 4, 1956. The recovered manganiferous zinc ore yielded zinc and manganiferous residuum. Limestone Products Corp. of America operated its Lime Crest plant to produce hydrated lime. Output was sold for building, agricultural, water purification, and water-softening purposes. This company and F. W. Bennett & Son Co. (Sparta) also produced structural and paving sand and gravel. Hyper-Humus Co. (Andover) and Netcong Natural Products Co. (Stanhope) produced reed-sedge peat.

Union.—North Jersey Quarry Co.—operators of an open quarry, crusher, and mill near Summit—quarried and crushed basalt for use as concrete aggregate and roadstone. Loizeaux Builders Supply Co. produced a small quantity of sand for miscellaneous uses. Certified Industrial Products, Inc. (Hillside) expanded perlite from material produced in Western United States.

Warren.—Alan Wood Steel Co., at the Washington mine near Oxford, was the only producer of iron ore. Building and paving sand and gravel was produced by Portland Sand & Gravel Co. (Carpentersville) and Steckel Concrete Co. (Phillipsburg). The only marble-producing county in New Jersey in 1956 was Warren. The open quarry of The Royal Green Marble Co., Inc., near Phillipsburg yielded this commodity and the entire output was crushed for terrazzo. The Natco Corp. open-pit clay mine near Port Murray produced miscellaneous clay, which was used in heavy clay products. J. T. Baker Chemical Co. (Phillipsburg) produced a variety of magnesium compounds from oxides, carbonates, sulfates, and chlorides of magnesium.

The Mineral Industry of New Mexico

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker[1]

NEW MEXICO'S mineral industry in 1956 was characterized by substantial increases in the output of petroleum, potash, copper, natural gas, natural-gas liquids, sand and gravel, manganese ore and concentrate, zinc, lead, helium, perlite, magnesium compounds, salt, silver, gold, and columbite-tantalite. Production of lime, rare earths, and vanadium in New Mexico was reported in 1956 for the first time. Decreases in the output of stone, molybdenum, coal, pumice, manganiferous ore and concentrate, sulfur, clays, carbon dioxide, barite, beryl, iron ore, and tungsten tended to offset the gains reported for other minerals.

Increases in production of petroleum and natural gas and of most metals and nonmetals raised the total value of New Mexico's mineral output to a new record of $513 million in 1956—a gain of $77 million over the $436 million (revised figure) total for 1955. However, a major portion of the increase was due to the inclusion, for the first time, of a value for uranium. The total value of mineral production in New Mexico has risen steadily since 1950, when it was $210 million, and the 1956 figure represents a 2½-fold increase in 6 years.

The value of the output of mineral fuels, including petroleum, natural gasoline, and liquefied-petroleum gases composed 67 percent of the total value of mineral production in the State. New Mexico continued to rank seventh among the States in petroleum production, and eight refineries were in operation; a large part of the crude-oil output was refined in other States.

Among the nonmetals, which contributed 17 percent of the total value of mineral production in New Mexico in 1956, potash was by far the most important. Both production and shipments established new records, and two new companies were constructing productive facilities in the Carlsbad-Hobbs region of southwestern New Mexico.

Metals contributed 20 percent of the total value of mineral production in 1956 compared with 13 percent in 1955. The gain in the value of the metal output was due to the inclusion of a value for uranium and production increases of 28 percent for copper, 93 percent for lead, and 150 percent for zinc, resulting from higher average prices for these metals.

Interest in uranium in 1956 reached a new peak in New Mexico, particularly in Valencia and McKinley Counties. According to the Atomic Energy Commission (AEC), New Mexico had 41 million tons of uranium reserves—two-thirds of the national total. Production increased significantly over 1955 largely owing to the full-scale operation of the Jackpile mine of The Anaconda Co. Development of the Ambrosia Lake district in McKinley County continued in 1956, but

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production remained small because extensive construction and development must precede actual mining.

Many New Mexico ores contain minor quantities of such precious metals as cadmium, bismuth, selenium, tellurium, and gallium. These quantities sometimes are unknown and sometimes although known by analyses, are not accounted for metallurgically in early processing stages. As it is impossible to distribute these mineral products by States of origin, their values are not included in the total value of the mineral output of New Mexico; however, the amount involved is small.

Of 9 Defense Minerals Exploration Administration (DMEA) contracts signed during the year, 8 were for uranium exploration in McKinley County and totaled $559,000. The steady growth of exploration for uranium under DMEA contracts is indicated by comparing the 1956 total with $127,000 in 1955 and $32,000 in 1954.

TABLE 1.—Mineral production in New Mexico, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite	[2]	[2]	4,059	$81,180
Beryllium concentrate—gross weight	106	$56,420	31	[2]
Clays	45,351	108,582	39,623	95,386
Coal	201,579	1,236,125	158,444	922,724
Columbium-tantalum concentrates—pounds	76	129	95	405
Copper (recoverable content of ores, etc.)	66,417	49,547,082	74,345	63,193,250
Diatomite	[2]	[2]		
Gem stones	[3]	25,000	[3]	30,000
Gold (recoverable content of ores, etc.)—troy ounces	1,917	67,095	3,275	114,625
Helium—thousand cubic feet	53,721	946,447	76,072	1,350,194
Iron ore (usable)—long tons, gross weight	9,218	[2]	[2]	[2]
Lead (recoverable content of ores, etc.)	3,296	982,208	6,042	1,897,188
Lime			30,771	372,641
Manganese ore and concentrate (35 percent or more Mn)—gross weight	1,390	[2]	22,012	1,834,529
Manganiferous ore and concentrate (5 to 35 percent Mn)—gross weight	40,320	[2]	38,782	138,508
Mica:				
Sheet—pounds	9,431	64,930	6,247	52,566
Scrap	84	2,475	767	22,213
Natural gas—million cubic feet	540,664	48,119,000	626,340	55,118,000
Natural-gas liquids:				
LP-gases—thousand gallons	278,403	6,767,000	308,218	11,065,000
Natural gasoline—do	261,023	15,425,000	306,595	16,560,000
Perlite	147,805	1,091,250	167,705	1,270,993
Petroleum (crude)—thousand 42-gallon barrels	82,958	227,310,000	87,893	241,706,000
Potassium salts—(K_2O equivalent)	[4] 1,841,122	[4] 69,640,740	1,930,754	72,802,302
Pumice	393,597	780,339	292,330	667,146
Salt	49,738	596,780	57,156	501,040
Sand and gravel	4,556,447	6,004,554	6,054,500	5,775,900
Silver (recoverable content of ores, etc.)—troy ounces	251,072	227,233	392,967	355,655
Stone	1,573,441	1,546,665	1,268,235	1,271,837
Tungsten concentrate—60-percent WO_3 basis	1	3,036	[5]	1,586
Zinc (recoverable content of ores, etc.)	15,277	3,758,142	35,010	9,592,740
Value of items that cannot be disclosed: Carbon dioxide (natural), fluorspar (1955), molybdenum, magnesium compounds, rare-earth-metals concentrate (1956), elemental sulfur, uranium ore (1956), vanadium (1956), and values indicated by footnote 2		2,187,727		26,600,893
Total New Mexico		[6] 436,494,000		[7] 513,303,000

[1] Production, as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration purchase depots is excluded.

[2] Figure withheld to avoid disclosing individual company confidential data, included with, "Value of items that cannot be disclosed."

[3] Weight not recorded.

[4] Revised figure.

[5] Less than 1 ton.

[6] Figure excludes uranium; figure not released by Atomic Energy Commission.

[7] The total has been adjusted to eliminate duplication in the value of raw materials used in manufacturing lime.

TABLE 2.—Average unit value of selected mineral commodities in New Mexico, 1955–56 [1]

Commodity		1955	1956
Clays	short ton	$2.394	$2.407
Coal	do	6.132	5.824
Columbium-tantalum	pound	1.697	4.263
Copper [2]	do	.373	.425
Gold [3]	troy ounce	35.000	35.000
Helium	thousand cubic feet	17.618	17.749
Lead [2]	pound	.149	.157
Mica:			
Sheet	do	6.885	8.415
Scrap	short ton	29.464	28.961
Natural gas	thousand cubic feet	.089	.088
Natural-gas liquids:			
LP-gases	gallon	.024	.036
Natural gasoline	do	.059	.054
Perlite (crude)	short ton	7.383	7.579
Petroleum [4]	42-gallon barrel	2.740	2.750
Potassium salts	short ton	37.825	37.707
Pumice	do	1.983	2.282
Salt	do	11.998	8.766
Sand and gravel	do	1.318	.954
Silver [5]	troy ounce	.905+	.905+
Stone	short ton	.983	1.003
Zinc [2]	pound	.123	.137

[1] Based on average value f. o. b. mines or mills reported by the producers except as otherwise noted.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Value at wells.
[5] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505.

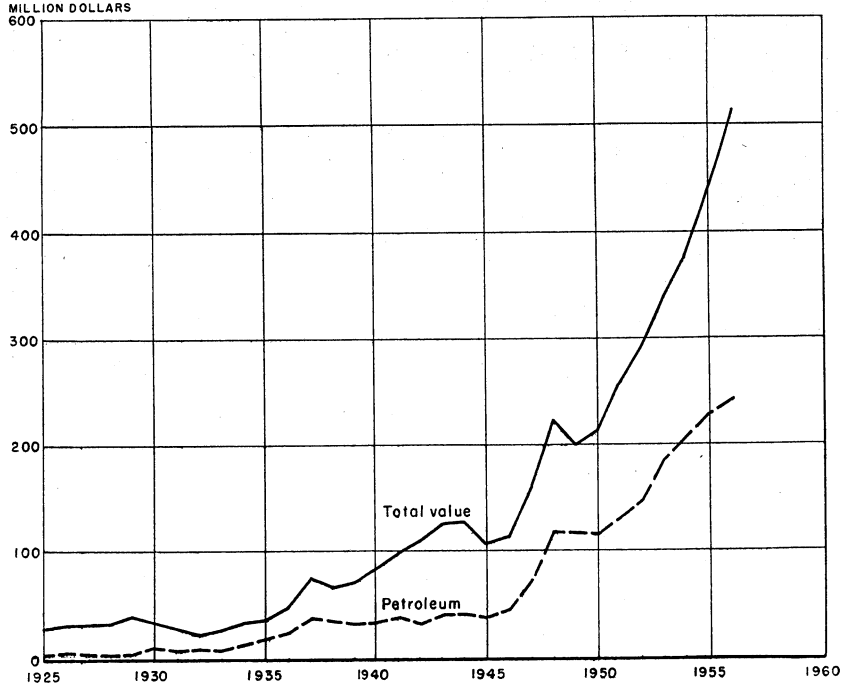

FIGURE 1.—Value of petroleum production and total value of all minerals produced in New Mexico, 1925–56.

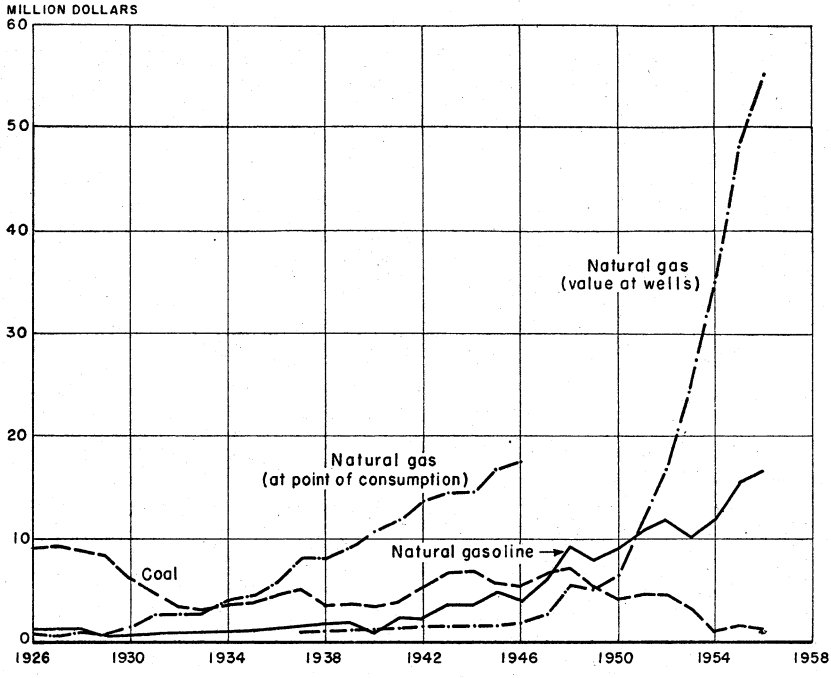

FIGURE 2.—Value of natural gas, natural gasoline, and coal produced in New Mexico, 1926–56.

TABLE 3.—DMEA contracts executed in 1956

County and contractor	Property	Commodity	Contract		
			Date	Total amount	Government participation (percent)
MCKINLEY					
Colamer Corp.	Phyllis, Deeta, and Fannie claims.	Uranium	Apr. 9	$102,580	75
Food Machinery & Chemical Corp.	Sec. 7, T. 13 N., R. 9 W.	do	Mar. 21	41,740	75
Do.	Sec. 9, T. 13 N., R. 9 W.	do	Mar. 21	71,928	75
Do.	Sec. 29, T. 13 N., R. 9 W.	do	Mar. 21	91,908	75
Four Corners Exploration Co.	Divide claims	do	Aug. 28	82,060	75
Do.	Red Rock claims	do	July 17	48,424	75
Parador Mining Co., Inc.	Betty claims	do	Mar. 9	45,580	75
San Jacinto Petroleum Corp.	Secs. 32 and 36, T. 14 N., R. 9 W.	do	Apr. 5	74,360	75
SANTA FE					
Mercury Uranium & Oil Co.	San Pedro mine	Copper	July 27	105,300	50
Total				663,880	71

EMPLOYMENT AND INJURIES

All employment data contained in this section were obtained from publications of the Bureau of Labor Statistics, U. S. Department of Labor, and Employment and Security Commission of New Mexico. Mining employment covers exploration, development, mining, and processing minerals to a marketable product. Metals, nonmetals, and fuels, including petroleum, are covered.

New Mexico employed 2 percent of the total mining labor force of the United States in its mineral industry. The percentage relationship was static in 1955 and 1956, despite the shutdown of most copper and lead-zinc mines in the State. The exploration, development, and mining of uranium, coupled with the surge of drilling for oil and gas in Lea and Eddy Counties and in the San Juan basin of northwestern New Mexico, were responsible for the stability in the number of men employed in mining. As further evidence of the substitution of uranium, petroleum, and natural gas for copper, lead, and zinc as areas of employment, the total mining labor force rose from 14,900 men in 1952 to 16,000 in 1956, a gain of 8 percent.

No major disasters occurred in any New Mexico mineral industry in 1956; however, 9 fatalities were charged to the mining industry as the result of 7 accidents.

TABLE 4.—Mining employment by types of mining, 1955–56

[U. S. Department of Labor]

	1955		1956	
	Percent of total	Number of men	Percent of total	Number of men
Mining total	100	14,800	100	16,100
Metal mining	26	3,800	27	4,300
Petroleum and natural gas	58	8,600	58	9,400
Nonmetal and coal mining	16	2,400	15	2,400

TABLE 5.—Average hours and earnings of workers in selected industries, 1955–56[1]

[U. S. Department of Labor]

	Average weekly earnings		Average weekly hours		Average hourly earnings	
	1955	1956	1955	1956	1955	1956
Mining	$95.21	$99.07	42.8	43.5	$2.22	$2.27
Contract construction	87.71	90.87	38.1	37.6	2.30	2.38
Manufacturing	80.90	85.80	40.5	41.1	2.00	2.11
Commercial and utilities	74.52	83.06	41.4	42.7	1.80	2.01
Wholesale and retail trade	62.12	62.79	41.9	41.3	1.48	1.52

[1] Excludes administrative and nonworking supervisory personnel. Average weekly earnings are gross amounts, including overtime, paid vacations, etc.

REVIEW BY MINERAL COMMODITIES

METALS

Beryllium.—Output of beryl in New Mexico in 1956 was less than one-third that in 1955. In 1956, as in former years, the principal beryl-producing mine in the State and the United States was the Harding mine near Dixon, Taos County. The beryl, marketed at the Government purchase depot, Custer, S. Dak., was recovered from pegmatite by hand sorting. Andy Royball produced beryl in New Mexico and sold it to the Beryl Ores Co., Arvada, Colo.

Columbium-Tantalum.—Production of columbite-tantalite in New Mexico in 1956 came from a mine in Rio Arriba County operated by Columbium Milling & Mining Co., Inc. The material was sold to St. Anthony Mines, Lovelock, Nev.

Copper.—The output of copper in New Mexico in 1956 was 12 percent above 1955. The value of production increased 28 percent owing to the higher price for copper. The gain in output was due to the demand for copper at the beginning of the year that exceeded the supply. The United States producer's price advanced to 46 cents a pound late in February. By midyear the demand declined and the available supply was augmented by production from new mines, so that by the end of October the price fell to 36 cents a pound. The weighted average price for copper in 1956 was 42.5 cents a pound, compared with 37.3 cents in 1955.

TABLE 6.—Principal custom mills, smelters, refineries, grinding plants, and brick plants in 1956

Name of operator or owner	County	Nearest city or town	Minerals processed	Remarks
Kinney Brick Co	Bernalillo	Albuquerque	Clays	Produces building and face brick and structural clay and tile.
El Paso Brick Co	Dona Ana	Brickland	do	Do.
Kennecott Copper Corp.	Grant	Hurley	Copper	400,000-ton-annual-charge capacity smelter.
American Smelting and Refining Co.	Luna	Deming	Copper, lead, and zinc ores.	600-ton-a-day flotation mill.
Florida Manganese, Inc.	do	do	Manganese	Custom mill.
Peru Mining Co	do	do	Copper, lead, and zinc ores.	1,250-ton-a-day flotation mill.
Gallup Brick & Tile Co.	McKinley	Gallup	Clays	Produces building and face brick and structural clay and tile.
Petaca Mining Corp.	Rio Arriba	Petaca	Mica	Dry grinding mill.
Kerr-McGee Oil Industries, Inc.	San Juan	Shiprock	Uranium	50-ton-a-day rated capacity.
Santa Fe Mica Co	Santa Fe	Santa Fe	Mica	Dry grinding mill.
James H. Rhodes Pumice, Inc.	do	do	Pumice	Do.
Ambrosia Minerals, Inc.	Socorro	Socorro	Manganese	Custom mill.
Birchfield Mining Co.	do	do	do	Do.
The Anaconda Co	Valencia	Bluewater	Uranium	3,000-ton-a-day rated capacity.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1848–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	82	3	7,639,051	3,436	$120,274	443,242	$401,151
1952	66	1	9,120,841	2,949	103,215	479,318	433,807
1953	55	2	8,070,056	2,614	91,490	205,309	185,815
1954	37	4	6,763,529	3,539	123,865	109,132	98,770
1955	50	6	7,446,772	1,917	67,095	251,072	227,233
1956	75	1	8,751,559	3,275	114,625	392,967	355,655
1848–1956	----------	----------	[3]	2,214,311	50,835,078	71,408,739	56,252,234

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	66,028	$28,541,200	5,737	$1,838,265	37,927	$10,766,695	$41,667,585
1952	76,112	36,838,208	7,021	2,260,762	50,975	16,923,700	56,559,692
1953	72,477	41,601,798	2,943	771,066	13,373	3,075,790	45,725,959
1954	60,558	35,729,220	887	243,038	6	1,296	36,196,189
1955	66,417	49,547,082	3,296	982,208	15,277	3,758,142	54,581,760
1956	74,345	63,193,250	6,042	1,897,188	35,010	9,592,740	75,153,458
1848–1956	2,030,246	768,044,277	323,714	43,901,487	1,149,214	213,213,334	1,132,246,410

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore, old tailings, old slag, or copper precipitates shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed or tonnage of precipitates shipped.
[3] Figure not available.

TABLE 8.—Gold and silver produced at placer mines, 1947–51 (average) and 1952–56, in terms of recoverable metals

Year	Gold		Silver		Total value	Year	Gold		Silver		Total value
	Fine ounces	Value	Fine ounces	Value			Fine ounces	Value	Fine ounces	Value	
1947–51 (ave.)	15	$511	4	$4	$515	1954	14	$490	-------	-------	$490
1952	2	70	-------	-------	70	1955	81	2,835	10	$9	2,844
1953	5	175	2	2	177	1956	2	70	-------	-------	70

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	92	26,615	6,497	386	2,394
February	214	27,248	6,515	336	2,474
March	207	31,649	7,349	425	2,956
April	154	30,453	6,016	446	2,787
May	201	33,030	6,670	463	3,005
June	444	29,319	5,779	398	2,922
July	361	31,386	6,318	458	3,110
August	700	53,477	6,352	803	3,375
September	267	30,032	5,572	525	3,172
October	235	34,625	5,511	616	3,508
November	188	33,321	5,664	584	2,632
December	212	31,812	6,102	602	2,675
Total	3,275	392,967	74,345	6,042	35,010

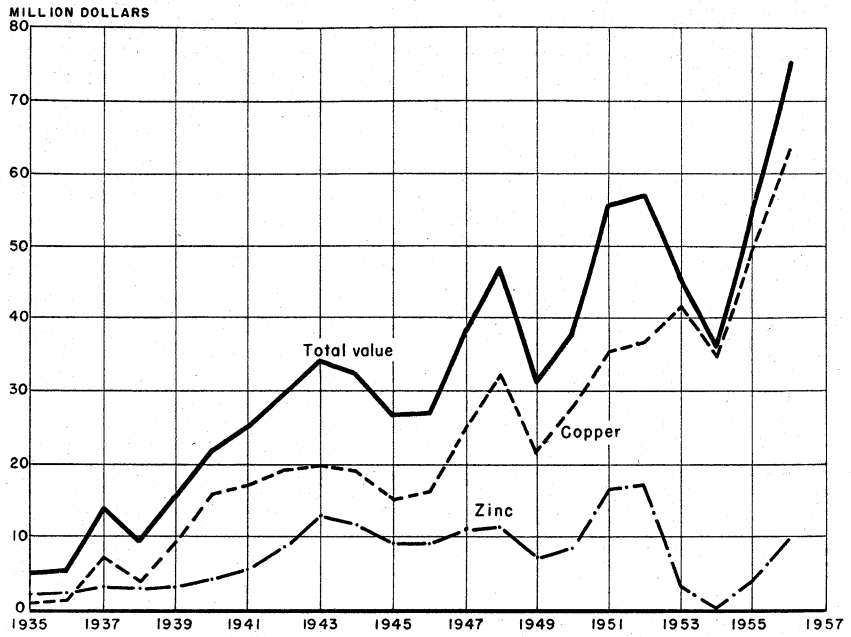

FIGURE 3.—Total value of gold, silver, copper, lead, and zinc in New Mexico and value of mine production of copper and zinc, 1935–56.

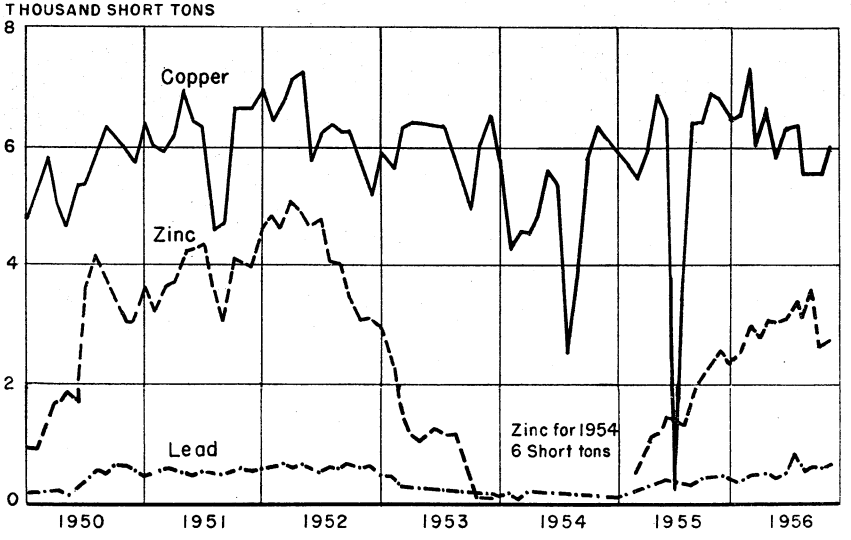

FIGURE 4.—Mine production of copper, lead, and zinc in New Mexico, by months, 1950–56, in terms of recoverable metals.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956 [1] by counties and districts, in terms of recoverable metals

County and district	Mines producing (lode and placer) [2]	Material sold or treated (short tons) [3]	Gold (lode and placer)		Silver (lode and placer)	
			Fine ounces	Value	Fine ounces	Value
Eddy County	1	349				
Grant County: Burro Mountain	4	1,581	9	$315	348	$315
Central	8	8,570,011	2,306	80,710	259,575	234,928
Eureka	1	900	4	140	2,601	2,354
Pinos Altos [4]	1		2	70		
Steeple Rock and Swartz [5]	3	3,897	186	6,510	13,422	12,148
Total	17	8,576,389	2,507	87,745	275,946	249,745
Guadalupe County: Pintado	2	24,621				
Hidalgo County:						
Apache	1	50			85	77
Lordsburg	3	88,142	543	19,005	60,699	54,936
Total	4	88,192	543	19,005	60,784	55,013
Luna County:						
Cooks Peak	1	14			101	91
Florida Mountains	1	35			29	26
Tres Hermanas	2	92			97	88
Total	4	141			227	205
Mora County	2	44			1	1
Otero County:						
Sacramento	3	213			68	62
Tularosa	1	75				
Total	4	288			68	62
Rio Arriba County: Cuba (Nacimiento Mountains)	3	11,168			7,231	6,544
Sandoval County: Cuba (Nacimiento Mountains)	2	1,735			333	301
Santa Fe County:						
Cerrillos and San Pedro (New Placers) [5]	4	1,363	112	3,920	2,890	2,616
Cooper (Pecos)	1	149			63	57
Total	5	1,512	112	3,920	2,953	2,673
Sierra County:						
Chloride	3	79			50	45
Hermosa	1	20			323	292
Kingston	3	748	56	1,960	6,585	5,960
Pittsburg and Tierra Blanca [5]	4	27	3	105	29	27
Total	11	874	59	2,065	6,987	6,324
Socorro County:						
Hansonberg	2	28,592			3,029	2,741
Magdalena	12	17,273	53	1,855	35,353	31,996
Scholle Area	1	39				
Silver Mountain (Water Canyon)	1	3			13	12
Total	16	45,907	53	1,855	38,395	34,749
Taos County: Red River	1	15				
Torrance County: Carocito	1	146			17	15
Union County	1	4			10	9
Valencia County:						
Hell's Canyon	1	55	1	35	4	4
Rio Puerco	1	119			11	10
Total	2	174	1	35	15	14
Total New Mexico	76	8,751,559	3,275	114,625	392,967	355,655

See footnotes at end of table.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956 [1] by counties and districts, in terms of recoverable metals—Continued

County and district	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Eddy County	13,200	$5,610					$5,610
Grant County:							
Burro Mountain	17,600	7,480	1,000	$157			8,267
Central	142,432,700	60,533,897	9,364,300	1,470,195	67,262,800	$9,215,003	71,534,733
Eureka	700	298	47,700	7,489	71,400	9,782	20,063
Pinos Altos [4]							70
Steeple Rock and Swartz [5]	4,600	1,955	248,500	39,014	399,400	54,718	114,345
Total	142,455,600	60,543,630	9,661,500	1,516,855	67,733,600	9,279,503	71,677,478
Guadalupe County: Pintado	1,274,300	541,577					541,577
Hidalgo County:							
Apache	3,500	1,488					1,565
Lordsburg	4,240,500	1,802,212	37,400	5,872			1,882,025
Total	4,244,000	1,803,700	37,400	5,872			1,883,590
Luna County:							
Cooks Peak			9,300	1,460			1,551
Florida Mountains	2,000	850					876
Tres Hermanas	100	43					131
Total	2,100	893	9,300	1,460			2,558
Mora County	1,600	680					681
Otero County:							
Sacramento	4,700	1,997	5,800	911			2,970
Tularosa	1,100	468					468
Total	5,800	2,465	5,800	911			3,438
Rio Arriba County: Cuba (Nacimiento Mountains)	502,500	213,563					220,107
Sandoval County: Cuba (Nacimiento Mountains)	45,700	19,423					19,724
Santa Fe County:							
Cerrillos and San Pedro (New Placers) [5]	45,900	19,507	105,700	16,595	156,200	21,399	64,037
Cooper (Pecos)	8,500	3,613					3,670
Total	54,400	23,120	105,700	16,595	156,200	21,399	67,707
Sierra County:							
Chloride	500	212	2,100	330	1,500	206	793
Hermosa			2,700	424	900	123	839
Kingston	10,200	4,335	55,700	8,745	66,300	9,083	30,083
Pittsburg and Tierra Blanca [5]	800	340	1,500	235			707
Total	11,500	4,887	62,000	9,734	68,700	9,412	32,422
Socorro County:							
Hansonberg			826,200	129,713			132,454
Magdalena	65,200	27,709	1,376,100	216,048	2,061,500	282,426	560,034
Scholle Area	900	383					383
Silver Mountain (Water Canyon)	100	43					55
Total	66,200	28,135	2,202,300	345,761	2,061,500	282,426	692,926
Taos County: Red River	400	170					170
Torrance County: Carocito	4,600	1,955					1,970
Union County	800	340					349
Valencia County:							
Hell's Canyon	2,000	850					889
Rio Puerco	5,300	2,252					2,262
Total	7,300	3,102					3,151
Total New Mexico	148,690,000	63,193,250	12,084,000	1,897,188	70,020,000	9,592,740	75,153,458

[1] The report of this series for 1929 (Mineral Resources of the United States, 1929, pt. 1, pp. 729–759) gives the yearly production of each important metal-producing district in New Mexico from 1904 to 1929, inclusive. Subsequent records, year by year, may be found in annual issues of Mineral Resources and Minerals Yearbook.

[2] All lode mines except for 1 placer mine in Pinos Altos district.

[3] Does not include gravel washed or tonnage of precipitates shipped.

[4] Placer production.

[5] Combined to avoid disclosing individual company confidential data.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore and other source materials, in terms of recoverable metals

Source	Number of mines[1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	4	200	30	73	2,000	----------	----------
Dry gold-silver	4	3,957	368	19,245	54,200	9,200	----------
Dry silver	17	13,556	--------	9,183	560,600	2,100	----------
Total	25	17,713	398	28,501	616,800	11,300	----------
Copper [2]	27	8,250,490	1,890	79,337	113,490,000	1,800	----------
Copper-lead	1	1,368	35	3,331	23,900	28,200	----------
Copper-lead-zinc	1	91,011	576	33,014	2,062,000	1,671,500	5,996,300
Copper-zinc	1	71	--------	182	8,700	----------	6,700
Lead [3]	16	29,485	29	5,215	5,000	1,020,400	28,300
Lead-zinc	13	114,479	244	180,512	746,200	7,489,400	30,338,500
Zinc	2	246,942	101	62,875	206,200	1,861,400	33,650,200
Total	57	8,733,846	2,875	364,466	116,542,000	12,072,700	70,020,000
Other "lode" material: Copper precipitates [4]	2	19,824	--------	--------	31,531,200	----------	----------
Total "lode" material	75	8,771,383	3,273	392,967	148,690,000	12,084,000	70,020,000
Gravel (placer operation)	1	----------	2	--------	----------	----------	----------
Total, all sources	76	8,771,383	3,275	392,967	148,690,000	12,084,000	70,020,000

[1] Detail will not necessarily add to totals because some mines produce more than 1 class of material.
[2] Includes 137,500 tons of newly mined ore treated by heap and vat leaching, yielding 147,100 pounds of copper.
[3] Includes 26,839 tons of lead-barite ore yielding 536 tons of lead concentrate, averaging 70 percent lead, and 4,059 tons of barite.
[4] Excludes 103 tons of precipitates recovered from newly mined ore treated by leaching. See footnote 2.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation [1]	24	8	----------	----------	----------
Concentration, and smelting of concentrates [1]	2,769	360,033	114,180,200	11,879,600	69,990,800
Direct-smelting:					
Ore	480	32,926	2,978,600	204,400	29,200
Copper precipitates	----------	----------	31,531,200	----------	----------
Total	480	32,926	34,509,800	204,400	29,200
Placer	2	----------	----------	----------	----------
Grand total	3,275	392,967	148,690,000	12,084,000	70,020,000

[1] Ore only; no old tailings, etc., processed by this method in 1956.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For ore treated at mills

	Ore treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Grant [1]	8,519,667			299,118	2,310	264,231	109,958,900	9,659,500	67,733,600
Hidalgo	86,139			7,846	421	57,144	4,186,200	28,200	
Santa Fe	793	21	7	239	11	1,982	2,400	99,600	156,200
Sierra	553	3	1	120	4	1,940	3,500	57,100	67,800
Socorro [2]	44,555			3,594	23	34,736	29,200	2,035,200	2,033,200
Total: 1956	8,651,707	24	8	310,917	2,769	360,033	114,180,200	11,879,600	69,990,800
1955	7,354,983	36	11	232,625	1,204	201,451	106,962,441	6,447,960	30,525,000
BY CLASSES OF ORE TREATED									
Dry Gold	104	24	8						
Copper [1]	8,169,113			228,049	1,813	77,140	111,133,200		
Copper-lead	1,368			70	35	3,331	23,900	28,200	
Copper-lead-zinc	91,011			10,555	576	33,014	2,062,000	1,671,500	5,996,300
Copper-zinc	71			25		182	8,700		6,700
Lead [2]	28,627			598		3,065		830,100	
Lead-zinc	114,471			35,417	244	180,426	746,200	7,488,400	30,337,600
Zinc	246,942			36,203	101	62,875	206,200	1,861,400	33,650,200
Total: 1956	8,651,707	24	8	310,917	2,769	360,033	114,180,200	11,879,600	69,990,800
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS									
Copper				232,088	2,203	87,589	113,103,200	24,000	
Copper-lead				34	4	1,490	3,900	34,700	300
Copper-lead-zinc				5,389	165	108,102	277,600	5,487,500	934,700
Copper-zinc				9		34	600	400	9,400
Lead				4,642	245	104,073	98,200	5,589,600	365,300
Zinc				68,755	152	58,745	696,700	743,400	68,681,100
Total: 1956				310,917	2,769	360,033	114,180,200	11,879,600	69,990,800

See footnotes at end of table.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Eddy	349			13,200		
Grant	76,546	195	11,715	32,496,700	2,000	
Guadalupe	24,621			1,274,300		
Hidalgo	2,053	122	3,640	57,800	9,200	
Luna	141		227	2,100	9,300	
Mora	44		1	1,600		
Otero	288		68	5,800	5,800	
Rio Arriba	11,168		7,231	502,500		
Sandoval	1,735		333	45,700		
Santa Fe	719	80	964	52,000	6,100	
Sierra	321	52	5,046	8,000	4,900	900
Socorro	1,352	30	3,659	37,000	167,100	28,300
Taos	15			400		
Torrance	146		17	4,600		
Union	4		10	800		
Valencia	174	1	15	7,300		
Total: 1956	119,676	480	32,926	34,509,800	204,400	29,200
1955	107,010	596	49,600	25,871,559	144,040	29,000
BY CLASSES OF MATERIAL						
Dry gold: Crude ore	96	6	65	2,000		
Dry gold-silver: Crude ore	3,957	368	19,245	54,200	9,200	
Dry silver: Crude ore	13,556		9,183	560,600	2,100	
Copper:						
Crude ore	81,377	77	2,197	2,356,800	1,800	
Precipitates [3]	19,824			31,531,200		
Lead: Crude ore	858	29	2,150	5,000	190,300	28,300
Lead-zinc: Crude ore	8		86		1,000	900
Total: 1956	119,676	480	32,926	34,509,800	204,400	29,200

[1] Includes 137,500 tons of newly mined ore treated by heap and vat leaching, yielding 147,100 pounds of copper.
[2] Includes 26,839 tons of lead-barite ore yielding 536 tons of lead concentrate, averaging 70 percent lead, and 4,059 tons of barite.
[3] Excludes 103 tons of precipitates recovered from newly mined ore treated by heap and vat leaching. See footnote 1.

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Material shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Copper	232,088	6,493	154,880	[1]114,967,080	40,050	
Copper-lead	34	4	1,490	4,883	35,413	421
Copper-lead-zinc	5,389	165	108,102	347,026	5,599,469	1,198,293
Copper-zinc	9		39	709	507	10,416
Lead	4,642	245	104,073	147,707	5,703,374	468,935
Zinc	68,755	507	98,469	1,411,122	1,179,405	76,864,478
Total: 1956	310,917	7,414	467,053	[1]116,878,527	12,558,218	78,542,543
1955	232,625	7,275	281,268	109,306,919	6,629,528	34,049,557
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold: Crude ore	96	6	65	2,058		
Dry gold-silver: Crude ore	3,957	368	19,245	55,892	15,381	
Dry silver: Crude ore	13,556		9,183	578,131	3,381	
Copper:						
Crude ore	81,377	136	2,837	2,635,177	3,078	
Precipitates [2]	19,824			31,875,019		
Lead: Crude ore	858	29	2,150	6,446	194,492	36,194
Lead-zinc: Crude ore	8		86	18	1,021	1,098
Total: 1956	119,676	539	33,566	35,152,741	217,353	37,292
1955	107,010	662	50,282	26,717,590	162,537	39,022

[1] Includes 151,700 pounds of copper contained in 103 tons of precipitates obtained from newly mined ore treated by heap and vat leaching.
[2] Excludes 103 tons obtained from newly mined ore treated by heap and vat leaching.

Most of the gain in output of copper in New Mexico in 1956 was due to increased production from the Chino open-pit mine of the Kennecott Copper Corp., the State's outstanding producer. Output from the Miser's Chest mine, operated by Banner Mining Co., the second largest producer of copper in the State for many years, was about the same in 1956 as in 1954 and 1955. Other substanital producers of copper were the Bayard mines operated by the United States Smelting Refining and Mining Co. and the Stauber mine operated by the Drusan Mining Co.

Gold.—In 1956 gold production in New Mexico rose from the lowest figure on record, that of 1955, to virtually the same level as in 1954. Most of the increase in 1956 came from the Chino Mines Division, Kennecott Copper Corp., and was due to an increase in the output of blister copper (from which gold was recovered as a byproduct during electrolytic refining) and a reduction in output of fire-refined copper (from which no gold is recovered). The output of blister copper increased when the demand for fire-refined copper diminished and the corporation had to place its copper fire refinery on a standby basis.

Iron Ore.—Iron ore for use in cement was mined in 1956 from the Hanover-Bessemer's Pearson iron pit in Grant County by White & Mathis. Magnetite Products Corp. mined iron ore from the Ferro Iron Mines, Inc., pit in Lincoln County for use in coating underwater pipelines and transmission lines. This special pipe weighed 4.25

times the weight of water. All iron ore mined and used was magnetite.

Lead.—Lead output in New Mexico rose from 3,296 tons in 1955 to 6,042 tons in 1956, an 83-percent increase. The value of output increased more (93 percent) because of the higher average weighted price—15.7 cents a pound in 1956 compared with 14.9 cents in 1955. Most of the increased output was due to the stimulus to mining of the increased price for lead.

The bulk (71 percent) of the State's lead output was recovered as a byproduct or coproduct from complex base-metal ores from 3 mines. The leading producer was the Ground Hog Unit mines of the American Smelting and Refining Co., which resumed operations in March 1955 after being idle since February 1953. The United States Smelting Refining and Mining Co. Bayard mines, operated by lessees, ranked second in lead output. The third-ranking producer was the Lynchburg mines owned by The New Jersey Zinc Co. The lead was recovered from lead-zinc ore from the Ground Hog and Lynchburg mines and copper-lead-zinc ore from the Bayard mines.

Other mines reopened late in 1955 that recovered lead (as a byproduct of zinc ore mined) were the Hanover zinc mine operated by The New Jersey Zinc Co. and the Kearney zinc mine operated by New Mexico Consolidated Mining Co.

Manganese.—Shipments of manganese ore and concentrate from New Mexico increased from 1,390 tons in 1955 to 22,012 short tons (gross weight) in 1956. Thirteen individuals and companies shipped ore and concentrate from deposits in Hidalgo, Luna, Sandoval, and Socorro Counties to the Government General Services Administration (GSA), purchase depot under the "carlot" program that required a minimum manganese content of 40 percent. Nine operations iy Socorro County shipped 89 percent of the State total.

Manganiferous ore (ferruginous manganese ore containing 10.5 percent manganese and 35 to 38 percent iron) was mined in 1956 from the Boston Hill deposit by the Luck Mining & Construction Co. and shipped to the Colorado Fuel & Iron Corp. for use in making steel at its Pueblo (Colo.) plant. The output was slightly below that in 1955.

Molybdenum.—Molybdenum concentrate recovered as a byproduct of copper ore mined from the Chino open-pit mine in Grant County by Kennecott Copper Corp. and milled at Hurley continued to be the major source of molybdenum in New Mexico in 1956. The Questa molybdenum mine, 6 miles east of Questa in Taos County, also continued to be an important producer of molybdenum concentrate in the State in 1956.

Rare-Earth Metals.—Owing to fluctuations in market price and erratic demand, the rare-earth-mineral industry in New Mexico remained relatively static in 1956. The sale of combined rare-earth oxides recovered from the treatment of bastnaesite ores by the New Mexico Copper Corp. was reported; however, the mill at Carrizozo, recently revamped to recover rare earths, was idle most of the year.

Silver.—Output of silver in New Mexico in 1956, recovered mainly as a byproduct of ores of copper, lead, and zinc, increased 57 percent over 1955. This increase was due primarily to reopening of a number of lead-zinc and zinc mines late in 1955 and early in 1956. The leading silver producer in the State in 1956, as in 1955, was the Ground

Hog Unit mines. Other mines producing substantial quantities of silver, in order of output, were Miser's Chest, Kearney, Bayard, Lynchburg, Hanover, and Chino.

Tungsten.—The two operations that produced tungsten concentrate in New Mexico in 1955 also supplied the entire output in 1956. David D. Osmer mined ore from the Morning Star mine in Grant County and D. H. Abel & W. V. Westfall operated the Wichita group in Taos County.

Uranium.—New Mexico's leading position with respect to domestic uranium-ore reserves was formally established in December with announcement by the Atomic Energy Commission (AEC) of the Nation's uranium reserves.[2]

As of November 1, 1956, the State was credited with 41 million tons of measured, indicated, and inferred ore—two-thirds of the national total. Average grade of the reserves was 0.24 percent (4.8 pounds contained U_3O_8 per ton). All but a small portion of the reserves lay in the Ambrosia Lake district (McKinley County) and the Laguna district (Valencia County).

Private drilling increased over the preceding year. Much of the work was done on Ambrosia Lake ore bodies, which required careful and detailed examination because of their depth and the high capital expenditures necessary for exploitation.

During the first 6 months of the year ore was shipped from 41 properties. Total tonnage for the 6-months period increased several-fold over shipments in the last 6 months of 1955. Continuous operation of the Jackpile mine was primarily responsible for the increase. Valencia and McKinley Counties produced over 90 percent of the total output; the remainder came from Socorro, San Juan, and Rio Arriba Counties.

Production from the Ambrosia Lake district was small, as several years of construction and development work were necessary before the district could be fully exploited. At the close of 1956 only the Dysart shaft of Rio de Oro Uranium Mines, Inc., had been sunk to the ore horizon.

Milling capacity at the Bluewater and Shiprock uranium mills continued to increase, as the Bluewater acid-leach plant went into full production and alterations were made at Shiprock. Capacity to process ore at these 2 plants was 3,500 tons a day in December. In the spring, the AEC established a temporary station between Grants and Bluewater in Valencia County to purchase ores from the Grants area. Previously these ores had gone to the Anaconda plant at Bluewater. The buying station is to be maintained until new mills have been constructed to treat Ambrosia Lake ore.

Vanadium.—Many New Mexico uranium ores contain vanadium; however, except for some ores in western San Juan County and at one property in McKinley County, the vanadium content is too low to warrant recovery. Processing plants at Bluewater and at Shiprock did not recover vanadium in 1956. Small quantities of San Juan County ore were shipped to Durango, Colo., and the recoverable content of these shipments was credited to New Mexico.

[2] Atomic Energy Commission, Statistics on Domestic Uranium Production and Reserves: Grand Junction (Colo.) Operations Office Press Release 178, Dec. 13, 1956, 3 pp.

Zinc.—Zinc output in New Mexico in 1956 was more than double that in 1955. The remarkable increase was due primarily to the continued increase in the price of zinc from an annual weighted average of 12.3 cents a pound in 1955 to 13.7 cents in 1956. This increase stimulated increased output at the mines reopened in 1955 and the reopening of other zinc mines in 1956. The leading zinc producers in the State in 1956, in order of output, were the Ground Hog, Hanover, Kearney, Bayard, and Lynchburg mines, which furnished 99 percent of total output.

NONMETALS

Barite.—Barite production in New Mexico in 1956 came solely from the Mex-Tex Mining Co., Inc., which operated the Malchite mine 5 miles south of Bingham. The crude lead-barite ore was trucked 35 miles to the company mill at San Antonio, where lead and barite concentrates were produced. Output of ground barite was reported to be 4,059 tons in 1956, considerably less than production in 1955. The entire production of ground barite was used in preparing oil-well-drilling mud.

Cement.—The existence of a cement industry in New Mexico moved closer to reality in 1956 with the announcement by Permanente Cement Co. and Dewey Portland Cement Co. of plans to build plants.

Permanente Cement Co. revealed that it planned to construct a $10-million, 1.4-million-barrel plant at Scholle, 55 miles southeast of Albuquerque. Plant equipment would include a rotary kiln 12 feet in diameter and 450 feet in length, one of the largest in the industry.

Dewey Portland Cement Co. of Kansas City announced that it intended to build a $10-million plant at Placitas, 17 miles north of Albuquerque. Planned capacity was 1,250,000 barrels of cement annually; this will increase the number of company-owned plants to 3.

Clays.—The output of clays in New Mexico has declined since 1951. Clays sold and used in the State dropped to 39,600 tons in 1956, a decrease of 13 percent from 1955 and 59 percent from 1949.

TABLE 15.—Production of clays, 1949–56

Year	Short tons	Value	Year	Short tons	Value
1949	97,751	$69,002	1953	49,089	$103,931
1950	63,337	77,582	1954	47,832	83,085
1951	75,653	148,876	1955	45,351	108,582
1952	57,668	107,633	1956	39,623	95,386

The downward trend was due to decreased demand for building brick and other structural-clay products and partial substitution of other building materials in construction. New Mexico has few large, good-quality clay or shale deposits, thus a large volume high-grade building brick cannot be made at a favorable price. Of the 98,000 tons of clays produced in 1949, 60,000 tons was classified as adobe, whereas in 1956 only 16,000 tons of adobe clay was mined—an indication of higher incomes, better standards of living, and a change in consumer preference for better quality building materials.

Of the 39,600 tons of clays mined in 1956, only 8,300 tons was fire clay, whereas 31,300 tons was miscellaneous clay. The major producer

of fire clay was the El Paso Brick Co., followed by Phelps Dodge Corp., Gallup Brick & Tile Co., and Yacomo, Inc. The Kinney Brick Co., operating an open pit in Bernalillo County, produced the bulk of the miscellaneous clay. Other important producers were El Paso Brick Co. in Dona Ana County, Native Blanca Clay Co. in Chaves County, and Gallup Brick & Tile Co. in McKinley County. The State penitentiary also operated a miscellaneous-clay pit in Santa Fe County. The bulk of the output of miscellaneous clay was used for making brick and other heavy clay products, but 1,700 tons of carbonaceous shale was used as an admixture in preparing oil-well-drilling mud. Fire clay was used in manufacturing heavy clay products, firebrick and block, and furnace stoppers in copper smelters.

Fluorspar.—Shattuck Denn Mining Corp. announced that it had decided to sell its Acid-grade fluorspar mill at Los Lunas. The 400-ton-per-day plant had been operated by Zuni Milling Co., a Shattuck Denn affiliate, until competition from imported fluorspar forced its closing. The General Chemical mill at Deming, the only other Acid-grade mill in the State, also was idle in 1956.

Gem Stones.—The value of gem and ornamental stones produced in 1956 rose to $30,000 and included agate, serpentine, selenite, jasper, and desert scenic stone. The principal productive area was near Deming, Luna County, but output was also reported in Bernalillo, Catron, Hidalgo, Sierra, Socorro, and Valencia Counties.

Lime.—A rotary kiln and a continuous hydrator operated by the Chino Mines Division, Kennecott Copper Corp., yielded 35 tons of quicklime and 30,700 tons of hydrated lime. All output was used in copper concentration and water purification by the producing company.

Mica.—Production and sales of sheet mica in New Mexico in 1956 declined to 6,200 pounds compared with 9,400 pounds in 1955. This drop was due almost entirely to decreased activity at the Apache mine of J. H. Stivers, and shipments would have declined even more sharply had it not been for larger shipments of hand-cobbed mica by Continental Mine Products Co. from the Globe mine. Except for a small quantity of full-trimmed mica produced by Continental Mine Products Co. and Coronado Mining & Milling Co., all shipments made to the Government (GSA) Custer (S. Dak.) Purchase Depot were hand-cobbed material. Virtually all of the mine production came from Rio Arriba County in 1956, and the major producers were Continental Mine Products Co., Lothmann & Lothmann, J. H. Stivers, and Mica Corp. of America.

In conjunction with the production of hand-cobbed mica, 767 tons of scrap mica also was produced in 1956 compared with 84 tons in 1955. The increase was due almost entirely to activities of the Petaca Mining Corp. The company first shipped ground mica from its Petaca mill on February 20. The mill operated on an intermittent basis until July, when it was shut down to revamp part of the mill process to effect better recovery. In December the company announced plans for operating its Rio Arriba County mine and mill by the Minerals Engineering Co. of Grand Junction, Colo.

The Petaca mill was one of four processing firms in the country that used compressed air in fine grinding. In the compressed-air

TABLE 16.—Mica sold or used by producers, 1954–56

	1954	1955	1956
Hand-cobbed mica: [1] Pounds	39,036	219,894	174,367
Sheet mica: [1]			
Full trimmed:			
Pounds	8	399	11
Value	$208	$5,559	$256
Average per pound	$26.00	$13.93	$23.27
From hand-cobbed mica:			
Pounds	2,046	9,032	6,236
Value	$13,637	$59,371	$52,310
Average per pound	$6.67	$6.57	$8.39
Total:			
Pounds	2,054	9,431	6,247
Value	$13,845	$64,930	$52,566
Average per pound	$6.74	$6.88	$8.41
Scrap mica:			
Short tons		84	767
Value		$2,475	$22,213
Average per pound		$29.46	$28.96
Total sheet and scrap mica:			
Short tons	1	89	770
Value	$13,845	$67,405	$74,779

[1] Sold to the Government through GSA.

process, crude mica is fed to a pulverizing and classification system at ½-inch and plus 18-mesh, which yields a product meeting closely controlled particle-size specifications. A fluid-energy system does the exacting job of air pulverization and classification. Dry mica is fed by a screw feeder into the pulverizing chamber. Here the mica is impacted while entrained in two opposed, high-velocity air streams. The mica is then carried to a classification section above the grinding chamber, which provides precise control of the end product by controlling the speed of rotation of the classifier blades and the amount of fan air introduced in this section. Thus, only particles of suitable size are discharged from the mill. Oversize particles are returned to the ends of the opposing high-pressure air nozzles, where they are entrained in the jets for further reduction. The jet pulverizer uses power provided by 2,500 c. f. m. of free air from a Worthington compressor, at 100 p. s. i., heated to 800° F. and distributed to the entrances of the opposing high-pressure nozzles.

A total of 717 tons of ground mica was produced by Petaca, of which 478 tons was used in paint and roofing and 239 tons in joint cement in the plasterboard industry. A grinding plant operated at Santa Fe also produced 50 tons of roofing mica.

Perlite.—Production of crude perlite in 1956 rose to 168,000 tons, a 13-percent increase over 1955 and a 98-percent gain over 1953. Great Lakes Carbon Corp., F. E. Schundler & Co., Inc., and United States Gypsum Co. were the only mine producers. Great Lakes Carbon Corp. also operated an expanding plant at Socorro. The 3 companies employed a total of 51 men—12 in mining operations, 24 at 2 mills, 1 at the expanding plant, and 14 at plant-auxiliary facilities.

Potash.—Five Carlsbad companies were active producers of potash in 1956, and many improvements were reported at their mines and refineries. A sixth company—National Potash Co.—entered the field in 1956, sinking two 15-foot-diameter shafts to 1,700 feet, laying a 21-mile waterline from Caprock, and constructing necessary aux-

iliary and office buildings and access roads. The Farm Chemical Resources Development Corp. moved closer to the status of a producing company by awarding a contract for design and construction of a shaft for the firm's potash mine 30 miles northeast of Carlsbad.

TABLE 17.—Production of crude perlite, 1953–56

Year	Short tons	Value	Year	Short tons	Value
1953	84,891	$661,698	1955	147,805	$1,091,250
1954	111,040	885,824	1956	167,705	1,270,993

TABLE 18.—Production and sales of potassium salts, 1947–51 (average) and 1952–56, in short tons

Year	Crude salts; [1] mine production		Marketable potash salts				
			Production		Sales		
	Gross weight	K_2O equivalent	Gross weight	K_2O equivalent	Gross weight	K_2O equivalent	Value
1947–51 (average)	5,406,980	920,347	1,848,733	1,013,753	1,851,831	1,014,287	$35,851,343
1952	7,852,732	1,644,034	2,530,596	1,468,029	2,439,042	1,411,125	52,483,464
1953	9,100,671	1,908,280	2,937,960	1,721,435	2,661,587	1,552,831	58,076,435
1954	9,975,460	1,985,626	3,007,724	1,763,378	2,954,043	1,732,240	64,366,641
1955	10,956,466	2,159,010	[2] 3,221,460	[2] 1,898,770	[2] 3,122,432	[2] 1,841,122	[2] 69,640,740
1956	11,941,474	2,304,572	3,383,882	1,996,693	3,278,977	1,930,754	72,802,302

[1] Sylvite and langbeinite.
[2] Revised figure.

Sales of potash in New Mexico—the Nation's leading potash-producing State—rose to 1.93 million tons valued at $72.8 million in 1956, compared with 1.84 million tons valued at $69.6 million in 1955. A byproduct hydrochloric-acid plant owned by International Minerals & Chemical Corp. operated in conjunction with the company potash refinery. A byproduct-magnesium-compound plant also was active in 1956, producing heavy magnesium oxide for the refractory, uranium-processing, and chemical industries.

The near completion of the sixth potash mine in New Mexico and the first in Lea County dominated the news of the industry in 1956. By the end of the year work on the National Potash Co. mine and mill was in the final stages. Begun in May 1955, the two shafts and accompanying refinery and auxiliary facilities are expected to be in operation by February 1957. The $18-million project will employ 300 men when the mine and refinery are in full production. This joint venture by Freeport-Sulphur Co. and Pittsburgh Consolidation Coal Co. will have an annual capacity of 400,000 tons of high-grade muriate of potash.

The Farm Chemical Resources Development Corp., owned jointly by the National Farmers Union, Kerr-McGee Oil Industries, Inc., and Phillips Petroleum Co., was the seventh operator to enter the potash field. Overall exploratory work was completed and an ore body established under some 15,000 acres. A concrete-lined shaft 15 feet in diameter and 1,700 feet in depth to service the mine was scheduled for completion in December 1957. Research to develop a refining

process had been under way for some time; but, before the company began constructing a refinery, a second shaft, and other facilities, it planned to test the refining process on the available ore. A daily output of 1,000 tons of finished product was expected when facilities were in full operation.

Other developments in 1956 included the merger of Pacific Coast Borax Co. and United States Potash Co. into the United States Borax & Chemical Corp. The United States Potash Co. Division completed a $3-million expansion program at the mine and refinery to increase production 20 percent. Work also progressed on a third shaft approximately 6 miles north of the original shaft. The company expected to begin mining the northernmost ore body early in 1957 with continuous miners and to transport the ore by conveyor belts. From the collar of No. 3 shaft the ore would be hauled to No. 1 shaft by 50-ton diesel trucks for processing at the refinery. The United States Potash Co. Division also reported constructing a new 100,000-ton storage warehouse at the refinery site, erecting a new chemical plant to produce high-purity potassium chloride, and building a new plant to produce a white, high-purity, granular muriate for agricultural use. The Potash Division of International Minerals & Chemical Corp. completed expansion of its potassium-sulfate plant, which now has a rated capacity of 400 tons a day. Capacity was increased by installing additional equipment in the refinery and chemical plants. The corporation also placed 125 new mine cars in underground service to keep pace with a stepped-up mining program.

Another innovation was introduced by the Potash Co. of America in 1956. Company engineers developed a method of measuring the weight of ore traveling on a conveyor belt. The device converts the weight of potash on the belt into air pressure, which activates a recorder pen attached to a circular chart.

Pumice.—Sales of pumice, pumicite, and scoria in New Mexico dropped to 292,000 tons in 1956, a 26-percent decrease from 1955. High freight rates, increased cost of production, and substitution of lower cost materials caused the decline. The largest consumers were concrete-aggregate and block producers and railroads. In 1956, 194,000 tons was used in concrete aggregate (251,000 tons in 1955) and 90,000 tons for railroad ballast (137,000 tons in 1955). Cleansing and scouring compounds, abrasives, concrete admixture, acoustic plaster, and insulating mediums consumed only 3 percent of the total output. Mine production was centered in Union, Dona Ana, and Rio Arriba Counties, although shipments were also reported from open pits in Sandoval and Santa Fe Counties.

Some high-grade pumice was processed in a mill at Santa Fe by James H. Rhodes Pumice, Inc., for use in cleansing and scouring compounds and hand soaps as an abrasive and in acoustic plaster, water filtering, paints, etc.

Salt.—Potash tailings continued to be the most important source of sodium chloride in New Mexico in 1956, although there was one producer of solar-evaporated salt. Total sales of rock and evaporated salt rose to 57,000 tons (an increase of 15 percent over 1955) owing to increased production in Eddy and Lea Counties. The bulk of the salt was used for cattle feed. Other uses were for oil-well drilling, water softening, ice manufacture, and meat packing.

Production in 1956 was again concentrated in Eddy County, where the principal producer of rock salt was the Salt Supply Co. The bulk of the rock-salt output in Lea County was reported by the Champion Salt Co., and solar-evaporated salt was recovered by the Curtis Salt Co. at Quemado, Catron County.

TABLE 19.—Salt sold or used by producers, 1953–56

Year	Short tons	Value	Year	Short tons	Value
1953	62,087	$216,364	1955	49,738	$596,780
1954	50,669	333,255	1956	57,156	501,040

Sand and Gravel.—Highway-construction activities continued to be the most important stimulus to increased production of sand and gravel. Output in 1956 rose to 6 million tons, a 32-percent increase over 1955 but 8 percent below the 6.5-million-ton peak of 1954.

Of the total State output, 4.5 million tons or 75 percent was produced by contractors engaged in highway construction. The remaining 25 percent or 1.5 million tons, classed as commercial sand and gravel, was produced for the local market. Six counties—Otero, Bernalillo, Dona Ana, Santa Fe, Torrance, Eddy, and Chaves—yielded 3.8 million tons (63 percent of the total). Of this quantity, 2.7 million tons (71 percent) was Government-and-contractor production.

Stone.—Stone output in New Mexico in 1956 dropped to 1.3 million tons, a 19-percent decline from 1955. The decrease was due entirely to a smaller output of stone by commercial producers. In 1955 commercial output was 700,000 tons, whereas in 1956 it was only 239,000 tons, due largely to a cutback in the production of crushed limestone and sandstone. In 1956 crushed sandstone comprised the bulk of the output, followed by crushed miscellaneous stone and limestone. A small quantity of dimension sandstone and crushed marble was sold for building purposes. Bernalillo, Valencia, Torrance, and Dona Ana Counties supplied most of the stone output of the State.

Sulfur.—Output of sulfur in New Mexico in 1956 declined 12 percent from 1955, largely because of reduced recovery at the Eunice plant of El Paso Natural Gas Co. Production decreases also were reported at the Monument works operated by the Warren Petroleum Corp.

Vermiculite.—As a result of the increased demand for exfoliated vermiculite marketed under the trade name Zonolite, Southwest Vermiculite Co. of Albuquerque doubled its output. All crude ore was received from out-of-State mines.

MINERAL FUELS

Carbon Dioxide.—Production of natural carbon dioxide declined slightly in 1956 compared with 1955. The gas was produced from fields in Harding and Union Counties; other occurrences have been reported in Colfax, Mora, and Torrance Counties.

Coal.—Coal output from 24 underground and 3 strip mines in New Mexico was 158,000 tons in 1956 compared with 202,000 in 1955. Average employment dropped from 222 men to 175 men.

Kaiser Steel Corp., owner and operator of the Koehler mine, did exploratory drilling on its properties in Colfax County to discover and determine the extent of coking reserves.

TABLE 20.—Production of coal, 1955–56, by counties. (Exclusive of mines producing less than 1,000 tons annually)

	1955		1956	
	Short tons	Average value per ton [1]	Short tons	Average value per ton [1]
Colfax	75,639	$6.08	72,786	$6.15
McKinley	88,123	6.63	50,868	5.50
Rio Arriba	14,860	5.48	16,025	5.16
Sandoval	3,797	4.28	2,537	5.11
San Juan	16,032	4.68	9,946	4.89
Sante Fe	3,128	6.25	4,582	9.25
Socorro			1,700	5.21
Total	201,579	6.13	158,444	5.82

[1] Value received or charged f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially).

Helium.—Helium shipments from the Bureau of Mines plant at Shiprock (San Juan County) continued to increase. In 1956 shipments totaled 76 million cubic feet compared with 54 million in 1955, 42 million in 1954, and 11 million in 1953, when operation of the plant was resumed to meet increasing demand by the Government and private industry. New Mexico's share of the national output rose from 23 percent in 1955 to 28 percent in 1956.

Natural Gas.—Marketed production of natural gas, primarily from oilfields of Lea County and the Blanco field of San Juan and Rio Arriba Counties, continued to gain. In 1956 the State output totaled 626 billion cubic feet compared with 541 billion in 1955 and 300 billion in 1951. The average wellhead price remained essentially the same as in 1955—8.9 cents per thousand cubic feet. The price in 1951 was 3.8 cents.

The Pacific Northwest pipeline was completed in 1956. Coincident with construction and completion of the new line, there was a steady increase in development of natural-gas-producing capacity. During the 3-year period 1954 through 1956, 1,430 successful gas development wells were completed in San Juan and Rio Arriba Counties; 619 of these wells were completed in 1956.

Natural-Gas Liquids.—The rise in marketed production of natural gas brought about a 14-percent increase in output of LP-gases and natural gasoline. Plants producing natural-gas liquids were listed in this chapter of Minerals Yearbook, 1955. Plans for an additional plant at Chaco (San Juan County) were announced by El Paso Natural Gas Co.

Petroleum.—Output of crude petroleum rose 6 percent in 1956 over 1955.

In Lea County, which yielded nine-tenths of the output of crude petroleum in New Mexico in 1956, exploration for oil shifted to the deeper Pennsylvanian and Devonian horizons. The average depth of wildcat wells in Lea County increased from 7,800 feet in 1955 to

TABLE 21.—Wildcat- and development-well completions in 1956, by districts and counties

[Oil and Gas Journal]

District and county	Oil	Gas	Dry	Total	Footage
NORTHWEST NEW MEXICO					
Wildcat:					
McKinley			24	24	52,700
Rio Arriba	1	7	4	12	71,000
Sandoval	1		12	13	56,200
San Juan	12	1	43	56	258,000
San Miguel			1	1	3,200
Total	14	8	84	106	441,100
Development:					
Rio Arriba		301	19	320	1,351,700
Sandoval	2	3		5	19,200
San Juan	70	318	31	419	1,462,300
Total	72	622	50	744	2,833,200
SOUTHEAST NEW MEXICO					
Wildcat:					
Chaves	3		24	27	74,500
Curry			2	2	11,200
Eddy	11	2	43	56	179,800
Guadalupe			2	2	8,200
Lea	27		56	83	780,700
Roosevelt	1		1	2	24,500
Total	42	2	128	172	1,078,900
Development:					
Chaves	82		14	96	287,200
Eddy	158	1	32	191	451,700
Lea	493	41	61	595	3,366,700
Total	733	42	107	882	4,105,600
Total all drilling	861	674	369	1,904	8,458,800

9,400 in 1956. Offsetting the deeper drilling—frequently over 10,000 feet—were the abnormally high wildcat success ratio of 33 percent and satisfactory production rates from the newly discovered pools. At the close of 1956 the Oil and Gas Journal reported that over 50 wells were being drilled to depths of 10,000 feet or more in southeastern New Mexico.

The discovery of the Bisti field in 1955 and the Black Rock field early in 1956 stimulated oil-well drilling in San Juan County. Successful wildcat wells increased from 4 in 1955 to 12 in 1956 and successful development wells from none in 1955 to 70 in 1956. Most of the drilling was done along the northwest-southeast trend established by the Bisti and Black Rock discoveries.

Exploration in other northwestern counties resulted in oil discoveries in Rio Arriba and Sandoval Counties.

As a result of the newly discovered oil potential of the Four Corners area, construction was begun on one new refinery at Ciniza, east of Gallup in McKinley County, and expansion plans were announced for the refineries at Bloomfield (San Juan County) and Prewitt (McKinley County).

REVIEW BY COUNTIES

Bernalillo.—The value of output of all minerals produced in Bernalillo County in 1956 rose to $1.25 million, a 26-percent increase over 1955. The quarrying and preparation of sand and gravel yielded

a product valued at $677,000; stone output was valued at $559,000 and clay output at $16,000. The county continued to be one of the major nonmetal-processing areas in the State. An exfoliated-vermiculite plant was operated by Southwest Vermiculite Co. and a brick plant by Kinney Brick Co., and numerous sand and gravel preparation plants and concrete-block plants were in operation.

Catron.—Sand and gravel production was again the main source of income of the mineral industry of Catron County. The total value of mineral output reached $173,000 in 1956 including $153,000 for sand and gravel. The entire output of sand and gravel resulted from highway contracts let by the State highway department; Longenbaugh & Coe and G. I. Martin were the contractor-producers.

TABLE 22.—Value of mineral production in New Mexico, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Bernalillo	[2] $989,301	$1,252,002	Sand and gravel, stone, clays, gem stones.
Catron	[2] 83,379	173,030	Sand and gravel, salt, gem stones.
Chaves	181,898	336,922	Sand and gravel, clays, stone.
Colfax	466,521	494,300	Coal, sand and gravel.
Curry	----------	52,264	Sand and gravel, stone.
De Baca	27,250	77,000	Sand and gravel.
Dona Ana	[2] 221,421	994,991	Sand and gravel, stone, pumice, clays.
Eddy	[2] 70,262,128	73,997,331	Potash, magnesium compounds, salt, sand and gravel, copper, stone.
Grant	[2] 53,773,331	73,414,329	Copper, zinc, lead, molybdenum, lime, silver, manganese ore, stone, gold, sand and gravel, iron ore, clays, tungsten.
Guadalupe	109,492	555,577	Copper, sand and gravel.
Harding	----------	35,259	Sand and gravel, stone.
Hidalgo	[2] 1,797,760	1,903,535	Copper, silver, gold, clays, manganese ore, lead, gem stones.
Lea	549,771	438,827	Sand and gravel, salt, sulfur.
Lincoln	1,419	(4)	Iron ore, rare-earth minerals.
Luna	[2] 271,986	253,887	Manganese ore, sand and gravel, gem stones, lead, copper, silver.
McKinley	607,902	345,939	Coal, sand and gravel, clays.
Mora	752	22,681	Sand and gravel, copper, silver.
Otero	236,088	590,438	Sand and gravel, copper, lead, silver.
Quay	15,824	99,500	Sand and gravel.
Rio Arriba	171,294	819,268	Sand and gravel, copper, pumice, coal, mica, silver, columbium-tantalum.
Roosevelt	----------	96,000	Sand and gravel.
Sandoval	[2] 101,942	120,400	Pumice, copper, manganese ore, sand and gravel, coal, stone, silver.
San Juan	1,158,471	1,695,918	Helium, sand and gravel, coal.
San Miguel	20,249	134,530	Sand and gravel, stone.
Santa Fe	480,089	947,112	Sand and gravel, pumice, coal, copper, zinc, lead, gold, silver, clays.
Sierra	[2] 6,855	40,497	Lead, zinc, sand and gravel, silver, copper, gold, gem stones.
Socorro	[2] 816,884	2,945,459	Manganese ore, gem stones, lead, zinc, sand and gravel, barite, silver, copper, stone, coal, gold, gem stones.
Taos	667,639	631,954	Perlite, sand and gravel, molybdenum, beryl, tungsten, copper.
Torrance	----------	572,870	Sand and gravel, stone, copper, silver.
Union	384,484	386,061	Sand and gravel, pumice, copper, silver.
Valencia	500,522	625,837	Perlite, stone, sand and gravel, copper, gem stones, gold, silver.
Undistributed	302,589,307	[5] 349,340,783	
Total	[3][6] 436,494,000	[7] 513,303,000	

[1] Los Alamos County not listed because no production was reported.
[2] Excludes value of manganese ore sold and blended at Government low-grade stockpiles for future beneficiation.
[3] Revised figure.
[4] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[5] Includes petroleum, natural gas, natural-gas liquids, carbon dioxide (natural), sand and gravel, gem stones, vanadium, rare-earth minerals, uranium, and values indicated by footnote 4.
[6] Figure excludes uranium; value of uranium for 1955 was not released by the Atomic Energy Commission.
[7] Total has been adjusted to eliminate duplicating the value of raw materials used in lime manufacture.

The Curtis Salt Co. operated its Quemado solar-evaporation plant throughout 1956, and the salt was shipped to feed dealers for use by livestock and sold for use as water softener. A small quantity of agate was collected in the John Kerr Canyon area by McCargish Industries.

Chaves.—Nonmetals, petroleum, and natural gas were the only minerals produced in Chaves County in 1956. Total value of the output of nonmetals jumped from $182,000 in 1955 to $337,000, owing largely to increased output of sand and gravel. Sand and gravel production was divided nearly evenly between commercial production reported by J. D. Hurford, F. M. Reeves & Son, Inc., and F. A. Stacy & Son, and Government-and-contractor output. Armstrong & Armstrong, Floyd Haake, Harry Trotz, and Wheeler Construction Co. worked on highway contracts let by the State highway department.

Miscellaneous clay for use as a constituent in oil-well-drilling mud was produced by Native Blanco Clay Co. of Lovington. Three men were employed by the company. A small quantity of miscellaneous stone for riprap was produced by Armstrong & Armstrong and Floyd Haake in connection with highway contracts let by the State highway department.

Colfax.—Coal and sand and gravel were the only minerals produced in Colfax County in 1956. The value of coal production declined 3 percent—from $460,000 in 1955 to $447,000 in 1956.

Kaiser Steel Corp. (operator of the Koehler mine) carried out a drilling program on its coal properties to determine the extent and quality of coking-coal reserves.

Construction and maintenance crews of the State highway department produced 31,000 tons of paving gravel valued at $27,000, and Wylie Paving Co. (a contractor for the highway department) produced 12,000 tons of paving gravel with a value of $18,000.

Curry.—Armstrong & Armstrong and Harry Trotz produced 50,000 tons of paving gravel for highway projects under way in 1956, and Armstrong & Armstrong produced 264 tons of crushed miscellaneous stone for highway riprap.

De Baca.—Contracts let by the Federal Bureau of Reclamation (List & Clark, contractor) and the New Mexico State Highway Department (Floyd Haake, contractor) resulted in the production of 1,000 tons of structural sand, 6,000 tons of structural gravel, and 48,000 tons of paving gravel.

Dona Ana.—Nonmetals were the only minerals produced in the county in 1956, and the total value of output rose from $221,000 to $995,000 owing to a substantial increase in sand and gravel production. Sand and gravel sold and used in 1956 reached 609,000 tons valued at $715,500 compared with 48,000 tons valued at $44,000 in 1955. A. Courchesne Sand & Gravel Co. was the only commercial producer and reported an output of only 1,000 tons of paving gravel. On the other hand, the expanded highway-construction program of the State caused considerable activity by other sand and gravel producers. The city of Las Cruces, United States Corps of Engineers, and the State highway department were active through contracts let to private contractors and the output of construction and maintenance crews. McMillan Quarries, Inc., was the leading Government-and-contractor producer, followed by Brown Contracting Co. and Northwestern

Engineering Co.; each produced over 100,000 tons of sand and gravel.

Stone ranked second in value of output. Northwestern Engineering Co. reported production of 98,000 tons of crushed miscellaneous stone for concrete aggregate.

The entire output of scoria in the county was quarried at the Klinker claim near Aden of the Volcanic Cinder Co. Production in 1956 dropped to 58,000 tons—a 35-percent decrease from 1955. This cutback can be attributed to inability of the industry to compete successfully with lower price substitutes.

Mine production of clays remained relatively stable in 1956, and the entire output was reported by the El Paso Brick Co. The miscellaneous clay mined was used at the company brick plant at Brickland for manufacturing building brick and other structural-clay products.

Eddy.—The Permian basin of the Carlsbad region remained the focal point for the mining industry of the county in 1956. In terms of value, potash valued at $72.8 million was the most important mineral produced. Mines and refineries operated by International Minerals & Chemical Corp., Potash Co. of America, United States Potash Co. Division of the United States Borax & Chemical Corp., Duval Sulphur & Potash Co., and Southwest Potash Co. accounted for the output of potassium salts in New Mexico and for over 90 percent of the total United States output. Magnesium compounds and hydrochloric acid were recovered as byproducts by International Minerals & Chemical Corp. at its Carlsbad refinery.

Salt was the third-ranking mineral in value in 1956, and output increased slightly over 1955. The Salt Supply Co. and Carlsbad Salt Products, Inc., were the major producers.

Construction materials (sand and gravel and stone), a small quantity of copper, petroleum, and natural gas constituted the remainder of the total value of mineral production in the county. Except for 20,000 tons of commercial sand and gravel reported by Walter Nugent, all sand and gravel production in the county was quarried by contractors engaged in State highway work. Jack Adams, J. H. Ryan & Son, Inc., Henry Thygesen & Co., and construction crews of the State highway department produced 466,000 tons of paving gravel. J. H. Ryan & Son, Inc., quarried 439 tons of crushed miscellaneous stone for use as highway riprap.

The Lone Eagle Mining Co. shipped 349 tons of copper ore (containing 13,639 pounds of copper) from the Lone Eagle mine (15 miles northwest of Carlsbad in Eddy County) to the El Paso (Tex.) copper smelter of the American Smelting and Refining Co., in 1956.

Grant.—In order of importance, copper, zinc, lead, molybdenum, lime, silver, manganese, stone, gold, sand and gravel, iron ore, clays, and tungsten comprised the minerals produced in Grant County in 1956. The total value of output of all minerals rose to $73.4 million in 1956, compared with $53.8 million in 1955. The 36-percent gain was due almost entirely to an increased output of metals. Copper was the most important mineral produced and accounted for the bulk of the increase in value. Increased production also was reported for gold, silver, lead, zinc, lime, sand and gravel, and stone. On the other hand, decreased production was reported for clays, iron ore,

manganese, molybdenum, and tungsten. Metals composed 99 percent and nonmetals 1 percent of the total value of mineral output in 1956.

Gains in copper, lead, and zinc output were due to higher prices for these metals; output of gold and silver also increased because these precious metals were recovered principally as byproducts of copper, lead, and zinc.

Most of the county as well as the State output of copper in 1956, as in 1955, came from the Chino open-pit mine of the Kennecott Copper Corp., Chino Mines Division, at Santa Rita. According to the annual report of the Kennecott Copper Corp. for 1956, 69,629 tons of copper was recovered from 7,945,386 tons of ore and leach dumps in 1956, compared with 63,490 tons of copper from 6,992,950 tons of ore and leach dumps in 1955. The ore mined in 1956 averaged 17.4 pounds of copper a ton, whereas the ore mined in 1955 averaged 18.2 pounds. The ore was transported from the pit by railroad to the 22,500-ton-per-day concentrator at Hurley. The copper concentrate recovered from the ore was smelted in the smelter adjacent to the mill. Copper precipitate recovered by leaching the mine dumps was also smelted. Siliceous copper ore from the pit was used for flux in the smelter charge of concentrate and precipitate. Molybdenum was recovered in the Hurley mill as a byproduct of the copper ore. Part of the copper from the smelter was fire-refined at Hurley, and the remainder was marketed as blister copper for electrolytic refining. A selenium-bearing copper slag was separated during smelting and marketed for its selenium content.

No gold or silver was recovered from the fire-refined copper bullion at Hurley, but a substantial quantity was recovered from the residue sludge of blister copper that was refined by electrolysis.

The Ground Hog mine of the American Smelting and Refining Co. was the principal New Mexico producer of lead, zinc, and silver in 1956. The Hanover mine (operated by The New Jersey Zinc Co.) and the Kearney mine (operated by New Mexico Consolidated Mining Co.) were the second and third largest zinc producers in the State, respectively. Each of these mines operated all year in 1956 after reopening in 1955.

The Bayard mines owned by the United States Smelting, Refining and Mining Co. were operated by leasers throughout 1956. The ore was treated in the company 600-ton-per-day flotation mill where copper, lead, and zinc concentrates were recovered. As a group, the Bayard mines ranked second in output of lead, third in copper, and fourth in zinc and silver in the State in 1956.

In addition to these 5 major mines, 11 other mines produced gold, silver, copper, lead, and zinc in Grant County in 1956. Four of these mines were outstanding producers. Douglas B. White mined and treated 137,500 tons of copper ore from the Zuniga mine in 1956. This ore (130,000 tons treated by heap leaching and 7,500 tons by vat leaching) yielded 103 tons of copper precipitate containing 151,700 pounds of copper, which was shipped to the American Smelting and Refining Co. El Paso (Tex.) copper smelter. The Steeplerock Exploration Syndicate shipped 1,979 tons of ore (containing 186 fine ounces of gold, 11,345 ounces of silver, and 1,644 pounds of copper) to the El Paso copper smelter from the East Camp group of mines. The

Ace Mining Co. produced a substantial quantity of lead and zinc and smaller quantities of silver and copper from the Royal John mine. The ore was treated at the American Smelting and Refining Co. Deming mill and at the United States Smelting Refining and Mining Co. Bayard mill. The mine was closed on December 1 and the lease was dropped. Copper ore from the Austin-Amazon mine was shipped by Tejano Mining Co. to the El Paso smelter of the American Smelting and Refining Co. and to the Peru Mining Co. mill for treatment.

The Luck Mining & Construction Co. shipped 38,782 short tons (gross weight) of manganiferous ore (ferruginous manganese ore containing 10.5 percent manganese and valued at $138,508) from the Boston Hill mine in Grant County to the Colorado Fuel & Iron Corp. Pueblo (Colo.) plant for use in making steel in 1956.

All of the iron ore shipped in New Mexico in 1956 was mined by White & Mathis from Hanover-Bessemer's Pearson iron pit in Grant County and was used in manufacturing cement.

In the nonmetal group, lime produced and used in ore concentration by the Chino Mines Division, Kennecott Copper Corp., was the most important commodity. Wade A. White produced 39,000 tons of commercial sand and gravel, and construction crews of the New Mexico Highway Department produced 12,000 tons of paving gravel.

Guadalupe.—The Drusan Mining Co. shipped 23,637 tons of siliceous copper fluxing ore, containing 633 tons of copper, from the Stauber mine near Santa Rosa to the American Smelting and Refining Co. El Paso copper smelter. The mine was operated from March 1 to December 31, 1956. Copper ore, mined by Quentin M. Drunzer from the d'Autremont mine, also was shipped to the El Paso copper smelter.

Hidalgo.—The value of mineral production in Hidalgo County in 1956 increased to $1.9 million, a 6-percent gain over 1955, resulting mainly from an increased output of copper. An increase was also reported for lead, and a small quantity of manganese ore and concentrate was shipped to the Government purchase depot under the "carlot" program.

In 1956, as in each year since 1936, the Banner Mining Co. Miser's Chest group, 6 miles south of Lordsburg, was the leading metal producer in the county. Copper was the principal product, with gold and silver as byproducts. The company conducted an extensive exploration and development program in 1956 and installed a 200,000-gallon water-storage tank.

In all, 1,795 tons of gold-silver ore containing minor quantities of copper and lead was mined by Werner Lake Nickel Mines, Ltd., from the Henry Clay mine and shipped to the Phelps Dodge smelter at Douglas (Ariz.) and the American Smelting and Refining Co. smelter at El Paso. In addition, 1,368 tons of copper-lead ore was mined and treated at the Peru Mining Co. mill at Deming. Other mines in the county—Apache (Roy Billingsley), Anita (I. L. Moseley), and Bighorn & Buckhorn (Quad Mining Co.)—produced small quantities of silver and copper.

Combined Minerals, Inc., and John D. Flack shipped manganese ore from the Ridge No. 1 mine to the Government purchase depot under the "carlot" program administered by GSA.

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Phelps Dodge Corp. was the only clay producer in the county in 1956. Although the output decreased 7 percent, the total value of fire clay sold or used was 6 percent greater due to a higher average price. Agate and serpentine valued at $780 were collected near Red Rock.

Lea.—Oilfields of Lea County supplied over 90 percent of the crude petroleum and two-thirds of the natural gas produced in New Mexico in 1956. Petroleum exploration in the county in 1956 was notable because of the increased number of plus-10,000-foot wildcat holes and the high rate of success.

Sand and gravel produced by the Lea County Sand & Gravel, Inc., and construction crews of the New Mexico Highway Department was valued at $179,000. Salt was produced from potash tailings treated by Champion Chemical Co., K. L. Towle Trucking Co., and Lee S. Williams. The bulk of the output was used in oil-well drilling, but some refined salt was used as cattle feed. Lea County was the sole producer of elemental sulfur in the State; the entire output was recovered at two plants operated by El Paso Natural Gas Co. and Warren Petroleum Corp.

Lincoln.—The mineral industry of Lincoln County in 1956 comprised the mining and shipment of iron ore from the Ferro Iron Mines, Inc., pit by Magnetite Products Corp. and the processing and sale of combined rare-earth concentrate by the New Mexico Copper Corp. at Carrizozo. The iron ore was used in manufacturing underwater pipe lines and transmission lines, which had to weigh at least 4.25 times as much as water. The rare-earth concentrate was recovered from bastnaesite ore mined locally and treated at the company mill 2 miles west of Carrizozo.

Luna.—Reports from mineral producers indicated that manganese, sand and gravel, gem stones, lead, copper, and silver were the only minerals produced in Luna County in 1956. Without operation of the fluorspar mines of the region and with closing of the Deming fluorspar mill, the value of mineral output continued to decline and reached $254,000 in 1956—a 7-percent drop. The total value would have declined further, except for shipments of manganese ore and concentrate and gains reported in sales of sand and gravel and the base metals.

Sand and gravel production totaled 41,500 tons of which 31,500 tons was produced by Floyd Haake (a highway-department contractor) and construction crews of the State highway department. Luna County (particularly near Deming) was the center of gem- or ornamental-stone production in the State. Agate, the only material collected in 1956, was produced by Cholly Adams, Mrs. Clyde Brown, Ted Burkheiser, and the Deming Agate Shop.

Florida Manganese, Inc., shipped a substantial quantity of manganese ore under the Government "carlot" program from the Luna-Manganese Valley mine in 1956. The value of this ore composed the bulk of the total value of mineral production in Luna County.

Small quantities of silver, copper, and lead were recovered by direct-smelting small lots of ore from the Rimrock Nos. 1, 2, 3, and 4, Stenson group, Calumet, Lindy Ann, and Benefactor-group mines.

McKinley.—Uranium, coal, sand and gravel, and clays were the principal minerals mined in McKinley County in 1956.

Henry Thygesen & Co., a contractor for the State highway department, produced 32,000 tons of paving gravel valued at $56,000. Gallup Brick & Tile Co. continued to operate its open-pit clay mine, employing 4 men in mining for an average of 50 days. Of the 1956 shipments, half was used in manufacturing firebrick and block and half in oil-well-drilling mud.

Production of uranium ore continued to increase in McKinley County in 1956. Most of the ore came from mines in the Haystack Mountain-Poison Canyon area operated by Haystack Mountain Development Co., Holly Minerals Corp., Federal Uranium Corp., and others.

Major interest in the county, however, was centered on the Ambrosia Lake district where drilling indicated reserves of 25 million tons. Because of the depth (350–750 feet) and magnitude of the ore bodies, much of the drilling in 1956 was designed to confirm tonnage and grade of the deposits before major capital expenditures were committed on milling facilities and underground development.

Rio de Oro Uranium Mines, Inc., completed the Dysart shaft at the beginning of the year. The shaft, the first to be sunk to the ore horizon in the Ambrosia Lake district, was completed to a depth of 360 feet in the spring. In the following months, shaft facilities and a station were completed, horizontal development was carried out, and samples were taken for metallurgical tests.

At the end of 1956 work on five additional shafts had begun or was to begin during the winter; these shafts were: Kermac Nuclear Fuels, Inc. (sec. 10 and 22, T. 14 N., R. 10 W.); Holly Minerals Corp. (sec. 14, T. 14 N., R. 10 W.); Homestake-New Mexico Partners (sec. 32, T. 14 N., R. 9 W.); and Phillips Petroleum Co. (sec. 28, T. 14 N., R. 9 W.).

El Paso Natural Gas Products Co. began construction of a 7,000-barrel-per-day refinery at Ciniza east of Gallup. Design of the plant allowed for doubling the initial capacity. At Prewitt the company also announced plans to double the capacity of its 2,500-barrel-per-day refinery.

Mora.—Construction and maintenance crews of the New Mexico State Highway Department produced 39,000 tons of paving gravel in Mora County in 1956—the total value of mineral production, except for 1 ton of copper and 1 ounce of silver.

Otero.—In Otero County 13 mines or quarries produced minerals valued at $590,000 in 1956. Sand and gravel contributed the bulk of the value of the output, owing almost entirely to highway construction. T. J. Martin, McMillan Quarries, Inc., and Vowell Material Co. were contractors for the United States Corps of Engineers, and Henry Thygesen & Co. was contractor for the State highway department. Total Government-and-contractor production reached 301,000 tons valued at $229,000 in 1956. Frank P. Llewellyn, Inc., and Standard Aggregates Co., the only commercial operators, produced 349,000 tons valued at $358,000; 33 men worked an average of 229 days in commercial quarrying and preparation.

The metal output in Otero County was 3 tons of copper, 3 tons of lead, and 68 fine ounces of silver in 1956, recovered by direct-smelting ore from the Courtney, Speckilbird, Alamo Extension Nos. 2, 3, 4, and 12, and El Cobre Rico mines.

Quay.—Value of mineral production in Quay County was recorded as $99,500 in 1956 and resulted from Government-and-contractor sand and gravel produced by Longenbaugh & Coe and Leslie Wheeler, contractors for the State highway department, and commercial output by C. W. Roweth, contractor for the Chicago, Rock Island & Pacific Railroad, and Frank May.

Rio Arriba.—The mineral industry of Rio Arriba County recovered considerably from the precipitous drop in value of production in 1955. Value of output in 1956 reached $819,000, compared with $171,000 in 1955 and $603,000 in 1954.

Mica (hand-cobbed and scrap), pumice and pumicite, and sand and gravel were the nonmetals produced and accounted for 63 percent of the total value of mineral output. James P. Johnson, J. W. Jones Construction Co., Lowdermilk Bros., J. H. Ryan & Son, Inc., and D. D. Skousen & Son, contractors for the New Mexico State Highway Department, and construction crews of the highway department produced 298,500 tons of paving sand and gravel valued at $295,300 in 1956. These figures compare with 135 tons valued at $100 in 1955. New highway work accounted for the increase.

Production of pumice by the General Pumice Corp. dropped below that in 1955, as did output of scoria by Folsom Cinder Co. The bulk of 1956 shipments went to concrete-aggregate consumers, but part of the pumice was shipped to a mill at Santa Fe, which manufactured cleansing and scouring compounds, hand soap, and other abrasive-grade pumice.

Rio Arriba County was the major producer of sheet and scrap mica in 1956, and the value of mica sales rose to $75,000, compared with $64,000 in 1955. However, less hand-cobbed and more scrap mica was produced in 1956 than in 1955. Output from the Apache mine of J. H. Stivers dropped considerably below that reported for 1955. This drop was more than offset by larger shipments of hand-cobbed material from the Globe mine of Continental Mine Products Co. The latter company and Coronado Mining & Milling, Inc., shipped full-trimmed mica. Petaca Mining Corp. mined and ground most of the scrap-mica output.

A total of 7,231 fine ounces of silver and 251 tons of copper was produced in Rio Arriba County in 1956. The active mines were D. A. M. 1 through 8 (operated by the Mining Mountain Uranium Co.), London No. 4 (operated by Lee Williamson), and Eureka (operated by G. M. Baker and R. D. Morton).

Roosevelt.—The production of paving gravel by construction and maintenance crews of the New Mexico State Highway Department and Harry Trotz, a contractor on highway work, totaled 133,000 tons valued at $96,000. Output of washed or otherwise prepared gravel totaled 71,000 tons valued at $84,000.

Sandoval.—Despite a decline in the production of silver, copper, pumice and pumicite, stone, and coal in Sandoval County in 1956, total value of the output rose from $102,000 in 1955 to $120,400 in 1956. This gain was caused by increases in production of sand and gravel and shipments of manganese ore and concentrate.

Production and sales of volcanic scoria by the Big Chief Mining Co., Dooley Bros. Pumice, Inc., and Lava Pumice, Inc., totaled 38,000 tons value at $55,000—a decline of 21 percent in quantity and 12 per-

cent in value. Except for a small quantity used for concrete admixture and insulation, most of the scoria was used in concrete aggregate. The entire output of sand and gravel resulted from quarrying activities of the State highway department. C. R. Davis, contractor for the Federal Bureau of Reclamation, produced 526 tons of crushed basalt used for riprap.

The Bluebird mine, operated by Mid-Continent Exploration Co., and the San Miguel mine, operated by Great Eastern Mines, supplied the silver and copper output in the county in 1956.

San Juan.—The backbone of the mineral industry in San Juan County in 1956 continued to be the production and sale of natural gas and helium. The Navajo plant at Shiprock, operated by the Federal Bureau of Mines, was the only producer of helium in the State.

Government-and-contractor production of sand and gravel totaled 61,000 tons valued at $79,000, and commercial output reached 161,000 tons valued at $218,100. Commercial producers who reported sales were San Juan Gravel Products Co., Farmington Sand & Gravel Co., Jensen Ready-Mix Co., Inc., and Daniels Construction Co. Government-and-contractor production was reported by the State highway department and Skousen-Hise Contracting Co.

Oil-well drilling increased markedly in San Juan County in 1956. Late in 1955 El Paso Natural Gas Co. discovered the Bisti field in sec. 16, T. 25 N., R. 12 W. In the spring of 1956 British-American Oil Producing Co. discovered the Black Rock field 4 miles to the northwest in sec. 1, T. 25 N., R. 13 W. Development drilling between the two fields showed a continuous reservoir; successful wildcat drilling to the northwest and southeast established a trend of potential production more than 15 miles long.

At Bloomfield, El Paso Natural Gas Products Co. announced expansion of its small oil refinery from 500 to 1,500 barrels a day. The company also planned to construct a natural-gas processing plant at Chaco.

Uranium-vanadium ore was shipped to mills at Shiprock and Durango, Colo. Ores processed at Durango were the source of New Mexico's output of vanadium.

Kerr-McGee Oil Industries, Inc., completed the third modification of its uranium mill at Shiprock; a continuous solvent-extraction circuit was installed in October. The circuit, designed to handle half of the plant's pregnant solution from acid leaching, exceeded 99-percent recovery of the dissolved uranium. The Shiprock plant had a daily rated capacity of 500 tons in December.

San Miguel.—According to reports filed with the Bureau of Mines, sand and gravel and stone were the only minerals produced in 1956. The sand and gravel was produced by Henry Young Gravel Co. and contractors for the State highway department, and crushed and dimension sandstone was quarried by Taylor Quarries, Albert Coca, and Benito Lopez.

Santa Fe.—Increased output was reported for all minerals in Santa Fe County in 1956, except clays and pumice and pumicite. Sand and gravel led all minerals, with a production of 521,500 tons valued at $641,000; except for 72,000 tons of commercial material, the entire output was Government-and-contractor sand and gravel. Output of

scoria for concrete aggregate and pumice for cleansing and abrasive use continued to decline, owing to increasing production costs, distance from markets, and substitutes. As mine production of clay in New Mexico results from the need for clay by the State penitentiary, fluctuations in output are independent of economic factors affecting the clay industry in general.

The total value of the gold, silver, copper, lead, and zinc output in the county in 1956 more than doubled the value of the 1955 output. As in 1955, Western Mines, Inc., operated the Bottom Dollar mine and the Tom Payne mine and dump. The ore was concentrated at the American Smelting and Refining Co. mill at Deming. The Tom Payne mine and dump was the principal producer of lead and zinc in the county. The San Pedro Copper mine, operated by Tom B. Scartaccini, was the important producer of copper. Copper ore containing some silver was shipped from the Kindom-Moya No. 1 mine to the American Smelting and Refining Co. copper smelter at El Paso by the Kindom Uranium Corp. and by the Uranium Corp. of America. Small quantities of gold and silver were recovered by amalgamation of ore from the Elena Marie mine by The Onego Corp.

Sierra.—Combined value of the gold, silver, copper, lead, and zinc production in Sierra County rose to $32,400 in 1956 from $6,700 in 1955. Eleven mines, 2 with outputs of more than 100 tons of ore and 9 with outputs of less than 100 tons, accounted for the production. The two major mines were the Ivanhoe (McDaniel Investment Co.) and the Miner's Dream (Frank Daniel & Earl Richardson and Uni-Soil Oil & Uranium Corp.).

A small quantity of agate was collected near Engle, and construction crews of the highway department produced 7,000 tons of paving gravel.

Socorro.—In value of output, manganese ore and concentrate replaced perlite as the most important mineral commodity produced in Socorro County in 1956. Total value of production in the county reached $2.9 million, compared with $817,000 in 1955. Significant increases in production were reported for all minerals except barite, output of which declined 28 percent.

Nine mining operations in Socorro County in 1956 shipped 19,517 short tons (gross weight) of manganese ore and concentrate averaging 41.6 percent manganese and valued at $1.6 million. This ore was marketed under the Government "carlot" program administered by the GSA. Specifications limited the ore to a minimum of 40 percent manganese, and an annual maximum of 10,000 tons from each deposit. The Manganese Corp. of Arizona, operating the Red Hill and Big Basin mines, was by far the leading shipper of manganese ore and concentrate in the State and county. Other major producers were Joe Gianero from the Black Canyon mine, Pinnacle Mining Co. from the Black Crow mine, and the Rific Co. from the RFC pits.

The value of the output of gold, silver, copper, lead, and zinc in Socorro County increased from $220,000 in 1955 to $693,000 in 1956. Most of this increase was due to increased production of silver, lead, and zinc from the Lynchburg group, operated by C. S. Elayer under lease from The New Jersey Zinc Co. This mine ranked third in lead production and fifth in zinc and silver production in the State in 1956. The second-ranking lead producer in the county was the Malchite

mine, operated by the Mex-Tex Mining Co., Inc. The company mined and treated 26,839 tons of lead-barite ore, which yielded 536 tons of lead concentrate and 4,059 tons of barite. The lead concentrate contained 2,750 fine ounces of silver and 375 tons of lead.

Fourteen other mines produced gold, silver, copper, lead, and zinc in the county in 1956. Substantial quantities of silver and lead were produced by A. L. Greer & Associates from the Oscura mine. Of the remaining mines, the leading producers of silver, copper, lead, and zinc were the Nitt (operated by W. R. & W. L. Dobson), Queen group (operated by Mrs. Sadie Papa), and Waldo (operated by Chamberlin & Scartaccini).

Mining perlite continued to be the largest source of income to the nonmetallic-mineral industry. Production was reported by Great Lakes Carbon Corp. at its Socorro mine, where 5 men were employed an average of 260 days. The company also operated an expanding plant at the mine which employed 6 men for 215 days.

Construction materials (sand and gravel and stone), plus a small quantity of gem stones, accounted for the remaining value of output of nonmetals.

Taos.—The value of the output of the mineral industry of Taos County dropped to $632,000 in 1956, a 5-percent decline from 1955. This decrease was due almost entirely to lower mine production of molybdenite and a drop in the shipments of beryl and copper. No silver or mica production was reported, but a small quantity of sand and gravel and tungsten was mined and sold.

In Taos County, output of perlite increased, the only mineral to show a gain in 1956; a 7-percent rise in mine shipments was reported. F. E. Schundler & Co., Inc., operated its No Agua perlite property for 307 days, employing an average of 3 men in mining. In addition, 16 men were employed at the preparation plant for 173 days.

The Harding mine, operated by Arthur Montgomery, was again the leading beryl-producing mine in the county and State in 1956. The 60,000 pounds of beryl marketed to the Government through the GSA was hand-sorted from pegmatite. Andy Royball also produced beryl in the county and sold his output to Beryl Ores Co., Arvada, Colo.

Molybdenum Corp. of America continued to operate its molybdenum mine near Questa. The concentrate produced from the ore in the company mill at the mine was shipped to the refining plant at Washington, Pa., where molybdenum oxide, ferromolybdenum, and other molybdenum compounds were produced.

Torrance.—Mine production in Torrance County in 1956 was valued at $573,000 ($394,000 for sand and gravel, $177,000 for stone, $2,000 for copper, and $15 for silver), according to reports from mineral producers.

The entire output of sand and gravel came from Government-and-contractor operations. The State highway department produced 29,000 tons of paving gravel, and Skousen-Hise Contracting Co. and Wylie Paving Co., road contractors for the highway department, produced 487,000 tons of paving gravel. These contractors also produced 140,900 tons of crushed miscellaneous stone for use in concrete aggregate.

Union.—Pumice and pumicite, sand and gravel, silver, and copper were mined and sold in the county in 1956. Twin Mountain Rock Co. was again the only producer of scoria, and mine production dropped 20 percent owing to a decline in the demand for scoria as railroad ballast. Because of the accelerated highway-construction program, Government-and-contractor output of sand and gravel reached 233,000 tons, an increase of 43 percent over 1955. Crews of the highway department, Jack Adams, and Wylie Paving Co. were the only producers.

Valencia.—Uranium ores originating in Valencia County in 1956 were derived primarily from the Jackpile mine operated by The Anaconda Co., the largest producer in the State. In January the final acid-leach circuit of the Bluewater plant was placed in operation, bringing the total daily plant capacity to 3,000 tons. According to the annual report of the company, about one-fourth of the capacity was in the carbonate-leach section and three-fourths in the acid-leach section.

Ore from the Jackpile mine was transported by conveyor belt to a railroad siding, then carried by rail to Bluewater. In 1956 the company explored and developed a second ore body a few miles north of the Jackpile mine.

The Anaconda Co. reported its uranium reserves to be 15 million tons, with an average grade of 0.16 percent contained U_3O_8.

St. Anthony Uranium Co. was reported to have begun work on a 235-foot shaft north of the Jackpile mine.

Fifteen mining companies or individuals produced gold, silver, copper, perlite, sand and gravel, stone, and gem or ornamental stones valued at $626,000 in 1956, compared with 7 companies or individuals producing mineral products valued at $500,500 in 1955.

Perlite continued to be the principal nonmetallic mineral produced in the county, and the Grants quarry, operated by United States Gypsum Co., was the only producer. Four men were employed for 286 days at the mine and 16 men for 186 days at the mill. The Sais quarry of Sharp & Fellows Contracting Co. was again the principal producer of stone in the county, and 160,000 tons of crushed sandstone was quarried in 1956. Contracts let by the Federal Bureau of Reclamation and the New Mexico State Highway Department resulted in production of 2,000 tons of crushed basalt and 54,000 tons of crushed miscellaneous stone. Paving gravel produced by contractors for the State highway department totaled 62,000 tons valued at $55,000, and structural sand and gravel was produced by the Belen Sand & Gravel Co., which employed 4 men for an average of 80 days. Selenite, jasper, and agate valued at $624 were collected in the Laguna Reservation area.

The Mineral Industry of New York

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, Department of the Interior, and the New York State Science Service.

By Joseph Krickich[1] and Geraldine C. Slaypoh[2]

NEW YORK mineral production in 1956 increased 9 percent in value compared with 1955 owing primarily to valuation increases of most of the State's 22 mineral commodities. Cement, iron ore, stone, sand and gravel, and salt, in decreasing order of value, were the leading minerals produced during the year. In terms of value, the centers of greatest mineral activity were St. Lawrence, Essex, Erie, Greene, and Columbia Counties.

TABLE 1.—Mineral production in New York, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement:				
Portland 376-pound barrels	16,906,607	$48,725,030	(2)	(2)
Masonry do	1,035,519	3,425,069	(2)	(2)
Clays	1,393,665	1,676,215	1,234,860	$1,507,749
Emery	10,735	151,455	12,153	174,032
Gem stones	(3)	194	(3)	2,000
Gypsum	1,249,119	4,403,895	1,140,187	4,817,353
Iron ore (usable) long tons, gross weight	3,201,927	38,018,783	3,188,276	41,093,670
Lead (recoverable content of ores, etc.)	1,037	309,026	1,608	504,912
Lime	82,890	1,365,481	86,737	1,029,996
Natural gas million cubic feet	3,637	1,073,000	4,098	1,160,000
Peat	5,622	51,740	2,900	23,244
Petroleum (crude) thousand 42-gallon barrels	2,904	10,310,000	2,748	12,091,000
Salt (common)	3,779,547	25,214,191	3,872,777	27,544,908
Sand and gravel	25,561,941	25,542,363	27,814,958	28,721,718
Silver (recoverable content of ores, etc.) troy ounces	66,162	59,880	84,158	76,167
Slate	90,668	1,344,715	64,282	943,544
Stone	22,812,222	37,919,063	22,805,494	36,134,765
Zinc (recoverable content of ores, etc.)	53,016	13,041,936	59,111	16,196,414
Value of items that cannot be disclosed: Abrasive garnet, natural cement, crude iron oxide pigments, talc, titanium concentrate, wollastonite and items indicated by footnote 2		8,721,015		68,969,168
Total New York [4]		216,907,000		237,016,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Weight not recorded.
[4] The total has been adjusted to avoid duplicating the value of clays and stone.

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REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—In terms of value, cement was New York's most important mineral commodity in 1956. Portland, masonry, and natural cements were produced during the year. Production and value of all types of cements increased in 1956 compared with 1955. The average value per 376-pound barrel of portland, masonry, and natural cements increased from $2.88, $3.31, and $3.15 in 1955 to $3.06, $3.42 and $3.17, respectively, in 1956. Cement-producing counties for all types of cement, in decreasing order of value, were Greene, Erie, Columbia, Warren, Schoharie, Onondaga, and Ulster. Natural cement was produced in Ulster County.

Clays.—Production of miscellaneous clay decreased 11 percent in 1956 compared with 1955. The decrease was attributed to declines in the demand for clay used in manufacturing heavy clay products and cement, the principal uses for New York's miscellaneous clay. Other uses of clay in 1956 were as lightweight aggregate and for artificial abrasives, pottery, and stoneware. Twenty-one pits in 10 counties were active, with the bulk of production from Ulster, Albany, and Orange Counties.

Emery.—Although there was a steady demand, production and sales of emery ore increased only slightly in 1956 as compared with 1955. The entire output of emery in New York and the United States came from two open-pit operations in Westchester County. The output was used for abrasives.

Garnet.—Abrasive garnet was recovered from 2 operations in the State, 1 each in Essex and Warren Counties. The abrasive garnet produced in Essex County was recovered as a byproduct of wollastonite production and was sold for tumbling-barrel and rouge use. The garnet output of Warren County was used for sandpaper manufacturing and glass grinding and polishing.

Gem Stones.—The value of gem stones recovered in New York increased substantially in 1956 compared with 1955. The output of gem stones resulted from the efforts of several amateur gem collectors. Varieties of gem stones collected during the year included garnet, quartz, and tourmaline.

Gypsum.—Production of crude gypsum, all from underground operations, declined slightly in New York in 1956 compared with 1955. The gypsum-mining industry was centered in Erie, Genesee, and Monroe Counties. Gypsum-calcining plants were active in Bronx, Erie, Monroe, Rockland, and Richmond Counties. Bestwall Gypsum Co. acquired the gypsum mine and mill, as well as the perlite-expanding plant, of Certain-teed Products Corp. in Erie County during the year.

Iron Oxide Pigments.—Crude and finished iron oxide pigments were produced in New York in 1956. Crude iron oxide pigment (hematite) was mined in Oneida County and used to manufacture finished natural red iron oxide. Finished natural red iron oxide also was manufactured in St. Lawrence County from crude material shipped from outside the State.

Lime.—Quick lime and hydrated lime were produced in New York in 1956 by 3 operators, 1 each in Clinton, Erie, and St. Lawrence

TABLE 2.—Production of crude gypsum, 1947–51 (average) and 1952–56

Year	Active mines	Short tons	Value	
			Total	Average per ton
1947–51 (average)	6	1,126,687	$3,320,033	$2.95
1952	5	1,143,920	3,816,148	3.34
1953	5	987,156	3,507,207	3.55
1954	5	1,133,579	4,005,353	3.53
1955	5	1,249,119	4,403,895	3.53
1956	5	1,140,187	4,817,353	4.23

Counties. The output was utilized for building, agricultural, chemical, and industrial purposes.

Nitrogen Compounds.—At two plants in Niagara Falls, Niagara County, atmospheric nitrogen was used in manufacturing fertilizers and explosives and in numerous other chemical and industrial applications.

Perlite.—Crude perlite from Western United States was expanded at six plants in Bronx, Erie, Genesee, and Onondaga Counties. The bulk of output was used as plaster aggregate. National Gypsum Co. reported that its new plant in New York City began expanding perlite from Colorado.

Salt.—Salt production was one of New York's major mineral industries. Output was derived from evaporated salt, rock salt, and brine. The average value per short ton of all types of salt sold or used by producers in New York increased from $6.67 in 1955 to $7.11 in 1956. Producing counties, in order of decreasing output, were Livingston, Onondaga, Tompkins, Schuyler, and Wyoming.

TABLE 3.—Salt sold or used by producers, 1947–51 (average) and 1952–56

Year	Evaporated		Rock and brine	
	Short tons	Value	Short tons	Value
1947–51 (average)	453,871	$5,828,676	2,599,378	$7,891,343
1952	508,317	6,674,698	2,909,126	10,071,764
1953	532,924	7,832,362	2,789,735	9,518,749
1954	529,602	8,734,524	2,883,034	14,019,594
1955	568,497	9,655,884	3,211,050	15,558,307
1956	560,693	10,116,141	3,312,084	17,428,767

Sand and Gravel.—In 1956 the output and value of sand and gravel increased 9 and 12 percent, respectively, compared with 1955. Production by both commercial producers and Government-and-contractor operators increased significantly to meet the increased demands for sand and gravel, primarily in highway and building construction. Eighty-two percent of the total sand and gravel output was washed, screened, or otherwise prepared. Production was reported from 54 of New York's 62 counties. The three leading sand and gravel producing counties were Suffolk, Nassau, and Erie, in decreasing order of output.

Slate.—Production and value of slate in New York decreased 29 and 30 percent, respectively, in 1956 compared with 1955. The

TABLE 4.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955		1956	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand:				
Molding	316,092	$879,883	(1)	(1)
Building	7,525,795	7,443,321	8,370,927	$8,417,239
Paving	6,058,430	5,204,455	4,897,649	4,636,483
Blast			3,470	1,215
Engine	(1)	(1)	28,636	32,017
Filter	(1)	(1)	40,823	59,403
Other	1,044,363	448,165	294,821	181,787
Undistributed [2]	45,548	68,129	371,501	1,019,755
Gravel:				
Building	4,307,193	6,328,538	5,885,760	8,513,814
Paving	4,046,077	3,984,741	3,917,430	4,118,184
Railroad ballast	39,232	23,630	34,470	35,795
Other	593,247	454,425	1,600,058	1,098,767
Total	23,975,977	24,835,287	25,445,545	28,114,459
GOVERNMENT-AND-CONTRACTOR OPERATIONS [3]				
Sand:				
Building	2,086	2,639	20,877	28,708
Paving	450,630	224,897	166,452	89,723
Gravel:				
Building	103,618	37,391	90,896	39,444
Paving	1,029,630	442,149	2,091,188	449,384
Total	1,585,964	707,076	2,369,413	607,259
Grand total	25,561,941	25,542,363	27,814,958	28,721,718

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes railroad ballast (1955), glass (1956), and data indicated by footnote 1.
[3] Includes figures for State, counties, municipalities, and other Government agencies.

decreased output was due to a decline in the demand for slate in the building industry. The number of active producers dropped from 13 in 1955 to 10 in 1956. The bulk of the State output was used for granules, flour, and flagging. Washington County was the center of the slate industry in New York.

TABLE 5.—Slate sold by producers, 1947–51 (average) and 1952–56, by uses

Year	Operators	Roofing		Flagging, granules, flour, and other uses		Total value
		Squares (100 square feet)	Value	Short tons	Value	
1947–51 (average)	17	1,224	$36,193	132,873	$1,719,819	$1,756,012
1952	20	600	21,456	125,694	1,789,409	1,810,865
1953	20	566	20,037	113,345	1,713,295	1,733,332
1954	13	242	10,879	114,832	1,731,169	1,742,048
1955	13	82	5,587	90,635	1,339,128	1,344,715
1956	10	171	7,995	64,216	935,549	943,544

Stone.—The output of stone in New York in 1956 remained virtually the same as in 1955. Basalt, limestone, marble, sandstone, and miscellaneous stone were crushed or broken for highway and railroad construction and maintenance, concrete aggregate, riprap, and other uses. In addition, crushed and broken limestone was used in manufacturing cement and lime, for flux, and for agricultural purposes. Dimension limestone, sandstone, and miscellaneous stone also were

quarried for use as rough and dressed building stone, rubble, and curbing and flagging. Limestone continued to be the principal stone quarried in New York and constituted 88 percent of the total stone production. The leading stone-producing counties were, in order of decreasing value, Rockland, Dutchess, Onondaga, Erie, and Greene. A limited quantity of crushed or broken limestone for riprap, concrete aggregate, and roadstone was produced by Government-and-contractor operations and composed less than 1 percent of the State's total stone value.

TABLE 6.—Stone sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Dimension stone:				
Building stone	22,603	$662,274	20,192	$677,470
Curbing and flagging	19,654	446,789	19,865	521,197
Total	42,257	1,109,063	40,057	1,198,667
Crushed and broken:				
Riprap	(1)	(1)	256,737	433,642
Crushed stone	15,528,682	27,020,109	16,399,087	26,057,076
Furnace flux	(1)	(1)	124,339	239,990
Agricultural	430,169	1,048,467	419,986	1,342,430
Other	2,671,716	4,773,015	2,188,540	3,249,208
Limestone for cement and lime	4,139,398	3,968,409	3,376,748	3,613,752
Total	22,769,965	36,810,000	22,765,437	34,936,098
Grand total	22,812,222	37,919,063	22,805,494	36,134,765

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."

Talc.—New York was the leading talc-producing State in 1956. All production was from St. Lawrence County. The ground talc was sold for use in ceramics, paint, floor and wall tile, and miscellaneous other uses.

Vermiculite.—During the year, Zonolite Co. operated plants in Albany and Oneida Counties, exfoliating crude vermiculite from Montana, South Carolina, and South Africa.

Wollastonite.—Output of wollastonite increased in 1956 compared with 1955. This material was recovered from an open pit in Essex County, and the refined material was sold for use mainly in the paint and ceramic industries.

METALS

Iron Ore.—Production of crude ore increased while shipments of usable ore decreased in 1956 compared with 1955. Although shipments of usable ore declined, valuation increased substantially owing to an increased average value per ton. The average value of New York's iron ore rose from $11.87 in 1955 to $12.89 in 1956. Five mines were active during the year—3 in Essex County and 1 each in Clinton and St. Lawrence Counties. All mines produced magnetite, the bulk of which was recovered from open-pit operations. Beneficiation of New York's magnetite consisted of magnetic separators, spirals and jigs, concentrating, and agglomerating. Most of the usable output was shipped as sinter. Pelletizing experiments were carried on at Republic

Steel's mines in the Port Henry district, and a pilot plant for pellet production will be in operation in the near future. The company sintered most of the concentrate from its mines at a 2-strand Dwight-Lloyd sinter plant, which had a capacity of 3,000 tons per day.[3]

Lead.—The production and value of New York's recoverable lead output increased 55 and 63 percent, respectively, compared with 1955. The increased production was due to an increased lead content of a predominantly zinc ore recovered from the Balmat mine in St. Lawrence County—the only lead-producing mine in the State. Increased valuation resulted from a national increase in the price of lead in 1956.

Silver.—Production of silver (a byproduct of lead and zinc mining at the Balmat mine in St. Lawrence County) increased substantially in 1956 compared with 1955. Increased demand for silver-free lead was the major contributing factor in the increased recovery of silver from the lead concentrates of the Balmat mine.

Titanium Concentrate (Ilmenite).—Ilmenite continued to be recovered as a coproduct of iron ore (magnetite) mining at the MacIntyre mine in Essex County. National Lead Co., operators of the MacIntyre mine, announced a 25-percent expansion in the capacity of the mine and mill at Tahawus, N. Y. The operation was the largest of its kind in the world. The announcement follows a statement by the company in October 1955 indicating the discovery of large new titanium deposits near its plant at Tahawus.[4]

Zinc.—A record high output of over 59,000 tons of recoverable zinc in New York was reported in 1956—an 11-percent increase compared with 1955. The previous record year was 1954, when production exceeded 53,000 tons of recoverable zinc. The increased production was due to higher grades of ore from the Balmat and Edwards mines in St. Lawrence County.

TABLE 7.—Mine production of silver, lead, and zinc, 1947–51 (average) and 1952–56, in terms of recoverable metals

Year	Mines producing	Material sold or treated (short tons)	Silver		Lead		Zinc		Total value
			Fine ounces	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	3	480,282	27,954	$25,299	1,406	$441,480	37,005	$10,465,932	$10,932,711
1952	2	437,099	38,895	35,202	1,120	360,640	32,636	10,835,152	11,230,994
1953	2	646,041	35,398	32,037	1,435	375,970	51,529	11,851,670	12,259,677
1954	2	662,665	34,576	31,293	1,187	325,238	53,199	11,490,984	11,847,515
1955	2	650,877	66,162	59,880	1,037	309,026	53,016	13,041,936	13,410,842
1956	2	657,445	84,158	76,167	1,608	504,912	59,111	16,196,414	16,777,493

MINERAL FUELS

Peat.—Peat was produced in 1956 from three bogs in Duchess and Seneca Counties; it consisted of humus, moss, and reed or sedge peat.

Petroleum and Natural Gas.—Increased petroleum prices overcame a decrease in total output and caused a 17-percent increase in value compared with the previous year.[5] The increased output of natural

[3] Severn, Brown, Northeastern U. S.: Min. Eng., vol. 9, No. 2, Feb. 1957, p. 190.
[4] American Metal Market, National Lead Co. Expands Ilmenite in New York State: Vol. 63, No. 32, Feb. 17, 1956, p. 1.
[5] Kriedler, W. L., Developments in New York in 1956: Bull. Am. Assoc. Petrol. Geol., vol. 41, June 1957, No. 6, pp. 1006–1009.

gas did not bring about proportionate increase in value, however, owing to a drop in the average value at the wellhead. The average value of natural gas at the wellhead dropped from 29.5 cents per 1,000 cubic feet in 1955 to 28.3 cents in 1956. Of the 512 wells completed in 1956, 222 were oil, 14 gas, 213 service, and 63 dry. In all, 750,000 feet was drilled during the year. Gas reserves, as of January 1, 1957, totaled 77 billion cubic feet.[6]

REVIEW BY COUNTIES

Albany.—The Callanan Road Improvement Co. at its Plant No. 1 produced crushed and broken limestone for riprap, blast-furnace flux, concrete aggregate, road material, railroad ballast, and agricultural purposes. The Grippy quarry operated by Julian Bocchi was idle in 1956. Albany Gravel Co., Inc., had six operations in 1956 at Bethlehem, Albany, Loudonville, and Cedar Hill, producing building and paving material. Charles M. Guptill recovered sand and gravel for paving purposes at an operation near Cohoes. Whitehead Bros. Co., with pits and fixed plants at Selkirk and Slingerlands, recovered molding sand. Harold S. Vincent & Son recovered gravel for road construction at their Selkirk operation.

The State of New York Department of Public Works produced paving sand. Miscellaneous clay production in Albany County was used for manufacturing brick and other heavy clay products, pottery, and artificial abrasives. Powell & Minnock Brick Works, Inc., Roah Hook Brick Co., and Sutton & Suderley Brick Co. (Coeymans), and Rex Clay Products Co., Inc. (Albany), were the active producers. Zonolite Co. (Albany) operated its vermiculite-exfoliating plant during the year and processed crude material from outside the State.

Allegany.—Building and paving sand and gravel was produced by Buffalo Slag Co., Inc., Alfred Station, and Thomas Moogan, Friendship. Alfred Atlas Gravel and Sand Corp. (Alfred Station) and Nick Codispoti (Belmont), produced sand and gravel for undetermined uses.

Broome.—In 1956 Broome County had 3 commercial and 2 Government-and-contractor operations. Barney and Dickensen, Inc. (Vestal) and Binghamton Crushed Stone & Gravel Co. (Binghamton) recovered structural and paving sand and gravel from their pits. Royal Winne produced structura and paving gravel at his Vestal pit. Crews of the Broome County Highway Department and the State of New York Department of Public Works produced paving gravel. Building sand and gravel was produced under contract for the City Engineer, Binghamton.

Corbisello Quarries, Inc., produced crushed and broken sandstone for riprap, concrete aggregate, and road material. Dimension sandstone for architectural and flagging purposes was quarried by W. R. Strong & Sons near Deposit. Earl Tompkins of Hancock processed dimension sandstone quarried in Broome County for use as rough construction, rubble, dressed stone, and flagging purposes. Miscellaneous clay for use in heavy clay products was produced at the Binghamton pit of Binghamton Brick Co., Inc.

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[6] Oil and Gas Journal, Annual Review and Forecast Number, Jan. 28, 1957.

TABLE 8.—Value of mineral production in New York, 1955–56, by counties [1] [2]

County	1955	1956	Minerals produced in 1956 in order of value
Albany	$1,538,008	$1,416,215	Stone, sand and gravel, clays.
Allegany	261,003	265,350	Sand and gravel.
Broome	816,182	690,494	Sand and gravel, stone, clays.
Cattaraugus	463,163	777,223	Sand and gravel, stone.
Cayuga	(3)	(3)	Stone, sand and gravel.
Chautauqua	423,008	339,319	Sand and gravel.
Chemung	(3)	(3)	Sand and gravel, clays.
Chenango	(3)	122,064	Sand and gravel.
Clinton	4,852,994	5,311,890	Iron ore, stone, lime, sand and gravel.
Columbia	13,670,167	(3)	Cement, stone, sand and gravel.
Cortland	92,318	(3)	Sand and gravel.
Delaware	438,977	681,737	Stone, sand and gravel.
Dutchess	(3)	(3)	Stone, sand and gravel, clays, peat.
Erie	22,656,249	24,108,393	Cement, sand and gravel, stone, gypsum, lime, clays.
Essex	20,689,116	25,741,568	Iron ore, titanium concentrate, wollastonite, sand and gravel, garnet.
Franklin	111,647	111,066	Stone, sand and gravel.
Fulton	30,887	116,011	Sand and gravel.
Genesee	3,293,768	3,316,766	Gypsum, stone, sand and gravel.
Greene	(3)	(3)	Cement, stone, sand and gravel.
Herkimer	(3)	(3)	Stone, sand and gravel, gem stones.
Jefferson	768,959	(3)	Stone, sand and gravel.
Kings	50,620	18,320	Sand and gravel.
Lewis	29,773	(3)	Stone, sand and gravel.
Livingston	(3)	(3)	Salt, sand and gravel.
Madison	243,408	(3)	Stone, sand and gravel.
Monroe	2,750,812	2,924,089	Stone, sand and gravel, gypsum.
Montgomery	(3)	(3)	Stone, sand, and gravel.
Nassau	5,979,130	6,250,714	Sand and gravel, clays.
New York	354	----------	
Niagara	1,243,705	(3)	Stone, sand and gravel.
Oneida	1,673,118	1,798,040	Stone, sand and gravel, crude iron oxide pigments.
Onondaga	10,514,240	11,370,384	Salt, stone, cement, sand and gravel, clays.
Ontario	668,861	(3)	Sand and gravel, stone.
Orange	733,693	(3)	Sand and gravel, clays, gem stones.
Orleans	(3)	(3)	Stone, sand and gravel.
Oswego	285,399	226,066	Sand and gravel.
Otsego	62,670	(3)	Do.
Putnam	197,500	(3)	Stone.
Rensselaer	397,290	444,155	Stone, sand and gravel, clays.
Rockland	(3)	(3)	Stone, sand and gravel, gem stones.
St. Lawrence	34,493,983	38,234,301	Iron ore, zinc, talc, stone, lead, sand and gravel, silver, lime.
Saratoga	662,578	606,729	Sand and gravel, stone.
Schenectady	(3)	340,745	Sand and gravel.
Schoharie	(3)	(3)	Cement, stone, sand and gravel.
Schuyler	(3)	(3)	Salt.
Seneca	(3)	(3)	Peat.
Steuben	232,017	(3)	Sand and gravel.
Suffolk	6,178,841	6,613,096	Do.
Sullivan	255,900	291,626	Sand and gravel, stone.
Tioga	155,089	(3)	Sand and gravel.
Tompkins	(3)	(3)	Salt, sand and gravel, stone.
Ulster	2,745,252	(3)	Cement, stone, clays, sand and gravel.
Warren	(3)	(3)	Cement, garnet, stone, gem stones, sand and gravel.
Washington	1,476,304	1,074,990	Slate, stone, sand and gravel.
Wayne	(3)	(3)	Stone, sand and gravel.
Westchester	808,659	570,374	Stone, emery, sand and gravel.
Wyoming	(3)	(3)	Salt, stone, sand and gravel.
Yates	12,008	4,173	Sand and gravel.
Undistributed	74,949,459	103,249,909	
Total	216,907,000	237,016,000	

[1] The following counties are not listed because no production was reported: Bronx, Hamilton, Queens, and Richmond.

[2] Fuels, including natural gas and petroleum, not listed by counties, as data not available; value included with "Undistributed."

[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Cattaraugus.—Building and paving sand and gravel were recovered from the Allegany and Franklinville pits of Buffalo Slag Co., Inc. Other producers of sand and gravel in 1956 were Mrs. E. F. Lippert & Co. and William Lippert, both near Allegany; Ray Vogtli & Son,

Gowanda; Olean Gravel, Inc., Machias; Upper Allegheny Sand & Gravel Co., Inc., Onoville; and Work & Silvis, Red House. The State of New York Department of Public Works in Cattaraugus County produced paving gravel and limestone crushed for concrete aggregate and road material.

Cayuga.—Structural sand and gravel was produced by J. J. Harrington and Jay W. Robinson at their pits and fixed plants near Auburn. Paving and filter sand were also produced by J. J. Harrington. Crews of the Cayuga County highway department produced paving gravel. The Auburn quarry of General Crushed Stone Co. yielded crushed and broken limestone for use in highway construction ballast.

Chautauqua.—W. Lee Bull (Stow), Hildom Cinder Block Co. (Poland), Saybold Bros. (Dunkirk), and Sack's Pit (Jamestown) produced sand and gravel for structural purposes. Evans Builders Supply produced sand for construction purposes. Director of Public Works (Jamestown), Chautauqua County Highway Department (Falconer), and the State of New York Department of Public Works produced paving sand and gravel.

Clinton.—In 1956 Clinton County ranked second and third, respectively, in the value of lime and iron ore production. The Chateaugay underground and open-pit mine of Republic Steel Corp. continued to produce magnetite iron ore. Again this property ranked fourth among the iron ore mines of New York. International Lime & Stone Corp. (Chazy) quarried limestone for use as open-hearth and blast-furnace flux and road material and for agricultural purposes. It also continued to produce quicklime and hydrated lime for chemical uses at the Chazy plant. Lancaster Development Inc. (Dunkirk) produced crushed limestone for road construction.

Miscellaneous crushed stone for road construction, railroad ballast, and other uses was recovered as a byproduct of the Chateaugay mine of Republic Steel Corp. near Lyon Mountain. Paving sand and gravel was produced at Morrisonville by Bero Construction Co. Clinton County Highway Department and the State of New York Department of Public Works produced paving and structural sand and gravel.

Columbia.—In terms of value, Columbia County ranked third among New York's cement-producing counties. Lone Star Cement Corp. and Universal Atlas Cement Corp. operated their limestone quarries and cement plants near Greenport and Hudson, respectively. Catskill Mountain Stone Corp. crushed limestone for use in highway maintenance. The Columbia County Highway Department and State of New York Department of Public Works produced paving gravel. Paving sand, filter sand, and structural gravel were recovered by Columbia Sand & Gravel Corp. at its pit near Martindale Depot. F. H. Stickes & Sons produced structural and paving sand and gravel at its pit and fixed plant at Hudson. Reginald Sherman recovered paving sand from a pit near Lebanon Springs.

Cortland.—Sand and gravel for construction and paving purposes was produced and processed at a pit and fixed plant near Cortland by Cortland Ready Mix Concrete Co. Edward Morgan (Homer) produced paving and road gravel in 1956.

Delaware.—The leading sandstone producer, in terms of value, was American Bluestone Co. near Unadilla, which quarried rough and

dressed sandstone for building construction at its North River Quarry. Other dimension sandstone producers in Delaware County in 1956 included Johnson & Rhodes Bluestone Co., East Branch; Earl Tomkins, Hancock; and W. R. Strong & Sons, Deposit. The Delaware County Highway Department and the State of New York Department of Public Works produced paving gravel in 1956.

Dutchess.—Dutchess County had two limestone quarries active in 1956, the largest again being New York Trap Rock Corp. quarry at Clinton Point near New Hamburg. The output was used for riprap and highway and railroad maintenance. Dutchess Quarry & Supply Co., Inc., produced crushed limestone for concrete aggregate and road material at its Pleasant Valley quarry. The principal sand and gravel producer in the county was Fishkill Builders Supply Corp., with a pit and fixed plant near Beacon. Other producers were David Alexander, Stanford Sand & Gravel Plant, Larry Meddaugh, and Frank J. Melito, all of Poughkeepsie; Amenia Sand & Gravel, Inc., Amenia; Ralph Bierce, Pawling; Francis Ryan Sand & Gravel Co., Poughquag; Dutchess Quarry & Supply Co., Millbrook; and O. T. Cookingham, Red Hook. The Dutchess County Highway Department and Superintendent of Public Works produced paving gravel during 1956. Miscellaneous clay used for heavy clay products was recovered by Dennings Point Brick Works at its open-pit mine near Beacon.

Erie.—Erie County was displaced as second-ranking county among New York's mineral-producing counties, dropping to third in total value of mineral output in 1956. Cement continued to be the leading mineral produced in the county.

Lehigh Portland Cement Co. and Penn-Dixie Cement Corp. produced portland and masonry cements at plants near Buffalo. Louisville Cement Co. of New York produced masonry cement at its plant near Akron.

The leading sand and gravel producer was Pine Hill Concrete Mix Corp. (Lancaster). Other sand and gravel producers included Clarence Sand & Gravel Corp., and Meyer & Meyer, both of Clarence; Gravel Products Corp., Erie; Pfohl Bros., Inc., Lancaster; Arthur Maul, Orchard Park; Mrs. Leo Heary and Leroy Wiedman, both of Springville; North Collins Gravel, North Collins; Aurora Gravel, East Aurora; Dan Gernatt, Collins; and Jamison Bank Run Gravel Corp., Buffalo. The State of New York Department of Public Works in Erie County produced paving gravel during the year.

Buffalo Crushed Stone Corp. produced crushed limestone for riprap and highway and railroad maintenance at its Bowmansville quarry. The Cheektowaga quarry of the Federal Crushed Stone Corp. operated during 1956 and produced crushed and broken limestone for riprap, concrete aggregate, railroad ballast, asphalt filler and cement.

The leading clay producer in the county—Acme Shale Brick Co., Inc.—recovered miscellaneous clay to be used in heavy clay products at its Lake View Pit. John H. Black Co. (East Aurora) and Buffalo Brick Corp. (West Falls) mined clay for use in heavy clay products and as lightweight aggregate. Kelley Island New York Corp. produced quicklime and hydrated lime for building, agricultural, and chemical purposes, at its Buffalo plant.

On July 1, 1956, Bestwall Gypsum Co. took possession of the Certain-teed Products Corp. Erie County operations. This included the gypsum mine at Clarence Center and the gypsum-processing mill and perlite-expanding plant at Akron. Other gypsum producers were National Gypsum Co. (with a mine and plant at Clarence Center) and Universal-Atlas Cement Co. (Clarence). National Gypsum Co. (Clarence Center) and Buffalo Perlite Corp. (Buffalo) also manufactured expanded perlite from crude perlite from Western States.

Essex.—Essex County ranked second among New York counties in 1956 in total value of mineral output. Iron ore continued to be the most important mineral product of the county. The Fisher Hill and New Bed-Harmony-Old Bed iron ore mines of Republic Steel Corp. near Minesville operated throughout the year. National Lead Co. recovered iron ore and ilmenite concentrate from titaniferous magnetite ores at its MacIntyre mine and mill at Tahawus.

Sand and gravel for use in road construction and building was produced from pits owned by Saranac Lake Sand & Gravel Co., Inc., and Clarence G. Brooks (Saranac Lake) and Mrs. Ernest Smith (Elizabethtown). The Essex County Highway Department produced a small amount of gravel for paving purposes. Cabot Carbon Co. at Fox Knoll and Willsboro recovered wollastonite and byproduct (andradite) garnet. This garnet has been used very effectively for abrasive purposes, and Cabot Carbon Co. hopes to increase its annual production 3 to 5 times the present level.

Franklin.—Adirondack Stone Quarries, Inc., prepared dimension sandstone for rough construction and flagging purposes at its quarry near Burke. Louis Paro recovered sand and gravel for construction purposes at a pit near Malone. Paving sand was produced at Paul Smiths College, Paul Smiths. Other sand and gravel producers were Farmers National Bank, Bombay; Achille Blain and Dave Williams, Malone; Norman LaBounty, St. Regis Falls; and Saranac Inn and Walter Rock, Saranac Lake. The Franklin County Highway Department and State of New York Department of Public Works recovered sand and gravel for structural and paving purposes.

Fulton.—Paving sand and gravel was produced by E. G. Delia & Sons Construction Corp., Northville. Other sand and gravel producers during the year were Edward Bradt and Art Stone Co., Gloversville; John Edwards, Ephratah; and Herman Smith, St. Johnsville. The Fulton County Highway Department produced gravel for paving purposes.

Genesee.—Genesee County ranked second in value of gypsum production in New York in 1956. The United States Gypsum Co. mine and plant near Oakfield was the only producer of crude gypsum during the year. The largest limestone producer was Genesee Stone Products Corp., which quarried crushed and broken limestone for riprap, road material, railroad ballast, and agricultural purposes. The General Crushed Stone Co., and Leroy Lime & Crushed Stone Corp. (Leroy) crushed limestone for road material and railroad ballast.

Sand and gravel for structural and paving purposes was recovered by Batavia Washed Sand & Gravel Co., Inc., Batavia. Genesee County Highway Department and State of New York Department of Public Works produced sand and gravel for paving purposes.

Greene.—Greene County was the leading cement-producing county in 1956. Limestone was crushed for use in portland and masonry cement by Alpha Portland Cement Co., Cementon; Lehigh Portland Cement Co., Alsen; and North American Cement Corp., Catskill. Catskill Mountain Stone Corp. quarried sandstone, which was crushed for road material at its Cairo plant. Sand for sanding highways was produced by Lawrence Bros., Windham. Molding sand was recovered by Whitehead Brothers Co. at its Catskill and Coxsackie pits.

Herkimer.—Crushed limestone for road construction and agricultural purposes was produced by the General Crushed Stone Co., Jordanville. Crushed limestone for road material was quarried at the Newport quarry of Newport Quarries, Inc. Structural and paving sand and gravel was produced by F. J. Steber, Poland; Eastern Rock Products, Inc., Utica; and Material Sand & Gravel, Gravesville. The Herkimer County Highway Department produced gravel for paving purposes in 1956. John Moyer recovered a small amount of gem stones (quartz) in 1956 near Middleville.

Jefferson.—The General Crushed Stone Co. crushed limestone for highway and railroad maintenance at its Watertown quarry. Carbola Chemical Co., Natural Bridge, crushed limestone for use in whiting and insecticides. The highway departments of the towns of Cape Vincent, Hounsfield, and Lyne produced limestone for concrete aggregate and road material. Colwell Bros. (Watertown) was the leading sand and gravel producer in Jefferson County in 1956, producing sand and gravel for structural purposes and gravel used as fill. Other producers were Carlyle A. Loughlin, Anthony Marzano, Angelo Vespa, and City of Watertown, Watertown; Rural Sand & Gravel Co., Belleville; C. Fred Carter, Clayton; Ontario Construction Co., Chaumont; and Morris Hatcliffe, Donald Cool, and Frank Sischo, Adams. The Jefferson County Highway Department and the State of New York Department of Public Works produced sand and gravel for paving purposes.

Kings.—F. E. Grauwiller Transportation Co., Inc., produced building sand and other sands which were used for filter, engine, ballast, and fill purposes and for brick manufacture.

Lewis.—Messrs. Haggerty and Widrick (Lowville) produced paving gravel, and Hoch Bros. (also of Lowville) produced miscellaneous sands. Mr. Rudd of Lyons Falls recovered gravel for road construction. Mr. Nofstier produced paving sand. The Highway Department of Lewis County produced gravel for paving purposes. Limestone for use as riprap was produced by the town of Lowville.

Livingston.—Livingston County was the leading salt-producing county in New York in 1956. Rock salt was recovered from the Retsof underground mine of International Salt Co., Inc. The Valley Sand & Gravel Corp. produced paving and structural sand and gravel near Avon. Colburn and Davis (Conesus) produced sand for their private use. The Livingston County Highway Department and the State of New York Department of Public Works produced gravel for paving purposes.

Madison.—Conley quarry of Munnsville Limestone Corp. (Munnsville) and Worlock Stone Co., Inc. (Sullivan) quarried crushed and broken limestone for riprap, road material, agricultural uses, stone sand, and other purposes in Madison County in 1956. John Filose

produced a small quantity of miscellaneous stone for use in rock gardens from a quarry near Chittenango. Gossitt Concrete Products, Inc., produced gravel for railroad ballast.

Monroe.—Dolomite Products Co. produced crushed and broken limestone for riprap, concrete aggregate, highway and railroad construction, railroad ballast, and agricultural purposes. At its Penfield and Rochester plants Central Materials Corp. (near Sweden) produced crushed and broken limestone for riprap and highway construction and maintenance. The Ruberoid Co., the only producer of gypsum in Monroe County in 1956, operated its mine and mill at Wheatland.

The leading sand and gravel producer in Monroe County was Redman Sand & Gravel Corp. (Penfield), whose output was used for structural purposes. Sand and gravel for building and road construction was recovered by Brockport Ready Mix Concrete and Ingersoll Supply & Equipment Corp., Spencerport; Roy E. DeWitt, Webster; Elam Bros. Corp., Irondequoit; Newport Sand & Gravel Co., Penfield Gravel Co., and Rappl & Hoenig Co., Rochester area; and Dolomite Products Co., Inc., Manitou Construction Co., and Jack Miller. The State of New York Department of Public Works and the Highway Department of Monroe County produced gravel for paving purposes.

Montgomery.—Crushed and broken limestone for riprap, railroad ballast, and highway construction and maintenance was produced by Crushed Rock Products, Inc., and Cushing Stone Co., Inc., South Amsterdam. St. Johnsville Supply Co., Inc., produced sand and gravel for structural and paving purposes at its pit and plant in St. Johnsville.

Nassau.—Nassau County had eight commercial producers of sand and gravel in 1956. Building and paving sand and gravel were produced by Builders Sand & Gravel Corp., East Meadow; Colonial Sand & Stone Co., North Hempstead; Colonial Sand Stone Co., Inc., Port Washington; Metropolitan Sand & Gravel Corp., Port Washington; Penn Industries, Roslyn; Pine Hollow Sand & Gravel Co., and Approved Sand & Gravel Corp., Oyster Bay; and Milburn Contracting Co., Inc., Baldwin. The only producer of clay in Nassau County in 1956 was Nassau Brick Co., Inc., which manufactured heavy clay products from clay recovered at its pit at Farmingdale.

Niagara.—Gasport Sand & Gravel Co., Inc., recovered structural sand, paving sand, filter sand, and paving gravel at their pit and fixed plant at Lockport. The Niagara County Highway Department and State of New York Department of Public Works produced sand for paving purposes in 1956. Niagara Stone Corp., Niagara Falls, produced crushed limestone for highway construction. Royalton Stone Corp. (Gasport) and Frontier Stone Products, Inc. (Lockport), produced crushed and broken limestone for riprap, road material, agricultural and metallurgical work. Atmospheric nitrogen (anhydrous ammonia) was recovered at plants operated by E. I. du Pont de Nemours & Co., Inc., and Olin-Mathieson Chemical Corp. at Niagara Falls.

Oneida.—Eastern Rock Products, Inc. (Boonville) was the leading sand and gravel producer in Oneida County in 1956; along with the other sand and gravel companies in the county it produced structural

and paving sand and gravel, gravel for railroad ballast, and engine sand. The other sand and gravel producers in the county were George W. Bryant Core Sands, Inc., McConnellsville; Frank Cittadino, Clayville; John H. Waghorn and Mrs. Belva Driscoll, Barneveld; Hanicker Bros., and Rome Sand, Inc., Rome; Whitehead Bros. Co., McConnellsville; and Eastern Rock Products, Inc., Boonville. Sand and gravel for structural purposes was produced by the Oneida County Highway Department.

Limestone was quarried at the Oriskany Falls and Prospect quarries of Eastern Rock Products, Inc., in 1956 for riprap, railroad and highway construction, and agricultural purposes. Clinton Metallic Paint Co. produced crude red iron oxide and processed pigments for use in paint manufacture at its mine and mill at Clinton. Zonolite Co. exfoliated crude vermiculite from Montana, South Carolina, and South Africa at its Utica plant.

Onondaga.—The General Crushed Stone Co. (Fayettesville) was the leading sand and gravel producer in the county. During 1956 its output as well as the output of the other producers included sand and gravel for building and paving purposes. The other producers were S. F. Clough, Harlow H. Galster, Clarence Nichols, and W. F. Saunders & Son, Inc., all of Syracuse; Syracuse Sand & Gravel Co., Inc., Nedrow; William Hessler, William V. Young, and Cecile Perry, Clay; Steve Kravec, Jamesville; H. Amidon, Marcellus; Ruth Eno, Jordan; and E. Burgett. The superintendent of highways of the town of Elbridge produced gravel for paving purposes.

The Jamesville quarry of Allied Chemical & Dye Corp., Solvay Process Division, yielded crushed limestone for use in highway and railroad construction and agricultural purposes. Clay for use in manufacturing lightweight aggregate was produced by Onondaga Brick Corp. at its pit near Warners. Syracuse Pottery Co., Inc., Warners, mined red clay for use in pottery and stoneware. Syracuse Brick Corp. recovered miscellaneous clay at its Cicero pit for use in heavy clay products. Portland and masonry cements were produced at the Jamesville plant of Alpha Portland Cement Co. Expanded perlite was manufactured by Minerals Processing Corp., Syracuse, from crude material shipped from Western States. Allied Chemical & Dye Corp., Solvay Process Division, operated wells at Tully, and a plant at Solvay for producing evaporated salt.

Ontario.—The largest sand and gravel producer in the county was Ontario Sand & Gravel Co., Inc. The company operated a pit and fixed plant near Phelps, producing glass sand, molding sand, and gravel for paving and structural purposes. Other producers of sand and gravel, used mainly for road and building construction, included Nathan Oaks & Sons, Inc., Oaks Corners; McKenzie Sand & Gravel, Clifton Springs; and Hoadley Sand & Gravel Co., Inc., and Victor Malcuria Bros., Inc., both of Geneva. The Ontario County Highway Department and the State of New York Department of Public Works at Ontario produced gravel for paving purposes. Crushed limestone for railroad ballast and highway and railroad construction was quarried at the Geneva quarry of The General Crushed Stone Co. near Oaks Corners.

Orange.—The leading producer of sand and gravel in the county in 1956 was Otisville Sand & Gravel Co., Inc. Its pit and fixed plant

at Cuddebackville produced paving and building sand and gravel. A. W. Hollenbeck, Inc., Chester, produced filter sand, as well as structural and paving sand and gravel. Other sand and gravel producers in the county were Delaware Valley Sand & Gravel Co., Inc., Port Jervis; Newburgh Sand Stone & Gravel Corp. and C. Moriello, Newburgh; E. C. Townsend Estate, Cornwall; Windsor Building Supplies Co., Inc., Plum Point, Dickinson Sand & Gravel, Bloomingburg; F. Gibson, Monroe; and E. Stevens, Walden. The Orange County Highway Department recovered gravel for paving purposes in Orange County in 1956. Miscellaneous clay for heavy clay products was produced at the Newburgh plant of the Jova Brick Works. John Moyer recovered a small amount of gem stones (tourmaline) in 1956 near Tuxedo.

Orleans.—Clarendon Stone Co., Inc., quarried crushed limestone, which was used for concrete aggregate and road material at its quarry near Clarendon. Bank-run gravel for use as fill was recovered by Arnold H. Pickett Sand & Gravel Co. near Gaines. Donald Rorick (Medina) produced sand and gravel for structural purposes. Crawford Hucknell (Albion) had an output of paving and road gravel. The Orleans County Highway Department and the State of New York Department of Public Works in Orleans County produced sand and gravel for paving purposes.

Oswego.—Building and paving sand and gravel was produced by The General Crushed Stone Co. at its pit and fixed plant near Lacona. Molding sand was recovered near Pulaski by Whitehead Bros. Co. Building sand and gravel was produced at the Scriba pit of Davis Sand & Gravel Co. The highway department of Oswego County produced gravel for paving purposes.

Otsego.—Seward Gravel Co. (Colliersville), produced building and paving sand and gravel, as well as a small output of filter sand and gravel for railroad ballast. Unadilla Concrete Products Co. recovered building sand and gravel at its pit and fixed plant near Unadilla. The Otsego County Highway Department and the State of New York Department of Public Works in Otsego County produced gravel for paving purposes.

Putnam.—Eastern Mineral Co., Inc., produced crushed limestone at its quarry near Patterson for agricultural purposes and flooring compounds.

Rensselaer.—The Campbell Mountain quarry of Fitzgerald Bros. Construction Co. near Brunswick yielded Rensselaer grit (a conglomerate), which was sold for use as concrete aggregate and road material. Albany Gravel Co., Inc., the largest sand and gravel producer in Rensselaer County, operated pits near Rensselaer, Troy, and Wynantskill, producing structural and paving sand and gravel. Other sand and gravel producers were Ackner & Hunter, Averill Park; Everett Holser and Valente Sand and Gravel Co., Troy; Sidney B. Sharpe, Wynantskill; and C. W. Wicks, West Sand Lake. The city engineer of Rensselaer County produced gravel for paving purposes in 1956. Bleau Brick Works, Inc. (Troy), and Champlain Brick Co. (Mechanicville) produced clay for use in manufacturing heavy clay products and artificial abrasives.

Rockland.—In terms of value, Rockland County was the leading stone-producing county in New York in 1956. Crushed and broken

limestone used for riprap and highway construction and maintenance was produced at the Tomkins Cove Plant of New York Trap Rock Corp. The company was also the principal producer of basalt in Rockland County; output from its Haverstraw and West Nyack quarries was crushed and broken for riprap, concrete aggregate, roadstone, and other uses. Suffern Stone Co. (Suffern) quarried basalt for use in highway and railroad construction and maintenance. Sand and gravel producers in Rockland County in 1956 had an output of building and paving sands. Producers were Graney Building Material Corp., Sparkill; Mt. Ivy Sand & Gravel Co., Inc., Spring Valley; Ramapo Sand & Gravel Corp., Suffern; Ward Pavements, Inc., Thiells; and William H. Larenzen & Son, Pearl River. John Moyer recovered gem stones (pink garnet) near Hillburn.

St. Lawrence.—St. Lawrence County continued in 1956 to be the leading mineral-producing county in New York, with 16 percent of the State's total value. St. Joseph Lead Co. operated its Balmat and Edwards mines at capacity in 1956. The Balmat mine produced silver, lead, and zinc. The Edwards mine yielded zinc only. Jones & Laughlin Steel Corp. continued to operate its Benson mine near Starlake during 1956, and the concentrate produced was sintered for shipment to the company steel mills.

Crushed limestone, for highway maintenance and construction, and agriculture was produced by Balducci Crushed Stone Co., Gouverneur; Barrett Division, Allied Chemical & Dye Corp., Norwood; and McConville, Inc., Ogdensburg. Broken stone for riprap was produced by Barrett Division, Allied Chemical & Dye Corp.

The leading producer of building and paving sand and gravel in St. Lawrence County was Putnam Hawley Building Materials Co., Potsdam. Other producers of sand and gravel were: James Coffey, Pine Hill; Vance Lucas, Nicholville; K. J. Premo & Co., Massena; Miller Simms; and Emery Billings. The St. Lawrence County Highway Department and Department of Public Works produced sand and gravel for paving and structural purposes. Agricultural lime was produced by Balducci Crushed Stone Company at Gouverneur. Manufactured finished iron oxide pigments from crude iron oxide imported from outside the State was produced by Rossie Iron Ore Co.

New York talc production was centered in the Gouverneur and Edwards areas, St. Lawrence County. Three companies were active, recovering talc from underground mines and operating grinding mills.

Saratoga.—The major output of the 10 sand and gravel producers in Saratoga County in 1956 was molding sand. The leading producer in this area was Whitehead Bros., Saratoga. The other molding sand producers were: Albany Sand & Supply Co., Schuylerville and Ushers; John Belott & Son, Elnora; W. J. Dyer, Gansevoort; William Fawthrop, Mechanicville; Jewett Sand Co., Lashers; and Archie Meyers, Ushers. Hudson Valley Sand & Stone Co. (Wilton) produced paving sand and structural sand and gravel. The Highway Department of Saratoga County produced gravel for paving purposes. The Saratoga Springs Quarry of the Pallette Stone Corp. yielded crushed and broken stone for riprap, metallurgical purposes, highway construction, agricultural purposes, and miscellaneous filler.

Schenectady.—The major structural and paving sand and gravel producer in Schenectady County in 1956 was Scotia Stone & Gravel

Co. Other sand and gravel producers during the year included Melvin Borst, Rotterdam; DeLuke Sand & Gravel Co., Inc., Scotia; Ernest Quay, Scotia Stone & Gravel Co., and William M. Larnard & Sons, all of Schenectady; Whitehead Bros., Aqueduct; Bernard Beers, Wyatt's Crossing; and J. S. Garve, Glenville. The Highway Department of Schenectady County produced sand for paving purposes.

Schoharie.—Masick Soil Conservation Co., operated by A. Arthur Masick, used its production of crushed and broken limestone in manufacturing lime. North American Cement Corp. produced crushed limestone at its Howes Cave plant for use in portland and masonry cement production. Schoharie Stone Corp. (Schoharie) and Allied Materials Corp. (Cobleskill) produced crushed and broken limestone, which was used for riprap and road construction. The State of New York Department of Public Works in Schoharie County produced gravel for paving purposes in 1956.

Schuyler.—Watkins Glen plants of International Salt Co., Inc., and the Watkins Salt Co. recovered evaporated salt from artificial brines.

Steuben.—Steuben County had three active sand and gravel producers in 1956. The largest producer was Rhinehart & Son Sand & Gravel Co. (Corning) which had an output of structural and paving sand and gravel. The other producers were Bath Sand & Gravel Co. (Bath) and Buffalo Slag Co., Inc. (Cohocton). The Highway Department and State of New York Department of Public Works in Steuben County produced sand and gravel for structural and paving purposes.

Suffolk.—Suffolk County continued to rank first in sand and gravel production in 1956. The principal producer of sand and gravel in Suffolk County was Steers Sand & Gravel Corp., with a pit and fixed plant at Northport. Other active sand and gravel producers during the year were Metropolitan Sand & Gravel Co., with operations at Smithtown and Northport; U. S. Dredging Corp., Huntington; Broad Hollow Estates, East Coast Lumber Terminal, Inc., and J. W. Robinson & Sons, New Highway; Commack Sand & Gravel Co., Commack; Coram Sand & Gravel Corp., Coram; Roanoke Sand & Gravel, Middle Island; Setauket Sand & Gravel Co., East Setauket; and Penn Industries, Inc., Mount Sinai. The Suffolk County Highway Department produced sand and gravel for paving purposes.

Sullivan.—The leading producer of sand and gravel in Sullivan County was Sullivan Highway Products Corp. (Summitville); the other two producers were Louis Pshonick and Liberty Sand & Gravel Co., Inc. (Liberty). The Department of Public Works in Sullivan County produced gravel for paving purposes in 1956. Earl Tomkins with a stone yard in Hancock, processed dimension sandstone quarried in Sullivan County for use in rough construction, rubble, dressed stone, and flagging.

Tioga.—The leading producer of sand and gravel in Tioga County was Central Materials Corp. (Oswego), which recovered structural and paving sand and gravel. The other producers were Herman E. Bunce, Barton; Hollis Reed, Red Creek; and A. O. Swanson, Waverly.

Tompkins.—The leading producer of sand and gravel in Tompkins County was Rumsey-Ithaca Corp. (Ithaca); its output was used mainly for building purposes. University Sand & Gravel Corp. (Brooktondale) produced structural sand and gravel. Mrs. Amy H. Scott (Ulysses) produced paving gravel. The only dimension sandstone

producer in Tompkins County was Finger Lakes Stone Co., whose output was used for construction purposes. Paul Mancini & Sons abandoned its East Ithaca quarry.

The rock-salt mine and mill of Cayuga Rock Salt Co., Inc., near Myers operated during 1956. Evaporated salt was produced from artificial brines by the vacuum-pan process by International Salt Co., Inc., Ludlowville.

Ulster.—The Callanan Road Improvement Co. produced crushed and broken limestone for road construction and riprap. Curbstone was produced at the Jockey Hill quarry of Richard F. Dunn Estate, Elizabeth M. Dunn, executrix. The principal clay producer in Ulster County in 1956 was the Hutton Co., near Kingston, whose production was used for manufacturing heavy clay products. Other producers of miscellaneous clay in the county were Star Brick Corp., East Kingston; Brigham Brick Corp., East Kingston; and Alva S. Staples, Saugerties. James Ricker produced molding sand at his Connelly pit. Raymond Davis (Rosendale) produced building sand. Joe Clark (Kingston) and Tom Shuker (Gardiner) produced paving and road gravel.

Warren.—Jointa Lime Co., Inc., quarried limestone for highway construction and maintenance at its Glens Falls quarry. Glens Falls Portland Cement Co. operated its masonry and portland cement plant and limestone quarry at Glens Falls. Garnet for sandpaper manufacturing and glass grinding and polishing was produced from the open-pit mine and mill of Barton Mines Corp. at North Creek. H. Russell Harris (Glens Falls) produced paving and road gravel. Downing Braley recovered gem stone (garnet) in 1956 near North Creek.

Washington.—The only source of slate in New York in 1956 was Washington County. The principal producer was Central Commercial Co. (Hampton). Other producers included Darius Slate Products, Adolph A. Hadeka, Hilltop Slate Co., Theodore Pafundi, Joseph A. Ponda Slate Co., Western Slate Co., and Zayachek Bros., all of Granville; Henry Phillips, Hampton; and Vermont Structural Slate Co., Whitehall.

Hudson Valley Sand & Stone Co., at its Middle Falls quarry, produced crushed limestone for highway construction, agricultural purposes, and chemical uses and dimension stone for use as rubble in wall facings and fireplaces. The leading sand and gravel producer in Washington County in 1956 was Ray Stout, Argyle. Other producers included Hattie Dawson and Julius H. Hunt, Fort Ann; Ernest LeClair, Clemons; George Lightbody, Argyle; James Wever, Salem; and William Perry, Eagle Bridge. The Argyle superintendent of highways in Washington County produced sand and gravel for paving purposes.

Wayne.—Wayne County had 3 active commercial and 6 Government-and-contractor sand and gravel operations in 1956. M. A. Montmorano & Sons (Clyde) was the leading producer in the county and had an output of gravel that was used for road gravel and paving purposes. The other two commercial producers were Llewellyn Welch (Savannah) and Gustavus W. Young (Clyde). Government-and-contractor producers of sand and gravel for paving purposes in 1956 were Macedon superintendent of highways, Palmyra superintendent of highways, Rose superintendent of highways, Savannah superintendent of highways, Sodus superintendent of highways, and

Walworth superintendent of highways. The General Crushed Stone Co. (Sodus) quarried limestone, which was crushed for use in highway and railroad construction and agricultural purposes.

Westchester.—New York Trap Rock Corp. operated the Verplanck quarry, which produced crushed and broken limestone for use in highway construction and asphalt filler. The Thornwood quarry of Universal Marble Products Corp. produced white marble, which was crushed for various uses. Some of these uses included: Asphalt filler, hand soap, sweeping compounds, adhesives, chemicals, stucco, roofing, and bird gravel. Three commercial sand and gravel producers were active in Westchester County in 1956 and produced building and paving sand and gravel. The producers were: Bedford Hill Concrete Products Corp., Bedford Hills; Camarco Materials & Supply Co., Somers; and Peekskill Masons Supply Co., Peekskill. Joe DeLuca (Peekskill) and DiRubbo & Ellis (Croton) produced emery from the DeLuca mine and the Kingston mine, respectively.

Wyoming.—The Ambluco quarry of American Bluestone Co. (Portageville) produced architectural stone, both sawed and dressed. The Newburgh city engineer produced gravel for paving purposes. Evaporated salt from artificial brines was produced by the open-pan and vacuum-pan processes at the Silver Springs plant of Morton Salt Co.

Yates.—The Jerusalem town superintendent produced gravel for structural purposes in 1956.

The Mineral Industry of North Carolina

This chapter has been prepared under a cooperative agreement for collecting mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of North Carolina.

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NORTH CAROLINA mineral production in 1956 was valued at $40 million—down 3 percent from the $41.2 million reported for 1955. Although substantial gains in value were made by clays, feldspar, and sand and gravel, they were offset by decreases in the value of sheet and scrap mica, crushed limestone, and tungsten concentrates. The value of abrasive stones, gem stones, basalt, granite, marble, olivine, and the metals gold, silver, copper, and lead was also higher than in 1955. Sandstone (quartz) and talc decreased from the preceding year, and there was no production of absestos, miscellaneous stone, or vermiculite in 1956. The value of sand and

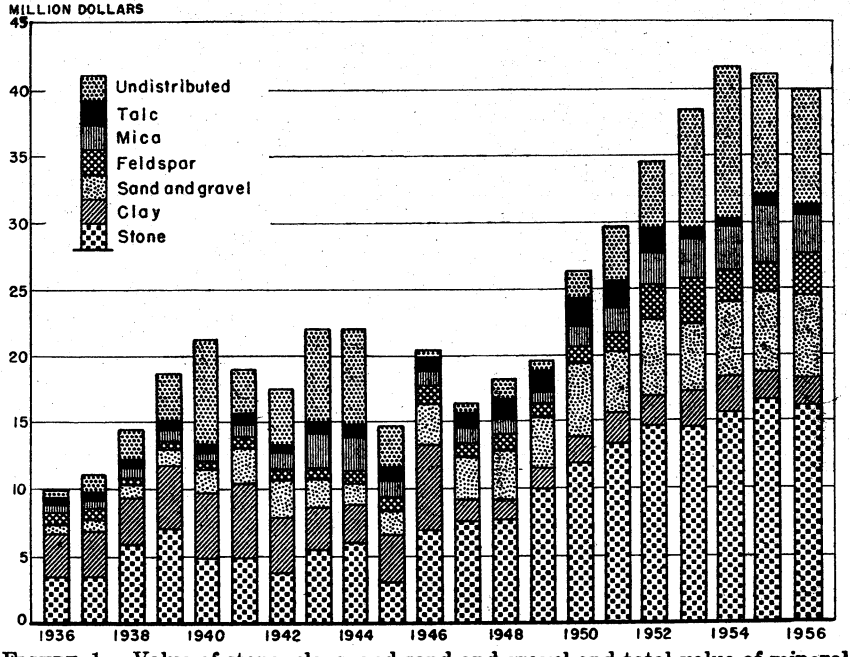

FIGURE 1.—Value of stone, clays, and sand and gravel and total value of mineral production in North Carolina, 1936–56.

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gravel and stone was over 50 percent of North Carolina's mineral-production total. Among the States, North Carolina ranked first in the production of feldspar, sheet and scrap mica and olivine, third in combined production of talc and pyrophyllite and tungsten, and fifth in the production of kaolin; it was the only State reporting the production of millstones.

New developments in the mineral industry of the State included: Sinking of a new shaft at the Ore Knob mine of Appalachian Sulfides, Inc. in Ashe County, construction of a new feldspar-flotation plant in Mitchell County, and opening of a new kyanite mine in Gaston County. Two lease agreements were approved by the North Carolina Council of State for prospecting parts of Albemarle Sound, Pamlico Sound, Pamlico River, and Chowan River for ilmenite.

Under the Defense Minerals Exploration Administration (DMEA) program of Government participation in exploration for critical and strategic minerals, 71 contracts were in force during 1956. In all, $164,575 was spent on these projects during the year, of which the Government share was 75 percent. In 1955 the total spent on 73 projects was $177,298. Two projects—one each in Cabarrus and Vance Counties—were for tungsten and the others for mica.

TABLE 1.—Mineral production in North Carolina, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stones	[2] 227	[3] $12,104	[2] 454	[3] $15,741
Beryllium concentrate—pounds	[4]	[4]	6,302	1,805
Clays	2,375,494	1,792,081	2,663,448	2,026,709
Copper (recoverable content of ores, etc.)—pounds	300	112	[4]	[4]
Feldspar—long tons	242,724	2,184,793	255,637	3,191,559
Gem stones	[5]	10	[5]	1,000
Gold (recoverable content of ores, etc.)—troy ounces	190	6,650	882	30,870
Lead (recoverable content of ores, etc.)	2	596	10	3,140
Mica:				
Scrap	60,887	1,377,035	47,125	1,064,631
Sheet—pounds	553,444	2,745,234	770,903	2,135,057
Sand and gravel	7,785,741	5,911,223	7,580,593	6,264,135
Silver (recoverable content of ores, etc.)—troy ounces	181	164	753	682
Stone	10,903,366	16,532,910	[6] 8,352,274	[6] 11,471,609
Talc and pyrophyllite	125,206	571,689	125,487	529,205
Tungsten concentrates—60-percent WO_3 basis	2,609	[4]	2,732	[4]
Value of items that cannot be disclosed: Asbestos (1955), olivine, stone (crushed limestone, marble, sandstone, basalt and dimension granite and marble, 1956), vermiculite (1955), and values indicated by footnote 4		10,074,950		13,248,948
Total North Carolina		41,210,000		39,985,000

[1] Production as measured by mine shipments, sales or marketable production (including consumption by producers).
[2] Grinding pebbles and tube-mill liners.
[3] Grinding pebbles, tube-mill liners, and millstones.
[4] Figure withheld to avoid disclosing individual company confidential data.
[5] Weight not recorded.
[6] Excludes certain stone; value included with "Items that cannot be disclosed."

TABLE 2.—Average unit value of mineral commodities produced in North Carolina, 1948–51 (average) and 1952–56 [1]

Commodity	1948–51 (average)	1952	1953	1954	1955	1956
Abrasives:						
Grinding pebbles short ton	$17.10	$18.00	$17.60	$20.25	$21.91	$24.60
Tube-mill liners do	16.30	21.75	17.95	22.00	22.71	25.18
Asbestos do	(2)		21.10	17.10	8.95	
Beryl do	275.00		400.00	504.76	591.60	601.67
Clay:						
Kaolin do	20.04	20.80	18.87	18.80	16.69	22.07
Miscellaneous do	.93	1.16	1.16	1.15	[3].61	.58
Coal do	7.65	7.93				
Columbite-tantalite (70-percent concentrate) pound	(2)	3.20				
Feldspar long ton	6.26	10.05	12.28	9.62	9.00	12.48
Manganiferous ore (10–35 percent Mn) long ton	(2)		20.00			
Mica:						
Scrap short ton	25.55	26.48	25.14	23.87	22.62	22.59
Sheet pound	.25	1.12	2.11	3.73	4.96	2.77
Olivine short ton	17.89	28.36	18.78	20.48	16.00	15.08
Quartz do	3.96	4.61	5.70	4.27	(4)	(4)
Sand and gravel:						
Gravel do	1.10	1.11	1.16	1.10	1.15	1.17
Sand do	.40	.38	.47	.47	.49	.58
Stone:						
Granite:						
Crushed do	1.42	1.44	1.42	1.41	1.40	1.37
Dimension do	48.91	54.45	33.90	41.13	33.81	
Limestone: Crushed do	1.35	1.35	1.39	1.39	1.37	1.32
Marble:						
Crushed do	2.70	5.34	5.60	6.75	7.88	12.24
Dimension do	116.38	117.50	117.70	117.62	117.62	117.62
Miscellaneous, crushed do	1.12	1.08	1.21	1.25	1.10	
Sandstone:						
Crushed do	1.36				[3] 4.59	4.30
Dimension do		2.40			6.86	10.98
Traprock: Crushed do	1.66	1.29		1.46	1.43	1.24
Talc and pyrophyllite do	(2)	[5] 15.34	4.85	3.44	4.57	4.22
Vermiculite do	13.09	8.93	8.93	8.92	8.46	

[1] For greater detail on prices by grade and market, see vol. I, Minerals Yearbook, 1956.
[2] Data not available.
[3] Revised figure.
[4] Included with sandstone, crushed.
[5] Average value of products sold or used.

EMPLOYMENT AND INJURIES

Reports submitted to the Bureau of Mines indicate that employment in the mineral industries was higher than in 1955. Employment expanded 62 percent at nonmetal mines, decreased 12 percent at quarries and mills, and decreased 14 percent at sand and gravel quarries.

Injury experience was considerably better than in 1955; frequency rate declined 45 percent below 1955. Frequency rate declined 66 percent at metal mines, declined 28 percent at quarries and mills, and declined 26 percent at nonmetal mines. Two fatal injuries occurred, the same as in 1955.

TABLE 3.—Employment in the mineral industries, 1955–56

Industry	1955			1956 [1]		
	Men working daily	Average active days	Man-days worked	Men working daily	Average active days	Man-days worked
Metal mines	589	301	177,071	[2] 1,410	[2] 338	[2] 477,107
Nonmetal mines	1,095	223	244,409	1,668	238	396,832
Quarries and mills	1,645	230	377,697	1,552	215	333,144
Sand and gravel quarries [3]	415	237	98,475	386	219	84,497
Total	3,744	240	897,652	5,016	257	1,291,580

[1] Preliminary figures.
[2] Includes aluminum smelters.
[3] Excluding Government-and-contractor operations.

TABLE 4.—Injuries in the mineral industries, 1955–56

Industry [1]	1955				1956 [2]			
	Fatal	Nonfatal	Total	Injuries per million man-days	Fatal	Nonfatal	Total	Injuries per million man-days
Metal mines		99	90	508	[3] 2	81	83	174
Quarries and mills	1	98	99	262		63	63	189
Nonmetal mines	1	76	77	315		92	92	232
Total	2	264	266	332	2	236	238	184

[1] Sand and gravel quarries not canvassed.
[2] Preliminary figures.
[3] Includes aluminum smelters.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasive Stones.—Grinding pebbles, millstones, and tube-mill liners were produced in Rowan County. Except for millstones, the value of production was higher than in 1955.

Asbestos.—No asbestos was produced in North Carolina in 1956.

Clays.—The output of clays continued to increase and reached an alltime high in 1956, although its value was still 20 percent lower than in 1954. Tonnage and value were up 12 and 13 percent, respectively, above 1955. Kaolin tonnage increased 3 and value 36 percent. Miscellaneous clay exceeded 1955 figures by 12 percent in tonnage and 7 percent in value. One producer mined kaolin at 2 mines in Avery County, and 26 companies mined miscellaneous clay from 31 mines in 20 counties for use in brick and other clay products.

Feldspar.—Crude-feldspar production was 256,000 long tons valued at $3.2 million; feldspar was the State's fourth-ranking mineral in terms of value. Output was up 5 percent and value 46 percent, the high percentage increase in value resulting from inclusion of value of flotation feldspar for the first time. Ground-feldspar production increased 5 percent above 1955. Consolidated Feldspar Department of International Minerals & Chemical Corp. and Feldspar Corp. operated flotation mills and grinding plants and were the principal producers in 1956.

TABLE 5.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	1,270,720	$1,606,329	1954	1,872,541	$2,519,721
1952	1,357,700	2,080,172	1955	2,375,494	1,792,081
1953	1,466,232	2,534,908	1956	2,663,448	2,026,709

TABLE 6.—Crude feldspar sold or used by producers, 1947–51 (average) and 1952–56

Year	Long tons	Value	Year	Long tons	Value
1947–51 (average)	186,615	$1,101,847	1954	230,744	$2,220,707
1952	240,364	2,416,031	1955	242,724	2,184,793
1953	268,042	3,290,495	1956	255,637	3,191,559

Gem Stones.—Gem stones and gem materials were collected in Avery, Buncombe, Iredell, Macon, and Mitchell Counties in 1956. Minerals reported included: Beryl, corundum, emerald, epidote, feldspar, kyanite, unakite, and quartz.

Mica.—The total value of sheet- and scrap-mica production declined from $4.1 million in 1955 to $3.2 million in 1956—a loss of 22 percent. Most production was sold through the General Services Administration (GSA) to the Government.

There were 69 DMEA contracts for mica active during the year; 24 of these were in force at the end of the year.

In 1956 production was reported from 259 mines in 21 counties compared with 542 mines in 22 counties in 1955. In addition, considerable production could not be identified as to county and/or mine origin. Mitchell, Yancey, Avery, Macon, Stokes, and Cleveland Counties, in the order named, each had a total production value of more than $100,000; together they accounted for 85 percent of the North Carolina mica production; these 6 counties produced 451,000 pounds of sheet valued at $1.75 million and 44,000 tons of scrap valued at $97,000.

Olivine.—Sales of olivine were up 27 percent in tonnage and 19 percent in value. Three mines were active in 1956—2 in Jackson County and 1 in Yancey.

Perlite.—Expanded perlite was produced by Carolina Perlite Co., Inc., at Salisbury from crude material shipped into North Carolina.

Quartz.—Consolidated Feldspar Department of International Minerals & Chemical Corp. and the Feldspar Corp. recovered quartz as a byproduct in feldspar-flotation plants in Mitchell County. In 1955–56 quartz production data are included under stone—sandstone, quartz, and quartzite. Although production was 5 percent higher than in 1955, value was 4 percent lower.

Sand and Gravel.—Production of sand and gravel decreased 3 percent in tonnage but increased 6 percent in value. Commercial sand and gravel made up 64 percent of the tonnage and 77 percent of the production value. Commercial sand—structural and paving—decreased 1 percent in tonnage but was 2 percent higher in value than in 1955. Commercial gravel—structural and paving—was also down

TABLE 7.—Defense Minerals Exploration Administration mica contracts in force during 1956

Operator	Property	County	Contract		
			Date	Total value [1]	Status, Dec. 31, 1956
Garland, A. T., et al	Johnson	Ashe	March 1956	$6,816	Terminated.
Shaffer Mining Co., Inc.	Shaffer	do	October 1955	7,100	Do.
Branch Mining Co	Branch	Avery	do	3,240	Do.
C & D Mining Co	C & D	do	December 1955	4,624	Do.
Phillips, John	Ed Burleson Prospect.	do	November 1956	4,580	In force.
Do	John Prospect	do	September 1956	6,940	Do.
Smith, Howard	Howard Smith	do	October 1955	8,064	Terminated.
Smith, Sam G	Doe Hill	do	December 1955	5,776	Do.
Do	Doe Hill No. 2	do	July 1956	5,164	In force.
Vance, Joe C	Leaning Locust	do	May 1956	2,948	Terminated.
Vance, T. B	Shuffle Vance	do	July 1955	5,310	Do.
Beam, J. R	Back Prospect	Cleveland	November 1956	4,840	In force.
Boone, R. L	Cliff Blanton [2]	do	January 1952	5,650	Terminated.
Buchanan Minerals, Inc.	Dream	Jackson	November 1955	7,200	Do.
Carolina Mining Co	Clark	do	June 1956	3,828	Do.
Do	Hall	do	May 1956	2,776	Do.
Do	Upper Clark	do	November 1956	5,240	In force.
Do	Wilson Prospect	do	December 1956	5,068	Do.
Holland, B. M	Holland Prospects 1 and 2.	do	May 1956	6,576	Terminated.
White, Alvin, et al	Coward	do	June 1955	4,940	Do.
Flynt, W. S	Leatherman	Lincoln	May 1956	4,440	Do.
Carolina Mining Co	Zeb Angel	Macon	May 1955	5,276	Do.
Crawford, E	Setzer	do	November 1956	5,484	In force.
Ferguson Mining Co	Ferguson	do	February 1956	4,832	Terminated.
Higdon, Ted	Dalton	do	July 1956	3,996	Do.
Do	Wild Cove	do	August 1956	3,148	Do.
Knob Mining Co	Lyle Knob	do	March 1956	4,616	Do.
Mica Industries, Inc	Baird Cove [2]	do	December 1952	9,100	Do.
Ward, A	Harris	do	September 1955	6,500	Do.
Black Jack Mining Co	Black Jack	Mitchell	February 1956	4,416	In force.
Boone, Howard	Howard Prospect	do	January 1956	3,288	Terminated.
Buchanan, C. D	Boone	do	December 1956	5,552	In force.
Freeman, Paul	Hesby Edwards	do	August 1955	4,464	Terminated.
Gouge, M., et al	Turbyfill Prospect	do	November 1956	5,500	In Force
Greene, W. A	Branch	do	November 1955	4,116	Terminated
Grindstaff, G	Grover	do	October 1956	3,388	In Force
Grindstaff, Roy et al	John Conley	do	June 1955	4,488	Terminated.
Huskins, Ed	Bill Prospects 1 and 2.	do	December 1956	4,936	In force.
Huskins, Ed & Gage, Fred.	Briggs	do	October 1956	2,696	Do.
Huskins, Ed	George	do	July 1956	4,104	Do.
Do	Hesby Edwards	do	June 1956	3,553	Terminated.
Huskins, Ed, et al	Randolph	do	June 1955	5,616	Do.
Huskins, P., et al	J. W. Boone	do	October 1955	4,016	Do.
Jarrett, J. & Grindstaff, F.	McBee Prospect	do	May 1956	10,662	In force.
Jarrett, John, et al	Fred Robinson	do	December 1955	4,220	Terminated.
McKinney, B	S. K. Kirby	do	April 1956	5,080	Do.
Phillips, C. R	Ed Prospect	do	June 1956	5,488	Do.
Do	Willis	do	August 1955	4,304	Do.
Phillips, John, et al (Hawk Mining Co.)	Hawk	do	July 1956	6,760	In force.
Phillips, John	May	do	August 1956	3,524	Terminated.
Do	Queen	do	December 1955	5,744	Do.
Do	Roby	do	September 1956	6,612	In force.
Phillips, John, et al	Bob Wise	do	January 1956	10,636	Terminated.
Phillips, S. L	Greene Prospect	do	February 1956	4,552	Do.
Do	Old Buchanan	do	June 1956	4,016	Do.
Richmond, Thomas, et al.	Black Bull	do	August 1955	4,464	Do.
Sparks, B., et al	Burleson & Gouge Prospect.	do	May 1956	5,192	Do.
Stevenson, Ted, et al	Stevenson	do	February 1956	6,716	In force.
Biggerstaff, John L	Dycus	Rutherford	July 1955	9,288	Terminated.
Toney, F & G	Claude Blanton	do	July 1956	5,412	In force.
Mines & Mining, Inc	Farlow Gap	Transylvania	July 1955	5,136	Do.

See footnotes at end of table.

TABLE 7.—Defense Minerals Exploration Administration mica contracts in force during 1956—Continued

Operator	Property	County	Contract		
			Date	Total value [1]	Status, Dec. 31, 1956
Beam, J. R. & Phillips, J.	Little Ray	Yancey	November 1955	$12,735	Terminated.
Beam, J. R., et al	Willie Shanty	do	July 1955	5,824	Do.
Boone, Ed	Goog Rock	do	October 1955	10,940	Do.
Boone, J	Riddle Prospects 1, 2, and 3.	do	December 1956	5,472	In force.
Brown, C. L. & Rathburn, G. C.	Fox	do	August 1954	5,788	Do.
Buchanan & Snyder	Jim Riddle	do	August 1955	4,764	Terminated.
McMurry, G., et al	Mitchell Branch	do	November 1956	5,876	In force.
Murphy Mining Co	Murphy	do	December 1956	4,236	Do.
Phillips, John	Laws	do	September 1955	5,096	Terminated.
Young & Burleson	Ruby	do	July 1954	4,350	Do.

[1] Government participation, 75 percent, except where noted. Total actual expenditures by Government on terminated and certified contracts were often less than the obligated funds.
[2] Government participation, 90 percent.

TABLE 8.—Mica sold or used by producers, 1955–56

Kind		1955		1956	
		Quantity	Value	Quantity	Value
Sheet mica:					
Uncut punch and circle	pounds	366,505	$39,365	565,618	$48,205
Larger uncut mica	do	3,263	4,094	41,979	29,335
Half trim purchased by GSA	do	(1)	(1)		
Full trim purchased by GSA [2]	do	183,676	2,701,775	163,306	2,057,517
Total sheet mica	do	553,444	2,745,234	770,903	2,135,057
Scrap mica: Total	short tons	60,887	1,377,035	47,125	1,064,631
Grand total (sheet and scrap)	do	61,164	4,122,269	47,510	3,199,688

[1] Combined with full-trimmed to avoid disclosing individual company confidential data.
[2] Includes full-trimmed-mica equivalent of hand-cobbed mica.

1 percent in tonnage and 2 percent higher in value. Government-and-contractor sand was 4 percent lower in tonnage and 44 percent higher in value, while Government-and-contractor gravel was down 16 and 27 percent, respectively, in tonnage and value. Commercial sand and gravel was produced in 8 counties, sand only in 7 others, and gravel in 7 counties. Twenty-three companies operated 31 pits in these counties compared with 26 companies with 35 pits in 1955. Government-and-contractors produced sand in 57 counties, gravel in 8, and both sand and gravel in 10 others—a total of 75 compared with 53 in 1955.

TABLE 9.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	6,022,153	$3,986,630	1954	7,441,200	$5,508,284
1952	8,724,748	5,665,169	1955	7,785,741	5,911,223
1953	6,910,982	4,992,991	1956	7,580,593	6,264,135

TABLE 10.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand:				
Structural	1,754,898	$1,181,645	1,767,319	$1,250,820
Paving	353,580	222,766	310,153	188,580
Filter	(1)	(1)	6,000	4,000
Railroad ballast	(1)	(1)	(1)	(1)
Other	26,730	25,865	(1)	(1)
Total	[2] 2,135,208	[2] 1,430,276	[2] 2,083,472	[2] 1,443,400
Gravel:				
Structural	724,452	1,033,325	881,246	1,309,121
Paving	1,720,307	1,875,511	1,545,957	1,661,208
Railroad ballast and other	(1)	(1)	(1)	(1)
Total	[2] 2,444,759	[2] 2,908,836	[2] 2,427,203	[2] 2,970,329
GOVERNMENT-AND-CONTRACTOR OPERATIONS				
Sand:				
Structural	146,445	47,844	58,073	50,026
Paving	2,187,741	703,210	2,190,367	1,030,310
Total	2,334,186	751,054	2,248,440	1,080,336
Gravel:				
Structural	8,260	8,606	76,161	152,322
Paving	543,308	497,375	387,629	214,628
Total	551,568	505,981	463,790	366,950
ALL OPERATIONS				
Sand	4,579,967	4,339,112	4,510,675	4,413,729
Gravel	2,885,754	1,257,035	2,712,230	1,447,286
Undistributed	320,020	315,076	357,688	403,120
Grand total	7,785,741	5,911,223	7,580,593	6,264,135

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Incomplete, portion not included is combined with "Undistributed."

Stone.—Total stone production was slightly below that of 1955. Basalt and marble showed large gains in tonnage and value, while limestone and sandstone (including quartz) were lower than in 1955. Crushed granite tonnage increased 6 percent and its value 4 percent. Crushed commercial granite was 3 percent higher in tonnage and value and Government-and-contractor granite was up 29 percent in tonnage and 14 percent in value. No miscellaneous stone was reported in 1956.

Stone ranks first among North Carolina minerals in both total tonnage and value. Granite was quarried in 27 counties, limestone in 5, basalt in Union County, marble in Cherokee, and sandstone in Mitchell (byproduct quartz) and Swain Counties. Excluding quartz, 22 operators produced commercial stone from 37 quarries, including 29 granite and 6 limestone quarries and 1 traprock and 1 sandstone quarry. North Carolina State Highway and Public Works Commission produced crushed stone from 18 granite quarries and 1 limestone quarry, and the United States Forest Service quarried a minor tonnage of limestone. Noncommercial stone comprised 11 percent of the tonnage and 10 percent of the value of the total crushed-stone production in 1956.

TABLE 11.—Crushed granite sold or used by producers, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	4,670,346	$6,691,472	1954	6,990,173	$9,897,038
1952	6,213,443	8,949,769	1955	7,878,491	11,004,765
1953	6,438,416	9,165,805	1956	8,351,953	11,468,086

Talc and Pyrophyllite.—Crude-talc and pyrophyllite production totaled 125,000 tons valued at $529,000—virtually the same tonnage as in 1955 but 7 percent lower in value. Ground talc and pyrophyllite also remained virtually unchanged in tonnage, with their value down 8 percent. Sawed talc, on the other hand, increased 16 percent in tonnage and 27 percent in value. Pyrophyllite was mined in Alamance, Moore, Orange, and Randolph Counties and talc in Cherokee County.

TABLE 12.—Talc and pyrophyllite production, 1947–51 (average) and 1952–56

Year	Crude mined		Sales (crude, sawed, and ground)	
	Short tons	Value	Short tons	Value
1947–51 (average)	104,389	(1)	103,718	$1,565,002
1952	116,722	(1)	115,481	1,771,518
1953	119,341	$578,239	118,614	1,909,027
1954	112,704	388,428	105,384	1,771,778
1955	125,206	571,689	120,885	1,999,560
1956	125,487	529,205	121,782	1,921,834

[1] Data not available.

Vermiculite.—No crude vermiculite was mined in the State in 1956. Exfoliated vermiculite was produced from crude shipped into the State by Alabama Vermiculite Co., Sylvia; American Vermiculite Co., Altapass; Roy M. Biddle, Franklin; and Zonolite Co., Highpoint. Although quantity sold or used declined 17 percent, the value remained virtually the same as in 1955.

METALS

Beryllium Concentrate.—Beryl production was 3 tons valued at $1,800; it came from 5 or more counties, including Alexander, Ashe, Avery, Mitchell, and Yancey.

Gold, Silver, Copper, and Lead.—H & H Mines, Inc., of Enfield (Halifax County) greatly increased production in 1956. Besides copper, 10 tons of lead, 882 ounces of gold, and 753 ounces of silver were recovered. Appalachian Sulfides, Inc., continued development at the Ore Knob mine in Ashe County. During the year the shaft was sunk 461 feet and completed at 1,037 feet. Drifting and crosscutting totaled 1,688 feet and diamond drilling 6,377 feet. A flotation mill with 700 tons daily capacity was under construction. Completed during the year were: Assay office, hoist and compressor building, changehouse, warehouse, machine and electric shops, and office.

Tungsten Concentrate.—Production of tungsten came from the Hamme mine in Vance County owned by the Tungsten Mining Co.

A total of 2,858 short tons (60-percent WO_3 basis) of concentrate was recovered in 1956—an increase of 8 percent above 1955. Sales were 2,732 tons (60-percent WO_3 basis) compared with 2,609 tons in the previous year. The value of shipments declined 15 percent below 1955, because smaller tonnages were sold to the Government for stockpiling in 1956.

Two DMEA contracts were active during the year; Carolina Tungsten Mining Co. explored the Furniss mine in Cabarrus County under a contract for $26,400, and Tungsten Mining Co. conducted exploration at the Hamme mine under a contract for $246,600; Government participation was 75 percent in both contracts.

TABLE 13.—Tungsten concentrate produced and shipped, 1947–51 (average) and 1952–56

Year	Produced		Shipped from mines	
	Short tons, 60-percent WO_3	Units	Short tons, 60-percent WO_3	Units
1947–51 (average)	917	55,002	911	54,658
1952	1,248	74,904	1,254	75,226
1953	[1] 2,146	128,645	2,074	124,465
1954	[1] 2,519	151,166	2,538	152,296
1955	[1] 2,638	158,304	2,609	156,537
1956	2,858	171,451	2,732	163,913

[1] Revised figure.

REVIEW BY COUNTIES

Of North Carolina's 100 counties, mineral production was reported from 96, with Mitchell, Guilford, Wilson, Surrey, Cleveland, and Rowan leading; each produced over $1 million. In addition to the detailed county production listed below, 264,000 pounds of sheet mica, 3,000 tons of scrap mica, a considerable quantity of crude feldspar, 657,000 tons of sand and gravel, 229,000 tons of crushed granite, 290 tons of crushed limestone, and a small quantity of gem stones were produced; all these were of undetermined county origin.

Alamance.—Boren & Harvey (Snow Camp mine) mined 14,700 tons of pyrophyllite for refractory purposes. North Carolina State Highway and Public Works Commission (Bason quarry) crushed 29,700 tons of granite for concrete aggregate and roadstone. Hanford Brick Co. Inc. mined miscellaneous clay for heavy clay products; production increased 25 percent over 1955.

Alexander.—A. H. DeVier (Ted Warren mine) produced 78 pounds of sheet mica.

Anson.—W. R. Bonsal Co., lessees of B. V. Hedrick, and the State highway commission mined structural, paving and railroad-ballast sands and structural, paving, railroad-ballast, and other gravels; production increased 7 percent over 1955. The State highway commission (Sugartown quarry) crushed 32,700 tons of granite for concrete aggregate and roadstone.

TABLE 14.—Value of mineral production in North Carolina, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Alamance	$158,122	$138,410	Talc, granite, miscellaneous clay, sand and gravel.
Alexander	(2)	11,858	Sand and gravel, mica, beryl.
Alleghany	7,635	3,523	Sand and gravel.
Anson	(2)	(2)	Sand and gravel, granite.
Ashe	(2)	(2)	Sand and gravel, mica, beryl.
Avery	900,013	989,311	Kaolin, mica, feldspar, sand and gravel, gem stones, beryl.
Beaufort	45,872	50,426	Sand and gravel.
Bertie		1,530	Do.
Bladen	3,050	62,050	Do.
Brunswick	15,320	40,900	Do.
Buncombe	(2)	(2)	Sand and gravel, granite, mica, feldspar, gem stones.
Burke	(2)	64,254	Sand and gravel, mica.
Cabarrus	(2)	(2)	Sand and gravel.
Caldwell	(2)	(2)	Granite, sand and gravel, mica.
Camden		8,000	Sand and gravel.
Carteret		1,500	Do.
Caswell	897,145	748,696	Granite, sand and gravel.
Catawba	17,756	(2)	Granite, miscellaneous clay, sand and gravel.
Chatham	231,027	219,383	Miscellaneous clay, granite.
Cherokee	213,302	294,122	Marble, talc, granite.
Chowan		25,000	Sand and gravel.
Clay	10		
Cleveland	(2)	(2)	Limestone, mica, sand and gravel, miscellaneous clay.
Columbus	9,859	81,000	Sand and gravel.
Craven	11,250	7,500	Do.
Cumberland	(2)	363,255	Sand and gravel, miscellaneous clay.
Currituck		5,500	Sans and gravel.
Dare		15,000	Do.
Davidson	140,900	109,200	Sand and gravel, miscellaneous clay.
Davie	24,000	36,540	Sand and gravel, feldspar.
Duplin	2,660	2,320	Sand and gravel.
Durham	(2)	(2)	Granite, miscellaneous clay.
Forsyth	816,858	583,635	Granite, sand and gravel.
Franklin	2,700	5,638	Sand and gravel.
Gaston	36,353	61,598	Mica, miscellaneous clay, sand and gravel.
Gates		7,000	Sand and gravel.
Granville	27,533	23,784	Granite, sand and gravel.
Greene	20,700	45,000	Sand and gravel.
Guilford	2,938,857	(2)	Granite, miscellaneous clay, sand and gravel.
Halifax	7,522	36,543	Gold, lead, sand and gravel, copper, silver.
Harnett	(2)	(2)	Sand and gravel.
Haywood	(2)	(2)	Granite, sand and gravel, mica.
Henderson	330,271	250,100	Limestone, miscellaneous clay.
Hertford		6,188	Sand and gravel.
Hoke	(2)	(2)	Do.
Hyde		31,538	Do.
Iredell	(2)	30,401	Sand and gravel, gem stones.
Jackson	(2)	(2)	Olivine, mica.
Johnston	15,000	26,000	Sand and gravel.
Jones	22,941	24,675	Do.
Lee	253,150	257,228	Miscellaneous clay, sand and gravel.
Lenoir	94,650	142,805	Sand and gravel.
Lincoln	(2)	(2)	Mica, sand and gravel.
Macon	660,608	(2)	Mica, sand and gravel, gem stones.
Madison	(2)	(2)	Feldspar.
Martin		15,058	Sand and gravel.
McDowell	(2)	(2)	Sand and gravel, limestone, mica.
Mecklenburg		(2)	Granite.
Mitchell	[3] 3,695,889	3,969,729	Feldspar, mica, sandstone, beryl, gem stones.
Montgomery	126,211	114,134	Miscellaneous clay, sand and gravel.
Moore	438,294	(2)	Pyrophyllite, sand and gravel.
Nash	5,215	(2)	Miscellaneous clay, sand and gravel.
New Hanover	(2)	15,000	Sand and gravel.
Northampton	(2)	241,766	Sand and gravel, miscellaneous clay.
Onslow	(2)	(2)	Limestone, sand and gravel.
Orange	114,540	(2)	Pyrophyllite, granite.
Pamlico		750	Sand and gravel.
Pasquotank		16,200	Do.
Pender	4,950	1,340	Do.
Perquimans		4,000	Do.
Person	9,050	6,068	Do.
Pitt	33,750	54,296	Do.
Polk	5,800	25,000	Do.
Randolph	(2)	(2)	Granite, pyrophyllite, sand and gravel.

See footnotes at end of table.

TABLE 14.—Value of mineral production in North Carolina, 1955–56, by counties [1]—Continued

County	1955	1956	Minerals produced in 1956 in order of value
Richmond		$5,120	Sand and gravel.
Robeson	$8,000	28,500	Do.
Rockingham	193,414	208,831	Granite, miscellaneous clay, mica, sand and gravel.
Rowan	1,230,780	1,220,936	Granite, miscellaneous clay, sand and gravel, abrasive stones.
Rutherford	88,916	171,369	Sand and gravel, mica, beryl.
Sampson	60,610	123,854	Miscellaneous clay, sand and gravel.
Scotland	12,000	15,898	Sand and gravel.
Stanly	[3] 163,545	234,490	Miscellaneous clay, granite.
Stokes	177,283	253,892	Mica, sand and gravel, miscellaneous clay.
Surry	(2)	(2)	Granite, sand and gravel.
Swain	(2)	(2)	Limestone, feldspar, sandstone.
Transylvania	(2)	170	Mica.
Tyrrell		300	Sand and gravel.
Union	(2)	(2)	Traprock, granite, miscellaneous clay, sand and gravel.
Vance	(2)	(2)	Tungsten, granite.
Wake	(2)	(2)	Granite, sand and gravel.
Washington		1,766	Sand and gravel.
Watauga	(2)	(2)	Sand and gravel, mica, granite.
Wayne	54,266	140,573	Sand and gravel.
Wilkes	13,752	(2)	Sand and gravel, granite, mica.
Wilson	1,454,756	1,774,309	Granite, sand and gravel.
Yadkin	(2)	(2)	Do.
Yancey	[3] 901,757	765,027	Mica, sand and gravel, feldspar, olivine, beryl.
Undistributed	[3] 24,512,158	25,765,483	
Total	41,210,000	39,985,000	

[1] The following counties are not listed because no production was reported: Edgecombe, Graham, and Warren.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Revised figure.

Ashe.—McCrary Construction Service and the State highway commission mined paving gravel; production increased considerably over 1955 owing to initial production by McCrary. Hawkins Mining Co. (Duncan No. 2 mine), Johnson Mining Co. (Johnson mine), and Hayden Ollis (Osborne mine) mined 16,000 pounds of sheet mica. Appalachian Sulfides, Inc. continued underground development and surface-plant construction at the Ore Knob copper mine.

Two DMEA mica contracts were in force.

Avery.—Harris Clay Co. (Gusher Knob and Kaolin mines) mined kaolin for whiteware, floor and wall tile, refractories, plastics, and artificial abrasives; production increased 8 percent over 1955. Over 38 companies mined 276,000 pounds of sheet mica and 6,800 tons of scrap mica; leading producers of sheet mica were: Elk Mica Miners (Elk mine), Dellinger Bros. (Charlie Ridge mine), Donald Autrey (Mill Race mine), and Frank Burleson (Emmons Knob mine); the leading producer of scrap mica was Harris Clay Co. (Gusher Knob and Kaolin mines). Nine DMEA mica contracts were active.

The Feldspar Corp. operated the Buchanan, Dugger, Hughes, and Pine Patch mines for feldspar; production more than doubled that in 1955. Warren Duncan, W. M. Johnson, and F. O. Scruggs produced a small quantity of gem stones.

Buncombe.—Bell Sand Co., Grove Stone & Sand Branch of B. V. Hedrick Gravel & Sand Co., and James Harris (Reed & Abee mine) mined structural and paving sands and structural, paving and railroad ballast gravels; production declined 26 percent below 1955, owing to decreased production from the Reed & Abee mine. The State highway commission (Weaverville quarry) crushed 36,600 tons of granite for concrete aggregate and roadstone.

TABLE 15.—Sand and gravel produced by the State highway commission in 1956, by counties

County	Sand (short tons)	Gravel (short tons)	Use
Alamance	1,000		Paving sand.
Alexander	36,000		Do.
Alleghany		1,600	Paving gravel.
Anson	(1)	(1)	Paving sand and gravel.
Ashe		(1)	Paving gravel.
Avery	600		Paving sand.
Beaufort	67,200		Do.
Bertie	5,100		Do.
Bladen	56,000	6,100	Paving sand and paving gravel.
Brunswick		40,900	Paving gravel.
Burke	142,000	30,000	Paving sand and paving gravel.
Cabarrus	(1)	(1)	Paving sand and gravel.
Caldwell	5,300		Paving sand.
Camden	32,000		Do.
Carteret	2,000		Do.
Catawba	54,000		Do.
Chowan	100,000		Do.
Cleveland	69,800		Do.
Columbus	81,000		Do.
Craven	10,000		Do.
Cumberland	(1)	(1)	Structural, paving and railroad ballast sand and structural and paving sand.
Currituck	22,000		Paving sand.
Dare	56,000		Do.
Davidson	22,000	136,000	Paving sand and paving gravel.
Davie	61,000		Paving sand.
Duplin		23,200	Paving gravel.
Forsyth	(1)		Structural and paving sand.
Franklin	11,300		Paving sand.
Gaston	48,400		Do.
Gates	28,000		Do.
Granville	3,000		Do.
Greene	60,000		Do.
Guilford	5,500	10,000	Paving sand and paving gravel.
Halifax	5,400		Paving sand.
Harnett	(1)	(1)	Structural, paving, filler, and ballast sand, and structural, paving sand and gravel, and railroad ballast gravel.
Hertford	20,600		Paving sand.
Hyde	56,200		Do.
Iredell	101,300		Do.
Johnston	26,000		Do.
Jones	(1)	(1)	Paving sand and paving gravel.
Lee	1,800		Paving sand.
Lenoir	(1)	(1)	Structural and paving sand and structural gravel.
Lincoln	41,900		Paving sand.
Martin	52,200		Do.
Montgomery	14,000	22,100	Paving sand and paving gravel.
Moore	(1)		Structural and paving sand.
Nash	(1)		Paving sand.
Northampton	(1)	(1)	Structural and paving sand and structural gravel.
Onslow		(1)	Paving gravel.
Pamlico	1,000		Paving sand.
Pasquotank	60,000		Do.
Pender	13,400		Do.
Perquimans	16,000		Do.
Person	9,300		Do.
Pitt	72,400		Do.
Polk	25,000		Do.
Richmond	5,500	3,800	Paving sand and paving gravel.
Robeson	114,000		Paving sand.
Rockingham	(1)		Paving gravel.
Rowan	38,000		Paving sand.
Sampson		22,200	Paving gravel.
Scotland		15,900	Do.
Stokes	82,000		Paving sand.
Surry		(1)	Paving gravel.
Tyrrell	1,200		Paving sand.
Union	8,000		Do.
Wake	3,600		Do.
Washington	7,100		Do.
Watauga	(1)	(1)	
Wayne	(1)		Structural and paving sand.
Wilkes	20,000	41,200	Paving sand and paving gravel.
Wilson	30,600		Paving sand.
Yadkin	4,400	44,000	Paving sand and paving gravel.

[1] See county review.

Seven companies mined 2,000 pounds of sheet mica; the leading producer was S & B Mining Co. (Watkins mine). The Feldspar Corp. (Arrowood mine) mined feldspar; production increased 39 percent over 1955. R. A. Campbell and John Vance produced a small quantity of gem stones.

Burke.—Buchanan & Beam Mining Co. (Britton mine), R. P. Vanhorn (Vanhorn mine), and D. A. Young (Young mine) mined 2,900 pounds of sheet mica and 9 tons of scrap mica.

Cabarrus.—The State highway commission and Lee White Gravel Pit (Concord mine) mined paving sand and gravel; production declined 56 percent below 1955.

DMEA activity consisted of a project for tungsten by Carolina Tungsten Mining Co. amounting to $26,400 at the Furniss mine.

Caldwell.—Clement Bros. Inc. (Caldwell quarry), crushed granite for concrete and roads; production was nearly 4 times that of 1955. Bowman Bros. (Bowman mine) mined 200 pounds of sheet mica.

Caswell.—Lambert Bros. (Danville quarry) and the State highway commission (Ivy Bluff quarry) crushed 587,000 tons of granite for concrete aggregate and roadstone.

Catawba.—Superior Stone Co. (Hickory quarry) crushed granite for concrete aggregate and roadstone. Statesville Brick Co. mined 119,000 tons of miscellaneous clay for heavy clay products.

Chatham.—Boren Clay Products Co., Chatham Brick & Tile Co. Inc., Cherokee Brick Co., and Pomona Terra Cotta Co. mined 298,000 tons of miscellaneous clay for heavy clay products. The State highway commission (Goldston quarry) crushed 21,100 tons of granite for concrete aggregate and roadstone.

Cherokee.—Columbia Marble Co. (Pleasant Valley quarry) quarried dimension marble for exterior, dressed building stone, and cut and dressed monumental stone and crushed marble for terrazzo and agstone; production of dimension marble was 73 percent higher than in 1955, and production of crushed marble increased 59 percent. The Hitchcock Corp. (Nancy Jordan mine) and Minerals & Metals Corp. (Mulberry Gap mine) mined talc for crayons, insecticides, rubber, textiles, toilet preparations, and other uses. The State highway commission (McDonald quarry) mined 5,100 tons of crushed granite for concrete aggregate and roadstone.

Cleveland.—Superior Stone Co. (Kings Mountain quarry) crushed limestone for concrete aggregate and roadstone; production decreased 13 percent below 1955. Eighteen individuals mined 4,900 pounds of sheet mica; Ellis Mining Co. (Magness mine), W. H. Humphries and Pink Loveless (Fred Blanton mine), and Sparks & Buchanan (Carpenter mine) were the leading producers. Kings Mountain Mica Co. Inc. (Patterson mine) mined scrap mica. Two DMEA contracts were in force. Bennett Brick & Tile Co. (Kings Mountain mine) mined 21,800 tons of miscellaneous clay for heavy clay products.

Cumberland.—Becker County Sand & Gravel Co. (Fayetteville mine), Bryan Rock & Sand Co. (Linden mine), and State highway commission mined 383,000 tons of structural, paving and railroad-ballast sands and structural and paving gravels. Ideal Brick Co. (Linden mine) mined 52,000 tons of miscellaneous clay for heavy clay products.

Davidson.—Cunningham Brick Co. (Thomasville mine) mined 52,000 tons of miscellaneous clay for heavy clay products.

Davie.—Clinchfield Sand & Feldspar Co. opened the Porter-Strand mine and produced 750 tons of feldspar.

Durham.—Nello L. Teer Co. crushed granite for concrete and roads; production decreased 11 percent below 1955. Borden Brick & Tile Co. mined 47,000 tons of miscellaneous clay for heavy clay products.

Forsyth.—W. E. Graham & Sons (Graham quarry) and Piedmont Quarry Co. (Salem quarry) crushed 474,000 tons of granite for concrete aggregate and roadstone. Ira Pope & Sons, Inc. (Yadkin River mine), and the State highway commission mined 112,000 tons of structural and paving sand.

Gaston.—Four companies mined 11,700 pounds of sheet mica; the leading producers were: Arlind Crowder (Huskins mine), Esper Willis (Gant mine), and Garnet Mining Co. (Self and Kings Mountain mines). Kendrick Brick & Tile Co. (Mount Holly mine) mined 29,600 tons of miscellaneous clay for heavy clay products.

Granville.—The State highway commission crushed 11,000 tons of granite for concrete aggregate and roadstone and mined 3,000 tons of paving sand.

Guilford.—Buchanan Stone Co. (Buchanan quarry), Pioneer Quarries Co. (Guil quarry), State highway commission (Pearman quarry), and Superior Stone Co. (Jamestown, Pomona and Reuben quarries) crushed granite for concrete aggregate roadstone and stone sand; production decreased 21 percent. Boren Clay Products Co. (Pleasant Garden mine) mined 87,500 tons of miscellaneous clay for heavy clay products. Zonolite Co. operated its High Point plant for exfoliated vermiculite.

Halifax.—H & H Mines, Inc. operated the H & H mine, and recovered 882 fine ounces of gold and 753 fine ounces of silver, as well as copper and lead.

Harnett.—Becker County Sand & Gravel Co. (Senter mine), Southern Sand & Gravel Co., and the State highway commission mined structural, paving, filler, and railroad-ballast sands and structural, paving, and railroad-ballast gravels; production expanded 28 percent over 1955.

Haywood.—Clement Bros., Inc., opened a new quarry and crushed granite for concrete aggregate and roadstone. Sale & Alexander mined structural and paving sands and structural, paving, and other gravels; production decreased 12 percent. Everett L. Poston (Shining Rock mine) and William Willis (Big Ridge mine) mined a small quantity of sheet mica.

Henderson.—Cogdill Limestone Co., Inc. (Cogdill quarry), and Fletcher Limestone Co. (Fletcher quarry) crushed 209,000 tons of limestone for concrete aggregate and roadstone. Etowah Brick Co., Inc. (Etowah mine), mined 23,300 tons of miscellaneous clay for heavy clay products.

Hoke.—Cumberland Gravel & Sand Co. (Vass mine) mined structural sand and gravel; production expanded 36 percent.

Iredell.—R. A. Campbell produced a small quantity of gem stones.

Jackson.—Harbison-Walker Refractories Co. (Addie mine) and Balsam Gap Co. (Balsam Gap mine) expanded production of olivine by 22 percent over 1955. Ten companies mined 4,000 pounds of

sheet mica and 149 tons of scrap mica. Leading producers of sheet mica were Southern Mineral Development Co., Inc. (Buzzard Roost mine), Carolina Mining Co. (Eagle Cope mine), and Buchanan Minerals, Inc. (Dream No. 2 mine). Carolina Mining Co. (Clark mine) was the only producer of scrap mica. Seven DMEA mica contracts were in force.

Jones.—The Simmons Marl & Lime Co. (Simmons mine) and the State highway commission mined 12,000 tons of paving sand and 12,500 tons of paving gravel.

Lee.—The Sanford Brick & Tile Co. (Colon mine) and Borden Brick & Tile Co. (Sanford mine) mined miscellaneous clay for heavy clay products.

TABLE 16.—Miscellaneous clay sold or used by producers in Lee County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	262,936	$252,741	1954	360,831	$418,564
1952	348,600	397,200	1955	415,000	253,150
1953	314,000	378,800	1956	442,500	256,700

Lenoir.—Barrus Construction Co. (Kinston mine) and the State highway commission mined 164,000 tons of structural and paving sands and 8,500 tons of structural gravel.

Lincoln.—Eight companies mined sheet mica; the leading producers were Harold & Guy Brown (Brown mine) and A. W. Warlick (Warlick mine).

The DMEA activity consisted of a prospect for sheet mica by W. S. Flynt at the Leatherman mine, amounting to $4,440.

Macon.—Eighteen companies mined 18,200 pounds of sheet mica; the leading producers were Harris Mining Co. (Harris mine), N. E. Mashburn (Bowers, Bruce, and Rock Cut mines), Mica Development Corp. (Chalk Hill mine), and Parks Brendle (George Reid mine). Four companies mined scrap mica, but the leading producer was Macon Mining Co. (Shepherds Knob mine). Harp Block Co. mined 3,400 tons of structural sand. R. A. Campbell, Warren Duncan, and W. M. Johnson mined a small quantity of gem stones. Roy M. Biddle operated the Franklin plant for exfoliated vermiculite.

Eight DMEA mica contracts were in force.

Madison.—The Feldspar Corp. produced a small quantity of feldspar at the Metcalf mine.

McDowell.—Becker County Sand & Gravel Co. (Marion mine) mined structural and paving sands and structural, paving and railroad-ballast gravels. The State highway commission (Woodlawn quarry) crushed 82,000 tons of limestone for concrete aggregate and roadstone. A small quantity of sheet mica was mined by Bennett & Edwards (Wiseman mine).

Mecklenburg.—The State highway commission and Superior Stone Co. (Charlotte quarry) crushed granite for concrete aggregate and roadstone.

Mitchell.—Six companies mined feldspar; the leading producers were International Minerals & Chemical Corp. (Hawkins and Kona

mines), The Feldspar Corp. (Bear Creek, Bennett, Dogwood Flats, Gopher, Neilus, Poteat, Wiseman, and Young mines). Feldspar production increased 1 percent over 1955. Mica was produced at 77 mines. The leading producers of sheet mica were: R & B Mining Co. (R. B. Phillips mine), Sink Hole Miners (Sink Hole mine), Cook Mining Co. (Robinson mine), W. K. Buchanan (Martin mine), Claude Buchanan (Horton Rock mine), J. E. Wilson (Bee Ridge mine), Birch Mining Co. (Birch mine), T-Cut Mining Co. (T-Cut mine), Abernathy Mining Co. (Abernathy mine), and Mountain Mining Co. (Jimmy Cut mine). The leading producers of scrap mica were: The Feldspar Corp. (Poteat and Wiseman mines), International Minerals & Chemical Corp. (Kona and Hawkins mines), and English Mica Co. (Martin mine). Sheet-mica production totaled 89,700 pounds and scrap-mica production 11,800 tons.

International Minerals & Chemical Corp. and the Feldspar Corp. recovered crushed sandstone (quartz) from feldspar milling; production increased 5 percent over 1955. Linten B. Greene and the Weatherspoon Mining Co. mined 2,200 pounds of beryl. R. A. Campbell, Warren Duncan, F. O. Scruggs, and John Vance produced a small quantity of gem stones. American Vermiculite Co. operated the Altapass plant for exfoliated vermiculite.

Twenty nine DMEA exploration contracts for mica were in force in Mitchell County.

Montgomery.—Mt. Gilead Brick Co. mined 150,000 tons of miscellaneous clay for heavy clay products. Harrison Sand Pit produced 56,500 tons of structural sand.

Moore.—Glendon Pyrophyllite Co. and Standard Mineral Co., Inc., mined pyrophyllite for asphalt filler, ceramic, insecticide, paint, refractory, rubber, and other uses. Aberdeen Sand & Gravel Co. (Aberdeen mine), Bryan Rock & Sand Co. (Montrose and West End mines), Monroe Sand Pit, Pleasants Sand & Supply Co., and the State highway commission mined structural and paving sands.

Nash.—Nash Brick Co. mined miscellaneous clay for heavy clay products; production decreased 18 percent below 1955. The State highway commission mined paving sand.

New Hanover.—Mrs. E. L. Robbins mined 15,000 tons of sand for fertilizer filler.

Northampton.—Grant Brick Works mined 12,000 tons of miscellaneous clay for heavy clay products. Bryan Rock & Sand Co. (Garysburg mine) and the State highway commission mined 80,200 tons of structural and paving sands and 181,500 tons of structural gravel.

Onslow.—Superior Stone Co. (Belgrade quarry) crushed limestone for concrete aggregate and roadstone. The State highway commission mined paving gravel.

Orange.—Boren & Harvey (Hillsboro mine) mined pyrophyllite for refractory uses. The State highway commission crushed 11,500 tons of granite for concrete aggregate and roadstone. Duke University prepared 700 tons of rough construction granite.

Randolph.—The State highway commission (Parks Crossroad and Glenola quarries) crushed granite for concrete aggregate and roadstone, as well as paving sand. Carolina Pyrophyllite Co., Inc. (Gerhardt mine), mined pyrophyllite for ceramic uses.

Rockingham.—The State highway commission (Newman quarry) crushed granite for concrete aggregate and roadstone and a small quantity of paving sand; Roanoke-Webster Brick Co., Inc. (Draper mine), and Pine Hall Brick & Pipe Co. (Madison mine) mined miscellaneous clay for heavy clay products. H. A. Knight, Sr. (Knight mine), and John Blalock (Smith mine) mined 700 pounds of sheet mica.

Rowan.—Superior Stone Co. (Woodleaf quarry) crushed granite for concrete aggregate, roadstone, and railroad ballast; production decreased 4 percent below 1955. Carolina Tufflite Co. and Isenhour Brick & Tile Co. mined miscellaneous clay for lightweight aggregate and heavy clay products; production increased 9 percent over 1955. G. M. Earnhardt (Rockwell quarry), Harris Granite Quarries Co. (Balfour, Collins, and Shuping quarries), and H. P. Stirewalt quarried dimension granite for rough construction, rubble, and rough architectural building stone, rough monumental stone, paving blocks, curbing and flagging; production increased 57 percent over 1955. Gardner Granite Works produced millstones. Harris Granite Quarries Co. produced 300 tons of tube-mill liners and 150 tons of grinding pebbles. Carolina Perlite Co., Inc., operated its expanded perlite mill; production decreased 16 percent.

Rutherford.—A. R. Thompson, contractor, mined 216,300 tons of paving gravel. Ben Bumgarner (Sherwood Withrow mine), Mace & Son (Mace mine), and Frank W. Phillips (Dycus mine) mined 7,700 pounds of sheet mica.

Two DMEA contracts were in force.

Sampson.—Patterson Brick Co. and Sampson Brick Co. mined 205,800 tons of miscellaneous clay for heavy clay products.

Stanly.—Carolina Solite Corp. (Solite Site mine), Stanly Shale Products, Inc. (Norwood mine), and Yadkin Brick Yards, Inc., mined 340,000 tons of miscellaneous clay for lightweight aggregates and heavy clay products. The State highway commission (Aquadale quarry) crushed 30,000 tons of granite for concrete aggregate and roadstone.

Stokes.—Hawkins Mining Co. (Hawkins mine), L & M Mining Co. (Steel mine), and Spencer Mining Co. (Spencer mine) mined 22,900 pounds of sheet mica. Spencer Mining Co. (Spencer mine) mined 50 tons of scrap mica. Pine Hall Brick & Pipe Co. (Nos. 1 and 2 mines) mined 77,000 tons of miscellaneous clay for heavy clay products.

Surry.—North Carolina Granite Corp. quarried dimension granite for rough construction, rubble, rough architectural building stone, dressed construction and dressed architectural building stone, rough and dressed monumental stone, paving blocks, and curbing and flagging; production declined 13 percent. North Carolina Granite Corp. (Mt. Airy quarry) crushed granite for riprap, concrete aggregate, and roadstone, and other uses; production increased 55 percent. W. E. Graham & Sons (Mt. Airy mine) and the State highway commission mined paving gravel; production increased 80 percent.

Swain.—Nantahala Talc & Limestone Co. (Hewitt quarry) crushed 91,000 tons of limestone for concrete aggregate, roadstone, and agstone. The Feldspar Corp. (Akexander mine) mined feldspar; production decreased 13 percent. J. O. DeBord (Needmore quarry) quarried 300 tons of dimension sandstone for flagging.

Transylvania.—Thomas Kitchen (Kitchen mine), James E. Moore (Broom mine), and Fred Wilson (Bee Tree No. 1 mine) mined 21 pounds of sheet mica.

Union.—Superior Stone Co. (Bakers quarry) crushed traprock for concrete aggregate and roadstone; production increased 34 percent. The State highway commission crushed 100,000 tons of granite for concrete aggregate and roadstone. Kendrick Brick & Tile Co. (Monroe mine) mined 122,000 tons of miscellaneous clay for heavy clay products.

Vance.—Tungsten Mining Corp. (Hamme mine) shipped 2,300 tons of tungsten concentrate. Greystone Granite quarries (Greystone quarry) crushed granite for concrete aggregate and roadstone.

DMEA activity consisted of a contract with Tungsten Mining Corp. in the amount of $246,600.

Wake.—Bryan Rock & Sand Co. (Crabtree and Rolesville quarries) and Nello L. Teer Co. (Raleigh quarry) crushed granite for concrete aggregate, roadstone, and other uses; production was about the same as in 1955.

Watauga.—McCrary Contracting Service and the State highway commission mined paving sand and paving gravel; production was more than eight times that of 1955, due to initial production of McCrary Contracting Service. Southern Mineral Development Co., Inc. (Old Susie mine), mined sheet mica. The State highway commission crushed 8,700 tons of granite for concrete aggregate and roadstone.

Wayne.—Bryan Rock & Sand Co. (Goldsboro mine) and the State highway commission mined 159,200 tons of structural and paving sand.

Wilkes.—The State highway commission crushed 6,000 tons of granite for concrete aggregate and roadstone. Zeb Greene (Snipes mine) mined a small quantity of sheet mica.

Wilson.—Bryan Rock & Sand Co. (Elm City and Neverson quarries) crushed granite for concrete aggregate, roadstone, and other uses; production increased 10 percent over 1955.

Yadkin.—J. E. Dooley (Cycle quarry) crushed granite for concrete aggregate and roadstone; production declined 42 percent.

Yancey.—A total of 59 mines produced sheet mica, the 6 leading producers were: Burdette Thomas (Goog Rock mine), Amos Presnell (Moody Rock mine), Gouge & Allen (Barger and Gouge & Allen mines), Cook Mining Co. (Charlie Robinson mine), L. J. Williams (Little Ray mine), Gibbs & Buchanan Mining Co. (Bowditch mine), and J. Mack Thompson (Presnell mine). The leading producers of scrap mica were: Southern Mica Co. of N. C., Inc. (Thompson and Sparks mines), DeWeld Mica Corp. (Crabtree and Hall's Chapel mines), and Hassett Mining Co. (Edge and Simpson mines); production of sheet mica totaled 40,000 pounds and of scrap mica 16,400 tons. Ten DMEA contracts for mica were in force.

McCrary Contracting Service opened a new mine and produced paving gravel. The Feldspar Corp. (Hurst, Mud Hole, Thomas, Towe, and Webb mines), Southeastern Mining & Development Co. (Brushy Fox mine), and Ward Woody (Ward Woody mine) mined crude feldspar; production declined 38 percent.

The Mineral Industry of North Dakota

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the State Geological Survey of North Dakota.

By D. H. Mullen [1]

NORTH DAKOTA in 1956 continued an unbroken upward trend since 1938 in the value of minerals produced and established a new record of 53.6 million—an increase of 21 percent compared with 1955. The greater production and value of petroleum, natural gas, and natural-gas liquids furnished the gain. The value of lignite decreased 9 percent. Mineral fuels as a group supplied 92 percent of the value of mineral production in the State and were 19 percent greater than in 1955.

Exploratory drilling increased to 78 wells completed in 1956 compared with 69 in 1955—a 13-percent gain. Five new fields were discovered, and 3 others were apparent discoveries not completed at the end of the year. Development drilling increased from 181 wells in 1955 to 185 in 1956. Geophysical activity declined from 510 crew weeks in 1955 to 353 in 1956. Additions and expansions were completed at the three refineries, and the first shipment of sulfur from the natural-gasoline plant at Tioga was reported.

TABLE 1.—Mineral production in North Dakota 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	(2)	(2)	[3] 52,282	[3] $70,555
Coal (lignite)	3,102,087	$7,261,120	2,815,174	6,578,532
Natural gas, million cubic feet	5,256	405,000	11,725	950,000
Petroleum (crude), thousand 42-gallon barrels	11,143	32,200,000	13,495	39,136,000
Pumice	3,500	10,000	4,840	4,840
Sand and gravel	11,168,849	2,637,988	5,946,000	4,259,250
Stone	77,366	80,560	82,999	87,100
Sulfur, long tons	----------	----------	1,735	45,990
Value of items that cannot be disclosed: Bentonite, natural-gas liquids, and value indicated by footnote 2	----------	1,528,636	----------	2,423,200
Total North Dakota	----------	44,123,000	----------	53,555,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[3] Excludes bentonite; included with "Value of items that cannot be disclosed."

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.

The value of clays produced increased 2 percent, and the value of crushed stone advanced 8 percent. The quantity of sand and gravel decreased sharply from 1955, but the value was increased 61 percent because of a more realistic unit value assigned to production from Government-and-contractor operations.

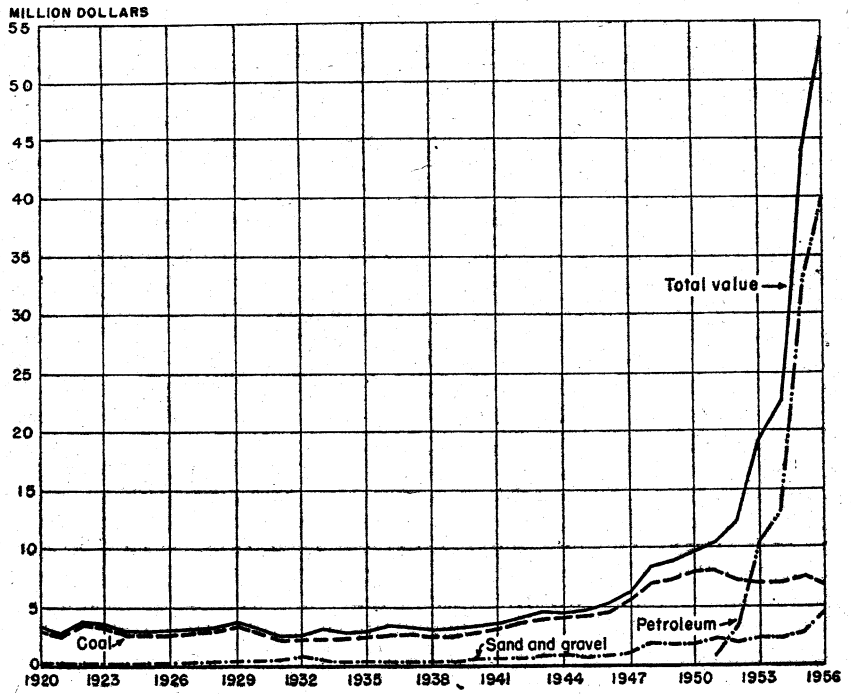

FIGURE 1.—Value of sand and gravel, petroleum, and coal, and total value of mineral production in North Dakota, 1920–56.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Lignite).—Coal (lignite) was reported by 44 mines in 16 counties. Production decreased 9 percent compared with 1955. Nearly all of the coal was produced from 39 strip mines in 15 counties. The remainder came from 5 underground mines in 4 counties. The average value of coal in 1956 from strip mines was $2.34 a ton and $3.61 from underground mines. Part of the production was treated for dust control by applying oil. A small tonnage was treated with wax.

Production declined as the result of increased available hydroelectric power from dams on the Missouri River. Generation of power at the Garrison Dam began in February; and, although the pool had not reached the normal operating level at the end of the year, all commitments to firms for power had been met. Power generation at Federal dams on the Missouri River increased 65 percent. The increased power that will be available as Missouri Basin dams are com-

TABLE 2.—Production of coal (lignite) in 1955–56, by counties

(Exclusive of mines producing less than 1,000 tons)

	1955		1956	
	Short tons	Average value per ton [1]	Short tons	Average value per ton [1]
Adams	41,646	$3.00	38,589	$2.74
Bowman	183,750	1.70	211,948	1.85
Burke	500,078	2.33	459,507	2.31
Burleigh	17,752	3.29	18,867	3.26
Divide	287,036	2.49	286,874	2.45
Dunn	12,657	2.88	12,609	2.83
Grant	26,565	2.83	25,049	3.04
Hettinger	13,882	2.77	11,508	2.74
McKenzie			1,625	3.94
McLean	224,697	2.67	123,772	2.90
Mercer	1,037,372	2.24	993,690	2.25
Morton	31,937	2.53	30,934	2.47
Oliver	6,352	2.25	9,739	2.33
Stark	76,535	2.65	79,933	2.31
Ward	630,769	2.34	506,444	2.38
Williams	11,059	3.29	4,086	4.05
Total	3,102,087	2.34	2,815,174	2.34

[1] Value received or charged f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially).

pleted will reduce the demand for coal for thermal-power generation for several years.

The Federal Bureau of Mines continued to investigate gasification of lignite and use of the products of gasification at the Charles R. Robertson Lignite Laboratory at Grand Forks. The results of the experimental work were published.[2]

Natural Gas.—Natural gas was marketed from 28 gas wells in the Cedar Creek gas field in Bowman County and from the Tioga oilfield in Williams County after processing in the natural-gasoline plant at the field. Production was marketed through lines of the Montana-Dakota Utilities Co. in North Dakota, Montana, Wyoming, and South Dakota. The quantity marketed in 1956 more than doubled that of 1955. Large quantities of gas from other oilfields was flared or otherwise wasted.

Natural-Gas Liquids.—The natural-gasoline plant at the Tioga field in Williams County, active the entire year, recovered natural gasoline, butane, and other natural-gas liquids.

Petroleum. Crude-petroleum production increased 21 percent in quantity and 22 percent in value compared with 1955. The increase reflects the active development of new fields and additional refinery capacity at Mandan, Dickinson, and Williston. Standard Oil Co. (Indiana) completed a 6,000-barrel-per-day ultraformer at the plant at Mandan. Queen City Oil & Refining Co. added 3,000 barrels per day of crude capacity to its plant at Dickinson. The company also added 1,200 barrels of vacuum capacity, built a 1,200-barrel-per-day fluid catalytic cracker and a 100-barrel-per-day thermal-polymerization unit. Westland Oil Co. increased the crude-oil capacity of its refinery at Williston by 500 barrels a day, installed a 1,200-barrel

[2] Ongstad, O. C., Chetrick, M. H., and Oppelt, W. H., Cost Data for Gasification of Lignite in an Externally Heated Retort: Bureau of Mines Rept. of Investigations 5272, 1956, 17 pp.

TABLE 3.—Production of crude petroleum, 1955–56, by counties in thousand barrels [1]

County	1955	1956	Producing fields in 1956
Billings	231	172	Fryburg.
Bottineau	356	392	Westhope-N, Landa-NE, Souris-N, Kuroki, Newburg, Haas, Unnamed, Westhope.
Burke	110	126	Tioga, Coteau, Columbus.
Divide		11	Noonan.
McKenzie	912	2,054	Charlson, Blue Buttes, Sanish-W, Antelope, Croff.
Mountrail	2,323	2,514	Tioga, White Earth, Tioga-E.
Renville	3	9	Bluell.
Stark	5	1	Belfield.
Williams	7,203	8,216	Beaver Lodge, Tioga, Capa, Hoffiund, McGregor.
Total	11,143	13,495	

[1] Based on North Dakota Geological Survey county data adjusted to Bureau of Mines total.

thermal cracking unit, and added 530 barrels of platformer capacity. Throughput of the 3 plants in 1956 was 12.4 million barrels.

Crude-oil production in 1956 came from 26 fields in 9 counties. Four of the producing fields were 1956 discoveries. Major production came from Williams County, followed by Mountrail, McKenzie, and Bottineau Counties, in that order. Divide County became an oil producer in 1956 with discovery of the Noonan field when the No. 1 Braathen was completed on March 12. The most significant discovery in the State was the Antelope field in McKenzie County on May 12 when the No. 1 Lacey-Norby well was completed.

Discoveries of oil in the Madison limestone have become commonplace, but fields with a gross-production section of 300 feet or more are unusual. At the Antelope field the gross-producing section was

TABLE 4.—Wildcat and development well completions in 1956, by counties

[Oil and Gas Journal]

County	Oil	Dry	Total	Footage
WILDCAT				
Bottineau	1	24	25	99,200
Burke	1	11	12	76,700
Cavalier		1	1	2,300
Divide	1	1	2	14,800
Dunn		1	1	9,200
Eddy		3	3	7,600
Foster		7	7	19,600
McHenry		1	1	4,500
McKenzie	3	5	8	79,900
McLean		1	1	8,700
Mountrail		1	1	7,700
Renville		8	8	41,900
Ward		4	4	24,100
Wells		1	1	4,400
Williams	2	1	3	30,800
Total wildcat	8	70	78	431,400
DEVELOPMENT				
Bottineau	10	3	13	48,400
Burke		2	2	14,200
McKenzie	68	10	78	743,900
Mountrail	14	2	16	130,300
Renville	1	2	3	14,400
Williams	63	10	73	594,500
Total development	156	29	185	1,545,700
Total drilling	164	99	263	1,977,100

570 feet compared with 350 feet at the Beaver Lodge field—the largest and most productive in the State.

Other discoveries in 1956 were the Kuroki field on June 19 and the Haas field on November 17, both in Bottineau County, and the Columbus field on January 25, in Burke County. Three apparent discoveries were nearing completion at the end of the year: The No. 1 Albert Anderson well in McKenzie County, the No. 1 F. L. Kahlert well in Williams County, and the No. 1 Lucy-Fritz well in Billings County.

Geophysical (seismograph and gravimeter) work declined from 510 crew weeks in 1955 to 353 crew weeks in 1956. Most of the work was seismograph (325 crew weeks) in 17 counties, principally in Bottineau, McHenry, McKenzie, Williams, and Burke Counties. Gravimeter work (28 crew weeks) was done in 5 counties, mostly in Adams and McLean Counties.

NONMETALS

Clays.—Miscellaneous clay was produced in Adams, Divide, and Morton Counties for manufacturing building brick, draintile, other heavy clay products, and lightweight aggregate. A small quantity of bentonite used in foundries was produced in Morton County.

Pumice.—Shale, partially fused by the burning of underlying coal beds and locally termed "scoria," was produced in Bowman and Mercer Counties and used for road surfacing.

Sand and Gravel.—Reported production of sand and gravel declined 47 percent from the record high of 1955. Reported Government-and-contractor production, especially the State highway department, is based on the quantity of material used on a contract in the year in which the contract is completed, rather than on pit production. Consequently it may vary widely from year to year while the rate of mining remains relatively stable. The production of commercial sand and gravel increased 39 percent; the reported production by Government agencies and contractors decreased 57 percent compared with 1955. Of the 1956 production 80 percent was used for paving and road construction, 14 percent for building, and 6 percent for railroad ballast and other uses. Government-and-contractor operations furnished 84 percent of the sand and gravel used for paving and road construction; almost the entire quantity (82 percent) was produced by or for the State highway department. Because of the realistic price applied to production from Government-and-contractor operations, value of sand and gravel was 61 percent higher than the value of 1955.

Sand and gravel was produced in 28 counties; 21 counties reported commercial production, and 18 counties reported Government-and-contractor production. Leading commercial producers included John Bender in McIntosh County, Bradshaw Gravel Supply in Grand Forks County, Edwin Lindteigen in McLean County, Minot Sand & Gravel Co. in Ward County, and Morrison-Knudsen Co., Inc., in Mountrail County.

Stone.—Production of stone in 1956 consisted of crushed granite and crushed miscellaneous stone. The quantity increased 7 percent and the value 8 percent compared with 1955. The entire production

TABLE 5.—Sand and gravel sold or used by producers, 1955–56, by classes of operation and uses

Class of operation and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building	201,924	$201,754	$1.00	301,500	$291,750	$0.97
Paving	127,212	37,512	.29	110,000	87,750	.80
Engine	824	830	1.01			
Total sand	329,960	240,096	.73	411,500	379,500	.92
Gravel:						
Building	241,274	344,320	1.43	314,000	390,250	1.24
Paving	439,482	358,622	.80	623,000	429,000	.69
Railroad ballast	181,285	162,023	.89	303,000	269,250	.89
Other	45,213	21,368	.47	69,500	49,000	.71
Total gravel	907,254	881,333	.97	1,309,500	1,137,500	.87
Total sand and gravel	1,237,214	1,121,429	.91	1,721,000	1,517,000	.88
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	168,750	18,750	.11	3,000	2,000	.67
Paving	1,848,723	300,986	.16	1,500,000	750,000	.50
Total sand	2,017,473	319,736	.16	1,503,000	752,000	.50
Gravel:						
Building	223,025	262,670	1.18	227,000	272,000	1.20
Paving	7,691,137	934,153	.12	2,495,000	1,718,250	.69
Total gravel	7,914,162	1,196,823	.15	2,722,000	1,990,250	.73
Total sand and gravel	9,931,635	1,516,559	.15	4,225,000	2,742,250	.65
ALL OPERATIONS						
Sand	2,347,433	559,832	.24	1,914,500	1,131,500	.59
Gravel	8,821,416	2,078,156	.24	4,031,500	3,127,750	.78
Grand total	11,168,849	2,637,988	.24	5,946,000	4,259,250	.72

came from Government-and-contractor operations and was used for riprap and concrete aggregate and roadstone.

Sulfur.—Elemental sulfur has been recovered at the natural-gasoline plant at Tioga in Williams County since the plant began operating in 1954. The plant used the Modified Claus process, and recovered sulfur has been stockpiled. In 1956 the first shipment of sulfur was recorded; 1,735 long tons was sold.

Vermiculite.—Crude vermiculite from deposits in Montana was exfoliated at a plant at Minot in Ward County. The chief use of the exfoliated product was for insulating houses. A small quantity was used as a lightweight aggregate in concrete and plaster and for miscellaneous applications.

METALS

Uranium.—Exploration of uraniferous lignite deposits continued. The work included drilling, radioactive surveys, and geological investigations. Uranium mineralization was found in sandstones of the Fort Union formation west of the lignite ore area in Golden Valley

County. None of these occurrences have been explored sufficiently to determine the extent or grade of the deposits.

Exploration of the uraniferous lignite deposits has outlined several areas where estimated reserves of several hundred thousand tons of material contained 0.15 to 0.30 percent uranium oxide.

The chief obstacle to the development and exploration of the uraniferous lignite deposits continued to be the lack of a suitable process to recover uranium from lignite. The Ohio Oil Co. and the Atomic Energy Commission (AEC) have been active in developing and testing various processes. Dissolving the uranium in acid has not been difficult, however, filtration by normal milling methods was almost impossible. Further work by the AEC was directed toward a process consisting of roasting the material at 1,200° to 1,500° F. to remove interfering tars and oils and leaching the residue with acid to remove the uranium. A pilot plant was erected at Grand Junction, Colo., by the AEC to test the process. The AEC also indicated a contract to purchase uranium concentrate from uraniferous lignite would be considered if a suitable process were perfected and adequate reserves to support the plant were developed.

A small shipment of uraniferous lignite from the E. L. C. and Smith No. 1 leases in Billings County was made to the Mines Development Co. mill at Edgemont, S. Dak., for test purposes.

REVIEW BY COUNTIES

Adams.—The Marion Clay Works produced miscellaneous clay to manufacture building brick and other heavy clay products. Arrowhead Coal Co. produced lignite from a strip pit. Argo Oil Co. completed 10 crew weeks of gravimetric work.

Barnes.—Paving gravel was produced by the county highway department. Barnes County led the State in sand and gravel production from Government-and-contractor operations.

Billings.—The county ranked fifth in the State in the production of petroleum, which came from the Madison limestone and the Heath sandstone in the Fryburg field. Northern Pump Co. recovered 50 barrels of oil per hour from the Lucy Fritz No. 1 well at 8,043–8,081 feet in the Heath sandstone. The well was bottomed at 9,360 feet in the Madison limestone and was being plugged back to the Heath sandstone at the end of the year. The well was 12 miles south of the Fryburg field—the only producing area in the southwestern part of the State.

A small shipment of uraniferous lignite was made to the Mines Development Co. mill at Edgemont, S. Dak., for test purposes.

Bottineau.—Petroleum was produced from 8 fields, 2 of which were discovered in 1956. The county ranked fourth in the State in petroleum production. The principal producing fields were Westhope N, Landa NE, and Souris N. Two new fields were discovered—the Kuroki field in June and the Haas field in November; both produced from the Madison limestone. An apparent discovery, not completed at the end of the year, was the Russell R. Smith well 8 miles south of the Westhope field. Oil and gas was recovered in a drill-stem test at 3,425–3,435 feet from the Spearfish formation.

TABLE 6.—Value of mineral production in North Dakota, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Adams	$125,738	$106,567	Coal, clays.
Barnes	19,900	147,000	Sand and gravel.
Benson	52,598	39,500	Do.
Billings	668,000	498,800	Petroleum.
Bottineau	1,028,000	1,136,800	Do.
Bowman	317,128	393,196	Coal, pumice.
Burke	1,520,337	1,477,842	Coal, petroleum, sand and gravel.
Burleigh	149,396	188,557	Sand and gravel, coal.
Cass	398,322		
Dickey	29,383	15,000	Sand and gravel.
Divide	747,401	750,893	Coal, petroleum, clays.
Dunn	36,482	35,630	Coal.
Eddy	(2)	47,250	Sand and gravel.
Foster	1,522	22,000	Do.
Grand Forks	79,230	127,000	Do.
Grant	75,151	76,218	Coal.
Griggs	1,176	13,000	Sand and gravel.
Hettinger	38,500	47,043	Coal, sand and gravel.
McIntosh	35	102,750	Sand and gravel.
McKenzie	2,674,863	6,003,000	Petroleum, stone, coal.
McLean	732,869	536,523	Coal, sand and gravel.
Mercer	2,332,722	2,243,076	Coal, pumice.
Morton	239,036	239,583	Sand and gravel, coal, clays.
Mountrail	6,831,895	7,490,600	Petroleum, sand and gravel.
Nelson	3,552	121,375	Sand and gravel.
Oliver	14,292	22,644	Coal.
Pierce	17,200	19,250	Sand and gravel.
Ransom	1,494	10,000	Do.
Renville	269,000	254,030	Sand and gravel, petroleum.
Richland	84,617		
Rolette	11,641	30,500	Sand and gravel.
Sargent	3,000	22,500	Do.
Sheridan	14,330	42,250	Do.
Stark	280,778	258,144	Coal, sand and gravel, petroleum.
Stutsman	300	6,000	Sand and gravel.
Traill	26,600	37,500	Do.
Walsh	47,343	96,250	Do.
Ward	1,704,800	1,567,360	Coal, sand and gravel.
Wells	(2)	35,000	Sand and gravel.
Williams	20,925,601	24,001,861	Petroleum, sand and gravel, sulfur, coal.
Undistributed [3]	2,649,072	5,292,975	
Total	44,123,000	53,555,000	

[1] The following counties are not listed because no production was reported: Cavalier, Emmons, Golden Valley, Kidder, LaMoure, Logan, McHenry, Pembina, Ramsey, Sioux, Slope, Steele, Towner.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes, natural gas-liquids sand and gravel, natural gas, and value indicated by footnote 2.

The county led in the number of wildcat wells completed (25) and in the number of crew weeks (65) of geophysical (seismograph) work completed and ranked fourth in the number of development wells completed (13).

Bowman.—The county was fifth in the State in output of lignite, which was produced by the Knife River Coal Mining Co. from the Peerless strip mine. The company also mined shale, partly fused by burning of underlying coal beds and locally termed "scoria", for road construction. Natural gas was produced from 28 wells in the Cedar Creek field by Montana-Dakota Utilities Co.

Burke.—Burke County ranked third in the State in lignite production, sixth in petroleum production, and sixth in total value of all minerals. Truax-Traer Coal Co. operated the Kincaid strip mine, and Bonsness Coal Co. produced lignite from a strip pit. Petroleum was produced from that part of the Tioga field lying within the county, Coteau field, and Columbus field—a 1956 discovery. The initial production of the Columbus field was 36 barrels of oil per day from the Madison limestone at a depth of 6,507 feet. An apparent

discovery—the Flaxten field—was made when the No. 1 Sorum well pumped 80 barrels of oil a day on December 29 from the Madison limestone at a depth of 6,295 feet. No production was recorded, and the well had not been officially completed at the end of the year. Geophysical (seismograph) exploration was done by 3 companies completing 26 crew weeks of work. Sandberg Construction Co. and Syg Susag produced building sand and gravel and paving gravel. Contractors produced paving gravel for the county highway department.

Burleigh.—Ecklund Taplin Coal Co. produced lignite from a strip mine. Dakota Sand & Gravel Co. produced building sand and gravel.

Divide.—Divide County was fourth in the State in the production of lignite in 1956 and became a petroleum producer in March when the Braathen No. 1 well was completed in the Madison formation at a depth of 7,076–7,085 feet. Initial production at the new field (Noonan) was 12 barrels of oil per day. At the end of the year total production exceeded 10,000 barrels. Lignite was produced by Baukol-Noonan, Inc., at its strip mine at Noonan. This company also produced miscellaneous clay for manufacturing lightweight aggregate and operated the Noonlite lightweight aggregate plant at Noonan.

Grand Forks.—Bradshaw Gravel Supply produced building sand and gravel and building sand. Dakota Reddymix Co. produced building sand and paving gravel for the city of Grand Forks.

McIntosh.—Building sand and gravel and paving gravel was produced by John Bender, Ervin Betsch, Otto F. Hinz, and Dave A. Tschetter.

McKenzie.—McKenzie County ranked 3d in value of mineral production, 3d in output of petroleum, and 16th in production of lignite and was the only county reporting output of crushed stone. Petroleum came from six fields. Charlson field, with 24 producing wells, ranked 3d in the State, and Blue Buttes with 28 wells was 5th. Antelope field was discovered in May when the Lacey-Norby No. 1 well was completed at 9,118 feet in the Madison limestone. Initial production was 386 barrels of oil per day, and at the end of the year 11 wells had been completed and were producing. The Antelope field was unusual in that the producing section of the Madison limestone has a thickness of 570 feet. The county led in the number of development wells completed (78), of which 68 were successful. Geophysical work (seismograph) was done by 4 companies and 53 crew weeks of work were completed. Nygard Coal Co. produced lignite at the Nygard strip mine at Watford City. The McKenzie County Highway Department produced crushed miscellaneous stone for road construction.

McLean.—Lignite was produced from strip mines by Burns & Wretling Coal Co. and Garrison Lignite Co. at Garrison, Turax-Traer Coal Co. from the Custer mine, and Underwood Coal Co. The county ranked sixth in the State in lignite production. Edwin Lindteigen produced paving gravel, and the Minneapolis, St. Paul and Sault Ste. Marie Railroad Co. produced gravel for ballast and fills. Geophysical explorations were made by 2 companies; 10 crew weeks of gravimeter work and 4 crew weeks of seismograph work were completed.

Mercer.—Mercer County led in lignite production; the entire quantity came from strip mines. Bauer Coal Co. operated the Bauer mine at Beulah. Dakota Collieries Co. operated the Indian Head mine and mined shale, partly fused by the burning of underlying coal beds and locally termed "scoria", for road construction. Knife River Coal Mining Co. operated the Beulah mine and Truax-Traer Coal Co. mined at the Dakota Star. Reinhart Grishkowsky mined lignite.

Morton.—Hebron Brick Co. produced miscellaneous clay for manufacturing of building brick, tile, and other heavy clay products. The company also produced a small quantity of bentonite for use in foundries. Molite, Inc., produced miscellaneous clay for manufacturing lightweight aggregate and operated its bloating plant at Mandan. Lignite was produced from strip mines by Flemmer Coal Co., Kaelberer Coal Co., Richter Coal Mine, and the Timpe & Nilles Coal Co. The Harnisch coal mine produced lignite from an underground mine. Helm Bros., Inc., and Riverside Gravel produced building and paving sand and gravel. The county led in sand and gravel production.

Mountrail.—Mountrail County ranked second in petroleum production and total value of mineral output and third in sand and gravel production. Petroleum was produced at three fields—Tioga (that part lying in the county), White Earth, and Tioga East fields. Development drilling comprised 16 wells of which 14 were successful. Four crew weeks of geophysical (seismograph) work was completed. Morrison-Knudsen Co., Inc., produced building gravel, railroad ballast, and fill gravel.

Nelson.—Clarence Wiseman produced paving gravel for the State highway department, and H. J. Byrnes produced paving gravel for the county highway department.

Renville.—Petroleum was produced at the Bluell field. Geophysical exploration (consisting of 5 crew weeks of gravimeter work and 2 crew weeks of seismograph work) was completed. J. L. Shieley Co., Inc., produced building gravel for the United States Corps of Engineers.

Stark.—Lignite was produced from strip mines by Dakota Briquets & Tar Products, Inc., Dickinson Coal Mining Co., and Valentine Walter. Petroleum was produced at the Belfield field. Building and paving sand and gravel was produced by Badinger Sand & Gravel pit and Fisher Sand & Gravel Co.

Ward.—Ward County led in sand and gravel production, ranked second in lignite output, and was fifth in the total value of minerals. Minot Sand & Gravel Co. produced building and paving sand and gravel and fill gravel. Minneapolis, St. Paul and Sault Ste. Marie Railroad Co. produced gravel for road ballast and for fills. Lignite was produced from strip mines by Quality Lignite Co., Sawyer Fuels, Inc., Truax-Traer Coal Co., and Valley Coal Co. Lignite from an underground mine was produced by the Vix Coal Co. Crude vermiculite from Montana deposits was exfoliated by the Robinson Insulation Co. at its plant at Minot for use mostly in house insulation. A small quantity was used as a lightweight aggregate in plaster and concrete and for soil conditioning.

Williams.—Williams County was the major producer of petroleum and led the State in the value of mineral production. Petroleum was produced in five fields—Tioga (that part lying within the county) Beaver Lodge, Capa, Hofflund, and McGregor. Development drilling

declined slightly from 1955, with 73 wells completed, of which 63 were successful. Exploratory drilling resulted in one discovery near the Hofflund field, when the No. 1 Kahlert well was completed in the Madison limestone. Initial production was 104 barrels of oil a day from perforations at 8,446–8,466 feet. Total depth of the well was 8,571 feet. Geophysical (seismograph) investigations were made by 3 companies, and 28 crew weeks of work was completed.

Signal Oil & Gas Co. operated its natural-gasoline plant at Tioga using wet gas from the Tioga and Beaver Lodge fields. Natural gasoline, butane, and propane were recovered. Elemental sulfur was recovered by the Modified Claus process. Throughput in 1956 was 11.7 billion cubic feet of wet gas. A part of the dried gas was marketed through pipelines of the Dakota-Montana Utilities Co. Lignite was produced at underground mines by Archie Trowbridge at the Star mine and Ben L. Nelson at the Black Diamond mine.

George Mockel produced building sand and Pioneer Sand & Gravel Co. produced building sand and paving gravel. Bober Construction Co., D. Schubert, and Schultz & Lindsay produced paving gravel for the county highway department.

The Mineral Industry of Ohio

By James R. Kerr[1] and Jean A. Pendleton[2]

OHIO'S mineral industries in 1956 produced commodities valued at 10 percent more than in 1955. With few exceptions, increased production was reported for each of Ohio's 15 mineral commodities. Bituminous coal, stone, cement, lime, and sand and gravel, in order of decreasing value of output, were the leading minerals produced during the year. Ohio ranked high nationally in output of minerals, leading in output of grindstones, clay, and lime, and ranked third in output of stone, fourth in sand and gravel, fifth in coal, and fifth in salt. Counties leading in total value of mineral output were Harrison, Belmont, Sandusky, Jefferson, and Greene.

TABLE 1.—Mineral production in Ohio, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement:				
Portland ..... 376-pound barrels	13,981,909	$39,642,957	15,150,874	$46,341,562
Masonry ..... do	931,810	3,322,967	914,371	3,451,959
Clays	6,297,413	15,677,389	6,702,531	17,675,504
Coal	37,869,791	133,814,166	38,933,557	148,650,186
Lime	3,038,949	39,393,634	2,995,320	40,804,580
Natural gas ..... million cubic feet	33,756	7,595,000	25,368	6,088,320
Peat	22,484	249,427	15,509	174,469
Petroleum (crude) ..... thousand 42-gallon barrels	4,353	12,580,000	4,785	15,025,000
Salt (common)	2,905,028	14,768,761	2,971,702	15,922,765
Sand and gravel	27,906,047	31,995,215	30,199,822	36,146,175
Stone	33,272,567	49,841,246	[3]33,417,662	[2] 50,946,715
Value of items that cannot be disclosed: Abrasives stones, gypsum, natural gasoline, natural salines, crushed sandstone (1956), and recovered elemental sulfur	----------	2,864,455	----------	5,393,583
Total Ohio [3]	----------	340,457,000	----------	375,488,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes certain stone, value for which is included with "Undistributed."
[3] Totals have been adjusted to avoid duplicating value of limestone for cement and lime.

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REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Output of bituminous coal in Ohio in 1956 increased 3 percent compared with 1955. This increase follows a general nationwide trend, but Ohio's increase in coal output did not parallel the rise in neighboring States, falling below increases in production in West Virginia and Pennsylvania. Strip mining made up 62 percent of the total coal output; underground mining, 34 percent; and auger mining, 4 percent. Virtually the entire underground production (over 99 percent) was cut by machine. Ninety percent of output was mechanically loaded by mobile loaders, the chief mechanical loading device; 58 percent went into shuttle cars; 22 percent into mine cars; and 2 percent onto conveyors. Continuous miners did 17 percent of the mechanical loading. The remaining 1 percent was loaded either by self-loading conveyors or handloaded onto conveyors. Of the total coal production, 40 percent was mechanically cleaned, mostly by wet-washing methods. Thirty-one percent was crushed, and 11 percent was treated for dust preventive or antifreezing purposes using either oil or calcium chloride, or a combination of both.

TABLE 2.—Bituminous coal production, 1947–51 (average) and 1952–56

Year	Short tons	Value	Value per ton	Year	Short tons	Value	Value per ton
1947–51 (average)	36,585,360	$140,011,516	$3.83	1954	32,468,728	117,519,936	3.62
1952	36,208,450	138,090,700	3.81	1955	37,869,791	133,814,166	3.53
1953	34,736,773	131,475,408	3.78	1956	38,933,557	148,650,186	3.82

Coke and Coal Chemicals.—Ohio led the Nation in number of coke plants (16) but ranked second to Pennsylvania in both number of coke ovens and tons of coke produced. In all 2,493 coke ovens were in existence, as of December 31, 1956, producing 11,799,000 tons of coke valued at $201,232,720 ($17.06 per ton). A total of 51 ovens was abandoned during the year, and on December 31, 1956, 186 ovens were under construction. There were no beehive coke ovens in Ohio in 1956. Coke coproducts recovered at coke plants included 819,222 tons of coke breeze, 170,641,300 thousand cubic feet of coke-oven gas, 256,559,900 pounds of ammonium sulfate and 11,602,400 pounds NH_3 content of ammonia liquor, 127,709,300 gallons of coke-oven tar, and 47,779,600 gallons of crude light oil from which 28,035,700 gallons of benzene, 5,075,400 gallons of toluene, 1,805,300 gallons of xylene, and 719,800 gallons of solvent naphtha were derived.

Peat.—Production of peat in Ohio dropped for the second successive year to 31 percent below 1955 and 47 percent below 1954. This decrease was opposed to the national trend. The peat was used mostly for soil improvement, chiefly for constructing lawns and improving garden soils. Output was reported by 11 producers in 7 counties in 1956, with production centering in Wyandot County.

Petroleum and Natural Gas.—A total of 1,086 well completions (including 572 oil, 178 gas, 282 dry holes, and 54 service holes) was made in Ohio in 1956. Average footage was 2,378 feet. Most drilling was in extensions of known fields, although 13 wildcat completions (2 were oil, 5 gas, and 6 dry holes) were reported. Licking County led in total completions, with 145—112 oil, 6 gas, and 27 dry; Coshocton County had 115—82 oil, 10 gas, and 23 dry; and Ashland County had 104—51 oil, 3 gas, and 50 dry holes. Depth classification of wells drilled was as follows: Between 0 and 1,250 feet—254; between 1,250 and 2,500 feet—162; between 2,500 and 3,750—621; between 3,750 and 5,000 feet—46; and between 5,000 and 7,500 feet—3. No wells were drilled deeper than 7,500 feet. The deepest well ever drilled in Ohio was a 7,889-foot dry hole, completed in 1933 to the Clinton sandstone, in Independence Township (Washington County). The deepest producing well was drilled in 1941, a gas well to the Siluvian pay zone 5,899 feet, in Washington Township (Harrison County). Total completions were reportedly held down, owing to a steel shortage.[3]

The record oil-production year in Ohio was 1896, when 13,421,000 barrels was recovered. By comparison, production in 1956 was 4,785,000 barrels.

The oil and gas reserves on January 1, 1957, were given as 56 million barrels of oil and 837 billion cubic feet of gas.[4]

The most notable oil and gas activity in Ohio was leasing of a large block of land in the south-central part of the State for proposed test wells to the Cambrian or Precambrian. Gravimetric anomalies indicate subsurface conditions favorable for oil and gas accumulations.[5]

NONMETALS

Abrasive Stones.—Grindstones were produced by three operators in 1956. Most of the output was quarried in Washington County near Marietta and Constitution, and a smaller quantity was mined at Kipton in Lorain County.

Cement.—Shipments of portland cement increased 17 percent in value in 1956. Masonry-cement output dropped 2 percent. Of 11 cement producers in the State, 8 produced both portland and masonry cements, 2 produced portland only, and 1 masonry only. Although most of the cement produced was consumed in Ohio, considerable quantities were shipped to West Virginia, Indiana, and Michigan. Capacity of Ohio cement plants was 17,819,936 barrels, not counting the annual rated capacity of the Consolidation Cement Corp. new plant at Paulding, Ohio, which began operating September 1, 1956, at an annual capacity of 1,250,000 barrels. The company also announced that construction had already begun to increase the annual capacity of this new plant to 2.5 million barrels. The 44 kilns active during the year operated an average of 327 days. Plants were operating at 93-percent capacity during 1956. Although many cement-producing companies reported quarrying raw material from company-owned mines, considerable quantities of the necessary limestone and clay were purchased material.

[3] Oil and Gas Journal, Annual Review and Forecast Number: Vol. 55, No. 4, Jan. 28, 1957.
[4] Committee on Petroleum Reserves, American Petroleum Institute, prelim. rept., 1957, p. 9.
[5] Alkire, Robert L., and Floto, Bernard A., Oil and Gas Developments in Ohio in 1956: Am. Asso. Petrol. Geologists, vol. 41, No. 6, June 1957, pp. 1021–1031.

Demand was reported to be fair to good; price increased slightly, and wages rose during the year. Some quarrying operations were adversely affected by weather conditions in late spring.

In addition to the new plant of Consolidation Cement Corp. at Paulding, increased facilities were announced by other producers. Diamond Portland Cement Co. announced plans for a $4 million expansion program to boost annual capacity 1 million barrels. Diamond Alkali Co. announced plans to increase capacity of the Standard Portland Cement Co., (Painesville), Diamond Alkali cement-coke division, by 1 million barrels. Medusa Portland Cement Corp. was also in the midst of a large expansion program. Pittsburgh Plate Glass Co. put a new kiln and finishing mill into operation the last of the year. Addition of increased preparation, calcining, and finishing facilities was announced by other companies during the year.

TABLE 3.—Finished portland cement produced, shipped, and in stock, 1947–51 (average) and 1952–56

Year	Active plants	Production (barrels)	Shipments from mills			Stocks at mills on Dec. 31 (barrels)
			Barrels	Value		
				Total	Average per barrel	
1947–51 (average)	9	10,442,372	10,371,558	$22,601,803	$2.18	734,844
1952	9	11,270,431	11,377,806	28,488,500	2.50	748,541
1953	9	12,539,132	12,532,437	32,957,308	2.63	755,237
1954	9	13,306,570	13,076,921	35,929,163	2.75	984,704
1955	9	13,965,839	13,981,909	39,642,957	2.84	838,914
1956	10	15,722,402	15,150,874	46,341,562	3.06	1,293,165

Clays.—Ohio continued to lead the Nation in clay production, which increased 6 percent compared with 1955. Production value rose 13 percent, owing chiefly to a 31-percent increase in the value per ton assigned to fire clay used by the producer. The fire-clay industry was the most important in value because it comprised 79 percent of Ohio total-clays value but only 47 percent of the tonnage. Fire-clay output was used principally for manufacturing heavy clay products (61 percent), for fire brick and block (21 percent), and for foundries and steel works (12 percent). Miscellaneous clay was used chiefly for manufacturing heavy clay products (63 percent) and portland and other hydraulic cements (20 percent).

A total of 145 clay mines was active; 119 were open-pit and 26 underground. Leading clay-producing counties was Tuscarawas, Stark, Perry, Columbiana, and Cuyahoga.

Clay-producing companies reported a rise in labor costs during the year and slightly increased prices. The year was marred by labor disputes and strikes in some instances.

TABLE 4.—Clays sold or used by producers, 1955–56, by counties

County	1955		1956	
	Short tons	Value	Short tons	Value
Carroll	200,856	$480,887	209,335	$512,081
Columbiana	543,608	1,796,316	495,388	2,767,968
Cuyahoga	430,541	447,541	488,424	446,453
Darke	5,000	5,000	(1)	(1)
Franklin	61,038	54,698	(1)	(1)
Highland	17,111	34,222	16,778	(1)
Hocking	217,979	939,411	247,867	1,099,037
Holmes	86,417	164,618	113,207	(1)
Jackson	223,512	832,226	216,646	819,621
Jefferson	202,534	830,359	183,898	1,287,806
Lawrence	165,880	721,121	177,027	860,345
Madison	1,112	1,112	(1)	(1)
Mahoning	(1)	(1)	269,983	(1)
Medina	54,300	54,300	57,119	(1)
Muskingum	4,842	12,518	(1)	(1)
Noble	34,599	51,898	38,873	(1)
Paulding	19,091	40,982	22,407	41,272
Perry	389,283	599,941	528,135	684,678
Putnam	24,578	41,556	29,196	34,247
Scioto	96,162	578,412	86,248	602,330
Seneca	8,000	8,000	5,500	(1)
Stark	718,032	1,900,613	780,988	1,813,002
Summit	77,233	125,409	36,680	41,822
Tuscarawas	1,124,326	3,229,184	1,284,790	3,751,586
Van Wert	1,890	2,340	(1)	(1)
Washington	60,420	49,180	41,363	(1)
Wayne	48,455	48,455	51,224	48,427
Wood	1,841	2,301	2,151	(1)
Wyandot	27,594	27,594	25,344	(1)
Undistributed [2]	1,451,179	2,597,195	1,293,960	2,864,829
Total	6,297,413	15,677,389	6,702,531	17,675,504

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes data for the following counties: Ashland, Belmont, Darke (1956), Delaware, Franklin (1956), Hancock, Harrison, Henry, Licking, Madison (1956), Mahoning (1955), Marion, Muskingum (1956), Portage, Richland, Van Wert (1956), Vinton, and Williams; clays used in cement manufacturing not apportioned by counties; and values indicated by footnote 1.

TABLE 5.—Clays sold and used by producers in 1956, by kinds and uses, in short tons

Uses	Fire clay	Miscellaneous clay	Total
Tile, high-grade	87,399	61,986	149,385
Architectural terra cotta	2,282		2,282
Portland and other hydraulic cements		[1] 1,234,294	[1] 1,234,294
Refractories:			
Fire brick and block	669,283		669,283
Fire-clay mortar	56,809	(2)	56,809
Foundries and steelworks	386,392		386,392
Kiln furniture, saggers, pins, stilts, and wads	433		433
Zinc retorts and condensers	526		526
Chemicals	5,638		5,638
Heavy clay products	1,925,499	2,241,531	4,167,030
Rotary-drilling mud	2,910		2,910
Lightweight aggregate		(2)	(2)
Undistributed [3]	27,549		27,549
Total	3,164,720	3,537,811	6,702,531

[1] Includes fire-clay mortar and lightweight aggregate.
[2] Figure withheld to avoid disclosing individual company confidential data, included with "Portland and other hydraulic cements."
[3] Includes stoneware and art pottery, other refractories, and exports of fire clay.

Gypsum.—Output of gypsum in 1956 decreased 21 percent compared with 1955. Production was reported by two companies in Ottawa County. One open-pit and one underground mine were active during the year. Crude gypsum was mined and calcined for use in manufacturing wallboard and lath.

The National Gypsum Co. announced plans for erecting a $6-million wallboard plant at Lorain. The huge plant will employ 300 to 500 men and produce enough gypsum material annually for 50,000 homes.

Lime.—Lime production decreased slightly (1 percent) in 1956. Value of production increased 4 percent. The principal factor in the increased total value was the 11-percent rise in output of refractory lime, which had a high unit value; this increased almost $1.00 per ton (6 percent) over 1955. Agricultural lime output decreased during the year. Production of lime for building and chemical and industrial purposes also decreased. Lime for refractory material made up 47 percent of the State total; chemical and industrial lime, 32 percent; building lime, 20 percent; and agricultural lime, 1 percent. The greater part of Ohio production (77 percent) was sold or used as quicklime; the balance was hydrated. Producing companies reported 288 shaft-type and 27 rotary kilns active during the year, using mostly bituminous coal as fuel. The types of hydrators used to produce hydrated lime were as follows: batch—14, continuous—13, atmospheric—5, and pressure—2. Annual lime-burning capacity in Ohio was approximately 3,500,000 tons in 1956.

Basic, Inc., reported two plants idled by strikes from May 15, 1956, to September 18, 1956, during which there was no production. Other producers reported that the July–August steel strike caused a reduction in output.

TABLE 6.—Lime (quick and hydrated) sold by producers, 1947–51 (average) and 1952–56

Year	Agricultural (burnt)		Building		Chemical and other industrial		Refractory		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	48,999	$530,191	558,110	$7,062,107	400,884	$3,804,993	963,032	$11,562,570	1,971,025	$22,959,861
1952	53,467	637,589	578,088	8,009,903	407,007	4,139,066	1,166,870	15,606,702	2,205,432	28,393,260
1953	52,376	618,108	556,537	8,328,900	922,655	7,350,473	1,414,232	19,012,872	2,945,800	35,310,353
1954	68,460	889,070	516,679	8,133,692	1,040,082	9,135,604	923,825	13,285,717	2,549,046	31,444,083
1955	43,852	544,361	639,338	10,352,762	1,086,415	9,827,930	1,269,344	18,668,581	3,038,949	39,393,634
1956	36,651	541,952	577,592	9,574,331	967,767	8,612,008	1,413,310	22,076,289	2,995,320	40,804,580

Natural Salines.—The double salt calcium-magnesium chloride was produced in Meigs County by the Pomeroy Salt Corp., the only producer of this commodity in the State. The company operated 200 days, and reported demand was light during the year. Wages increased in 1956.

Perlite, Expanded.—Four companies reported production of expanded perlite in Ohio. Crude material was purchased from Western States, principally New Mexico, Colorado, and Nevada. The expanded product was used entirely as a lightweight-aggregate

material, mostly in plasters. Companies reported that demand was below normal, as building activity slowed during the year, and a price increase retarded sales temporarily.

Pigments, Iron Oxide.—Minnesota Mining & Manufacturing Co. processed pyrite cinders and manufactured red oxides (Fe_2O_3) at a plant near Copley in Summit County.

Salt.—The value of salt production in Ohio in 1956 increased 8 percent over 1955. The entire salt output came from artificially produced well brines. The greater part of salt produced was consumed in brine form for manufacturing soda ash and chlorine. Evaporated salt had a wide variety of users; some of the more important were feed dealers, meatpackers, tanners, casing manufacturers, grocers, and soap and detergent manufacturers. Demand remained about the same as in 1955, and one operator reported a wage increase. Capacity reported was 595,500 tons of evaporated salt and 2,759,250 tons of salt in brine. The industry operated at 94 percent of capacity during 1956. Salt was produced in 4 counties by 6 producers. Summit and Lake Counties were the leading salt-producing areas.

TABLE 7.—Salt sold or used by producers, 1947–51 (average) and 1952–56

Year	Evaporated		Brine		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	457,108	$4,146,321	2,253,257	$1,688,666	2,710,365	$5,834,987
1952	461,289	4,189,883	2,366,166	1,801,743	2,827,455	5,991,626
1953	498,438	5,175,816	2,541,799	2,308,979	3,040,237	7,484,795
1954	482,906	5,361,838	2,266,087	6,996,683	2,748,993	12,358,521
1955	509,905	6,113,567	2,395,123	8,655,194	2,905,028	14,768,761
1956	514,903	7,070,855	2,456,799	8,851,910	2,971,702	15,922,765

Sand and Gravel.—The output of sand and gravel increased 8 percent; the value of production increased 13 percent, reflecting continued activity in the construction industry in Ohio in 1956. Uses for sand and gravel—38 percent for building and 48 percent for paving—indicated the close relationship between the construction

TABLE 8.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Sand:				
Molding	453,056	$1,352,772	(1)	(1)
Structural	5,968,730	6,276,596	6,182,261	$6,736,928
Paving	4,762,545	4,553,402	4,629,399	4,633,557
Filter	49,804	72,757	90,430	133,422
Railroad ballast	(1)	(1)	18,360	15,606
Other [2]	777,204	2,692,872	1,574,986	4,625,052
Gravel:				
Structural	5,083,077	5,663,175	5,413,689	6,295,711
Paving	8,692,037	9,319,560	9,847,369	10,837,270
Railroad ballast	395,183	316,664	463,133	461,341
Other	1,724,411	1,747,417	1,980,195	2,407,288
Total sand and gravel	27,906,047	31,955,215	30,199,822	36,146,175

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes molding sand (1956), glass sand, grinding and polishing sand, blast sand, fire or furnace sand, engine sand, ground sand, railroad ballast (1955) other sands, and data indicated by footnote 1.

TABLE 9.—Commercial sand and gravel sold or used by producers, 1955–56, by counties

County	1955			1956		
	Number of pits	Short tons	Value	Number of pits	Short tons [1]	Value [1]
Adams	1	675	$270			
Allen				1	67,457	$77,577
Ashland	3	46,117	29,470	3	41,922	31,057
Ashtabula	5	154,471	162,659	5	237,668	235,846
Athens	2	41,200	49,800	2	57,150	73,965
Auglaize	4	292,186	333,155	3	374,034	440,277
Butler	9	1,277,606	1,297,807	8	1,655,938	1,765,289
Champaign	2	567,076	514,967	2	354,451	327,788
Clark	6	339,912	325,584	7	477,697	490,919
Clermont	1	492,284	539,287	1	702,441	772,685
Clinton	(2)	(2)	(2)	1	108,912	64,000
Coshocton	10	287,947	246,508	10	350,310	322,322
Crawford	1	34,153	29,701	1	45,313	41,715
Cuyahoga	9	958,973	1,169,656	8	823,781	814,088
Darke	6	259,568	272,280	6	253,912	274,983
Fairfield	6	219,520	237,037	7	170,087	189,653
Franklin	4	3,016,434	3,415,661	5	2,675,812	3,209,715
Gallia	(2)	(2)	(2)	3	222,487	437,696
Geauga	5	629,594	784,325	7	664,246	921,630
Greene	7	322,871	276,659	8	364,258	303,696
Hamilton	10	3,941,853	4,277,076	9	3,739,375	4,429,854
Hancock	1	54,045	64,066	1	76,313	76,148
Henry	2	36,902	48,561	2	74,630	99,505
Highland	1	9,327	5,965	1	6,482	4,036
Hocking	(2)	(2)	(2)	3	72,897	105,186
Holmes	(2)	(2)	(2)	3	126,044	119,093
Huron	3	114,261	115,809		(2)	(2)
Jackson				1	2,038	713
Jefferson	1	43,672	57,497	3	690,007	875,645
Knox	7	717,733	931,962	4	596,657	656,803
Lake	9	124,086	136,932	7	100,294	105,160
Lawrence	(2)	(2)	(2)	1	50,954	52,887
Licking	6	342,390	341,093	8	409,154	426,614
Logan	6	58,248	67,294	4	41,400	46,895
Lucas	4	220,091	202,159		(2)	(2)
Marion	1	41,195	45,314	1	53,382	57,720
Mahoning				2	22,553	33,884
Medina	3	498,559	584,814	6	898,630	989,650
Miami	7	292,267	337,514	4	502,240	521,937
Montgomery	17	2,725,779	2,370,749	15	2,733,445	2,700,548
Morgan	2	98,428	117,300	2	111,480	153,110
Morrow	1	39,000	40,785	1	38,830	41,606
Muskingum	4	350,556	399,059		(2)	(2)
Perry	1	18,776	59,144	1	16,019	53,775
Pike	5	340,270	457,679	4	427,301	614,037
Portage	15	1,492,620	2,297,659	17	1,446,829	2,374,862
Preble	3	144,040	153,551	4	176,851	199,683
Richland	4	157,188	135,117	4	287,856	237,748
Ross	8	603,877	585,980	6	918,056	861,960
Sandusky	1	25,222	36,572	1	25,685	37,204
Shelby	4	151,865	157,434	3	166,850	183,453
Stark	12	1,134,000	1,115,659	13	1,328,794	1,349,952
Summit	15	746,900	783,112	9	544,158	571,724
Trumbull	1	130,000	144,000	1	183,000	207,650
Tuscarawas	7	535,051	684,033	9	662,951	840,102
Warren	7	398,992	412,509	7	531,092	550,151
Washington	10	327,848	445,723	6	170,254	298,448
Wayne	3	17,112	14,357	4	126,104	121,007
Williams	6	141,288	95,525	6	199,347	125,445
Wyandot	3	93,106	91,232		(2)	(2)
Undistributed [3]	26	2,270,775	2,624,714	23	2,328,377	2,878,861
Total	297	27,377,909	30,122,775	284	29,524,205	33,797,957

[1] Excludes ground sand.
[2] Included with "Undistributed" to avoid disclosing individual company confidential data.
[3] Includes data for Carroll, Columbiana, Erie, Fulton (1956), Hardin (1955), Lorain, Madison, Meigs, Mercer (1955), Pickaway, Union and data indicated by footnote 2.

industry and the sand and gravel industry. The demand for sand and gravel was reported to be good; road building and public works consumed large quantities of this commodity. Private construction created less demand than formerly, as fewer homes were built. Com-

petition was keen, and many companies reported profits reduced because of inability to increase prices to cover greater costs and still compete favorably in a highly competitive field. Some dredge operators reported that abnormally high rivers during the spring months cut back production. Plants of the 334 reporting producers were as follows: fixed—188, portable—32, dredges—21, went out of business—26, temporarily abandoned—21, and no report—46.

Hamilton County led in output of sand and gravel, followed by Montgomery, Franklin, Butler, Portage, and Stark.

Stone.—Crushed and broken limestone was the leading type of stone produced in Ohio in 1956, comprising more than 90 percent of the stone total. Major uses for the products were as concrete aggregate and roadstone (45 percent), for manufacturing cement and lime (25 percent), as a metallurgical flux (17 percent), for agricultural purposes (6 percent), for railroad ballast (4 percent), for riprap and other uses (4 percent). In all, 56 Ohio counties reported stone production; those leading were Sandusky, Franklin, Ottawa, Seneca, and Wyandot. A small quantity of dimension limestone also was produced.

Both crushed and dimension sandstone was produced in the State; dimension sandstone was the more important industry in value. Sawed and dressed stone comprised the greater part of dimension sandstone. Crushed sandstone used was chiefly for refractory purposes.

Most stone producers reported normal trade and good demand. A few companies reported production above normal, owing to increased roadbuilding. Some reported that the steel strike and adverse weather during the spring slowed production. Competition was keener, and the margin of profit was smaller owing to the increased cost of supplies and maintenance.

National Lime & Stone Co. announced the building of a crushed-limestone plant at Buckland, its ninth plant. The France Stone Co., Toledo, announced plans to reopen a limestone quarry near Middlepoint, which had been inactive since 1944. Dewatering operations began in mid-July.

TABLE 10.—Stone sold or used by producers, 1955–56, by kinds

	1955		1956	
	Short tons	Value	Short tons	Value
Dimension stone:				
Limestone	7,187	$14,347	13,401	$33,223
Sandstone	177,424	6,254,099	180,779	6,991,580
Total dimension stone	184,611	6,268,446	194,180	7,024,803
Crushed and broken stone:				
Limestone	32,751,130	41,717,687	33,223,482	43,921,912
Sandstone	336,826	1,855,113	(1)	(1)
Total crushed and broken stone	33,087,956	43,572,800	33,223,482	43,921,912
Grand total	33,272,567	49,841,246	[2]33,417,662	[2] 50,946,715

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Incomplete total, excludes crushed and broken sandstone.

TABLE 11.—Limestone sold or used by producers, 1955–56, by counties

County	1955			1956		
	Number of pits	Short tons	Value	Number of pits	Short tons	Value
Adams	2	461,305	$609,942	2	381,477	$546,271
Allen	4	741,931	938,904	4	912,265	1,169,958
Athens	2	91,039	206,899	3	144,588	330,723
Belmont	2	35,275	78,240	2	28,880	60,608
Brown	2	32,104	36,921	2	29,496	35,916
Butler	1	20,060	26,078	1	14,714	19,128
Carroll				1	77,527	138,725
Clinton	1	385,923	441,278	1	365,587	439,268
Delaware	4	523,124	639,329	4	708,427	811,947
Erie	3	2,271,862	2,167,572	3	1,586,656	1,614,711
Fairfield	1	11,707	16,071	(1)	(1)	(1)
Fayette	3	603,870	748,683	3	710,684	906,152
Franklin	2	3,006,629	3,463,343	(1)	(1)	(1)
Guernsey	1	119,909	184,403	1	150,934	232,165
Hamilton	3	22,486	28,528	3	33,012	41,193
Hancock	3	432,929	521,693	3	580,737	721,261
Hardin	2	392,249	495,188	3	366,116	467,776
Harrison	1	181,097	242,518	1	222,652	307,743
Highland	3	360,331	474,951	2	371,702	523,062
Lawrence	4	642,367	784,640	2	320,399	451,659
Logan	3	162,943	188,703	3	165,279	201,723
Lucas	6	2,214,600	2,632,194	6	1,754,178	2,266,823
Mahoning	1	1,421,648	2,803,662	(1)	(1)	(1)
Marion	3	686,469	847,899	(1)	(1)	(1)
Mercer	2	430,209	530,479	2	387,923	482,828
Miami	1	691,397	1,373,059	1	586,103	1,195,070
Monroe	2	23,808	41,585	2	28,374	47,910
Morgan	1	29,613	71,262	1	6,482	11,343
Muskingum	2	804,535	1,064,995	(1)	(1)	(1)
Noble	1	73,000	96,500	1	18,000	30,766
Ottawa	(1)	(1)	(1)	3	2,673,053	3,008,347
Putnam	4	280,687	364,802	4	302,342	393,796
Sandusky	8	2,703,544	3,563,460	10	3,264,446	4,249,982
Seneca	4	2,107,282	2,336,684	(1)	(1)	(1)
Shelby				1	99,305	114,284
Union	2	303,342	382,846	(1)	(1)	(1)
Van Wert	3	284,532	334,493	3	375,490	436,914
Vinton	(1)	(1)	(1)	1	29,762	63,822
Wood	5	645,855	810,551	5	632,807	819,193
Undistributed [2]	20	9,558,656	12,183,679	29	15,957,486	21,820,068
Total	112	32,758,317	41,732,034	107	33,236,883	43,955,135

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes data for Auglaize, Clark, Crawford, Greene, Lake (1955), Meigs (1955), Montgomery, Paulding, Preble, Ross (1956), Stark (1955), Summit, and Wyandot and values indicated by footnote 1.

Sulfur, Recovered Elemental.—A small quantity of brimstone was recovered by the Republic Steel Corp. at a plant in Cuyahoga County near Cleveland using the Thylox process.

Vermiculite (Exfoliated).—Wyodak Chemical Division of the Federal Foundry Supply Co. processed crude vermiculite purchased from Zonolite Co. at Libby, Mont., to exfoliate vermiculite for insulation purposes and for use as a lightweight aggregate material.

METALS

Although metalliferous ores were not produced in Ohio in 1956, the State continued to lead in processing ores and other raw material into finished metal products.

Aluminum.—Olin Revere Metals Corp. was constructing an aluminum plant with a capacity of 180,000 tons of metal a year at Clarington, Ohio. At the beginning of the year Olin Mathieson Chemical Corp. had announced plans to construct a 60,000-ton plant. Later, when this company joined with the Revere Copper and Brass, Inc.,

to form the Olin Revere Metals Corp., the plans were revised upward to 180,000 tons.

The raw material, bauxite, will be imported from Surinam, processed to alumina in a company plant to be built at Brunside, La., and shipped up the Mississippi by barge to docks on the Ohio River at the reduction works. Of the metal produced, 120,000 tons will go to Olin and 60,000 tons to Revere. Power will be supplied by two 225,000-kilowatt, coal-fired, generating units owned by Olin Revere at a new plant to be constructed at Cresap, W. Va. A third 225,000-unit will be owned by Ohio Power Co., a subsidiary of American Gas and Electric, which will operate all 3 units. Initial production was expected late in 1957.

Beryllium.—Brush Beryllium Co. announced plans to construct a $4.5 million plant between Elmore and Oak Harbor, to handle the increased demand for Reactor-grade beryllium created by a contract awarded to the company by the Atomic Energy Commission (AEC). This company, the only industrial producer of atomic Reactor-grade beryllium, operated the AEC facility at Luckey and a fabrication plant in Cleveland.

Iron and Steel.—Ohio ranked second only to Pennsylvania in iron and steel production in 1956. The major Ohio steel producers announced increases in steel-making and auxiliary facilities. United States Steel Corp. announced plans to build a large sintering plant for processing iron ores at its Youngstown works. The plant, which will have a daily capacity of 5,000 tons, should increase blast-furnace capacity because of the use of higher quality iron ore. It is part of a rehabilitation and expansion program at the Ohio works that has been underway since 1946 and on which the company has spent more than $50 million.

Republic Steel Corp. announced plans to increase ingot capacity of its Warren works from 900,000 to 1,308,000 tons with the addition of two new 24-foot electric furnaces, each with capacity of 170 tons per heat.

Detroit Steel Corp. announced plans to expand its Portsmouth works by adding a sintering plant, a 275-ton open-hearth furnace, soaking pits, and other finishing facilities.

Wheeling Steel Corp. has initiated an expansion program at the Mingo Junction and Yorkville plants. Increased capacity, in additional steelmaking facilities in hot-strip mill and finishing and cold-rolling and finishing equipment, was planned.

Titanium.—Production of titanium metal in the United States has grown rapidly from 10 tons of sponge metal produced in 1948 to 14,600 tons in 1956. Ohio contained an important segment of the titanium industry, and the State probably will become increasingly important as a producer of sponge metal and mill products if announced expansion plans are carried out.

On September 24, 1956, United States Industrial Chemicals Co., Division of National Distillers Products Corp., announced plans for a 10-million-pound-annual-capacity titanium-sponge plant in Ashtabula near its existing sodium and chlorine plant. Metallic sodium will be used to reduce titanium tetrachloride to titanium sponge instead of magnesium.

Electro Metallurgical Co. produced its first sodium-reduced titanium metal at a 7,500-annual-ton plant at Ashtabula, the first United States plant to produce titanium commercially by a method other than the magnesium-reduction process.

Republic Steel Corp. (Cleveland) announced plans for a $8 million expansion of its titanium melting, preparation, forging, and laboratory facilities at its Canton and Massillon plants.

Zirconium.—United States Industrial Chemical Co., Division of National Distillers Products Corp., announced plans for constructing a 1.5 million-pound-per-year Reactor-grade, zirconium-sponge plant at Ashtabula and a 500,000-pound-per-year semicommercial metal plant, also at Ashtabula. The smaller plant, which will operate in the interim before construction of the larger one is completed, has been designed for easy conversion to production of titanium or hafnium sponge and also thorium and beryllium.

REVIEW BY COUNTIES

Adams.—Limestone was quarried and crushed at Peebles by the Plum Run Stone Division, New York Coal Co. Output was used mostly for concrete and roadstone; the rest was utilized for coal mine rock dust, agricultural purposes, and railroad ballast.

Allen.—The National Lime & Stone Co., Lima, lead in limestone production followed by Western Ohio Stone Co. (Lima), Bluffton Stone Co (Bluffton), and A. J. Suever Stone Co. (Delphos), in order of decreasing value. Four-fifths of the stone was quarried for use as concrete aggregate and roadstone. Railroad ballast and agricultural purposes consumed the remainder of the stone output.

Building and paving sand and gravel and filter sand was produced by C. E. Duff & Son (Westminster).

Ashland.—Paving gravel was produced by Bolin & Son (Lucas, the chief producer) and R. C. Meyers. Young Bros. Sand & Gravel Co. (Loudonville) produced a small quantity of sand and gravel for paving purposes. The Ashland County Highway Department reported output of sand for use in road paving.

Miscellaneous clay (shale) was mined by The E. Biglow Co. near New London for use in manufacturing heavy clay products.

TABLE 12.—Value of mineral production in Ohio, 1955–56, by counties [1] [2]

County	1955	1956	Minerals produced in 1956 in order of value
Adams	$610,212	$546,271	Stone.
Allen	938,904	1,247,535	Stone, sand and gravel.
Ashland	(3)	(3)	Sand and gravel, clays.
Ashtabula	162,659	235,846	Sand and gravel.
Athens	2,743,213	2,984,795	Coal, stone, sand and gravel.
Auglaize	(3)	(3)	Sand and gravel, stone.
Belmont	27,741,207	(3)	Coal, stone, clays.
Brown	36,921	35,916	Stone.
Butler	1,323,885	1,784,417	Sand and gravel, stone.
Carroll	2,385,911	2,581,803	Coal, clays, stone, sand and gravel.
Champaign	514,967	327,788	Sand and gravel.
Clark	(3)	(3)	Sand and gravel, lime, stone, peat.
Clermont	539,287	772,685	Sand and gravel.
Clinton	(3)	490,998	Stone, sand and gravel.
Columbiana	7,122,543	8,257,777	Coal, clays, sand and gravel.
Coshocton	3,567,566	(3)	Coal, sand and gravel, stone.
Crawford	(3)	(3)	Stone, sand and gravel.

See footnotes at end of table.

TABLE 12.—Value of mineral production in Ohio, 1955–56, by counties [1] [2]—Continued

County	1955	1956	Minerals produced in 1956 in order of value
Cuyahoga	$1,617,698	$1,260,607	Sand and gravel, clays, sulfur.
Darke	277,280	(3)	Sand and gravel, clays.
Delaware	1,136,602	(3)	Stone, lime, clays, sand and gravel.
Erie	(3)	(3)	Cement, stone, sand and gravel.
Fairfield	253,108	(3)	Sand and gravel, stone.
Fayette	748,683	900,825	Stone, sand and gravel.
Franklin	7,651,944	8,020,020	Stone, sand and gravel, lime, clays.
Fulton		(3)	Sand and gravel.
Gallia	(3)	3,272,988	Coal, sand and gravel.
Geauga	784,325	(3)	Sand and gravel, stone.
Greene	(3)	(3)	Cement, sand and gravel.
Guernsey	2,233,150	2,237,937	Coal, stone.
Hamilton	4,305,604	4,471,047	Sand and gravel, stone.
Hancock	687,969	(3)	Stone, sand and gravel, clays.
Hardin	(3)	467,776	Stone.
Harrison	34,291,313	43,556,460	Coal, stone, clays.
Henry	(3)	(3)	Sand and gravel, clays.
Highland	515,138	(3)	Stone, clays, sand and gravel.
Hocking	1,383,331	1,429,306	Clay, coal, sand and gravel.
Holmes	(3)	1,628,545	Stone, clays, sand and gravel, coal.
Huron	115,809	(3)	Sand and gravel, peat.
Jackson	3,105,480	3,366,146	Coal, clays, sand and gravel.
Jefferson	15,620,435	17,796,196	Do.
Knox	1,252,517	(3)	Sand and gravel.
Lake	(3)	(3)	Cement, salt, sand and gravel.
Lawrence	(3)	9,090,508	Cement, coal, clays, sand and gravel, stone.
Licking	(3)	(3)	Sand and gravel, clays.
Logan	253,397	248,618	Stone, sand and gravel.
Lorain	3,853,420	(3)	Stone, sand and gravel, grindstone.
Lucas	6,628,095	(3)	Cement, stone, sand and gravel.
Madison	(3)	(3)	Sand and gravel, clays.
Mahoning	6,707,768	6,238,277	Stone, coal, clays, sand and gravel.
Marion	959,033	(3)	Stone, clays, sand and gravel.
Medina	639,114	(3)	Sand and gravel, clays.
Meigs	3,143,751	(3)	Coal, sand and gravel, salt, natural salines.
Mercer	(3)	482,828	Stone.
Miami	1,710,573	1,717,007	Stone, sand and gravel.
Monroe	41,585	48,630	Do.
Montgomery	(3)	(3)	Sand and gravel, stone.
Morgan	4,823,574	5,718,571	Coal, sand and gravel, stone.
Morrow	55,148	51,703	Sand and gravel.
Muskingum	(3)	10,611,218	Cement, coal, sand and gravel, stone, clays.
Noble	2,910,778	(3)	Coal, clays, stone.
Ottawa	(3)	9,831,127	Lime, stone, gypsum.
Paulding	(3)	(3)	Cement, stone, clays.
Perry	8,845,195	(3)	Coal, sand and gravel, clays.
Pickaway	(3)	(3)	Sand and gravel.
Pike	460,479	(3)	Stone, sand and gravel.
Portage	3,825,964	4,658,442	Sand and gravel, stone, coal, clays, peat.
Preble	(3)	(3)	Lime, sand and gravel, stone.
Putnam	406,358	428,043	Stone, clays.
Richland	302,536	(3)	Sand and gravel, clays, peat.
Ross	585,980	(3)	Sand and gravel, stone.
Sandusky	16,840,954	17,847,616	Lime, stone, sand and gravel.
Scioto	2,470,215	2,729,187	Stone, clays.
Seneca	(3)	(3)	Lime, stone, clays.
Shelby	157,434	297,737	Sand and gravel, stone.
Stark	10,101,133	10,917,622	Cement, coal, clays, sand and gravel, peat.
Summit	(3)	12,688,748	Salt, lime, sand and gravel, stone, clays, peat.
Trumbull	144,000	207,650	Sand and gravel.
Tuscarawas	11,872,661	12,644,970	Coal, clays, sand and gravel.
Union	(3)	(3)	Stone, sand and gravel.
Van Wert	336,833	(3)	Stone, clays.
Vinton	(3)	(3)	Coal, clays, stone.
Warren	412,509	550,151	Sand and gravel.
Washington	1,044,635	1,139,093	Coal, sand and gravel, grindstone, clays.
Wayne	(3)	(3)	Salt, coal, sand and gravel, clays.
Williams	(3)	(3)	Sand and gravel, clays.
Wood	1,665,448	1,449,603	Stone, lime, clays.
Wyandot	(3)	(3)	Stone, lime, sand and gravel, peat, clays.
Undistributed	125,601,088	158,216,973	
Total	340,457,000	375,488,000	

[1] Defiance County was not listed as no production was reported.
[2] Fuels, including natural gas, petroleum, and natural gas liquids, not listed by counties as data are not available, included with "Undistributed."
[3] Figure withheld to avoid disclosing individual company confidential data. Value included with "Undistributed."

Ashtabula.—The Gleason Sand & Gravel, Inc. (formerly known as A. C. Meade Construction Co., Inc.) (Conneaut), and Northeast Materials, Inc. (Kingsville) were the leading sand and gravel producers. Other outstanding producers were Peerless Mineral Products Co., Conneaut, and Carter Sand & Gravel Co., Ashtabula. Building and paving claimed most of the output, and a small part was used as molding sand and railroad ballast. Pinney Dock & Transport Co., Kingsville, reported output of gravel for use as fill and for road paving.

Athens.—Of the 32 active coal mines, 23 underground operations supplied three-fourths of total output. Gem Coal Co. was by far the leading producer. Considerable tonnage was also mined from the strip pits of the Furr Coal Co. and the Carbondale Coal Co.

Limestone for concrete and roadstone was obtained from the quarries of Dickson Bros. and Diamond Stone Quarries, Inc., both of Albany; and Amesville Stone Co., Amesville.

The Athens Building Material Co. (Athens) was the leading producer of sand and gravel for building and paving. John Slater (The Plains) reported sand and gravel for building purposes, and the State highway department reported sand and gravel produced under contract for road maintenance.

Auglaize.—The value of sand and gravel increased one-third over the previous year. Wapak Sand & Gravel Co. (Wapakoneta) was the outstanding producer of building and paving sand and gravel. Quality Sand & Gravel Co. and Western Ohio Stone Co. (both near Wapakoneta) produced building sand and gravel and paving sand and gravel, respectively.

Limestone crushed for use as concrete aggregate and for agricultural purposes was quarried at the Buckland quarry of National Lime & Stone Co. near Wapakoneta.

Belmont.—Out of 25 coal-producing counties, Belmont ranked second in both tonnage (over 7 million tons) and number of active mines (52). The foremost underground producer was Powhatan Mining Co. followed in order of decreasing tonnage by The Youghiogheny & Ohio Coal Co., The Saginaw Dock & Terminal Co., The David Z. Norton Co., and the Lorain Coal & Dock Co. These companies supplied over three-fourths of the county output.

Limestone was crushed by W. J. Plumly at Somerton Crushing quarry, Somerton; and George & C. H. McCort, Malaga.

Belmont Brick Co. (Bellaire) mined miscellaneous clay for heavy clay products.

Brown.—Limestone was quarried by the Brown County Highway Department and by Howard S. Watson (Georgetown) for use as concrete aggregate and for agricultural purposes.

Butler.—Butler was an important area in output of sand and gravel, as the county ranked fifth in the State in value of sand and gravel production. The two plants of American Materials Corp. near Hamilton yielded the greater part of output. Other producers were Middletown Sand & Gravel Co. and Moorman Sand & Gravel Corp., both of Middletown; Hamilton Gravel Co., North Cincinnati Sand & Gravel Co., Sipp Sand Co., and W. J. Cisle & Son, all of Hamilton; and Central Gravel & Ready Mix Co., Oxford. Sixty-five percent of the production was used for paving and 30 percent for building purposes; the remainder was employed for railroad ballast and miscella-

neous uses. The North Cincinnati Co. also quarried limestone for use as concrete aggregate and roadstone.

Carroll.—The most important mineral mined in the county was coal. The greater part of coal output was obtained from strip mines. Leading producers were the James Bros. Coal Co., Clarence Mining, Inc., and Billman Coal Co.

Fire clay was mined by the Metropolitan Brick, Inc., Minerva; and Whitacre-Greer Fireproofing Co. and the Natco Corp., both of Magnolia. The Robinson Clay Products Co. (Malvern) reported miscellaneous clay, and the Natco Corp. also mined miscellaneous clay. Output was used for heavy clay products.

Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co. (Carrollton), quarried limestone for concrete aggregate. The Rainbow Stone Co. (Sherrodsville) produced dimension sandstone for architectural purposes.

Molding sand was produced by the Mineral City Sand Co. at Mineral City.

Champaign.—The American Aggregates Corp. (Urbana) produced large quantities of sand and gravel for road paving and railroad ballast. Walter R. Dorsey produced paving gravel at a plant near Cable.

Clark.—The value of sand and gravel rose over 50 percent in 1956 as compared with 1955. Springfield Cement Products, Inc. (Springfield), and Enon Sand & Gravel Co. (Enon) were the principal companies. Other producers were Springfield Gravel & Excavating Co., Springfield; Porter Bros. Washed Sand & Gravel Co., New Carlisle; and Kiefer Sand & Gravel Co., Yellow Springs. M. L. Eidemiller (Springfield) and W. M. & Lee Upton for New Carlisle Sand & Gravel (New Carlisle) mined gravel. County output was used mostly for building and paving purposes.

The Moores Lime Co. quarried and crushed limestone for use as concrete aggregate, blast-furnace flux, agricultural purposes, and for use in manufacturing lime at its Durbin plant. The product was used for water softening, sewage treatment, paper bleach and petroleum refining.

Humus peat was produced by Harold A. Skinner (New Carlisle).

Clermont.—Large quantities of sand and gravel were produced by the Ohio Gravel Co. at Miamiville. Output was used for building (36 percent), paving (27 percent) and railroad ballast (5 percent). Crushed boulders furnished the remainder of production (32 percent).

Clinton.—The Melvin Stone Co. (Melvin) quarried limestone for concrete aggregate, agricultural purposes, blast-furnace flux, riprap, and for use as refractory dolomite. Sand and gravel was also produced by the company at a plant near Wilmington for building and paving purposes.

Columbiana.—Coal mined in Columbiana County came principally from strip pits. The leading producers were Buckeye Coal Mining Co., Inc., Ferris Coal Co., A. B. C. Mining Co., Inc., and Industrial Mining & Engineering Co.

Of the 41 clay-producing counties in the State, Columbiana ranked second in value of production. Fire clay for use in fire brick and block, mortar, foundries and steelworks, heavy clay products, and stoneware was mined by McLain Fire Brick Co., Division of H. K. Porter Co., Inc., the leading producer, at an underground mine near

Hammondsville and two underground mines near Wellsville. Metropolitan Brick, Inc., and Natco Corp. (both of Negley) were the other fire-clay producers. Miscellaneous clay for heavy clay products and floor and wall tile was mined from the open pits of Summitville Face Brick Co., Summitville; American Vitrified Products Co., East Liverpool and Lisbon; and L. L. Adams Clay Co., Lisbon.

Iron City Sand & Gravel Corp. dredged large quantities of sand and gravel from the Ohio River for use in building and paving. Molding sand was produced by The Morgan Sand Bank Co. at a fixed plant near Leetonia.

Coshocton.—The leading producers of strip-mined coal were Mt. Perry Coal Co., Freeport Gas Coal Co., Blue Crystal Mines, Inc., Fresno Coal Co., Adam Mills Coal Co., and Hutt Coal Co.

Ten commercial sand and gravel operations yielded output for building and paving. The two plants of W. P. McCarren Co. (near Walhonding and Canal Lewisville) and the plant of B. W. Boyd & Son (Coshocton) furnished the greater part of county output.

The Pearl Sandstone Co. (Fresno) produced dimension sandstone for architectural purposes and flagging.

Crawford.—The National Lime & Stone Co. (Bucyrus) quarried a large quantity of limestone for concrete aggregate, agricultural purposes, and railroad ballast. The Crawford County Highway Department was the other producer of limestone in the county.

Sand and gravel output was reported by the Galion Gravel Co. (Galion) for building and paving. The company also reported filter sand production.

Cuyahoga.—The leading producer of sand and gravel was Newburg Sand & Gravel Co. (Garfield Heights). Considerable quantities were also produced by Charles Loparo Sand & Gravel Co., Canal Sand & Gravel Co., both of Cleveland; Testa Bros., Inc., Glenwillow; The Schmidt Bros. Sand & Supply Co., Garfield Heights; and Shaker Sand & Gravel Co., Cleveland.

Miscellaneous clay was mined from six open pits and was used for heavy clay products and lightweight aggregates. Production in order of decreasing value, came from the following companies: Hydraulic Press Brick Co., South Park; Cleveland Builders Supply Co. Warner plant at Garfield Heights and Pearl Plant at Cleveleand; The Collinwood Shale Brick & Supply Co., Cleveland; The Ohio Clay Co., Garfield Heights; and The Berea Brick & Tile Co., Berea.

Sulfur was recovered in the liquid purification of gas by Republic Steel Corp. at its plant near Cleveland. Expanded perlite was also processed near Cleveland by Cleveland Builders Supply Co. The Wyodak Chemical Division, Federal Foundry Supply Co., exfoliated vermiculite at Cleveland from crude material mined at Libby, Mont.

Darke.—The American Aggregates Corp. (Fort Jefferson) was the leading producer of sand and gravel. Output was reported by five additional small producers. The county output was virtually all utilized for paving with the exception of a small quantity used for building.

Miscellaneous clay for heavy clay products was mined by Darke County Tile Co. (Greenville).

Delaware.—The Scioto Lime & Stone Co. quarried limestone near Delaware. A large part of output was used as concrete aggregate,

railroad ballast, agricultural puposes, and riprap. The remainder of production was used in manufacturing lime at its plant. This lime was used for metallurgical purposes, in the purification of water, in sewage and trade-waste treatment, for chemical purposes, and as a paper bleach. Sizable quantities of limestone were also reported by Penry Stone Co., Radnor; Owens Stone Co., Ostrander; and Shawnee Stone Co., Inc., Powell.

The Delaware Clay Co. (Westerville) and Galena Shale Tile & Brick Co. (Galena) mined miscellaneous clay for heavy clay products.

Paving gravel was produced by the Ohio State Highway Department.

Erie.—The Medusa Portland Cement Co. quarried limestone for manufacturing cement at Baybridge. The Wagner Quarries Co. (Sandusky) and Castalia Quarries Co. (Castalia) quarried limestone for use as concrete aggregate, railroad ballast, agricultural purposes, and riprap.

Keener Sand & Clay Co. produced molding sand at a fixed plant near Huron.

Fairfield.—The plant of F. H. Brewer Co. near Lancaster was the principal producer of sand and gravel in the county. Sargent Gravel Co. and Homer Taylor & Son (Lancaster) and Industrial Minerals Co. (Bremen), reported output of considerable tonnages.

Limestone was quarried for concrete aggregate and agricultural purposes by the Rushcreek Limestone Co. at Lancaster.

Fayette.—Crushed limestone was produced by Blue Rock, Inc., Fayette Limestone Co., Inc., and Sugar Creek Stone Co., all of Washington. Of the total production, 74 percent was utilized as concrete aggregate; the remainder was used in riprap, agricultural purposes, and railroad ballast.

A small quantity of paving gravel was produced under contract by the Ohio State Highway Department.

Franklin.—Franklin County ranked second in the State in the value of stone and sand and gravel production. The Marble Cliff Quarries Co. (Columbus) crushed limestone for flux in blast furnaces, concrete aggregate, railroad ballast, agricultural purposes, and use in open-hearth plants. Part of the output was also used by the company in manufacturing quick and hydrated lime.

The American Aggregates Corp. (Columbus) was by far the leading producer of sand and gravel. Other producers were Jackson Pike Sand & Gravel Co., Mason's Sand & Gravel Co. and Arrow Sand & Gravel Co., subsidiary of Marble Cliff Quarries, all of Columbus. Output was used for building, paving, and railroad ballast. The Illinois Silica Sand Co. (Columbus) produced molding sand.

Miscellaneous clay for heavy clay products was mined from open pits near Blacklick by Columbus Clay Manufacturing Co. and the Claycraft Co.

Fulton.—The Stoop Gravel Co. produced a small quantity of paving gravel.

Gallia.—Coal was mined mostly from strip and auger mines; leading were those of the Ohio River Collieries Co., Gallia Coal Co., and Middleport Coal Co. Of the several small underground producers, Fitch Coal Co. was outstanding.

M. T. Epling Co. (Gallipolis) and Richards & Son (Cheshire) reported sand and gravel output for building, paving, and railroad ballast. Keener Sand & Clay Co. (Gallia) produced molding sand. M. T. Epling also produced a small quantity of blast sand. Paving gravel output was reported by the Gallia County Highway Department.

Geauga.—Molding sand, fire or furnace sand, and paving sand and gravel were reported by R. W. Sidley, Thompson, the leading producer in the county. Other companies were Jefferson Materials Co., Burton; General Refractories Co., Warren; and Sperry Road Sand & Gravel Co., Chardon, all for building and paving purposes.

Quartzite for silica brick was quarried near Thompson by Harbison-Walker Refractories.

Greene.—Greene County was the leading area in cement manufacture owing to the output of Southwestern Portland Cement Co. and Universal Atlas Cement Co. (both of Fairborn). Its limestone plants were also at Fairborn, where the stone was quarried and crushed for use in manufacturing cement.

Sand and gravel was produced by Charles F. McNamee, Fairborn; and K. E. Macy for Greene Township Gravel Co., Cedarville. Gravel output was reported by six operators; the leading producer was Phillips Sand & Gravel Co. (Xenia). Building and paving uses consumed the county sand and gravel output.

Guernsey.—The coal mined in Guernsey County came mostly from the strip and auger mines of Virginia Mining Co. The remainder of production came from 10 smaller mines; the largest were the strip pit of C. V. & W. Coal Co., Inc., and the underground mine of Byesville Coal Co.

John Gress (New Concord) quarried limestone for concrete and roadstone.

Hamilton.—Hamilton County led in the value of sand and gravel, owing to the large quantities produced at the four operations of the Ohio Gravel Co. at Newtown, Miamitown, Cleves, and Camp Dennison. The remainder of county output was produced, in order of decreasing value, by the Willey-Ruckstuhl Co., Miamitown; H. Lynne Barber, Cincinnati; George L. Rack, Inc., Cincinnati; Skinner Sand & Gravel Co., Reading; and Terrace Park Gravel Co., Terrace Park. Output was used almost exclusively for building and paving, except a small quantity that was utilized for railroad ballast and miscellaneous purposes.

The Ohio Gravel Co. operated two plants near Newton and Camp Dennison and quarried and crushed limestone for agricultural purposes. The City of Cincinnati, Highway Maintenance Division, produced a small quantity of limestone for use as concrete aggregate.

The Indoken Perlite Co. continued to expand perlite near Cincinnati.

Hancock.—Limestone for concrete aggregate, railroad ballast, and agricultural purposes was quarried by the National Lime & Stone Co. and the Tarbox-McCall Stone Co. both of Findlay; and the Pifer Stone Co., Inc., Williamstown.

Hobbs Bros. Sand & Gravel Co. (McComb) produced sand and gravel, principally for building and paving and gravel for filter beds.

The Hancock Brick & Tile Co (Findlay) mined miscellaneous clay for heavy clay products.

Hardin.—Limestone was quarried by the Herzog Lime & Stone Co. (Forest), the leading producer; Hardin Quarry Co., Blanchard; and the France Co., Kenton. The product was used for concrete aggregate, metallurgical work, agricultural purposes, railroad ballast, and riprap.

The Bell Sand & Gravel Co. reported operations permanently abandoned.

Harrison.—Harrison County led in coal production, as mining flourished in 1956 with output over 10 million tons, a 17-percent increase from 1955. Sixty-seven percent of the coal was mined from strip pits, 30 percent from underground mines, and 3 percent by auger methods. Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co., was by far the greatest producer, operating three mines—strip, underground, and auger. The underground mine of the Youghiogheny & Ohio Coal Co. was also a principal source of coal followed by the strip operations of Cadiz Mining Co., R. & F. Coal Co., Powhatan Mining Co., Cravat Coal Co., and Bedway Coal Co.

The Hanna Coal Co. also quarried large quantities of limestone near Cadiz for concrete aggregate and agricultural purposes.

The Bowerston Shale Co. mined miscellaneous clay from an open pit near Bowerston for heavy clay products.

Henry.—Sand for building purposes was dredged from the Auglaize River by Arthur A. Williams (McClure) and Leo Eberwine for Napoleon Sand & Gravel Co. (Napoleon). A small quantity of paving gravel was produced by the Henry County Highway Department.

August Honeck & Son (Malinta) and Napoleon Brick & Tile Works (Napoleon) mined miscellaneous clay for heavy clay products.

Highland.—Limestone was quarried and crushed for use as concrete aggregate and for agricultural purposes by Highland Stone Division New York Coal Co., Hillsboro; and Ohio Asphaltic Limestone Co., near Vienna.

Miscellaneous clay for heavy clay products was mined by the Mowrystown Brick & Tile Co. (Mowrystown).

A small quantity of gravel for use as fill was produced by Uhrig & Collins (Hillsboro).

Hocking.—Hocking County was an important area for fire-clay mining. The Natco Corp. Haydenville and Diamond plants (near Haydenville and Nelsonville, respectively) and General Hocking Brick Co. (Logan) reported output for heavy clay products. Miscellaneous clay was also mined by the General Hocking Brick Co.

Fifteen small coal mines were active during the year; the largest were the strip operations of Wharton Coal Co., Inc., and Red Arrow Coal Co.

Sand and gravel for building and paving was produced by the F. H. Brewer Co., Enterprise; and Hocking Valley Sand & Gravel Co., Logan. Central States Co. (Chillicothe) and the Ohio State Highway Department reported output of gravel for paving roads.

Holmes.—Dimension sandstone was quarried for architectural use and flagging by the Briar Hill Stone Co., Glenmont; and The Nicholl Stone Co., Killbuck.

Fire clay and miscellaneous clay were mined by the General Clay Products Co. (Baltic) for heavy clay products. The Holmes Limestone Co., Holmes Clay Division (Berlin) mined fire clay principally for heavy clay products and also for use in foundries and steelworks, for manufacturing fire brick and block, and for rotary-drilling mud.

The sand and gravel output of Feikert Sand & Gravel Co. (Millersburg) was used almost entirely for paving except for a small quantity, which was used for fill. Gravel was produced by Close Sand & Gravel Co. (Millersburg) and F. E. Kaser (Holmesville) for building and paving.

The county output of coal, was mined underground by Union Coal Co. and strip-mined by Kuhn & Smith, Inc., and The Holmes Limestone Co.

Huron.—The greater part of the Huron Sand & Gravel Co. production was gravel for use in paving roads. The remainder of output was filter sand and building sand and gravel. Production of sand for building and a small quantity of molding sand was reported by Greenwich Sand Co. (Greenwich) and Tesmer Sand Co. (Norwalk), respectively.

The Mello-Peat Co. produced peat from a bog near Willard.

Jackson.—Coal was mined from 14 strip and 5 underground mines in the county. The principal mine was the strip mine of Broken Aro Coal Co. Some of the larger remaining mines were the strip pits of Waterloo Coal Co., Clinton Coal Co., and Collins & Walton Coal Co.

Fire clay was mined by seven companies, which are listed in order of decreasing production value: Cedar Heights Clay Co., the Pyro Refractories Co., General Refractories Co., Poetker & House Co., Aetna Fire Brick Co., Jefferson Clay Co., and Waterloo Coal Co., all of Oak Hill. Output was used for refractories, agricultural terra cotta, and floor and wall tile.

A small quantity of bank-run gravel was removed from the pit of R & R Coal Co. (Jackson) by the Ohio State Highway Department for use in paving roads.

Jefferson.—The most important mineral of Jefferson was coal; the county ranked third in coal production. The principal producing properties were the strip and auger mines of Powhatan Mining Co., the underground mines of Hanna Coal Co., Division of Pittsburgh Consolidation, and the Warner Collieries Co. and the strip pits of Polen Coal Co., Zimnox Coal Co., Pier Coal Co., Teramana Bros. Coal Co., Ohio Edison Co., and Tri-State Coal Co.

Fire clay was mined for heavy clay products and refractories by McLain Fire Brick Co., Division of H. K. Porter Co., Inc., and Frederick J. Dando Co., Irondale; Toronto Fire Brick Co., Stratton; the Kaul Clay Manufacturing Co., and Peerless Clay Corp., Toronto; and Union Clay Manufacturing Corp., Empire. Miscellaneous clay for heavy clay products was also mined by the Kaul Clay Manufacturing Co.

The Iron City Sand & Gravel Corp. and the Duquesne Sand Co. dredged sand and gravel from the Ohio River for building and paving.

Fire and furnace sand and a small quantity of gravel was produced by the Brilliant Sand Co. from a fixed plant near Brilliant.

Knox.—Quartzite was quarried and ground for use in glass, at foundries, and as a constituent in pottery, porcelain, and tile by The Millwood Sand Co. (Howard).

Sand and gravel, primarily for use in paving roads and for building purposes, was produced by the Fredericktown Sand & Gravel Co., Fredericktown; the Killbuck Sand & Gravel Co., Brinkhaven; J. Harry Baughman, Mount Vernon; and R. D. Melick & Son Gravel Co., Fredericktown. Charles C. Engle sold his operation to L. E. Kearns (Gambier) April 1956. No production was reported by either company for the year. The Knox County engineer produced gravel for paving roads.

Lake.—Standard Portland Cement, Division Diamond Alkali Co., continued to manufacture cement at Painesville. The Diamond Alkali Co. also produced brine from wells near Painesville for use in chemicals.

Sand and gravel for building and paving was produced by Leonard Granger (Mentor), the chief producer; and Erie Road Gravel, Eastlake. The most prominent of several small companies reporting gravel for paving roads were Donald R. Keeney, Painesville; and Bradshaw & Thorne, Kirtland.

Lawrence.—Limestone was quarried by Alpha Portland Cement Co. (Ironton), for use in its cement-manufacturing plant. The Marquette Cement Manufacturing Co. (Superior) also produced cement in the county. The Lawrence County Highway Department reported limestone produced for concrete and roadstone.

Coal was mined mostly from the underground and strip mines of Collins Mining Co. and the strip mine of Greasy Ridge Coal Co.

Harbison-Walker Refractories Co. (South Webster) was the chief fire-clay producer, followed in order of decreasing value, by International Minerals & Chemical Corp., Eastern Clay Products Department, Pedro; the Carlyle Tile Co., Ironton; Cambria Clay Products Co. and Chaney Mining Co., both of Blackfork; Lawrence Clay Refractories Co., Pedro; and B. & B. Contracting Co., Olive Furnace. The Carlyle Tile Co. also mined miscellaneous clay. County output was used in refractories and floor and wall tile.

The sand and gravel plant of George B. Wilson was sold to The Wilson Sand & Gravel Co., Chesapeake, July 1956; its gravel was produced for paving purposes.

Licking.—Building and paving sand and gravel was produced, by Vanatta Gravel Co., Dry Creek Crushed Gravel Co., and North Fork Gravel Co., all of Newark; E. H. Hammond, Granville; Alexandria Sand & Gravel Co., Alexandria; Paul Jones, Newark; and Granville Gravel Co., Granville.

Miscellaneous clay for heavy clay products was mined by The Bowerston Shale Co., Hanover.

Logan.—Northwood Stone & Asphalt Co. (Belle Center), National Lime & Stone Co. (East Liberty), and Western Ohio Stone Co. (Huntsville) quarried limestone, which was crushed for use as concrete aggregate for agricultural purposes, riprap, and railroad ballast.

Sand and gravel for building and paving was produced by Neer's

Engineering Laboratories and Moraine Sand & Gravel, Bellefontaine; National Lime & Stone Co., Findlay; and Quincy Hardware & Supply, Quincy. C. E. Duff & Son (Huntsville) reported opening a new plant, to go into operation in 1957.

Lorain.—Lorain County ranked third in value of stone output owing to the high productivity of the Cleveland Quarries sandstone quarry at Amherst. Production was used for architectural purposes, flagging, curbing, riprap, refractories, concrete and roadstone, and at foundries. The Nicholl Stone Co. quarried sandstone for architectural purposes and also produced grindstones at Kipton.

The Lorain Elyria Sand Co. (Lorain) produced sand for paving, building, and for use as fill.

Lucas.—A large quantity of cement was manufactured at the Medusa Portland Cement Co. plant at Toledo. Limestone was quarried by the company near Silica for use in manufacturing cement. Companies reporting limestone production for use as concrete aggregate and for agricultural purposes, railroad ballast, and riprap were Maumee Stone Co., Maumee; Toledo Stone & Glass Sand Co., Sylvania; and the France Stone Co. (two quarries) at Waterville and Holland. The Holland plant was demolished by fire during the year, and the company reported operations closed indefinitely.

Sand was dredged from the Maumee River near Toledo for building purposes by Maritime Trades, Inc., the Lake Sand & Gravel Co., and Lake Erie Sand & Transport Co.

Madison.—Sand and gravel for building and paving was produced near West Jefferson by the West Jefferson Sand & Gravel Co. The Ohio State Highway Department produced paving gravel.

The Madison Tile Co. mined miscellaneous clay for heavy clay products from an open pit near London.

Mahoning.—Limestone was quarried and crushed by the Carbon Limestone Co. near Poland Township. Output was used mostly for metallurgical work (blast-furnace flux and foundries), and as concrete aggregate for agricultural purposes, dust for coal mines, mineral food, asphalt, and poultry grit.

All coal was mined from strip pits. The leading producers, in order of decreasing tonnage, were the Marshall Mining Co., the Earl Fairfield Coal Co., Keller Mines, Inc., DeLauter Coal Co., Poland Coal Co., Sunnyside Coal Mining Co., and the Carbon Limestone Co.

The American Fire Clay & Products Co. (Canfield) mined a large quantity of fire clay for use in foundries and steelworks and for making refractory cement. The Pen-Hio Clay Co. (Youngstown) and DeLauter Coal Co. (North Lima) produced fire clay for foundries and for lining blast furnances. Miscellaneous clay for heavy clay products was mined by the Alliance Brick Corp. and the Alliance Clay Products Co. (both of Alliance).

Gurlea Sand & Gravel (Salem) produced sand and gravel for building and paving. Sand for paving roads was reported by the Mahoning County Highway Department.

Marion.—The National Lime & Stone Co. (the leading producer), J. M. Hamilton & Sons Co. (both of Marion), and Tri-County Limestone Co. (La Rue) produced limestone for use as concrete aggregate, railroad ballast, agricultural purposes, and riprap.

Miscellaneous clay for heavy clay products was mined by Marion Brick & Tile Co., Iberia; and the La Rue Tile Co., La Rue.

Building and paving sand and paving gravel was produced by Penry Sand & Gravel Co. The Marion County Highway Department produced gravel for paving roads.

Medina.—The principal producers of sand and gravel for building, paving, and fill were Quillin Bros. Construction Co. and M. S. Worth for Lodi Sand & Gravel Co., both of Lodi; and Brunswick Sand & Gravel, Brunswick. A small quantity of filter sand was also reported by Quillin Bros.

Wadsworth Brick & Tile Co. mined miscellaneous clay from an open pit near Wadsworth for heavy clay products.

Meigs.—The strip and auger mines of Swisher Coal Co., Goeglein Bros. Coal Co., and Branch Fleming Coal Co. and the strip mine of Raymond Chuckler yielded most of the coal output of the county.

Tri-State Materials Corp. and Richards & Son (both of Pomeroy) produced sand and gravel for building and paving. The State Highway Department produced a small quantity of gravel in the county for paving purposes.

The Pomeroy Salt Corp. (Minersville) and Excelsior Salt Works, Inc. (Pomeroy), produced brine from wells. Output was evaporated by the open-pan method for use principally by feed dealers and meat packers. The Pomeroy Salt Corp. produced natural salines (calcium chloride) from well brines at Minersville.

Mercer.—The John W. Karch Stone Co. (Celina) and Rockford Stone Co. (Rockford) quarried limestone for concrete aggregate, agricultural purposes, and riprap.

Miami.—Armco Steel Corp., Piqua Quarries (Piqua) quarried a large quantity of limestone for metallurgical work as concrete aggregate, for agricultural purposes, roofing, and light bulbs, rubber and putty filler, and riprap.

Fenton Construction Co. (Troy) and Steiner Washed Sand & Gravel (Ludlow Falls) produced sand and gravel mostly for building and paving purposes. Vandalia Sand & Gravel, Inc. (Tipp City), and Eldean Gravel (Troy) were other producers. Armco Steel Corp. and Laura Gravel Co., former producers, reported no production in 1956. Estey Sand & Gravel Co. sold out early in 1956.

Monroe.—Walter L. and Nova A. Christman (the leading producer) and H. F. Zerger (both of Woodsfield) quarried limestone for concrete aggregate and agricultural purposes.

The State highway department reported gravel produced under contract for paving roads.

Montgomery.—The value of sand and gravel increased slightly in 1956 over 1955 as the county again ranked third in value of production. By far the leading producer was American Aggregates Corp. (Dayton), followed by Central Sand & Gravel Co., Dayton; Miller Bros., Union; the Keystone Gravel Co., Wysong Gravel Co., John W. Thomas Gravel Co., all of Dayton; and Englewood Sand & Gravel Co., Englewood. Output was used almost enirely for building and paving.

Laura Gravel & Stone Co. (Phillipsburg) and Limestone Dayton Co. (Dayton) reported output of limestone for concrete aggregate, asphalt, agricultural purposes, blast-furnace flux, riprap, and railroad ballast.

Perlite was expanded by the Schumacher Industries, Inc. (Dayton).

Morgan.—Coal in the county was mined mostly from the strip pit of Central Ohio Coal Co. The underground mine of Simpson Coal & Chemical Corp. and the strip pit of Haines & Lawrence Coal Co. also reported considerable tonnages.

Sand and gravel for paving purposes was reported by Stockport Sand & Gravel Co. A small quantity of gravel was produced by Douglas Ervin. Both operations were near Stockport.

Chesterhill Stone Co. (Hackney) quarried limestone for concrete aggregate.

Morrow.—Building sand and paving gravel was produced by Chesterville Sand & Gravel Co. (Chesterville). The county board of commissioners and the State highway department reported gravel production for paving purposes.

Muskingum.—Pittsburgh Plate Glass Co. manufactured cement at its East Fultonham (Ohio) plant. Owing to the high productivity of this plant, the county again ranked third in value of cement output. The Columbia Cement Division, Pittsburgh Plate Glass Co., quarried limestone in Newton Township for use in cement. Limestone for concrete aggregate and agricultural purposes was also produced by Sidwell Bros. near Zanesville.

Coal was mined from 16 underground, 9 strip, and 10 auger mines. Even though underground mines were more numerous, strip production constituted three-fourths of output. Production came principally from the strip mines of Central Ohio Coal Co. and Bruns Coal Co., Inc., and the underground mine of Ten X Coal Co.

Building sand and gravel was produced by the Muskingum River Gravel Co. (Duncan Falls). The Zanesville Gravel Co. (Dresden) reported sand and gravel for building, paving, and industrial use.

Quartzite for foundry use was quarried near Zanesville by the Ayers Mineral Co.

Nelson Clay Co. (Roseville) and Tionesta Clay Co. (Zanesville) mined fire clay for stoneware, art pottery, and flowerpots.

Noble.—Virtually the entire coal production (99 percent) was strip-mined. Output from auger mines supplied the remainder. The chief producers were Central Ohio Coal Co., Commercial Fuel Co., Bruns Coal Co., Inc., Selway Mining Co., and Boyd & Palmer Construction Co.

Miscellaneous clay (shale) for heavy clay products was mined near Ava by the Ava Brick Co.

James Merry Stone Co. (Caldwell) quarried limestone for use as concrete aggregate and roadstone and for agricultural purposes.

Ottawa.—Ottawa was an important area in limestone production and the only source of gypsum in Ohio. Chemstone Corp., Minerals & Chemicals of America, quarried and crushed limestone at Marblehead principally for metallurgical work and for concrete aggregate, agricultural purposes, and riprap. The United States Gypsum Co. at Genoa produced dolomite for concrete aggregate and for use in lime. Its lime works were also at Genoa. Basic, Inc., manufactured lime at Toledo.

Gypsum was produced by the Celotex Corp., Port Clinton, the leading producer; and United States Gypsum Co., Gypsum.

Paulding.—Consolidated Cement Corp. manufactured cement and quarried limestone for use in the cement plant at the Paulding site. The Auglaize Stone Co. (Oakwood) reported limestone produced and crushed for use as concrete aggregate, blast-furnace flux, and for agricultural purposes.

Miscellaneous clay for heavy clay products was mined by Haviland Clay Works Co., Haviland; and Baughman Tile Co. and Dangler Drain Tile Co., both of Paulding.

Perry.—The Coal in Perry County was mined mostly from the strip and auger mines of Sunnyhill Coal Co. Considerable tonnages were also mined from the underground mine of Ohio Land & Railway Co. and the strip pit of Sidwell Bros.

The Central Silica Co. quarried quartzite from an open quarry near Glenford for use in manufacturing glass, pottery, porcelain, and tile and at foundries.

Molding sand was produced by Industrial Minerals Co., Pike Township.

Fire clay was mined by the Claycraft Co., Shawnee; Straitsville Brick Co., Gore; and J. T. Coal Co., New Lexington. Miscellaneous clay was mined by Ludowici-Celadon Co. and Lite-Stone Aggregates Corp., both of New Lexington; the Rush Creek Clay Co., Junction City; and the Belden Brick Co., Somerset. Output of both fire and miscellaneous clays was reported by Logan Clay Products Co., Logan; and Junction City Clay Co., Junction City. County output was used for heavy clay products, refractories, lightweight aggregates, and floor and wall tile.

Pickaway.—Sturm & Dillard Co. (Circleville) produced sand and gravel for paving and gravel for railroad ballast. A small quantity of gravel for paving purposes was also produced by William J. Richards and the Ohio State Highway Department.

Pike.—Quartzite was quarried and crushed at Beaver by the Harbison-Walker Refractories Co. for use in manufacturing silica brick.

Glass, molding, foundry, refractory, fire and furnace sand and gravel for metallurgical and refractory use was produced by Ohio Minerals Co. (Beaver). The Standard Slag Co. (Sargents) and Scioto Valley Sand & Gravel Co. (Piketon) reported sand and gravel output for building and paving. Sharon Silica Co. produced gravel for metallurgical use.

Portage.—Seventeen sand and gravel operations were active in the county in 1956. Of these, the largest were the two fixed plants of Industrial Silica Corp. at Geauga Lake and Garrettsville; the Hugo Sand Co., Kent; the Standard Slag Co., Mantua; Twin Lakes Sand, Inc., Kent; Evans R. Beck, Kent; and Sober Sand & Gravel, Ravenna. County output was used mostly for building and paving although molding sand, fire and furnace sand, grinding and ploishing sand, blast sand, engine sand, and filter sand were reported.

Harbison-Walker Refractories Co. quarried and crushed quartzite at Nelson for use in silica brick.

Coal was strip-mined by Peterson Coal Co., the only producer in the county.

Universal Sewer Pipe Corp. mined miscellaneous clay near Palmyra for heavy clay products.

Peat (moss and humus) was produced by Green Oaks Peat Moss Co. from a bog near Ravenna.

Preble.—Marble Cliff Quarries manufactured lime at the site of its limestone quarry at Lewisburg. In addition to its use in lime, the limestone was employed as concrete aggregate and roadstone for agricultural purposes and blast-furnace flux.

Sand and gravel for building and paving was produced by White Gravel Co., Camden; and Steiner Washed Sand and Gravel Co., of West Alexandria.

Putnam.—Limestone was produced at the quarries of the National Lime & Stone Co., Columbus Grove; the Putnam Stone Co., Ottawa; Ottawa Stone Co., Gilboa; and Schumacher Stone Co., Pandora. The product was used mostly as concrete aggregate. Agricultural purposes and a small quantity for riprap consumed the remainder of production.

Miscellaneous clay for heavy clay products came from the open-pit mines of Snyder Tile Co., Continental; Glandorf Tile Co., Glandorf; Etter Tile & Coal Co., Dupont; and Miller Bros. Clay Works, Ottoville.

Richland.—Harvey Fleck & Son, Inc. (Lexington), and the Killbuck Sand & Gravel Co. (Lucas) produced sand and gravel for building and paving. The Killbuck Co. also produced a small quantity of filter sand. Gravel for paving was reported by D. H. Bowman Excavating, Jefferson Township; and Paul Farst, Perrysville.

The Richland Shale Brick Co. and Ohio Lumber and Face Brick Co. (both of Mansfield) mined miscellaneous clay for heavy clay products.

Peat was produced by Foster C. Reynolds and Swank Peat Moss Co. from bogs at Shelby and Shiloh, respectively.

Ross.—The foremost producer of sand and gravel was Central States Construction Co. (Chillicothe). Following in order of decreasing value were: Basic Construction Materials Division, New York Coal Co. and Brewer & Brewer Sons, Inc., both of Chillicothe; Miami Gravel Co., Richmond Dale; and the Paint Valley Sand & Gravel Co., Bainbridge. The Paint Valley Co. also quarried limestone for agricultural purposes. Molding sand was produced by Dubois Mineral Co. (Chillicothe).

Sandusky.—Sandusky County led in value in the State in both lime and limestone. Lime was manufactured by eight companies, which reported output for use in refractory material, for building, agricultural purposes, for use in glass, paper, and paint, for metallurgical purposes, and for sewage and trade-wastes treatment. Following are the producers listed according to decreasing value: The Dolite Co., Gibsonburg; Ohio Lime Co. and Standard Lime & Cement Co., both of Woodville; the J. E. Baker Co., Millersville; Woodville Lime Products Co., Woodville; National Gypsum Co., the Gibsonburg Lime Products Co., and Basic, Inc., all of Gibsonburg.

Limestone was quarried for a variety of uses, including metallurgical work (flux, refractory material, open-hearth plants), concrete aggregate, agricultural purposes, chemical uses (glass factories, paper mills), as a whiting or whiting substance (paint, putty, and rubber filler, pottery), fertilizer, and poultry grit, and as dust for coal mines. A large volume of output was used in manufacturing lime. Producers

were Ohio Lime Co. and Woodville Lime Products Co., both of Woodville; National Gypsum Co., and Gibsonburg Lime Products Co., both of Gibsonburg; the Gottron Bros. Co., Fremont; the J. E. Baker Co., Millersville; Standard Lime & Cement Co., Woodville; the Dolite Co., Gibsonburg; the France Stone Co., Bellevue; and Basic, Inc., Gibsonburg.

Home Sand & Coal Co. dredged sand from the Sandusky River near Fremont for building purposes.

Scioto.—Dimension sandstone was quarried near McDermott by the Taylor Stone Co. and Waller Bros. Stone Co. for architectural purposes and flagging.

Fire clay for fire brick and block and refractories was mined by Eastern Clay Products Department International Minerals & Chemical Corp., Lyra; Harbison-Walker Refractories Co., South Webster; the Pyro Refractories Co., Wheelersburg; Aetna Fire Brick Co., Oak Hill; and the Oak Hill Fire Brick Co., South Webster.

Seneca.—Basic, Inc. (Maple Grove), reported that its entire production of lime was used in dead-burned dolomite. Limestone was also quarried by the company at Maple Grove for use in lime as well as for metallurgical work, agricultural purposes, and as concrete aggregate and roadstone. Other producers of limestone in the county were the France Co., Bloomville; and Northern Ohio Stone Co., Flat Rock. Output from these companies was used for blast-furnace flux, concrete aggregate, railroad ballast, agricultural purposes, house-stone veneer, and riprap.

Arnold Gerhardstein mined miscellaneous clay for use as draintile from an open pit near St. Stephen.

Shelby.—Sidney Sand & Gravel Co. produced virtually all of the sand and gravel in the county for building and paving purposes. Miami River Quarries and Carl Tunks were the other producers. All three operations were near Sidney.

The Miami River Quarries, Inc., also quarried limestone near Sidney. With the exception of a small quantity used for riprap, output was consumed as concrete aggregate.

Stark.—Cement was manufactured at Middle Branch by the Diamond Portland Cement Co., which quarried limestone at the same place for use in cement manufacture.

Seventeen strip mines and 1 underground mine supplied the county tonnage of coal. Production came principally from the strip mines of the Truck Coal Co., Tri-Seam Mining, Inc., Magnolia Mining Co., Kroman Coal Co., and the underground mine of the Merrick Coal Co.

Fire and miscellaneous clays were mined by 13 companies, and the county ranked 3d in value of production. The underground and open-pit mines of Natco Corp., an outstanding producer, yielded a large quantity of fire clay. Stark Ceramics, Inc., was also an important producer of fire clay. The mines of both companies were near East Canton. The Alliance Clay Product Co. (Alliance) and Metropolitan Brick Inc. (Canton), were the leading producers of miscellaneous clay. Both fire and miscellaneous clays came from United States Ceramic Tile Co., East Sparta; and Magnolia Mining Co., Waynesburg. County output of clays was used for heavy clay products and floor and wall tile.

Except for a small quantity of filter sand and molding sand, sand and gravel was produced mostly for building and paving. The more important producers were Massillon Washed Gravel Co., Navarre; the Standard Slag Co., Massillon; Ray C. Oster, Canton; Uniontown Sand & Gravel Supply, Inc., Uniontown; and Diamond Washed Gravel Co. and Acme Sand & Gravel Co. both of Canton.

Humus peat was produced by Lab Peat Moss Co., Lantz Peat Moss Co., and Sanders Peat Moss Co., all of Canton.

Summit.—More minerals were produced in Summit County than in any other area of the State. Of the minerals produced, salt was the leading commodity, and the county led in salt output. Columbia-Southern Chemical Corp. (Barberton) and Diamond Crystal Salt Co. (Akron), reported brine from wells for use in chemicals and for evaporated salt. The Columbia-Southern Chemical Corp. also quarried limestone for use in quicklime and for concrete aggregate and agricultural purposes. Both the limestone quarry and the lime plant were near Barberton.

The leading producers of sand and gravel for building and paving were Rubber City Sand & Gravel Co., Akron; Twinsbury Silica Sand & Gravel, near Bedford; Portage Lake Sand & Gravel Co., Akron; Wilson Sand & Gravel, Peninsula; Busson Bros., Copley; Vanselow & Busson Gravel Co., Akron, and C. A. Heyl; Barberton.

Fire and miscellaneous clays were mined by Robinson Clay Products Co. (Mogadore) for heavy clay products.

H. W. Coddling & Sons continued to produce peat from a bog near Copley.

Perlite was expanded by J. P. Loomis Concrete & Supply Co. (Akron).

The Minnesota Mining & Manufacturing Co. purchased crude iron oxide pigments from the Pyrites Co. (Wilmington, Del.) for red iron oxides.

Trumbull.—Sand and gravel was produced at the fixed plant of the Kinsman Sand & Gravel Co. (Kinsman) for building and paving.

Tuscarawas.—Clay was recovered from 32 mines, and the county led in value of clay production in the State. Fire clay contributed over 90 percent of the value; miscellaneous clay, the remainder. Leading, in order of decreasing production value were the Evans Pipe Co., Uhrichsville; Goshen Brick & Clay Corp., Newcomerstown; the Ross Clay Product Co., Uhrichsville; Columbia Fire Brick Co., Strasburg; the Belden Brick Co. mines, Sugarcreek and Port Washington; Stone Creek Brick, Stone Creek; Dennison Sewer Pipe Corp., and Superior Clay Corp., both of Uhrichsville; North American Refractories Co., Dover Division, Strasburg; and Davidson Mining, Inc., Midvale. County output was used for heavy clay products, refractories, and floor and wall tile. A small quantity was mined for chemical use.

Coal was mined from deep and strip mines, and Tuscarawas County ranked fourth in the State in production. The underground mine of Columbia-Southern Chemical Corp. was the leading producer, followed by the strip mines of Copperhead Coal Co., Inc., Paul Varga & Sons, Inc., Cross Coal Co., Eberhart Coal, Inc., and Clyde A. Wallick.

The Industrial Silica Corp. produced molding sand and fire and furnace sand from a fixed plant at Dundee. The primary producers of sand and gravel for building and paving were Tri-County Gravel Co., Sandyville; Spring Bros., New Philadelphia; Stocker Gravel Plant, Gnadenhutten; and Edgar Spring, Inc., Midvale.

Union.—Clymer Materials Co. (Millcreek Township) and H. E. Rockhold & Sons (York Center) quarried and crushed limestone for concrete aggregate and roadstone and for agricultural purposes. A small quantity was also produced for riprap. Clymer Materials Co. also produced sand and gravel for building and paving.

Van Wert.—The Union Quarries Co. (Van Wert), the Delphos Quarries Co. (Delphos), and The France Co. (Middlepoint) produced and crushed limestone for road construction, railroad ballast, and agricultural purposes.

Miscellaneous clay was mined for draintile by Delphos Clay Works Co., Delphos (formerly Fred Minzing & Son); and Weck Tile Plant, Van Wert.

Vinton.—Benedict, Inc., strip mine was the leading coal property in Vinton County. The underground mines of Todd Bros., Loper Coal Co., and Fuller Coal Co. followed in order of decreasing tonnage.

The McArthur Brick Co. (McArthur) and Hope Fire Clay Co. (Zaleski), mined miscellaneous clay and fire clay, respectively. Output was used for heavy clay products and fire brick and block.

Limestone for concrete aggregate and agricultural purposes was quarried at McArthur by the McArthur Stone & Coal Co.

Warren.—Sand and gravel for building and paving was the only commodity produced in Warren County. The leading producers were the Van Camp Sand & Gravel Co., Morrow; Franklin Sand & Gravel Co., Franklin; Armitage & Son Plants, South Lebanon and Waynesville; and William Ceders Gravel Plant, Morrow.

Washington.—The strip mines of the Peaker Run Coal Co. and Freedom Coal Co. supplied the county output of coal.

Building and paving sand and gravel was produced by Marietta Concrete Corp. and Ohio River Sand & Gravel Corp. (both of Marietta). Molding sand and gravel for building, paving, and railroad ballast was reported by Briggs Gravel Co. (Marietta). Fred Price Contracting (Waterford), L. C. Riley (Marietta), and the Ohio State Highway Department produced sand and gravel for paving roads.

The Hall Grindstone Co. (Marietta) and Constitution Stone Co. (Constitution) continued producing grindstones.

Miscellaneous clay for use as lightweight aggregate was mined by Marietta Concrete Corp. Briggs Gravel Co. mined a small quantity of fire clay for use at foundries. Both companies mined at Marietta.

Wayne.—Evaporated salt was recovered by the open and vacuum-pan methods at Rittman by the Morton Salt Co.

The Mullet Coal & Clay Co. mined coal from two mines (strip and auger), the only coal-producing properties in Wayne County.

By far the leading producer of sand and gravel was Rupp Construction, Inc. (Marshallville). Smaller quantities were reported by Charles Zollinger, Rittman; and P. D. Seibert, Wooster. Output was used in building and paving.

Miscellaneous clay for heavy clay products was mined by the Medal Brick & Tile Co., Wooster; and Orville Tile Co., Orville.

Williams.—Building sand and gravel was dredged from the St. Joseph River one-half mile from Pioneer by the Tri-State Gravel Co.—the leading producer in Williams County. Building sand was produced by Mason Sand & Gravel Co., Edon; and sand and gravel for paving by Easler Sand & Gravel Co., Edgerton.

The Stryker Drain Tile Co. (Stryker) mined miscellaneous clay for heavy clay products.

Wood.—Limestone was quarried mostly for use as concrete aggregate and roadstone and for metallurgical purposes, agricultural use, and riprap. Companies in order of decreasing production value were: Pugh Quarry Co., Custar; National Gypsum Co., Luckey; Wood County Stone & Construction Co., Bowling Green; O. F. Brough, West Millgrove; and the France Stone Co., North Baltimore. The National Gypsum Co. reported part of its output was used in manufacturing lime at its lime plant at the same place.

A small quantity of miscellaneous clay was mined for draintile by the Perrysburg Tile & Brick Co. (Perrysburg).

Wyandot.—The National Lime & Stone Co. produced a large quantity of limestone for concrete and roadstone, metallurgical work, railroad ballast, and agricultural purposes, for use in glass factories, and for use in the company lime plant at Carey. The lime was utilized in manufacturing glass and for building and agricultural purposes. Limestone output was also reported by J. L. Foucht (Upper Sandusky) for use as concrete aggregate and in agriculture.

Sand and gravel for building and paving and for use as fill was produced by Wilson Sand Co., Upper Sandusky; and Corfman Gravel Co., Sycamore.

Humus peat was recovered from the bogs of the Humus Co. and Smith Agricultural Chemical Co. (both of Carey).

The Claycraft Co. mined miscellaneous clay from an open pit near Upper Sandusky for heavy clay products.

The Mineral Industry of Oklahoma

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Oklahoma Geological Survey.

By Peter Grandone [1] and William E. Ham [2]

OKLAHOMA mineral production totaled a record of $757 million in 1956 compared with $711 million in 1955 and $650 million in 1954. Production of 13 minerals and 5 mineral fuels was reported from 74 of the State's 77 counties. Compared with other States in 1956, Oklahoma ranked fourth as producer of natural-gas liquids, natural gas, and crude petroleum. Appreciable quantities of zinc, lead, cement, coal, gypsum, sand and gravel, and stone also were produced.

The mineral fuels—petroleum, natural gas, natural-gas liquids, and coal—were the most important minerals in value, furnishing 95 percent of Oklahoma's total value of mineral production. Metals and nonmetals supplied the remaining 5 percent. Petroleum was produced in 58 of Oklahoma's 77 counties, natural gas in 56 counties, nonmetals in 70 counties, and metals (lead and zinc) in Ottawa County only.

TABLE 1.—Mineral production in Oklahoma, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	724,156	$726,856	705,061	$701,038
Coal	2,163,536	12,667,563	2,006,987	12,340,642
Lead (recoverable content of ores, etc.)	14,126	4,209,548	12,350	3,877,900
Natural gas—million cubic feet	614,976	45,508,000	678,603	54,288,000
Natural-gas liquids:				
Natural gasoline and cycle products—thousand gallons	504,692	28,770,000	489,963	26,543,000
LP-gases—do	512,320	14,297,000	579,101	23,427,000
Petroleum (crude)—thousand 42-gallon barrels	202,817	563,830,000	215,862	600,096,000
Pumice			305	3,050
Salt (common)	[2]	[2]	9,980	89,764
Sand and gravel	6,293,798	4,785,786	5,946,693	4,842,506
Stone	10,933,355	12,295,274	10,546,612	12,416,886
Zinc (recoverable content of ores, etc.)	41,543	10,219,578	27,515	7,539,110
Value of items that cannot be disclosed: Asphalt (native), bentonite, cement, gypsum, lime, sulfur (recovered elemental) and tripoli		15,525,248		12,965,500
Total Oklahoma [3]		711,089,000		757,116,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total adjusted to avoid duplicating values of clays and stone.

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Oil and natural gas were produced in a wide belt extending from the northeastern part of the State to the southwestern and northwestern parts; nonmetal mining was widely distributed over the northeast, north central, and central regions and in the Arbuckle and Wichita Mountain areas of the southern part.

CONSUMPTION AND MARKETS

Oklahoma mineral industries processed a significant part of their output into finished and semifinished products for in-State consumption and for out-of-State shipments. These industries included oil refineries; natural gasoline and cycle plants stripping natural gas of condensible liquids; zinc smelters reducing zinc concentrate mined in Oklahoma; brick, tile, pottery, glass, and cement plants using clays, shales, silica sands, and limestone of Oklahoma; and producers of building materials made of Oklahoma gypsum. Large quantities of petroleum and natural gas continued to be transmitted by pipelines to industrial sections of the Eastern and North Central States.

The State regulatory body under the Interstate Oil Compact permitted the allowable production of oil to increase 4 percent above the 1955 allowable to conform with the indicated demand for Oklahoma petroleum. Total production increased 6 percent, as over half of it comes from unallocated fields, including secondary recovery operations.

TABLE 2.—Average unit value of mineral commodities produced in Oklahoma, 1952–56

Commodity	1952	1953	1954	1955	1956
Asphalt, native, short ton	$4.75	$4.75	$4.75	$4.75	$4.75
Cement:					
Portland, 376-pound barrel	2.47	2.54	2.64	2.72	2.89
Masonry, do					[1] 3.81
Clays:					
Miscellaneous, short ton	1.04	1.02	[2] 1.09	1.01	.99
Bentonite, do	15.00	9.64	10.00	4.50	4.50
For cement, do	1.00	1.00	1.00	1.00	1.00
Coal, do	5.78	6.10	5.88	5.86	6.15
Gypsum, do	2.64	2.76	2.81	2.94	2.93
Lead, pound	.161	.131	.137	.149	.157
Lime, short ton	10.25	8.67	9.85	9.55	11.02
Natural gas, 1,000 cubic feet	.054	.069	.070	.074	.080
Natural-gas liquids:					
Natural gasoline and cycle products per gallon	.073	.065	.051	.057	.054
LP-gases, gallon	.037	.036	.030	.028	.040
Petroleum, 42-gallon barrel	2.56	2.70	2.79	2.78	2.78
Pumice, short ton	9.87	9.54	8.36		10.00
Salt (common), do	7.47	7.47	7.62	7.83	8.99
Sand and gravel, do	.77	.85	.79	.76	.81
Stone:					
Granite, short ton	95.76	102.34	60.40	[3] 67.91	35.33
Sandstone, do	8.37	.60	1.45	1.16	1.49
Limestone, do	1.09	1.07	1.08	1.15	1.23
Miscellaneous (crushed), do	.46	.41	.34	.47	.58
Sulfur (recovered), long ton		[1] 26.74	26.50	26.63	[4] 26.64
Tripoli, short ton		[1] 5.00	3.00	3.00	3.00
Zinc, pound	.166	.115	.108	.123	.137

[1] First year reported.
[2] Revised figure.
[3] Dimension granite.
[4] Calculated on a sulfur-content basis.

TRENDS AND DEVELOPMENTS

Demand for Oklahoma crude petroleum showed no appreciable gain until the last month of the year. This was the first noticeable effect of increased shipments of oil to western Europe, which resulted from halting the passage of Middle East oil through the Suez Canal. As a result, production of petroleum gained only 6 percent over the preceding year, and recoverable reserves underwent a slight reduction. Widespread exploratory drilling during the year furnished many significant discoveries, especially in the deep areas of southern, southwestern, and northwestern Oklahoma. Osage County was the scene of the largest number of completions. Harper County, with its multiple pay zones and high initial potentials, gave promise of developing into a major gas reserve. Deep Simpson gas reserves in southern Oklahoma became a reality with the successful completion of the State's deepest well in southeastern Grady County.

In the refining of petroleum the trends continued toward increased capacity for producing premium-grade motor fuel and toward raising the octane rating of motor fuels. The competitive race for upgrading motor fuels was evidenced by new installations for catalytic cracking units and catalytic reformers at refineries at Cushing and Ponca City. The Tide Water Associated Oil Co. refinery at Drumright was shut down in 1955. A 20,000-barrel-per-day refinery at Cushing was to undergo change in ownership and modernization to upgrade product quality.

Custom Mills and Smelters.—Six custom mills in Oklahoma treated lead-zinc ores mined locally and from Kansas, and three mine mills treated lead-zinc ores from company mines only.

Three smelting companies operated three horizontal zinc retort plants in Oklahoma in 1956. These were the plants of American Metals Co., Ltd., at Blackwell, Kay County; National Zinc Co. at Bartlesville, Washington County; and Eagle-Picher Co. at Henryetta, Okmulgee County.

Mineral Brokers.—Several smelting companies maintained mineral brokers or ore buyers in the Tri-State District of Oklahoma, Kansas, and Southwest Missouri. No metal concentrates were stockpiled at the mines as all production continued to be purchased f. o. b. the mill by the brokers.

EMPLOYMENT AND INJURIES

Employment.—Total employment in the Oklahoma mineral industries increased slightly to an alltime high of 52,300 from the previous year. Distribution of this total employment was 93 percent to oil and gas mining, 2 percent to metals, 2 percent to coal, and 3 percent to nonmetals. Total wages for these mineral industries were $253.9 million, a 9-percent gain over 1955. In addition to the employment for petroleum mining, 17,000 were employed in petroleum refineries and received $70 million in wages during 1956.

Injuries.—Accidents reported in coal, metal, and nonmetal mining consisted of 5 fatal and 153 nonfatal injuries. Of these injuries, 3 fatal and 125 nonfatal were in coal mining.

TABLE 3.—Employment in mineral industries, 1947–51 (average) and 1952–56 [1]

(In thousands)

	1947–51 average	1952	1953	1954	1955	1956
Oil and gas industry	37.9	42.5	44.7	46.5	48.4	49.1
Coal mining	2.1	1.5	1.5	1.3	1.3	1.1
Other mining	2.8	2.8	2.0	2.2	2.3	2.2
Total	42.8	46.8	48.2	50.0	52.0	52.4

[1] Oklahoma Employment Security Commission, Handbook of Employment Statistics of Oklahoma, 1939–56.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Oklahoma, fabulous in oil discoveries since the turn of the century, continued to be a leading domestic producer of the Nation's crude petroleum and natural gas and remained a major supplier of refined products. Native asphalt and a substantial quantity of a low-ash bituminous coal also were produced.

Asphalt (Native).—Output of native rock asphalt (bituminous limestone and bituminous sandstone) was reported from Murray County. Production in 1956 rose 41 percent over the preceding year.

Coal.—Coal production in Oklahoma, which underwent a 6-year decline trend to the end of 1954, gained in 1955 and then dropped 7 percent in 1956. Part of the loss was due to closing of the Lone Star Steel Co. mine near McCurtain following two explosions. The State had 35 operators in 11 counties. Haskell, Rogers, Pittsburg, Le Flore, and Sequoyah Counties were the five principal producers, each reporting over $1 million in value. Total output in 1956 was 2 million short tons valued at $12.3 million.

TABLE 4.—Coal production, 1947–51 (average) and 1952–56

Year	Thousand short tons	Value		Year	Thousand short tons	Value	
		Total (thousand dollars)	Average per ton			Total (thousand dollars)	Average per ton
1947–51 (average)	2,961	15,080	$5.09	1954	1,915	11,265	$5.88
1952	2,194	12,688	5.78	1955	2,164	12,668	5.86
1953	2,168	13,227	6.10	1956	2,007	12,341	6.15

Natural Gas.—Oklahoma continued to rank third in the Nation in marketed production of natural gas; it amounted to 679 billion cubic feet valued at $54.3 million—a 10-percent gain in volume and 19 percent in value compared with 1955. Production was reported from 56 counties, chiefly from Texas, Garvin, Beckham, Oklahoma, and Grady, in the order named. The industry continued its search for more reserves by completing 317 gas wells out of a total of 8,052 wells of all types, as reported by the Oil and Gas Journal. Exploratory drilling alone furnished 39 gas discoveries out of 865 exploratory tests. Most promising of this exploratory drilling was in the Anadarko

basin, where gas discoveries were made in Harper and Woodward Counties. Deep Simpson gas reserves in southern Oklahoma were tapped in Grady County. Estimated proved recoverable reserves of natural gas increased 4 percent in Oklahoma during 1956 to 13,755,049 million cubic feet, according to the Committee on Natural Gas Reserves of the American Gas Association.[3]

TABLE 5.—Marketed production of natural gas, 1947–51 (average) and 1952–56

Year	Million cubic feet	Value		Year	Million cubic feet	Value	
		Total (thousand dollars)	Per thousand cubic feet, cents			Total (thousand dollars)	Per thousand cubic feet, cents
1947–51 (average)	471,192	22,476	4.8	1954	616,355	43,145	7.0
1952	554,033	29,918	5.4	1955	614,976	45,508	7.4
1953	599,955	41,397	6.9	1956	678,603	54,288	8.0

[1]Comprises gas either sold or consumed by producers, including losses in transmission, quantities added to storage, and increases in gas pipelines.

Natural-Gas Liquids.—Production of natural-gas liquids from a total of 76 natural-gasoline plants and 2 cycling plants in Oklahoma amounted to 1,069 million gallons in 1956 and was valued at $50.0 million. This was a year of rapid additions to storage of all light liquids. Demand for LP-gases for fuel was less than had been anticipated, and markets for natural gasoline were depressed by excessive motor-fuel stocks. Natural gasoline and cycle products furnished 46 percent of the quantity and 53 percent of the value, LP-gases the remainder. According to the American Petroleum Institute,[4] estimated proved recoverable reserves of natural-gas liquids in Oklahoma were 355.6 million barrels—a gain of only 1.2 million barrels over 1955 estimates.

TABLE 6.—Natural-gas liquids produced, 1947–51 (average) and 1952–56

Year	Natural gasoline and cycle products		LP-gases		Total	
	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)
1947–51 (average)	314,822	22,854	244,362	9,179	559,184	32,033
1952	405,720	29,459	376,026	14,090	781,746	43,549
1953	433,650	28,066	414,036	14,886	847,686	42,952
1954	478,590	24,332	453,810	13,506	932,400	37,838
1955	504,692	28,770	512,320	14,297	1,017,012	43,067
1956	489,963	26,543	579,101	23,427	1,069,064	49,970

Petroleum.—Oklahoma remained the Nation's fourth ranking producer of petroleum in 1956, with an output of 216 million barrels valued at $600.1 million. This 6-percent increase in production over 1955 still did not reach the 1927 record, when oil was allowed to flow unabated without State conservation laws. Petroleum was reported from 58 counties; the 5 leading producers were Garvin, Osage, Carter,

[3] American Gas Association and American Petroleum Institute, Proved Reserves of Crude Oil, Natural-Gas Liquids, and Natural Gas: Dec. 31, 1955, vol. 11, p. 19.
[4] Work cited in footnote 3, p. 5.

Stephens, and Creek. Over half of the 1956 production came from nonallocated fields, which include secondary-recovery projects.

The average price per barrel of petroleum at the wells was $2.78 in 1956, the same as in 1955. According to the Oil and Gas Journal, a total of 8,056 wells was drilled in Oklahoma in 1956; of these, 4,825 were oil wells, 2,476 were dry, and the remainder were either gas or service wells. The search for more oil led to the drilling of 867 test wells in 1956, third highest in the Nation. These 867 tests compared with 832 in 1955 and included 154 oil-productive and 41 gas-productive wells. Also, these tests discovered 93 oilfields and 39 gasfields, according to the Mid-Continent Oil & Gas Association.

Exploratory crews made many significant discoveries during the year. Success was widespread at depth in southern, southwestern, and northwestern Oklahoma. The Anadarko basin and the counties on and adjacent to the Nemaha granite ridge were the scenes of much exploratory activity. Osage County, first in both exploratory and field development wells, furnished 16 new fields out of 18 successful exploratory wells. The drive for natural gas was intense in Beaver County, which ranked second with 13 new fields, followed by Payne with 7 fields, and McClain with 5 fields. At the year end special attention was centered on Cleveland County, where three deep pools were tapped.

TABLE 7.—Production of petroleum (crude), 1947–51 (average) and 1952–56

Year	Thousand 42-gallon barrels	Value		Year	Thousand 42-gallon barrels	Value	
		At wells (thousand dollars)	Average per barrel			At wells (thousand dollars)	Average per barrel
1947–51 (average)	159,720	392,154	$2.46	1954	185,851	518,520	$2.79
1952	190,435	487,510	2.56	1955	202,817	563,830	2.78
1953	202,570	546,940	2.70	1956	215,862	600,096	2.78

TABLE 8.—Indicated demand, production, and stocks of petroleum (crude) in 1956, by months

Month	Thousand 42-gallon barrels			Month	Thousand 42-gallon barrels		
	Indicated demand	Production	Stocks originating in Oklahoma		Indicated demand	Production	Stocks originating in Oklahoma
January	18,164	18,778	22,373	September	17,670	17,485	25,653
February	16,669	17,919	23,625	October	17,615	17,141	25,261
March	18,438	19,324	24,511	November	17,908	17,075	24,517
April	16,374	17,880	25,870	December	20,397	18,896	23,016
May	17,369	17,850	26,207				
June	17,441	17,529	26,158	Total: 1956	213,632	215,862	----------
July	17,069	17,980	26,879	1955	205,349	202,817	----------
August	18,518	18,005	26,366				

Oklahoma's depth record (14,510 feet) was made by British-American Oil Producing Co. in the Knox field, Grady County. This discovery set off a deep search throughout the southern part of the vast Anadarko basin and is considered 1 of the 3 top discoveries of

the year in the Mid-Continent region. The estimated proved reserve of crude oil in Oklahoma was reported by the American Petroleum Institute at 2 billion barrels—6 million barrels less than 1955 estimates.

The indicated demand for total petroleum in 1956 was 213.6 million barrels compared with 205.3 million barrels in 1955. Crude-oil stocks, originating in the State, on December 31, 1956, totaled 23 million barrels, or 3 million more than the indicated demand.

At the end of 1956 there were 15 refineries operating, with a total daily crude-oil capacity of 352,000 barrels, and 2 inactive refineries.

TABLE 9.—Production of crude petroleum, 1952–56, by fields, in thousand barrels

[Oil and Gas Journal]

Field	1952	1953	1954	1955	1956
Allen	1,336	1,456	1,709	1,733	1,638
Bebee	1,244	1,087	926	836	745
Burbank	3,157	3,476	[1] 3,466	[2] 10,139	[2] 13,519
Cache Creek	1,042	956	787	707	661
Camp	975	1,606	1,329	[4]	[4]
Cement	3,964	4,070	3,517	4,186	4,372
Cumberland	3,102	2,562	1,690	1,841	1,944
Cushing	2,889	3,385	3,176	2,823	2,549
Dilworth	[3]	[3]	1,279	1,135	921
Doyle	2,475	3,934	2,976	2,683	3,056
Elk City	7,248	6,380	5,348	6,277	5,326
Eola	1,178	1,651	1,424	[5] 2,193	[5] 3,566
Fox-Graham	5,532	5,920	4,559	[4]	[4]
Glenn	2,252	2,145	2,045	1,983	1,901
Healdton	2,183	2,288	2,171	2,307	2,347
Hewitt	3,173	2,703	[6] 3,339	[6] 3,411	[6] 3,495
Holdenville-East	[3]	[3]	1,149	[7] 1,476	[7] 1,117
Hoover-Northwest	693	601	[8] 1,189	[9] 1,662	[9] 2,063
Knox	1,627	1,595	1,165	1,143	1,291
Milroy	1,091	2,325	1,755	[4]	[4]
Oklahoma City	5,513	5,187	4,148	3,803	3,743
Olympic	2,013	4,064	4,083	2,662	1,752
Payson-East	[3]	1,725	1,076	[10] 918	[10] 786
Ringwood	1,338	855	727	551	484
Seminole:					
Bowlegs	1,003	1,121	872	718	685
Little River	852	826	756	699	571
St. Louis	1,440	1,507	1,464	1,672	1,486
Seminole	1,077	1,211	998	921	827
Sholem-Alechem	12,239	12,736	10,261	[4]	[4]
Sho-Vel-Tum				[4] 30,316	[4] 29,717
South Burbank	617	894	1,429	[3]	[3]
Tatums	3,466	3,892	3,321	[4]	[4]
Velma-West	18,999	16,064	8,435	[4]	[4]
West Edmond	4,471	1,887	[11] 1,821	1,733	1,945
Witcher	1,120	660	541	439	378
Yale-Quay	1,891	2,171	1,915	1,479	1,322
Other fields	90,323	[12] 99,630	[12] 99,005	[12] 110,371	[12] 121,655
Total Oklahoma	191,523	[12] 202,570	[12] 185,851	[12] 202,817	[12] 215,862

[1] Includes Burbank South and Fairfax.
[2] Includes Burbank, Burbank South, Little Chief, Northeast, and Little Chief, West, consolidated in 1955.
[3] Included with "Other fields."
[4] Included with Sho-Vel-Tum. The following pools were consolidated in 1955: Alma, North; Alma, Northeast; Alma, Southwest; Ava; Ava, North; Ava, Northwest; Camp; Camp, Southeast; Fox-Graham; Milroy; Milroy, West; Sholem-Alechem; Sholem-Alechem, Northwest; Sholem-Alechem, Southwest; Sholem-Alechem, West; Tatums; Velma; and Wheeler.
[5] Includes Eola, North and Eola, Northwest; consolidated in 1955.
[6] Includes Brockwest and Lone Grove, Southwest.
[7] Includes Grief Creek.
[8] Includes Hoover, North; Brady, Southeast; and Roady, Northeast.
[9] Includes Holdenville, East, and Holdenville, West; consolidated in 1955.
[10] Includes Payson, consolidated in 1955.
[11] Includes Edmond, Northwest, and Lockridge, Northeast.
[12] Bureau of Mines data.

TABLE 10.—Capacity of petroleum refineries and cracking plants, Jan. 1, 1957

(Barrels per day)

Company	Location	County	Type of plant	Crude-oil capacity		Cracked-gasoline capacity	
				Operating	Shutdown	Operating	Shutdown
Allied Materials Corp.	Stroud	Lincoln	Skimming and asphalt.	3,000			
Anderson-Prichard Oil Corp.	Cyril	Caddo	Skimming, cracking, and asphalt.	11,000		4,000	
Bell Oil & Gas Co	Grandfield	Tillman	Skimming and cracking.	8,000		5,800	
Ben Franklin Refining Co.	Ardmore	Carter	Skimming, cracking, and asphalt.	13,000		8,000	
Champlin Refining Co.	Enid	Garfield	Complete	20,000		12,400	
Cities Service Oil Co.	Ponca City	Kay	do	23,000		7,400	
Continental Oil Co.	do	do	do	58,000		16,690	1,650
D-X Sunray Oil Co.	Duncan	Stephens	do	37,000	6,000	28,000	
Do	West Tulsa	Tulsa	Skimming, cracking, and lube.	73,000		34,500	1,000
Kerr-McGee Oil Industries, Inc.	Cleveland	Pawnee	Skimming and cracking.		6,500	1,800	3,500
Do	Cushing	Payne	Complete	22,000		5,250	
Do	Wynnewood.	Garvin	Skimming, cracking, and asphalt.	17,000		4,900	
Midland Cooperatives, Inc.	Cushing	Payne	Skimming and cracking.	12,000		5,140	
Monarch Refineries, Inc.	Oklahoma City.	Oklahoma	Skimming and asphalt.	1,000			
Phillips Petroleum Co.	Okmulgee	Okmulgee	Skimming and cracking.	19,000		4,300	
The Texas Co	West Tulsa	Tulsa	do	35,000		22,500	
Tide Water Associated Oil Co.	Drumright.	Creek	do		15,000		4,300
Total				352,000	27,500	160,680	10,450

In the refining industry of Oklahoma, upgrading of motor fuels was continued by the installations of more cracking and re-forming capacity and by the closing of two small refineries. Johnson Oil Refining Co. at Cleveland sold its pipeline gathering system to Kerr-McGee Oil Industries, Inc., and shut down its refinery in March. Wilcox Oil Co. shut down its 5,500-barrel-per-day refinery at Bristow because of inability to compete in the high-octane-gasoline race. The company sold 200 miles of crude-oil gathering lines to Mid-Continent Pipeline Co. and will continue marketing products manufactured by D–X Sunray Oil Co.

Midland Co-operatives, Inc., put a new platformer (platinum re-former) unit in operation at its Cushing (Okla.) refinery. The 3,000-barrel-per-day re-former will upgrade gasoline produced at the refinery.

Anderson-Prichard Oil Corp. was expanding its Cyril (Okla.) refinery capacity from 11,500 to 13,500 barrels of crude oil per day and also was adding a fluid-cracking capacity of 11,000 barrels per day.

Cities Service Oil Co. was expanding its Ponca City, Okla., plant capacity from 23,500 to 35,000 barrels per day. A 6,500-barrel-per-day re-forming unit was under construction.

TABLE 11.—Oil and gas wells drilled in 1956, by counties [1]

County	Proved field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Alfalfa	19	1	3	4		14	23	1	17
Atoka			1			7			8
Beaver	36	27	18	8	17	9	44	44	27
Beckham	6	3	8	1	1	6	7	4	14
Blaine						2			2
Bryan				1		8	1		8
Caddo	163	2	44	7	2	10	170	4	54
Canadian			1	1	1	2	1	1	3
Carter	297	8	81	6		12	303	8	93
Cherokee						4			4
Choctaw						2			2
Cimarron	5	15	3	1		6	6	15	9
Cleveland	160		21	3		16	163		37
Coal	11		6			8	11		14
Comanche	56	8	51	1		20	57	8	71
Cotton	7		13			13	7		26
Craig				1		2	1		2
Creek	382	10	189	4	1	10	386	11	199
Delaware	1					2	1		2
Garfield	70	1	43	3		16	73	1	59
Garvin	316	3	82	12		16	328	3	98
Grady	84	9	26	3		6	87	9	32
Grant	39	4	9	11	1	28	50	5	37
Greer	14		18			9	14		27
Harmon						1			1
Harper	12	5		4	3	5	16	8	5
Haskell		1						1	
Hughes	77	53	63	1	4	7	78	57	70
Jackson	7		8			7	7		15
Jefferson	13		26	1		24	14		50
Johnston			1			2			3
Kay	98	3	55	3		24	101	3	79
Kingfisher	4		2	3		1	7		3
Kiowa	29	2	34	3		29	32	2	63
Le Flore		1	1			3		1	4
Lincoln	177	18	81	4		25	181	18	106
Logan	113	4	35	1		23	114	4	58
Love	27		11	1		4	28		14
Marshall	58	1	21	2		4	60	1	25
Mayes						1			1
McClain	16		11	6	1	7	22	1	18
McCurtain			1			1			2
McIntosh			1		1	1		1	2
Murray	2		2			18	2		20
Muskogee	8		12			2	8		14
Noble	93	5	55	6		15	99	5	70
Nowata	2		2				2		2
Okfuskee	105	9	69	2	1	8	107	10	77
Oklahoma	37	1	17	2		10	39	1	27
Okmulgee	184	7	183				184	7	183
Osage	1,015	3	411	16	2	79	1,031	5	490
Ottawa						1			1
Pawnee	98	1	72			34	98	1	106
Payne	132	8	78	8		17	140	8	95
Pittsburg						3			3
Pontotoc	111	6	72			12	111	6	84
Pottawatomie	54	1	47	3		14	57	1	61
Pushmataha						1			1
Rogers	14		11			1	14		12
Seminole	143	1	69	2		6	145	1	75
Sequoyah						3			3
Stephens	265	15	103	5		14	270	15	117
Texas	9	38	10	5	2	9	14	40	19
Tillman	60		24	8		23	68		47
Tulsa	28		8				28		8
Wagoner	8		21				8		21
Washington	1		1				1		1
Washita	3	1	2			2	3	1	4
Woods	2	3	1	1	2	2	3	5	3
Woodward						2			2
Total: 1956	4,671	280	[2] 2,238	[3] 154	41	672	4,825	321	[2] 2,910
1955	4,977	328	2,274	154	31	647	5,131	359	2,921

[1] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957.
[2] Includes 434 service wells.
[3] Includes 24 distillate wells.

METALS

Output of metallic minerals in 1956 continued to decline for the third consecutive year owing to depletion of the higher grade ore and to increasing imports of concentrates and slab zinc. Production loss of zinc was attributed mainly to cutbacks in the automotive industry, a principal consumer of this metal. The value of lead and zinc totaled $11.4 million, declining 21 percent from 1955. Government stockpile buying of lead and zinc had a stabilizing effect on prices.

Cadmium, Germanium, Indium, and Gallium.—These minor metals, occurring as trace elements in Oklahoma lead-zinc concentrates, were recovered from the flue and zinc dusts of zinc-retort smelters and from the precipitates of electrolytic zinc smelters. Production of these metals could not be assigned to a State of origin, because they were recovered at the smelters from the accumulated flue dusts and residues of ores from various domestic and foreign sources.

Lead.—Mine production of lead, all from Ottawa County, was 8 percent less than in 1955 in concentrates and 13 percent less in recoverable metal. The value of the 12,350 short tons of recoverable lead produced in 1956 was $3.9 million, a loss of 8 percent from the 1955 value. The chief producer of lead in Oklahoma was Eagle-Picher Co., followed by American Zinc, Lead & Smelting Co.

The price of lead opened the year at 16.0 cents per pound, New York, rose to 16.5 cents in January, dropped back to 16.0 cents the same month, and remained unchanged to the end of the year.

Manganese.—Wayne Misner Ore Co. announced discovery of manganese in the Kiamichi area, Pushmataha County. The Kiamichi strike was reported to be higher grade ore and in larger quantities than the manganese being mined in Arkansas.

Uranium.—Prospecting for and occurrence of radio-active mineralization was reported in Roger Mills and Le Flore Counties. A uranium discovery near Cheyenne, Okla., where ore was reported to be valued at $60 a ton, was inspected by an Atomic Energy Commission geologist.

TABLE 12.—Mine production of lead and zinc, 1947–51 (average), 1952–56, and total 1891–1956, in terms of concentrates and recoverable metals [1]

Year	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content [2]			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	23,656	$4,553,617	89,422	$8,966,116	17,673	$5,555,487	47,821	$13,532,650
1952	20,473	4,104,934	101,726	11,714,605	15,137	4,874,114	54,916	18,232,112
1953	12,213	1,915,195	61,896	4,541,616	9,304	2,437,648	33,413	7,684,990
1954	19,004	3,194,245	84,444	5,466,727	14,204	3,891,896	43,171	9,324,936
1955	19,555	3,368,713	78,726	5,997,071	14,126	4,209,548	41,543	10,219,578
1956	17,971	3,225,015	52,993	4,485,122	12,350	3,877,900	27,515	7,539,110
1891–1956	1,657,395	159,975,445	9,694,067	479,249,276	1,272,276	191,135,097	5,110,897	767,195,674

[1] Based on Oklahoma ore ("dirt") and old tailings treated at mills during calendar year indicated.
[2] In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal, it should be noted that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

Zinc.—Mine production of recoverable zinc, all in Ottawa County, declined 34 percent from the preceding year to 27,515 tons, although metal prices remained steady during 1956. Zinc output valued at $7.5 million declined 26 percent from the 1955 value. Eagle-Picher Co. was the principal producer in the State, followed by American Zinc, Lead & Smelting Co., Buffalo Mining Co., C. & M. Mining, and Contack Mining Co., Inc.

Zinc-metal price at the beginning of 1956 was quoted at 13.0 cents per pound, East St. Louis, rose to 13.5 cents per pound on January 6, 1956, and remained stable to the end of the year.

Three zinc-retort smelters in Oklahoma operated in 1956. They were American Metals Co., Ltd., at Blackwell, Kay County; Eagle-Picher Co., at Henryetta, Okmulgee County; and National Zinc Co., at Bartlesville, Washington County.

TABLE 13.—Tenor of lead and zinc ore milled and concentrates produced, 1955–56

	1955	1956
Total material milled—short tons	3,007,235	1,755,607
Recovery of concentrate and metal from material milled:		
Galena—short tons	19,555	17,971
Sphalerite—do	78,726	52,993
Galena—percent	0.65	1.02
Sphalerite—do	2.62	3.02
Lead [1]—do	0.47	0.70
Zinc [1]—do	1.38	1.57
Average lead content of galena concentrate—do	73.72	70.11
Average zinc content of sphalerite concentrate—do	57.36	57.69
Average value per ton:		
Galena concentrate	$172.27	$179.46
Sphalerite concentrate	$76.18	$84.64

[1] Figures represent metal content of the crude ore (dirt) only insofar as it is recovered in the concentrate. Data on tailing losses not available.

TABLE 14.—Mine production of lead and zinc in 1956, by months, in terms of recoverable metals

Month	Lead (short tons)	Zinc (short tons)	Month	Lead (short tons)	Zinc (short tons)
January	973	2,835	August	992	2,122
February	1,083	2,660	September	929	1,829
March	1,199	3,002	October	1,059	2,077
April	969	2,017	November	1,136	2,190
May	1,104	2,364	December	944	1,956
June	1,048	2,286			
July	914	2,177	Total	12,350	27,515

TABLE 15.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1956 [1]

Zinc concentrate		Lead concentrate	
Week ended—	Price per short ton	Week ended—	Price per short ton
Jan. 1–Jan. 7	$80.00	Jan. 1–Jan. 4	$202.25
Jan. 9–Dec. 31	84.00	Jan. 5–Jan. 15	208.52
		Jan. 15–Dec. 31	201.32

[1] E&MJ Metal & Mineral Markets.

A Bureau of Mines report dealing with the recovery of germanium and cadmium from Oklahoma zinc ore was published during the year.[5]

TRI-STATE DISTRICT

The Tri-State district of Oklahoma, Kansas, and Southwest Missouri produced 3.6 million tons of crude ore in 1956 compared with 4.1 million tons in 1955. This crude ore yielded 28,597 tons of lead concentrate, which contained 20,373 tons of recoverable lead; and 107,997 tons of zinc concentrate, which contained 57,215 tons of recoverable zinc. Lead concentrate recovered was up 6 percent, and zinc concentrate recovered was down 18 percent from 1955 recoveries.

TABLE 16.—Mine production of lead and zinc concentrates in the Tri-State district, 1947–51 (average) and 1952–56

Year	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	37,271	$7,236,837	166,227	$16,425,167	28,017	$8,818,457	88,983	$24,946,096
1952	36,333	7,388,754	167,474	19,537,949	27,356	8,808,632	90,512	30,049,984
1953	17,403	2,715,987	102,821	7,455,540	13,273	3,477,526	55,729	12,817,670
1954	24,497	4,127,232	[1] 127,053	8,483,611	18,314	5,018,036	[2] 64,322	13,893,552
1955	[3] 26,992	4,734,339	[4] 131,026	10,052,448	[4] 19,679	5,864,342	[5] 69,696	17,145,216
1956:								
Kansas	10,130	1,955,278	53,142	4,688,130	7,635	2,397,390	28,665	7,854,210
Southwest Missouri	496	102,096	1,862	161,502	388	121,832	1,035	283,590
Oklahoma	17,971	3,225,015	52,993	4,485,122	12,350	3,877,900	27,515	7,539,110
Total: 1956	28,597	5,282,389	107,997	9,334,754	20,373	6,397,122	57,215	15,676,910

[1] Includes 360 tons from old tailing remilled.
[2] Includes 194 tons from old tailing remilled.
[3] Includes 2,736 tons from old tailing remilled.
[4] Includes 44 tons from old tailing remilled.
[5] Includes 256 tons from old tailing remilled.

TABLE 17.—Tenor of lead and zinc ore milled and concentrate produced in Tri-State district, 1952–56

	1952	1953	1954	1955	1956
Total material milled:					
Crude ore, short tons	6,140,155	3,454,980	4,092,278	4,140,281	3,584,902
Tailings and slimes, do	604,350	----------	18,000	486,280	----------
Recovery of concentrate and metal from material milled:					
Galena, percent	0.54	0.50	0.60	0.58	0.80
Sphalerite, do	2.48	2.98	3.09	2.83	3.01
Lead [1], do	0.41	0.38	0.45	0.43	0.57
Zinc [1], do	1.34	1.61	1.56	1.51	1.60
Average lead content of galena concentrate, percent	76.79	77.81	76.28	74.41	72.69
Average zinc content of sphalerite concentrate, percent	60.04	60.22	56.24	59.09	58.87
Average value per ton:					
Galena concentrate	$203.36	$156.06	$168.48	$175.40	$184.72
Sphalerite concentrate	$116.66	$72.51	$66.77	$76.72	$86.44

[1] Figures represent metal content of the crude ore (dirt) only insofar as it is recovered in the concentrate.

[5] Kenworthy, H., Starliper, A. G., and Ollar, A., Laboratory Recovery of Germanium and Cadmium in Sphalerite Concentrates: Bureau of Mines Rept. of Investigations 5190, 1956, 17 pp.

Oklahoma furnished 63 percent of the district's lead concentrate and 49 percent of its zinc concentrate; Kansas supplied 35 percent of the district's lead concentrate and 49 percent of its zinc concentrate; Southwest Missouri furnished 2 percent of the district's lead concentrate and 2 percent of its zinc concentrate. The district's combined lead-zinc concentrate recovery of 3.81 percent in 1956 compared with a combined lead-zinc concentrate recovery of 3.41 percent in 1955.

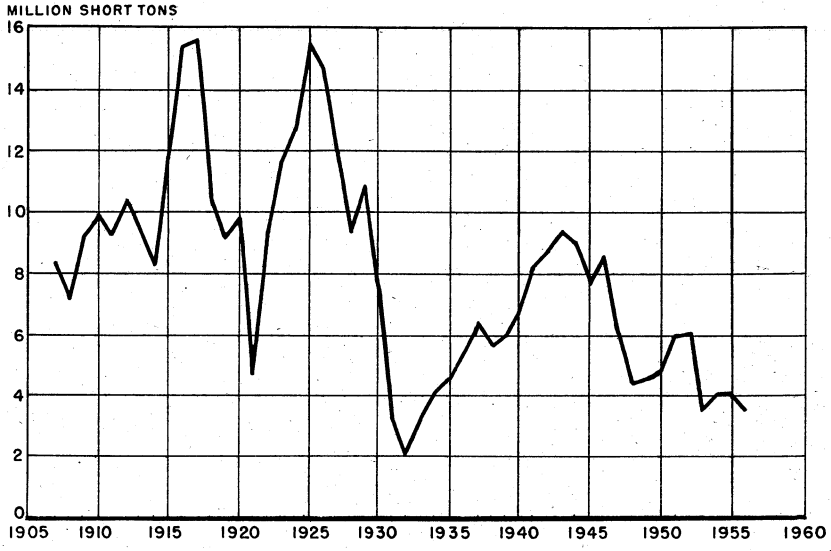

FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907–56.

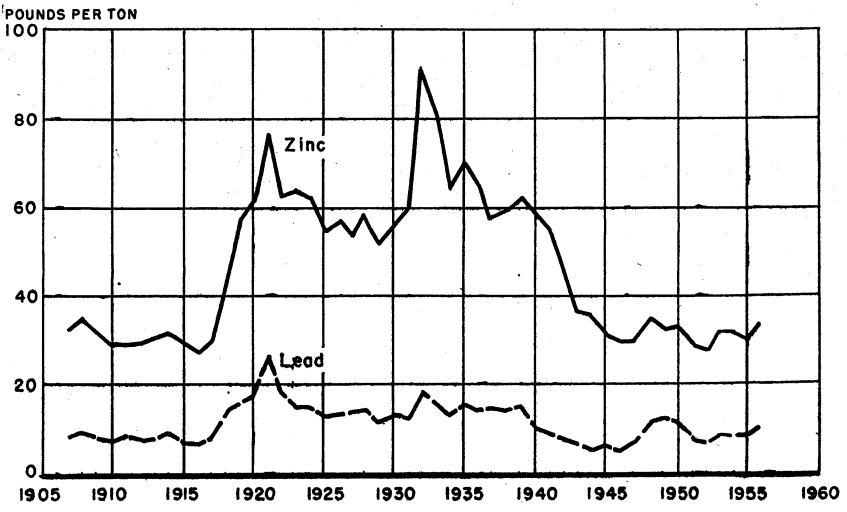

FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907–56.

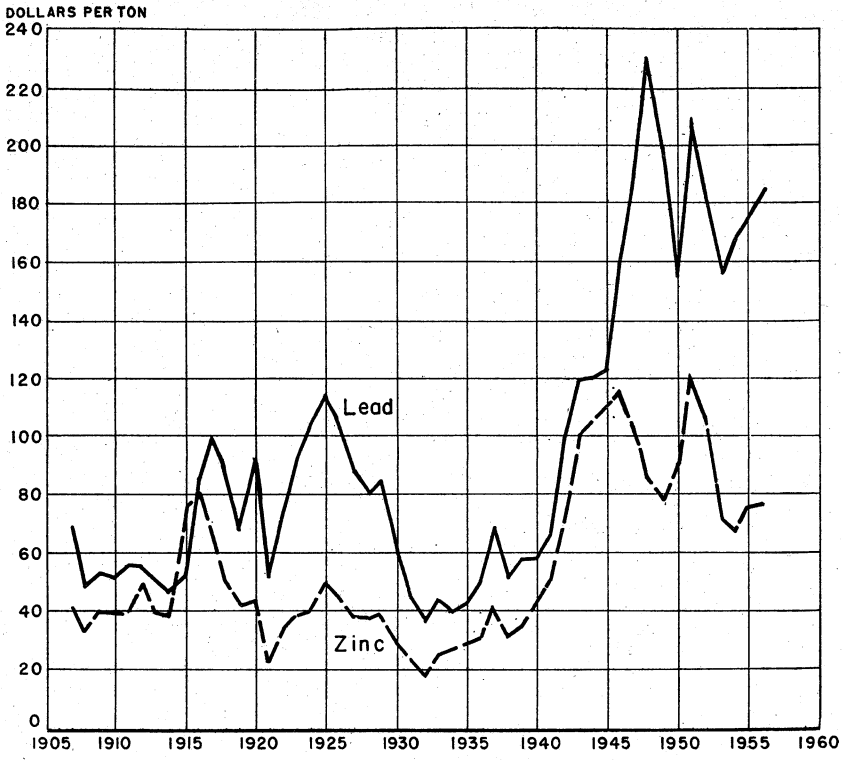

FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907–56.

NONMETALS

Oklahoma, endowed with abundant resources of nonmetals, yielded $28.6 million worth in 1956 compared with the record $31.3 million produced in 1955. A return to a more normal rate of construction activity accounted for most of the reduction. Also, a 96-day labor stoppage at one of the State's 2 cement plants caused an 85,000-ton production loss. Despite these reversals, the 1956 value of nonmetals was 11 percent higher than the 1954 value.

Individual commodity alltime high values in 1956 were those for sand and gravel, stone, lime, and common salt.

Cement.—Cement, the product ranking second in value of nonmetals produced in Oklahoma, underwent a one-fifth reduction from 1955. Two plants (at Dewey in Washington County and at Ada in Pontotoc County) operated throughout 1956. A third plant was being built near Locust Grove, Mayes County, by the Ozark Portland Cement Co., Inc. (formerly Hercules Cement Co.) This plant, with planned capacity of 1,500 barrels daily, is near a deposit reported to contain a 100-year supply of limestone.

Clays.—Oklahoma has extensive clay resources. Production was used principally in manufacturing brick and tile and to a small extent for manufacturing portland cement and lightweight, expanded-clay

products. Brick and tile were produced in Creek, Custer, Garfield, Greer, Lincoln, Oklahoma, Pittsburg, Seminole, and Tulsa Counties. Bentonite was produced in Dewey County. Expanded lightweight aggregate was made from clay in Tulsa and Oklahoma Counties.

Clays sold or used in 1956, including clays used for cement, totaled 705,000 tons, valued at $701,000. This tonnage was slightly less than in 1955. The Stroud Clay Products Co. in Lincoln County, which was idle for 3 years, changed management and underwent extensive remodeling and expansion. By the end of the year, this 1-kiln plant expected to be operating 8 kilns, with a total capacity of 2 million brick yearly.

TABLE 18.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	524,055	$433,677	1954	452,050	$1,282,848
1952	520,050	577,420	1955	724,156	726,856
1953	577,556	637,082	1956	705,061	701,038

Gypsum.—Tonnage and value of gypsum in 1956 remained relatively high—about the same as in 1955—in response to continued demands for wallboard, plasters, and portland cement. Most of the production was from Blaine County, where the United States Gypsum Co. operated quarries and plants to manufacture wallboard and plasters. At Southard, Universal Atlas Cement Co. quarried near Watonga, and S. A. Walton quarried near Southard. Production was reported from Caddo County for the first time. A survey of gypsum deposits in the area of Weatherford and Clinton (Custer County) was completed by the Oklahoma Geological Survey. The survey showed gypsum deposits suitable for manufacturing wallboard and plaster in enough quantity to meet the needs of the entire Nation for 130 years at the 1956 rate of consumption of 10 million tons annually.

Lime.—The entire lime production in the State came from the St. Claire Lime Co. in Sequoyah County and was slightly less in quantity than in the 1955 record year; however, the value increased 14 percent.

Pumice.—Production of pumice in 1956 reported by one operator in Beaver County, was comparable with the production and value in 1954. No pumice was produced in 1955. B. M. Sayler, Jr., announced purchase of a mine in Harper County. The deposit is close enough to the surface to permit open-pit mining and will be reopened. A promising use for the material is a filler for fertilizers.

Salt.—Output of salt—reported by 3 producers in 3 counties—increased 12 percent over 1955. At Sayre in Beckham County, salt continued to be produced by injecting fresh water through wells into a salt bed and recovering the brine for surface evaporation. In Woods County salt was produced from surface encrustations on the Big Salt Plain of the Cimarron River, and in Harmon County it was recovered by solar evaporation of brine from springs. Principal uses were for stock food and for recharging water softeners.

Sand and Gravel.—Sand and gravel deposits, suitable for concrete aggregate and road surfacing, occur along and adjacent to most of the

larger streams in Oklahoma. Production was reported from 57 counties in the State in 1956. Johnston, Tulsa, Cherokee, Pontotoc, Logan, and Murray were the leading counties, supplying half the total value.

Most of the sand and gravel produced in Oklahoma was used for paving concrete and mortar. Second in tonnage and value was high-purity glass sand, produced at two plants in the Arbuckle Mountain district. In addition to glass manufacturing a small part of the high-purity sand was used as foundry sand and for making sodium silicate.

Sand and gravel (including glass sand) produced in Oklahoma during 1956 amounted to 5.9 million tons valued at $4.8 million.

TABLE 19.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Commercial		Government-and-contractor		Total sand and gravel		Average value per ton
	Thousand short tons	Value (thousand dollars)	Thousand short tons	Value (thousand dollars)	Thousand short tons	Value (thousand dollars)	
1947–51 (average)	1,672	1,371	941	312	2,613	1,683	$0.64
1952	2,354	2,209	1,416	703	3,770	2,912	.77
1953	2,998	2,928	2,014	1,331	5,011	4,259	.85
1954	3,211	3,380	2,213	885	5,424	4,266	.79
1955	3,654	3,719	2,640	1,067	6,294	4,786	.76
1956	3,417	3,886	2,530	957	5,947	4,843	.81

Stone.—Oklahoma stone producers in 1956 reported 10.5 million tons of crushed limestone, crushed granite, dimension granite, dimension sandstone, dimension limestone, crushed sandstone, and miscellaneous stone. The reported value ($12.4 million) showed little change from 1955. Production was reported from 31 counties; Tulsa, Comanche, Murray, and Ottawa supplied most of the stone tonnage in the State. Crushed limestone (reported by 19 producers at 34 quarries in 1956) was used principally for cement and for concrete aggregate, and road construction.

Chat, included with miscellaneous stone, denotes coarse tailing from milling zinc and lead ores. The material is mostly chert or microcrystalline silica and small quantities of limestone, sphalerite, galena, marcasite, and pyrite. Most of the chat sold was used for railroad ballast, concrete aggregate, and road surfacing. In 1956 operators reported 35 percent more tonnage than in 1955.

Granite.—The dimension-granite industry of Oklahoma is centered in the Wichita Mountains in the southwestern part of the State, where 5 producers operated 6 quarries in Greer, Johnston, and Kiowa Counties in 1956. Crushed granite was produced at one quarry in Kiowa County.

Production came from Precambrian granites, which are predominantly pink and red. Dimension granite was used mostly for monumental stone and partly for exterior trim. Much of the stone was finished in plants in the Wichita Mountains, and some was shipped as rough rock to other States. In 1956, production of dimension was reported to be 5,074 tons with a value of $522,570.

TABLE 20.—Stone sold or used by producers, 1952–56, by kinds

Year	Granite		Limestone		Sandstone	
	Short tons	Value	Short tons	Value	Short tons	Value
1952	5,337	$511,073	[1] 6,355,780	[1] $6,940,219	1,350	$11,300
1953	[2] 6,862	[2] 702,250	[2] 5,654,022	6,029,258	228,897	137,407
1954	11,022	665,753	[1 3] 6,974,697	[1 3] 7,527,413	160,883	233,469
1955	576,187	1,276,088	[1 3] 8,826,553	[1 3] 10,123,738	236,778	275,702
1956	[4] 5,074	[4] 522,570	[1 3] 8,626,450	[1 3] 10,603,022	152,518	227,464

Year	Other stone		Total	
	Short tons	Value	Short tons	Value
1952	3,274,008	$1,511,742	[1] 9,636,475	[1] $8,974,334
1953	2,600,213	1,061,822	[3] 8,489,994	[3] 7,930,737
1954	2,092,209	720,360	[1 3] 9,238,811	[1 3] 9,146,995
1955	1,293,837	619,746	[3] 10,933,355	[3] 12,295,274
1956	1,762,570	1,063,830	[3] 10,546,612	[3] 12,416,886

[1] Excludes dimension limestone.
[2] Revised figures.
[3] Includes limestone used in cement and lime.
[4] Excludes crushed granite.

Limestone and Dolomite.—In 1956 limestone and dolomite were quarried in 23 counties; the largest production came from Tulsa, Comanche, and Murray Counties.

Chemical-grade limestone was quarried at Marble City in Sequoyah County for limemaking and for use as flux in glass manufacturing, fertilizers, and mineral feeds.

Dimension limestone was quarried for building stone in the Arbuckle Mountains in Pontotoc County, in Caddo County, and near Eldorado in Jackson County; limestone for portland cement was quarried in Washington and Pontotoc Counties.

Sandstone.—Dimension sandstone produced in Oklahoma was used for building and veneer stone in building construction. The stone was cut in slabs 1½ to 6 inches thick from shallow, open-face quarries in Okmulgee, Sequoyah, Maynes, and Pushmataha Counties. Approximately 1,000 tons valued at $12,000 was produced in 1956.

Stone, Crushed (Government-and-Contractor).—Stone crushed by municipal, county, and State agencies included limestone and sandstone obtained from local quarries through the State.

Sulfur (Recovered Elemental).—Decreases of 11 percent on both tonnage and value of sulfur produced from waste natural gases by Joe L. Parker at Madill, Marshall County, were reported in 1956.

Tripoli.—Eighteen percent less tripoli was mined in eastern Ottawa County in 1956 than in 1955. All of the tripoli mined was shipped to Seneca, Mo., for processing by the American Tripoli Division of the Carborundum Co. and sold chiefly for buffing compounds and foundry use.

REVIEW BY COUNTIES

Production of metals, nonmetals, and mineral fuels was reported from 74 of the 77 Oklahoma counties. Adair, Ellis, and Roger Mills were the only nonproducing counties.

Alfalfa.—A small quantity of petroleum was produced from the McWillie, N. field, and 4 of the 18 exploratory wells drilled proved oil productive. Construction sand and gravel was produced by Earl Kirkpatrick; other sand and gravel was produced by the county and State highway departments.

Atoka.—Limestone was crushed at the Southwest Stone Co. quarry near Stringtown for use as railroad ballast, road base, and aggregate in concrete. A small quantity of petroleum was produced west of Wesley. Seven exploratory wells were drilled; all proved dry.

Beaver.—Construction sand was quarried from a pit east of Beaver City by Everett Bush. Petroleum and natural gas were produced mainly from the Greenough, Floris, Camp Creek, and Light fields. Drilling of 34 test wells resulted in 8 that were oil productive and 17 that were gas productive. Stay-Ready Laboratories of Oklahoma City, Okla., prepared to mine a deposit of almost pure volcanic ash near Gate. The deposit (an estimated 5 million tons) has been known for 30 years and has been mined intermittently.

TABLE 21.—Value of mineral production in Oklahoma 1955–56 by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Adair	(2)		
Alfalfa	$50,222	$365,295	Petroleum, sand and gravel, natural gas.
Atoka	289,871	257,951	Stone, petroleum, sand and gravel.
Beaver	2,148,831	2,936,262	Petroleum, natural gas, sand and gravel, pumicite.
Beckham	26,060,772	22,683,546	Petroleum, natural-gas liquids, natural gas, salt.
Blaine	(2)	(2)	Gypsum.
Bryan	2,016,431	1,840,464	Petroleum, sand and gravel, natural gas.
Caddo	13,887,291	13,831,911	Petroleum, natural gas, gypsum, sand and gravel, stone.
Canadian	353,414	328,248	Petroleum, natural gas, sand and gravel.
Carter	58,949,629	61,641,664	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Cherokee	(2)	534,420	Sand and gravel, stone.
Choctaw	(2)	23,449	Sand and gravel.
Cimarron	1,447,760	1,647,715	Natural gas, petroleum, sand and gravel.
Cleveland	7,947,487	13,684,376	Petroleum, natural gas, natural-gas liquids.
Coal	2,205,728	1,978,215	Petroleum, stone, natural gas, coal, sand and gravel.
Comanche	2,550,103	2,517,057	Stone, petroleum, sand and gravel, natural gas.
Cotton	4,813,058	4,418,543	Petroleum, sand and gravel, natural gas.
Craig	110,753	221,153	Coal, stone, petroleum, natural gas.
Creek	31,276,145	31,031,687	Petroleum, natural-gas liquids, natural gas, clays, sand and gravel.
Custer	(2)	367,402	Natural-gas liquids, clays.
Delaware	(2)	18,090	Stone.
Dewey	(2)	(2)	Bentonite, sand and gravel.
Ellis	(2)		
Garfield	7,278,812	7,783,835	Petroleum, natural-gas liquids, natural gas, clays.
Garvin	81,626,943	99,725,969	Petroleum, natural-gas liquids, natural gas, stone sand and gravel.
Grady	16,735,306	21,789,241	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Grant	1,783,855	1,991,254	Petroleum, natural gas.
Greer	189,002	509,539	Petroleum, stone, clays, sand and gravel.
Harmon	174,122	18,200	Salt.
Harper	25,935	43,549	Natural gas, petroleum, sand and gravel.
Haskell	4,189,584	2,617,127	Coal, natural gas.
Hughes	12,822,773	10,603,304	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Jackson	1,964,499	1,006,593	Petroleum, natural-gas liquids, natural gas, stone.
Jefferson	2,362,831	3,205,422	Petroleum, natural gas.
Johnston	1,278,097	1,812,645	Sand and gravel, stone.
Kay	12,519,079	12,119,080	Petroleum, natural-gas liquids, natural gas, stone, sand and gravel.
Kingfisher	1,146,063	875,729	Petroleum, sand and gravel, natural gas.
Kiowa	965,988	1,143,126	Stone, petroleum, sand and gravel, natural gas.
Latimer	315,801	389,150	Coal, natural gas, sand and gravel.
Le Flore	2,102,590	2,380,770	Do.
Lincoln	24,268,790	25,064,864	Petroleum, natural-gas liquids, natural gas, stone, clays.

See footnotes at end of table.

TABLE 21.—Value of mineral production in Oklahoma 1955–56 by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Logan	$10,347,395	$10,932,125	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Love	534,706	1,132,533	Petroleum, stone.
Major	2,865,231	2,310,055	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Marshall	5,694,620	8,007,989	Petroleum, natural-gas liquids, natural gas, recovered sulfur, stone, sand and gravel.
Mayes	115,346	7,009	Stone, petroleum, sand and gravel.
McClain	6,570,047	7,274,912	Petroleum, natural gas, sand and gravel.
McCurtain	254,370	136,025	Sand and gravel.
McIntosh	628,929	680,503	Coal, petroleum, natural gas, sand and gravel.
Murray	2,007,591	2,140,311	Stone, asphalt, sand and gravel, petroleum, natural-gas liquids.
Muskogee	1,492,850	937,479	Petroleum, sand and gravel, natural gas.
Noble	8,871,939	9,676,220	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Nowata	13,683,708	15,681,295	Petroleum, stone, natural gas.
Okfuskee	11,971,541	10,132,686	Petroleum, natural gas, natural-gas liquids, stone, sand and gravel.
Oklahoma	35,248,226	35,065,312	Petroleum, natural-gas liquids, natural gas, sand and gravel, clays.
Okmulgee	7,680,766	7,821,495	Petroleum, coal, natural gas, stone.
Osage	56,223,179	68,558,343	Petroleum, natural-gas liquids, stone, natural gas, sand and gravel.
Ottawa	15,153,134	12,511,898	Zinc, lead, stone, tripoli, sand and gravel.
Pawnee	6,845,128	7,946,312	Petroleum, sand and gravel, natural-gas liquids, natural gas.
Payne	13,386,137	13,448,121	Petroleum, natural gas, sand and gravel.
Pittsburg	2,014,983	2,373,938	Coal, natural gas, stone, clays, sand and gravel, petroleum.
Pontotoc	18,784,928	17,436,733	Petroleum, cement, natural-gas liquids, sand and gravel, natural gas, stone.
Pottawatomie	12,830,112	16,227,843	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Pushmataha	222,750	53,763	Sand and gravel, stone.
Rogers	4,720,823	5,649,402	Petroleum, coal, stone, clays, sand and gravel, natural gas.
Seminole	33,293,324	28,532,761	Petroleum, natural-gas liquids, natural gas, clays, sand and gravel.
Sequoyah	1,416,971	2,786,748	Coal, lime, stone, natural gas, sand and gravel.
Stephens	57,929,516	59,003,172	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Texas	21,584,128	26,852,160	Natural gas, natural-gas liquids, petroleum, sand and gravel.
Tillman	862,774	1,638,025	Petroleum, sand and gravel.
Tulsa	6,523,799	7,082,548	Petroleum, stone, sand and gravel, clays, natural gas, natural-gas liquids.
Wagoner	1,108,834	1,165,168	Petroleum, stone, sand and gravel, coal, natural gas.
Washington	20,002,323	16,749,979	Petroleum, cement, stone, natural gas.
Washita	1,780,224	1,694,564	Petroleum, natural gas, sand and gravel.
Woods	787,314	665,988	Natural gas, petroleum, sand and gravel, salt.
Woodward	(2)	2,855	Sand and gravel.
Undistributed	1,794,869	1,393,122	
Total	711,089,000	757,116,000	

[1] Roger Mills County not listed, because no production was reported.
[2] Included with "Undistributed" to avoid disclosing individual company confidential data.

Beckham.—Salt was produced from wells southwest of Sayre by the Oklahoma Salt Industries, Inc. Petroleum and natural gas were produced from four fields, but mostly from the Elk City field. Natural-gas liquids were produced by the Shell Oil Co. Exploratory crews completed 1 oil well and 1 gas well.

Blaine.—Northeast of Watonga, gypsum was produced by Universal Atlas Cement Co., and west of Okeene by S. A. Walton & Sons. United States Gypsum Co. also quarried and crushed gypsum and operated a large calcining, sheet rock, and plaster plant at Southard.

Bryan.—Sand and gravel for paving was produced from the pits near Colbert by the State highway department. Petroleum and

natural gas were produced from the Aylesworth, S. E. field. Only 1 of 9 exploratory wells proved oil productive.

Caddo.—Petroleum and natural gas were produced from three fields. Cement (the largest of these fields) produced 4.4 million barrels of oil in 1956. Drilling of 19 exploratory wells proved 7 oil and 2 gas wells. The plant of Apache Gasoline Co. was shut down. Construction sand and gravel was produced by two operators and for highways by the State highway department. Dimension limestone was quarried by one operator. Gypsum was produced by the Harrison Gypsum Co.

Canadian.—Petroleum and natural gas were produced from the Edmond, W. field. Exploratory drilling furnished 1 oil well and 1 gas well. Construction sand and gravel was produced by Tindel Material Co.

Carter.—Carter County dropped from second to third in the value of mineral and mineral fuels produced in the State. Petroleum and natural gas were produced from 20 fields of which Fox-Graham, Healdton, Hewitt, Sholeum-Alechem, and Tatums were the largest. Natural-gas liquids were produced by the Magnolia Petroleum Co., Shell Oil Co., Signal Oil & Gas Co., Harry Ells, Inc., Apache Gasoline Co., and Sokla Gasoline Co. Six exploratory wells were completed as oil wells; 12 were dry. Paving sand and gravel was produced by the State highway department.

Cimarron.—Petroleum and natural gas were produced from several small fields in the Keys area. Only 1 of 7 exploratory wells drilled proved oil productive. Construction sand and gravel was produced northwest of Boise City by Jack Parker; paving gravel was produced by the State highway department.

Cleveland.—Petroleum and natural gas were produced from 19 fields. Natural-gas liquids were produced by Sunray Mid-Continent Petroleum Corp. Drilling of 19 exploratory wells resulted in 3 oil producers and 16 dry holes.

Coal.—Petroleum and natural gas were produced from five fields. Eight exploratory wells were drilled; all were dry holes. Paving gravel was produced by the State highway department, and limestone for concrete aggregate was quarried and crushed by one operator. Coal was mined by one producer in 1956.

Comanche.—Crushed limestone was produced by the Dolese Bros. Co. from its Richard Spur quarry north of Lawton. Paving sand and gravel was produced by the State highway department. Petroleum and natural gas were produced from a group of small fields comprising three districts and the Fort Sill Reservation field. Only 1 of 21 exploratory wells drilled proved oil productive.

Cotton.—Petroleum and natural gas were produced from a group of fields in the Walters and Cache Creek districts and from five other fields. The entire 13 exploratory wells drilled proved to be dry. A small quantity of sand and gravel was produced by the State highway department.

Craig.—Coal was strip-mined at 4 pits by 2 producers. Small quantities of petroleum and natural gas were produced. Three exploratory wells were drilled; 1 was oil productive. Limestone was crushed by a construction company.

Creek.—Petroleum and natural gas were produced from 51 fields,

of these, the prolific Cushing and Glenn fields supplied 4.4 million barrels of petroleum during the year. Natural-gas liquids were recovered by plants of Sinclair Oil & Gas Co., Kerr-McGee Oil Industries, Inc., Pure Oil Co., Gulf Oil Corp., and Sunray Mid-Continent Oil Corp. Exploratory drilling resulted in 4 oil wells and 1 gas well. Sunray Mid-Continent Oil Corp. shut down its gasoline plant at Drumright because of declining gas volumes. Wilcox Oil Co. refinery at Bristow was shut down, and Tide Water Associated Oil Co. refinery at Drumright (shut down in 1955) was dismantled. Clay for manufacturing brick and tile was produced at the Sapulpa plant of the Sapulpa Brick & Tile Co.; for pottery it was produced at Sapulpa by Frankhoma Pottery Co. A small quantity of sand and gravel was produced for highway purposes.

Garfield.—Petroleum and natural gas were produced from 26 fields. Natural-gas liquids were produced by the plants of Sterling Oil Co of Oklahoma near the East Spring Valley field and by Sinclair Oil & Gas Co. at Covington. A 9,000-barrel-per-day catalytic cracking unit, placed in operation at the Enid refinery of Champlin Refining Co., completed a $4 million expansion program begun in 1955. Exploratory drilling furnished 3 oil wells and 16 dry holes. The Davies Brick & Tile Co. continued to produce miscellaneous clay for manufacturing brick at its quarry south of Enid.

Garvin.—Garvin County retained first position in the value of minerals and mineral fuels produced in the State. Petroleum and natural gas were produced from the 44 fields, which supplied 30.8 million barrels of oil in 1956. Natural-gas liquids were recovered by Sohio Petroleum Co., Lone Star Gas Co., Otha H. Grimes, and Warren Petroleum Co. Exploratory drilling resulted in 12 oil wells and 16 dry holes. Construction sand and gravel was obtained from deposits east of Pauls Valley by two operators; paving sand and gravel and crushed limestone were produced for highways by the highway department.

Grady.—Petroleum and natural gas were produced from 11 fields. Natural-gas liquids were recovered by Magnolia Petroleum Co. Three of the nine exploratory wells drilled proved oil productive. Sand and gravel for construction was obtained from pits near Tuttle by the Dolese Bros. Co. and for paving by the State highway department.

Grant.—Petroleum and natural gas were produced from 10 fields. Exploratory drilling resulted in 11 oil wells, 1 gas well, and 28 dry holes.

Greer.—Granite was quarried by the Granite Monument Works near the town of Granite. Clay was produced from the pit of Mangum Brick & Tile Co., south of Mangum. Construction sand and gravel was produced by four operators. Petroleum was produced from the Lake Creek oilfield. Drilling of nine exploratory wells all proved to be dry holes.

Harmon.—Salt was produced by W. W. Flowers & Sons Salt Co. by solar evaporation of brine from salt springs. Only one exploratory well for petroleum was drilled, and it was dry.

Harper.—Small quantities of petroleum, natural gas, and stone were produced. Four oil wells and 3 gas wells were productive out of 12 exploratory tests. Sand and gravel was produced for highways.

Haskell.—Haskell County led in value of coal produced. Coal was mined underground by Dock Coal Co., and strip-mined by Garland Coal Mining Co., Cedar Creek Coal, Fall River Mining Co., Cary Contracting Co., and Choctaw Coal Co., Inc. Natural gas was produced from Quinton and Kinta districts.

Hughes.—Petroleum and natural gas were produced from 39 fields. The Holdenville, East field, discovered in 1946, furnished 1.1 million barrels of oil. Natural-gas liquids were recovered by the Grimes Gasoline Co. Exploratory drilling supplied 1 oil well and 4 gas wells. Sand and gravel was produced for highways.

Jackson.—Petroleum and natural gas were produced from five fields to the southeast of Altus. Seven exploratory wells all proved dry. Natural-gas liquids were recovered by the plant of Gulf Oil Corp. Dimension limestone was quarried by Eldorado Building Stone Co.

Jefferson.—Petroleum and natural gas were produced from eight fields. Of 25 exploratory wells drilled, only 1 proved oil productive.

Johnston.—Pennsylvania Glass Sand Corp. of Oklahoma continued to produce glass sand and ground silica from pits north of Mill Creek. Construction sand from a pit east of Tishomingo and paving sand and gravel were produced for highways. Crushed dolomite and dimension granite were produced from quarries near Troy.

Kay.—Petroleum and natural gas were produced from 29 fields and natural-gas liquids were recovered by the plant of Cities Service Oil Co. Exploratory drilling resulted in 3 oil wells and 24 dry holes. Cities Service Oil Co. was expanding the capacity of its Ponca City refinery from 23,500 to 35,000 barrels daily, and construction was in progress on a new Rexformer unit. Crushed limestone was produced by Cookson Stone Co. from its quarry northeast of Ponca City and by Mervine Stone Co. Sand and gravel was produced for construction by three operators and for paving by the State highway department. American Metal Co., Ltd., zinc smelter at Blackwell operated continuously throughout the year.

Kingfisher.—Construction sand and gravel was produced from pits near Dover. Petroleum and natural gas were produced from three fields: Cashion, NW.; Dover, SW.; and Edmond, W. Four exploratory wells were drilled, and three were oil productive.

Kiowa.—Dimension granite was quarried near Snyder by 2 operators and near Mountain Park by 2 operators. Crushed granite also was produced. Construction sand and gravel was produced by two operators; paving sand and gravel by the State highway department. Petroleum and natural gas were produced from nine fields.

Latimer.—Coal was strip-mined by Kinta Stripping Co. and mined underground by Limestone Prairie Coal Co. Natural gas was produced from the Red Oak and Morris fields. Paving sand and gravel was produced for highways.

Le Flore.—Coal was mined by 11 operators, 4 strip-mined, and the rest mined underground. In value, the county ranked third as a coal producer in the State. Crushed sandstone was produced by the Dixie Material Co., Inc.; sand and gravel was produced for highway surfacing. Natural gas was produced mainly from three fields. Uranium prospectors were active near the Arkansas State line. Interest in uranium also was high near Talihina, and in the Potatoe Hill area a company scheduled a core-drilling test.

Lincoln.—Petroleum and natural gas were produced from 71 fields, of which the East Payson field produced about 786,000 barrels in 1956. Natural-gas liquids were recovered by the Highway Gasoline Co., Magnolia Petroleum Co., and Moran Gasoline Corp. Extensive exploratory drilling in the county resulted in 4 oil wells and 25 dry holes. Crushed sandstone was produced for concrete aggregate.

The plant of Stroud Clay Products Co. was purchased by Troy Ragland of W & R Stone Co. of Austin, Tex., and extensive remodeling was under way. The plant, formerly shut down and equipped with 1 kiln, expected to be operating 8 kilns with a capacity of 2 million brick yearly.

Logan.—Petroleum and natural gas were produced from 41 fields, and natural-gas liquids were recovered by the Eason Oil Co. Twenty-four test wells were drilled, and only 1 was oil productive. Construction sand was produced by two operators.

Major.—Petroleum and natural gas were produced from the Ringwood and Seiling, NE. fields. Natural-gas liquids were recovered by Warren Petroleum Co. at Ringwood. Construction sand and gravel was produced near Cleo Springs by two operators.

Marshall.—Of 6 fields producing petroleum, the Cumberland yielded 1.9 million barrels in 1956. Natural-gas liquids were recovered by the Warren Petroleum Corp. and the Universal Gasoline Co. Sulfur from waste sour gas was recovered by the Joe E. Parker plant east of Madill. Two of six exploratory wells drilled were oil productive. Sand and gravel and crushed limestone were produced for highways.

McClain.—Petroleum and natural gas were produced from 27 fields, and by exploratory drilling 6 oil wells and 1 gas well were discovered. Sand and gravel for paving was produced by the State highway department.

McIntosh.—Coal was strip-mined by Leavell Coal Co. Petroleum and natural gas were produced from the Coalton and Morris fields. Sand and gravel was produced for highways.

Murray.—Asphaltic limestone and sandstone were produced near Dougherty by the United States Asphalt Corp. The Dolese Bros. Co. crushed limestone at the Rayford and Big Canyon quarries. Construction gravel was produced by Makins Sand & Gravel Co. near Dougherty; paving sand was produced for highways. Petroleum was produced from the Sulphur, NW. field. Eighteen exploratory wells all proved dry.

Muskogee.—Petroleum and natural gas were produced from 12 fields. Yahola Sand & Gravel Co. pumped sand and gravel from the Arkansas River north of Muskogee. At Muskogee, Fansteel Corp. began constructing a new $6.5 million columbium-tantalum plant.

Noble.—Petroleum and natural gas were produced from 27 fields, and natural-gas liquids were recovered by the Lucien Unit plant of the Gasoline Plant Management Co. Six exploratory wells were found oil productive out of 21 tests. Sand and gravel was produced by the Noble County Highway Department.

Nowata.—Petroleum and natural gas were produced from six fields. Peerless Rock Co. crushed limestone.

Okfuskee.—Petroleum and natural gas were produced from 72 fields; the Olympic field supplied 1.75 million barrels of oil in 1956. Natural-gas liquids were recovered by two plants of Grimes & Grimes.

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Two oil-discovery wells and one gas-discovery well were completed. Sand and gravel for highways and crushed sandstone for concrete aggregate were produced.

Oklahoma.—Of the 23 fields that produced petroleum and natural gas, Oklahoma City and West Edmond each produced more than 1 million barrels of oil. Natural-gas liquids were recovered by Patton & Swab, Inc., Phillips Petroleum Co., and Cities Service Oil Co. Two oil-discovery wells were completed. Clay for manufacturing brick and tile was obtained from pits in the western part of Oklahoma City by the Acme Brick Co. and the United Brick & Tile Co. Near Choctaw, the Oklahoma Lightweight Aggregate Corp. produced clay for lightweight aggregate. Construction and paving sand was produced by two operators; other sand and gravel was produced by the State highway department.

Okmulgee.—Coal was mined near Henryetta by Starr Coal Co., Carbon Hill Coal Co., Ben Hur Coal Co., and McGinnis & Grafe, Inc. Petroleum and natural gas were produced from 27 fields. The Ada Stone Co. quarried sandstone near Henryetta.

Osage.—Osage, with 127 fields producing oil and gas, rose from 4th to 2d in rank as an oil-producing county in 1956. The Burbank field, under an extensive waterflooding program, produced 13.5 million barrels of oil and remained the most prolific. Natural-gas liquids were recovered by Phillips Petroleum Co., Skelly Oil Co., Neal Gasoline Co., and Sunray Mid-Continent Oil Corp. The county led in exploratory drilling. Out of 97 tests, 16 were oil productive, and 2 were gas productive. Limestone was quarried and crushed east of Burbank; paving sand was produced by the State highway department.

Ottawa.—The entire Oklahoma lead and zinc output and most of the Tri-State district output was supplied from 80 mines in Ottawa County. Chat—a byproduct of zinc and lead milling—was supplied by six producers. Tripoli was quarried in east central Ottawa County by the American Tripoli Division and processed in its plant at Seneca, Mo. Sand and gravel was produced by the State highway department.

Pawnee.—Petroleum and natural gas were produced from 28 fields, and natural-gas liquids were recovered by the Frame Natural Gasoline Co. Exploratory drilling proved that 34 test wells were dry. Construction sand and gravel was produced by four operators.

Payne.—Petroleum and natural gas were produced from 71 fields; the Yale-Quay, with a yearly production of 1.3 million barrels of oil, was the largest in the county. The gasoline plant of Sunray Mid-Continent Petroleum Corp. near Stillwater was shut down. Exploratory drilling resulted in 8 oil wells and 17 dry holes. Sand and gravel was produced by the county highway department.

Pittsburg.—Pittsburg County ranked second in value of coal produced. Coal was mined underground by Lone Star Steel Co. and McAlester-Alderson Coal Co. Natural gas was produced from three fields near Quinton. Sand and crushed limestone were produced for highway construction. The Oklahoma State Penitentiary west of McAlester produced clay for manufacturing of brick and tile.

Pontotoc.—Petroleum and natural gas were produced from 23 fields; natural-gas liquids were recovered by the Carter Oil Co. plant. Twelve exploratory wells were drilled; all proved dry. Building

limestone was quarried near Fittstown by two operators; near Lawrence the Ideal Cement Co. quarried shale and limestone for use in its plant at Ada. Molding sand was produced by Grade A Sand & Gravel Co. and Mid-Continent Glass Sand Co.; paving sand and gravel by the State highway department. At Ada, Okla., Ideal Cement Co. started erecting buildings for a new $14 million plant. Combined cement capacity of the new and old plants will be 3,650,000 barrels yearly.

Pottawatomie.—Petroleum and natural gas were produced from 68 fields; the St. Louis field was the largest. Natural-gas liquids were recovered by the plants of Warren Petroleum Co. and the Sinclair Oil & Gas Co. Three oil-discovery wells were completed. Sand and gravel was produced for highways.

Rogers.—Coal was strip-mined by the McNabb Coal Co. and Peabody Coal Co. Petroleum and natural gas were produced from three fields; the Chelsea district supplied most of the oil produced. Sand and gravel and crushed limestone were produced for highways.

Seminole.—Petroleum and natural gas were produced from 76 fields; the Seminole City field was the most prolific. Natural-gas liquids were recovered by the plants of Carter Oil Co., Sinclair Oil & Gas Co., and Phillips Petroleum Co. Exploratory drilling crews completed two oil wells. Clay for manufacturing brick and tile was obtained west of Wewoka by Wewoka Brick & Tile Co. Sand and gravel was produced for highways.

Sequoyah.—Coal was strip-mined by the Sallisaw Stripping Co. Limestone was crushed north of Marble City at the quarry of the St. Clair Lime Co. Part of the limestone that had been crushed at Marble City was burned at Sallisaw in the kilns of the St. Clair Lime Co. Dimension sandstone was quarried by Cookson Hills Stone Co. Natural gas was produced from a small field. Sand and gravel was produced for highways.

Stephens.—The county ranked fourth in petroleum production. Petroleum and natural gas were produced from 38 fields. Natural-gas liquids were recovered by Magnolia Petroleum Co., Comanche Gasoline Co., and Skelly Oil Co. Exploratory drilling found five oil-productive wells. West of Duncan construction started on the Patoma Hydrocarbon Co. new plant, which will process natural gas and propane fuels. Sand and gravel was produced for highways.

Texas.—Natural gas, from the vast Hugoton gas field, and petroleum were produced during the year. Natural-gas liquids were recovered in the vicinity of Guymon by Cities Service Oil Co. and Hugoton Plains Gas & Oil Co. Five oil wells and two gas wells were completed as a result of exploratory drilling. Construction sand and gravel was produced north and south of Guymon by the Stewart Bros. and for highways by the State highway department.

Tulsa.—Petroleum and natural gas were produced from 23 fields, and natural-gas liquids were recovered by the plant of Pioneer Corp. near Bixby. In Tulsa, brick and tile were manufactured by the Acme Brick Co. and the United Brick & Tile Co.; in Collinsville, by the United Brick & Tile Co. East of Tulsa, near Garnett, crushed limestone was produced by the Anchor Stone Co., and the Chandler Materials Co.; elsewhere by Standard Industries, Inc. Construction

sand was produced by nine operators for paving by the State highway department.

Washington.—Petroleum and natural gas were produced from five districts. Limestone and clay were quarried near Dewey for the manufacture of portland cement by the Dewey Portland Cement Co. Part of the limestone quarried at Dewey was marketed as crushed limestone. Crushed limestone also was produced near Bartlesville by the Matoaka Stone Co. The Research Center of Phillips Petroleum Co. was under construction at Bartlesville during the year.

Washita.—Petroleum and natural gas were produced from 3 small fields and from part of the important Elk City field. Sand and gravel was produced for highways.

Woods.—Construction sand and gravel was produced near Waynoka by the Waynoka Sand & Gravel Co. Salt was produced west of Freedom by Ezra Blackmon. Petroleum and natural gas were produced from 1 field, and exploratory drilling proved 1 oil and 2 gas wells.

The Mineral Industry of Oregon

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Oregon State Department of Geology and Mineral Industries.

By Kenneth D. Baber,[1] Frank B. Fulkerson,[1] Norman S. Petersen,[1] and Albert J. Kauffman, Jr.[2]

OREGON'S mineral production increased 7 percent in 1956 and was valued at more than $34 million—a new record for the State. Increased output of metallic ores, with nickel, chromite, and mercury registering major gains, and increased production of cement more than offset a decline in the volume of sand-and-gravel and stone. Nickel-ore output was increased to meet smelter requirements. The gain in chromite production was due primarily to output from an operation in Coos County, whereas the gain in mercury production was due to a comparatively stable high price. A cement shortage was alleviated through installation of new capacity, and further expansion in production of this commodity was expected. The decline in sand-and-gravel and stone production was due to decreased output by contractors for the United States Army Corps of Engineers at The Dalles Dam on the Columbia River and by contractors for the State highway commission.

Trends and Markets.—Concrete pouring at The Dalles Dam was virtually completed in 1956, and riprap work was to be finished in 1957. Most of the cement used at the project was imported from other States. A drop of 15 percent in tonnage of upriver barge traffic from Portland was due primarily to a decline in cement shipments to The Dalles.

An expanded highway program in the State was assured through passage of the Federal Highway Act of 1956. Oregon planned to spend $650 million by 1970 for modernization of Federal-aid primary and secondary roads and more than $140 million by 1962 on two Oregon highways included in the interstate system. The Columbia River Highway (U. S. 30) was to be made a 4-lane divided highway from Portland to Ontario, and the Pacific Highway (U. S. 99) was to be made a 4-lane throughway from Portland to the southern border of the State. The National Crushed Stone Association estimated sand and gravel, crushed stone, and other aggregate needed for the new highway system in Oregon, in addition to normal requirements, as follows: 1957, 3.6 million tons; 1958, 3.7 million tons; and 1959, 4.1 million tons.[3]

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[3] Rock Products, vol. 60, No. 1, January 1957, pp. 78–79.

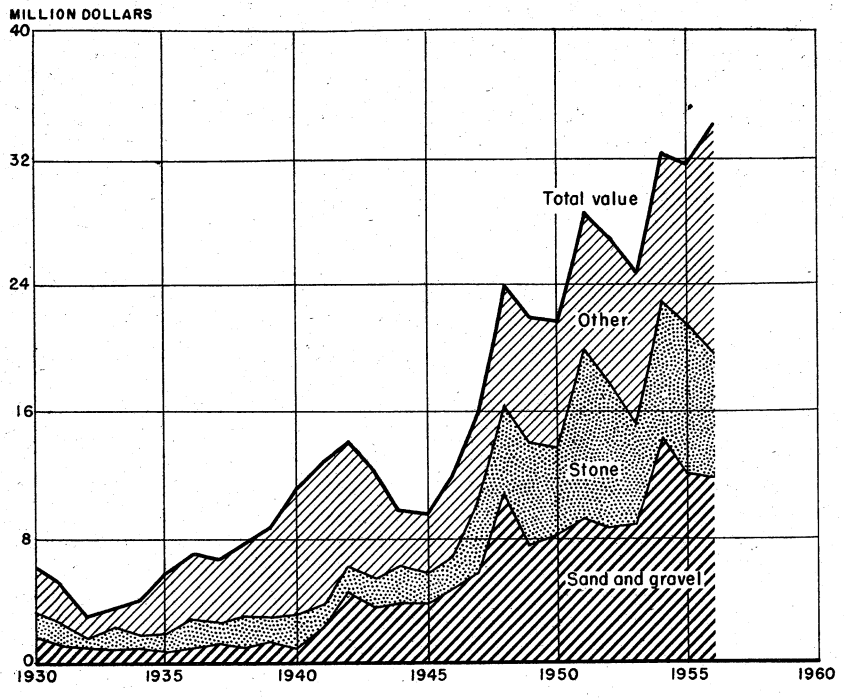

FIGURE 1.—Value of sand and gravel, stone, and total value of mineral production in Oregon, 1930–56.

TABLE 1.—Mineral production in Oregon, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Chromium ore and concentrate—gross weight	5,341	$463,514	[2] 54,577	[2] $2,001,083
Clays	250,608	275,916	256,942	278,205
Copper (recoverable content of ores, etc.)	4	2,984	7	5,950
Gold (recoverable content of ores, etc.)—troy ounces	1,708	59,780	2,738	95,830
Iron ore (limonite)—long tons	1,786	[3]	893	[3]
Lead (recoverable content of ores, etc.)	3	894	5	1,570
Mercury—76-pound flasks	1,056	306,610	1,893	492,029
Nickel ore—nickel content	4,181	[3]	6,866	[3]
Sand and gravel	11,953,878	11,832,344	11,637,183	11,646,367
Silver (recoverable content of ores, etc.)—troy ounces	8,815	7,978	13,542	12,256
Stone	7,741,937	9,417,834	6,097,965	7,890,197
Tungsten ore and concentrate—60-percent WO_3 basis	1	[3]	[3]	[3]
Value of items that cannot be disclosed: Carbon dioxide, cement, coal (1955), diatomite, gem stones, iron-oxide pigments (1956), pumice, and values indicated by footnote 3		10,500,091		12,929,235
Total Oregon [4]		31,736,000		34,011,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Includes 45,710 short tons of concentrate produced in 1955 and 1956 from low-grade ore and concentrate stockpiled near Coquille, Oreg., during World War II.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Total adjusted to eliminate duplicating value of clays and stone.

Continued expansion in primary metals contrasted with a recession in logging and lumbering, by far Oregon's principal manufacturing industry. One of the largest heavy-construction projects in the State was the Harvey Aluminum Co. $65-million smelter at The Dalles. The plant, with a capacity of more than 100 million pounds of aluminum annually, was to be completed in 1958. Electric energy was to be made available to the facility by the generators of the new The Dalles Dam through the network of the Bonneville Power Administration (BPA). Full production was reached at the Hanna Nickel Smelting Co. plant near Riddle after installation of the last 2 of 4 furnaces. Near Albany, Oregon Metallurgical Corp. initiated a titanium- and zirconium-sponge melting operation in 1956, and Wah Chang Corp. began constructing a metallurgical plant for production of zirconium.

Although production by the Pacific Northwest aluminum industry reached a record total in 1956, owing to expansion of established plants and completion of a new plant at Columbia Falls, Mont., further rapid growth may be limited by the availability of electric power. The smelter at The Dalles was the only aluminum plant scheduled for construction in the region. In 1956 the relative position of the aluminum industry in the Pacific Northwest compared with the United States as a whole was improved temporarily. However, planned construction in 1957 of three plants in the Ohio River Valley would tend further to diminish production in the Pacific Northwest compared with the total United States output. The Ohio River Valley plants were to use steam generated from coal for power.

A report published in 1957 itemized 45 chemicals and nonmetallic minerals, such as lime, limestone, sulfur, sulfuric acid, and chlorine, used in the Pacific Northwest pulp and paper industry in 1956.[4] The report gave information as to tonnages and percentages obtained from the northwestern, western, central, and eastern areas of the United States and from foreign sources.

There were two outstanding developments in the mineral-fuels industry in 1956. The first was completion of the natural-gas pipeline to the Pacific Northwest from the San Juan field in New Mexico. It was expected that the natural gas would be used extensively in the mineral industries, particularly at plants where heat was a high cost factor, such as those producing cement, lime, glass, ceramics, and primary metals. It was also expected that natural gas would be used in the production of industrial chemicals and fertilizers. Previously gas had been manufactured at Portland and had been used primarily for space heating of homes and businesses; the gas had found no heavy industrial use owing to its comparatively high cost. The Portland plant of Owens-Illinois, which began producing in the summer of 1956, was the first industrial establishment to employ natural gas. It was also the first glass plant in Oregon and the second in the Pacific Northwest. Because of high heat requirements, the melting furnaces of the new plant burned natural gas at a rate equivalent to the average

[4] Guthrie, Frank K., and others, The 1956 Chemical Requirements for the Pacific Northwest Pulp and Paper Industry: Raw Materials Survey, Portland, Oreg., March 1957, 10 pp.

annual consumption of 2,000 homes. Raw materials, including sand, soda ash, and limestone, were obtained from out-of-State sources. The new high-grade industrial lime plant of Chemical Lime Co. at Baker also was to use natural gas in firing the kilns. Capacity of the Pacific Northwest pipeline system was to be doubled in 1957 by completion of a pipeline from the Peace River field in Canada.

The second development in the mineral-fuels industry was the announcement by the Pacific Power & Light Co. of plans for extensive exploration of the Eden Ridge coal field in Coos County as a source of energy for a proposed 100,000-kw. steam-electric plant.

Employment and Wages.—Employment in mining industries covered by the Unemployment Compensation law averaged 1,260—280 in metal mining and 980 in nonmetallic-mineral mining. These figures did not represent the total number of persons engaged in mining, because small establishments hiring less than 2 workers (less than 4 workers before 1956) were exempt from coverage, as were self-employed persons and State and county agencies. In addition, some mining and quarrying were part of another major activity, such as road construction. With extension of the Unemployment-Compensation law to all plants hiring two or more workers, the data on covered employment in mineral manufacturing, approximated the total employment. Mineral manufacturing employed 6,940 workers in 1956—67 percent in primary-metals plants; 22 percent in making stone, clay, and glass products; and the remainder mainly at plants manufacturing products of petroleum, coal, and industrial chemicals. Employment increased 13 percent compared with 1955 and 21 percent compared with 1950. Virtually all of the expansion resulted from growth in the primary-metals industries in 1955 and 1956. Total employment in other mineral manufacturing remained about the same in 1956 as in the preceding 5 years. Payrolls of employers subject to the Unemployment-Compensation law were $6.2 million in mining and $36.5 million in mineral manufacturing—a total annual payroll in the mineral industries of $42.7 million in 1956.

Hours and Earnings.—Average hourly earnings for production workers (excluding supervisory and administrative personnel) in the primary-metals industry rose to a peak of $2.44 in 1956, according to data tabulated by the Oregon State Unemployment Compensation Commission on the basis of reports from representative employers. The average workweek was 40.1 hours in 1956, and average weekly earnings advanced to $97.64. The hours and earnings figures included premium pay for night-shift and overtime work. Average weekly earnings in the primary-metals industry increased to $101.89 in December, owing to higher hourly rates and a longer workweek.

Defense Minerals Exploration Administration.—The Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences.

TABLE 2.—Employment and payrolls in mineral-industry establishments subject to Oregon Unemployment-Compensation law, 1952–56, by industry [1]

Industry	1952		1953		1954		1955		1956	
	Employment	Payrolls	Employment	Payrolls	Employment	Payrolls	Employment	Payrolls	Employment	Payrolls
Mining:										
Metal	130	$492,475	125	$475,802	143	$607,140	201	$955,584	279	$1,378,443
Nonmetallic, including mineral fuels	1,046	4,506,989	1,077	4,831,919	1,039	4,696,891	987	4,603,607	980	4,849,906
Total mining	1,176	4,999,464	1,202	5,307,721	1,182	5,304,031	1,188	5,559,191	1,259	6,228,349
Mineral manufacturing: Stone, clay, and glass products:										
Glass and pottery	59	195,907	56	186,308	54	178,794	48	173,077	156	770,311
Hydraulic cement	462	1,949,424	455	2,052,879	466	2,119,640	450	2,107,650	453	2,337,194
Structural clay products	251	1,042,698	253	1,050,849	250	1,073,040	247	1,093,699	246	1,144,621
Concrete, gypsum, and plaster products	442	1,709,639	407	1,708,427	366	1,593,346	399	1,812,993	486	2,264,483
Cut-stone and stone products	50	177,137	56	225,568	58	242,123	51	218,574	51	233,342
Miscellaneous nonmetallic mineral products	90	319,699	83	311,664	81	316,228	73	306,812	77	338,154
Total	1,354	5,394,504	1,310	5,535,695	1,275	5,523,171	1,268	5,712,805	1,469	7,088,105
Primary-metals:										
Blast furnaces, steel works, and rolling mills; and primary and secondary smelting and refining of nonferrous metals	1,320	6,483,418	1,330	7,015,985	1,490	7,874,545	1,940	10,758,698	2,226	12,893,260
Iron and steel foundries	1,598	7,195,384	1,597	7,592,262	1,466	7,141,997	1,695	8,656,818	1,976	10,435,438
Nonferrous foundries	265	1,025,949	275	1,116,556	243	1,011,278	254	1,107,750	333	1,522,009
Miscellaneous primary metal industries	232	1,069,202	151	681,334	129	606,043	169	817,852	125	636,508
Total	3,415	15,773,953	3,353	16,406,137	3,328	16,633,863	4,058	21,341,118	4,660	25,487,215
Industrial organic and inorganic chemicals	478	2,021,909	634	2,624,381	507	2,296,151	326	1,514,980	334	1,605,525
Fertilizers	108	451,263	47	215,559	49	223,878	48	233,904	61	248,010
Products of petroleum and coal	368	1,679,532	369	1,702,677	406	1,914,165	432	2,035,638	418	2,086,474
Total mineral manufacturing	5,723	25,321,161	5,713	26,484,449	5,565	26,591,228	6,132	30,838,445	6,942	36,515,329
Grand total	6,899	30,320,625	6,915	31,792,170	6,747	31,895,259	7,320	36,397,636	8,201	42,743,678

[1] Oregon State Unemployment Compensation Commission. Figures were limited to data reported by employers subject to Oregon Unemployment-Compensation law, under the provisions requiring coverage of employers hiring 2 or more workers (4 or more workers before 1956) in any 6 weeks in a quarter in which the payroll amounted to $500 or more. Some industries were combined in the table because there were less than 3 employers.

TABLE 3.—Defense Minerals Exploration Administration contracts active in 1956

County and contractor	Property	Commodity	Contract		
			Date	Total amount	Government participation, percent
LANE					
Mercury & Chemicals Corp.	Black Butte	Mercury	Aug. 22, 1956	$62,340	75
MALHEUR					
H. K. Riddle	Jordan	do	May 28, 1956	31,000	75

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Production and shipments of portland cement continued the upward trend and increased 14 and 12 percent, respectively, over 1955. End-of-the-year stocks of portland cement were considerably higher than at the end of 1955. An increase in price was reported by most companies producing portland cement. The increase was in line with the upward trend of cement prices nationally, as announced in January by many major cement-producing companies. The average price for cement shipped by producers in Oregon was about 25 cents a barrel above the 1955 average. Companies producing portland cement in 1956 were Oregon Portland Cement Co. (with plants at Lime, Baker County, and Oswego, Clackamas County) and Pacific Division, Ideal Cement Co. (at Gold Hill, Jackson County).

Oregon Portland Cement Co. began constructing a new kiln to double the capacity of its plant at Lime. The increase in capacity was needed to meet cement requirements for hydroelectric construction projects in the area. The company also began operating a new kiln at its Oswego plant in 1956; construction of the kiln was part of a general expansion and modernization program begun in 1955.

Oregon cement output was shipped chiefly to consumers within the State, but some portland cement was shipped to neighboring States—Washington, Idaho, and California.

Clays.—The quantity and value of clays produced in 1956 were slightly higher than in 1955. Tonnage of clays used in heavy clay products increased, whereas the quantities of shale used for making lightweight aggregate and clays and shale used in the cement were slightly under 1955. Most of the clays mined in the State were used in building brick and tile, draintile, and sewer pipe. Two companies mined shale in Washington County for processing into lightweight aggregate. Northwest Aggregates, Inc., operated a pit and expanding plant near Banks, and Smithwick Concrete Products Co. operated the Vernonia pit near Buxton. The latter company shipped the shale to its Portland plant for expanding into lightweight aggregate.

Clays for all uses were produced from 24 operations in 15 counties; 19 of them supplied clays for building brick and other heavy clay products. Washington County, with two shale producers, ranked

first in clay output in the State; however, Multnomah County ranked first in the quantity of clays mined for heavy clay products. Other counties reporting output were Baker, Benton, Clackamas, Jackson, Josephine, Klamath, Linn, Malheur, Marion, Polk, Tillamook, Union, and Yamhill.

Clays obtained from Lincoln, Placer County, Calif., supplemented local clays at one plant in southern Oregon.

The development of the ceramic industry and raw material resources of Oregon were discussed in a Bureau of Mines report.[5]

Diatomite.—Great Lakes Carbon Corp., Dicalite Division, continued producing and preparing diatomite (diatomaceous earth) from its open pit west of Terrebonne, Deschutes County. The company reported a decline in demand in 1956, which resulted in reduced output compared with 1955. This was the third consecutive year in which diatomite production declined in Oregon. Despite the smaller output, Oregon remained the third-ranking State in production of diatomite in 1956; California was the leading producer in the Nation, and Nevada ranked second. The prepared product was marketed for filtration, filler, insulation, and other miscellaneous uses. The company was active in exploring diatomite deposits in the Otis Basin area of Harney County in 1956.

Gem Stones.—Gem stones include precious and semiprecious stones suitable for cutting and polishing for use as jewelry and decorative stones for private collections and for a variety of ornamental purposes. Semiprecious gems were the only type recovered in Oregon.

Gems were collected in 1956, as in 1955, largely by hobbyists, vacationers, and out-of-State collectors. No gem-stone mines were active in the State, but areas of central Oregon and the coastal beaches were sources of a large quantity of crude gem stones. Agate, petrified wood, obsidian, and thunder eggs were reported most frequently by collectors in 1956. Central Oregon was the most active area; in Jefferson, Crook, and Morrow Counties a fee was charged for digging or obtaining gem stones.

No revolutionary new techniques were introduced in 1956 for finishing or polishing gem stones, but the tumbling method developed in recent years continued to expand in scope. The costume-jewelry-manufacturing industry was the largest consumer of low-cost polished gems. Hundreds of individuals produced and sold agate dug or collected within the State. Some stones were sold in local gem and agate shops, and some were sold crude to buyers throughout the United States.

Iron Oxide Pigment.—Crude iron oxide pigment was produced by C. K. Williams & Co. from a deposit near Scappoose (Columbia County). The mineral pigment was shipped to out-of-State consumers for use in paints. The operation was idle in 1955. Orr Engineering & Chemical Co. reported production of a small quantity of manufactured iron oxide pigments. The raw material—limonite—was obtained from a pit, also near Scappoose.

Lime.—Chemical Lime Co. continued constructing a two-kiln limeplant northwest of Baker (Baker County). The plant, designed

[5] Kelly, H. J., Strandberg, K. G., and Mueller, J. L., Ceramic Industry Development and Raw-Material Resources of Oregon, Washington, Idaho, and Montana: Bureau of Mines Inf. Circ. 7752, 1956, 77 pp.

to produce chemical and hydrated lime for use by the carbide, metallurgical, sugar, and paper industries in the Pacific Northwest, was scheduled for completion about mid-1957. Natural gas, which became available during the year, was to be used for firing the kilns.

Natural Salines.—A. M. Matlock of Eugene produced a small quantity of sodium carbonate in 1956. The crystallized salt was produced from potholes in Alkali Lake (Lake County). The operator reported that demand was increasing and that larger output was expected in 1957.

Perlite.—Supreme Perlite Co. processed crude perlite to the expanded product at its plant at North Portland (Multnomah County). The expanded perlite was marketed chiefly as a plaster aggregate, with minor quantities for foundry, horticultural, and concrete-aggregate uses. Production from the plant decreased compared with 1955. Raises in wages and railway-transportation rates increased operating costs in 1956.

No production of crude perlite was reported in Oregon in 1956. The last output was recorded in 1953 from an operation near Freida (Wasco County).

Pumice.—Production of crude and prepared pumice was substantially the same as in 1955. The 1955 output was the largest since 1949, when 104,475 tons was produced. In 1955 Oregon ranked third in the Nation in tonnage output of pumice. Central Oregon Pumice Co. and Lloyd A. Williamson, both with operations near Bend (Deschutes County), produced and prepared pumice for concrete aggregate. Harney Concrete Tile Co., Burns (Harney County), produced both crude and prepared pumice. The Deschutes Concrete Products Co. near Tumalo (Deschutes County) was inactive in 1956. The Cinder Hill Co. of Redmond produced cinders for road and ballast use from operations in Crook County. Pumice-producing companies reported that new and improved methods of processing instituted during 1956 resulted in a uniform product of higher quality.

An article published in 1956 discussed pumice and the pumice industry in Oregon.[6]

Sand and Gravel.—Output of sand and gravel was reported from a wide variety of operations throughout the State. In tonnage and value, sand and gravel was again the most important mineral commodity produced in Oregon in 1956. Sand and gravel, often considered a plentiful commodity of relatively low value, nevertheless is one of the most important products of the mineral industry.

A gross output of 11.6 million tons of sand and gravel valued at $11.6 million in 1956 represented a 3-percent decrease from the 1955 production—11.9 million tons valued at $11.8 million. Commercial producers supplied 8.2 million tons valued at $8.4 million in 1956, compared with 6.8 million tons valued at $7.4 million in 1955. Government-and-contractor production was 3.4 million tons valued at $3.2 million in 1956 compared with 5.1 million tons valued at $4.4 million in 1955.

The largest single user of sand and gravel in the State was the Oregon State Highway Department, which reported a decrease in the quantity used for road building and maintenance in 1956. Other

[6] Mason, R. S., New Products from Old Volcanoes: Oregon State Dept. of Geol. and Min. Ind., The Ore.-Bin, vol. 18, No. 11, November 1956, pp. 93–97.

large users were the United States Army Corps of Engineers and county and municipal road departments.

TABLE 4.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956			Percent of change in	
		Value			Value			
	Short tons	Total	Average per ton	Short tons	Total	Average per ton	Tonnage	Average value
COMMERCIAL OPERATIONS								
Sand and gravel:								
Building	2,883,875	$3,284,641	$1.14	3,256,879	$3,418,622	$1.05	+13	−8
Road material	3,201,154	3,512,627	1.10	4,109,715	4,351,838	1.06	+28	−4
Railroad ballast (gravel)	176,814	160,415	.91	177,284	194,504	1.10	0	+21
Other [1]	597,588	473,785	.79	635,121	461,626	.73	+6	−8
Total sand and gravel	6,859,431	7,431,468	1.08	8,178,999	8,426,590	1.03	+19	−5
GOVERNMENT-AND-CONTRACTOR OPERATIONS								
Sand and gravel:								
Building	168,993	95,780	.57	138,713	119,447	.86	−18	+51
Road material	4,925,454	4,305,096	.87	3,319,471	3,100,330	.93	−33	+7
Total sand and gravel	5,094,447	4,400,876	.86	3,458,184	3,219,777	.93	−32	+8
TOTAL ALL OPERATIONS								
Sand and gravel:								
Building	3,052,868	3,380,421	1.11	3,395,592	3,538,069	1.04	+11	−6
Road material	8,126,608	7,817,723	.96	7,429,186	7,452,168	1.00	−9	+4
Railroad ballast (gravel)	176,814	160,415	.91	177,284	194,504	1.10	0	+21
Other	597,588	473,785	.79	635,121	461,626	.73	+6	−8
Grand total	11,953,878	11,832,344	.99	11,637,183	11,646,367	1.00	−3	+1

[1] Includes molding, engine, and ballast sands and sand and gravel used for miscellaneous unspecified purposes.

Of the total output of 11.6 million tons of sand and gravel in Oregon in 1956, 64 percent was used for road building and maintenance, 29 percent for building and construction projects, and the remaining 7 percent for miscellaneous applications, including railroad ballast and special sands.

Output was reported from 31 of the 36 counties in the State. Sand and gravel production from operations in Clackamas, Multnomah, and Lane Counties, totaled more than 5 million tons, amounting to over 40 percent of the sand and gravel produced in Oregon in 1956.

Stone.—Gross output of 6.1 million tons of stone valued at $7.9 million was reported in 1956—a drop of 21 percent in output and 16 percent in value from 1955. Decreased consumption by the Oregon State Highway Department was the principal cause for the large decline. Commercial production was 3.3 million tons valued at $4.7 million and Government-and-contractor output 2.8 million tons valued at $3.2 million. Comparable figures for 1955 were commercial output, 3.3 million tons ($4.3 million); and Government-and-contractor, 4.4 million tons ($5.1 million). About 69 percent of the total output was used for constructing and maintaining roads.

TABLE 5.—Stone sold or used by producers, 1955–56, by uses

	1955		1956	
	Short tons	Value	Short tons	Value
Building (dimension stone)	(1)	(1)	(1)	(1)
Concrete, roadstone, and screening	6,117,702	$6,991,936	4,205,073	$5,193,947
Riprap	246,082	221,465	685,571	574,007
Railroad ballast	540,059	565,415	(1)	(1)
Other [2]	838,094	1,639,018	1,207,321	2,122,243
Total	7,741,937	9,417,834	6,097,965	7,890,197

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Used at sugar refineries, in manufacturing paper and cement, in metallurgical and chemical plants, and for other unspecified uses.

Output of crushed limestone in 1956 totaled 960,000 tons—a 17-percent increase over the 821,000 tons recorded in 1955. Oregon Portland Cement Co. quarried limestone for use in the manufacture of cement from operations in Baker and Polk Counties, and Ideal Cement Co., Pacific Division, obtained limestone from its Marble Mountain quarry in Josephine County. National Industrial Products Corp., Durkee, Baker County, also crushed limestone for use in cement manufacture. Production of crushed limestone was recorded from Baker, Douglas, Josephine, Polk, and Wallowa Counties. The largest single consumer of crushed limestone in 1956 was the cement industry. Other consumers, in order of quantity used, were sugar refineries; paper, calcium carbide, and metallurgical plants; and agricultural users.

Northwestern Granite Co. quarried granite monumental stone from its Haines quarry (Baker County). Production remained substantially the same as in 1955. Bristol Silica Co. produced crushed granite for use as chicken grit from its quarry and crushing plant near Rogue River (Jackson County).

Tuff was quarried and split to building stone by the Rainbow Rock Co. at its quarry and plant near Maupin (Wasco County). The stone, used principally as a decorative building stone, was marketed as "rainbow rock," so named because of the various shades of red, pink, and brown. The company reported that demand for the stone was good throughout the year, but increased transportation rates resulted in price adjustments. Tuff also was quarried for building stone by the Oregon Tuff Stone Co. at its quarry near Sublimity (Marion County). Bristol Silica Co. continued operating a quarry near Rogue River (Jackson County) and produced crushed quartz for industrial uses; production increased over 1955.

Output of stone was reported from 34 of the 36 counties in Oregon.

Talc and Soapstone.—Soapstone mined in Skagit County, Wash., was ground by Stauffer Chemical Co. and Miller Products Co., both in Portland (Multnomah County). The ground product was used as a filler material in the manufacture of insecticides. Total production was lower than in 1955.

Vermiculite.—Vermiculite-Northwest, Inc., exfoliated vermiculite at its plant in Portland (Multnomah County); output was less than in 1955. Crude vermiculite came from Montana, and the expanded product was marketed throughout the Pacific Northwest for use as

insulation and concrete and plastera ggregate. The decrease in residential construction in the area in 1956 largely explained the decline in output.

METALS

Aluminum.—Harvey Aluminum Co., under a Government expansion-goal contract and a power contract with the Bonneville Power Administration (BPA), both signed in 1955, began work on facilities for a $65-million, 108-million-pound-annual-capacity, primary-aluminum-reduction plant at The Dalles in February. Owing to unavoidable delays in delivery dates for electrical equipment on order, the May 1 deadline for beginning plant construction was extended 90 days. The expansion-goal contract called for production of 270,000 tons of aluminum by June 30, 1963, and the 20-year BPA contract called for providing 40,000 kw. of firm power and 80,000 kw. of interruptible power yearly. Arrangements for obtaining alumina—the basic raw material consumed in an aluminum-reduction plant—were made public. Over 100,000 tons of alumina was to be provided annually by 2 Japanese companies, Nippon Light Metal Co., Ltd., and Sumitomo Chemical Co., Ltd. Alumina would be carried up the Columbia River to The Dalles from the ports of Niihama and Shimizu, Japan, by ocean-going barges.

The Reynolds Metals Co. continued to operate its aluminum reduction plant at Troutdale on the Columbia River 15 miles east of Portland. About 950 persons were employed. The company also was engaged in a $900,000 program to increase plant capacity 8 million pounds annually. Output at the plant was threatened with curtailment in the latter part of the year when less-than-average rainfall in the Northwest failed to replenish reservoirs from which water was drawn for hydroelectric power.

The Oregon State Department of Geology and Mineral Industries conducted detailed examinations on lateritic deposits in Marion County from 1953 to 1955.[7] During drilling and sampling, more than 250 samples were analyzed chemically in conjunction with spectrographic, petrographic, and X-ray diffraction studies. A report published in 1956 traced briefly the development of the Pacific Northwest aluminum industry and provided data on production, plant capacities, and employment.[8] In 1955, the Northwest primary-aluminum industry paid $3 million in taxes; obtained $24.2 million worth of materials, supplies, and services within the region; purchased electric power amounting to $20.5 million; had a payroll of $54.1 million; and employed 10,500 persons. In a subsequent newsletter,[9] employment in the Northwest primary-aluminum industry in 1956 was reported to be 11,400, with wages totaling $63.9 million. About 46 percent of the aluminum output was processed further by the producing companies into finished and semifinished forms, such as sheet, rod, wire, cable, and extrusions. The value of electric power purchased in 1956 totaled $22.8 million.

Chromium.—Output of chromite ores and concentrates rose sharply in 1956, owing primarily to inclusion in State totals of con-

[7] Corcoran, R. E., and Libbey, F. W., Ferruginous Bauxite Deposits in the Salem Hills, Marion County Oreg.: Oregon State Dept. of Geol. and Min. Ind., Bull. 46, 1956, 53 pp.
[8] Sterrett, Chester K., Aluminum Fabrication in the Pacific Northwest: Raw Materials Survey, Inf. Circ. 10, August 1956, 5 pp.
[9] Raw Materials Survey Newsletter, Issue 1, Series 57, Mar. 29, 1957.

centrate produced by Pacific Northwest Alloys, Inc., at Coquille (Coos County). The company completed operations in the summer of 1956. The concentrate, totaling 45,710 short tons, was produced in 1955 and 1956 under Government contract from low-grade concentrate resulting from mining chromite-bearing black-sand deposits on the Oregon coast during World War II. The low-grade material, averaging about 25 percent Cr_2O_3, yielded a concentrate containing a little more than 40 percent Cr_2O_3 with a chromium to iron ratio of 1.3–1.5 : 1. The product was shipped to the company plant at Mead, Wash., for conversion into ferrochromium. A smaller quantity of concentrate, stockpiled separately and containing about 39 percent Cr_2O_3, was shipped direct to the Mead plant without further concentration. This high-grade material was reported as mineral production in 1943. In that year, Humphreys Gold Corp. and Krome Corp. processed about 500,000 tons of sand and produced 87,840 short tons of concentrate averaging about 25 percent Cr_2O_3 which was shipped to a secondary processing plant built by the Defense Plant Corp. and operated for the Government by Southwestern Engineering Co. These operations were terminated in December 1943 because of the availability of higher grade foreign chromite.

TABLE 6.—Shipments of chromium ore and concentrate in 1956

County	Number of operations reported	Value		Short tons, gross weight		
		1955	1956	45 percent or more Cr_2O_3	Less than 45 percent Cr_2O_3	Total
Coos	2		[1]	26	45,725	45,751
Curry	5	$99,487	$95,111	1,007	42	1,049
Douglas	2	9,758	[1]	[1]	[1]	[1]
Grant	10	64,601	164,671	1,736	169	1,905
Jackson	3	[1]	2,776	24	15	39
Josephine	16	278,118	506,926	4,089	1,697	5,786
Malheur	1		[1]	[1]		[1]
Unassigned [2]		11,550	1,231,599	26	21	47
Total	39	463,514	2,001,083	6,908	47,669	54,577

[1] Included with "Unassigned" to avoid disclosing individual company confidential data.
[2] In 1955 includes operations for which county location was not determined.

Receipts of chromite ore and concentrate (newly mined) at the Government (GSA) Grants Pass (Oreg.) Chromite Purchase Depot also were substantially greater in 1956. The total for Oregon of 8,867 short wet tons represented a 66-percent increase over 1955. A factor in the higher output was revision of the chromite purchase regulations to extend the final date for delivery of material to the stockpile from June 30, 1957, to June 30, 1959. The revised regulations also provided for shipment of ore and concentrate on a carlot basis to points designated by the Government other than the Grants Pass Depot.

Despite the increase in newly mined output, the number of operations decreased from 47 in 1955 to 38 in 1956. As in preceding years, a large part of this production came from Josephine County. Curry and Grant Counties were the other major sources; the yield from Grant County was more than three times that in 1955. The Oregon Chrome

mine of Wm. S. Robertson was by far the principal producer of new chromite within the State; other major producing mines were Sourdough (Howard Beasley) and McCaleb (McCaleb & Kaiser), Curry County, and Haggard-New (Comstock Uranium-Tungsten Co., Inc.) and Ward and Zero (Wm. Gardner), Grant County.

Chromite production in Oregon has resulted directly from premium prices paid by the Government during periods of international tension. Output of the strategic mineral was first recorded in 1916, when nearly 3,500 short tons was produced. In 1918, which had the highest output before 1956, the yield was over 20,000 tons; however, production declined rapidly after World War I, and no significant quantities were produced until World War II and the Korean War. Through 1956, production totaled about 152,000 short tons of chromite ore and concentrate valued at approximately $6.3 million.

The Bureau of Mines conducted a study of chromite in the John Day area (Grant County).[10]

Copper.—Oregon's small output of recoverable copper (7 short tons valued at $5,950) was slightly higher than in 1955. Virtually the entire production came from copper and gold ores. Massive chalcopyrite extracted from the reactivated Fall Creek mine (Josephine County) provided the bulk of the metal output. J. W. Pressler operated the mine in the winter of 1955–56; ore was hauled to the Tacoma smelter. Copper also was recovered as a byproduct of gold ore mined at the Boaz Mining Co. Buffalo mine (Grant County), and small quantities were recovered from ore mined in Baker and Douglas Counties.

TABLE 7.—Mine production of gold and silver in 1956, by months, in fine ounces of recoverable metals

Month	Gold	Silver	Month	Gold	Silver
January	50	20	August	40	35
February	5		September	310	2,985
March	20	5	October	224	224
April			November	655	2,441
May	280	1,600	December	59	17
June	635	4,065			
July	460	2,150	Total	2,738	13,542

A preliminary study of the Takilma-Waldo copper district was summarized in a Bureau of Mines report.[11] Surface samples were analyzed by spectrographic and chemical methods; analytical results, when plotted on a map, indicated 7 anomalies—3 in previously unexplored areas. Test drilling of an anomaly over the Queen of Bronze workings indicated that much of the anomalous mineralization is surficial and possibly the result of ground-water movement.

Ferroalloys.—Output of ferromanganese, ferrosilicon, and calcium carbide continued in 1956 at the Portland plant of Electro Metallurgical Co., a division of Union Carbide & Carbon Corp. Operations at the plant, begun by the company in July 1942, averaged 84

[10] Hundhausen, R. J., Banning, L. H., Harris, H. M., and Kelly, H. J., Exploration and Utilization Studies, John Day Chromites, Oreg.: Bureau of Mines Rept. of Investigations 5238, 1956, 67 pp.

[11] Hundhausen, R. J., Preliminary Investigation of the Takilma-Waldo Copper District, Josephine County, Oreg.: Bureau of Mines Rept. of Investigations 5187, 1956, 21 pp.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1852–1956, in terms of recoverable metals [1]

Year	Mines producing [2]		Material sold or treated [3] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	23	36	3,673	13,760	$481,607	15,191	$13,748
1952	13	25	931	5,509	192,815	4,037	3,654
1953	8	21	1,215	8,488	297,080	12,259	11,095
1954	20	26	2,916	6,520	228,200	14,335	12,974
1955	19	21	3,835	1,708	59,780	8,815	7,978
1956	15	15	1,991	2,738	95,830	13,542	12,256
1852–1956	----------	----------	(4)	5,785,316	130,449,103	5,354,253	4,911,132

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	13	$5,571	10	$3,007	6	$1,757	$505,690
1952	1	484	1	322	1	332	197,607
1953	9	5,166	5	1,310	----------	----------	314,651
1954	5	2,950	5	1,370	----------	----------	245,494
1955	4	2,984	3	894	----------	----------	71,636
1956	7	5,950	5	1,570	----------	----------	115,606
1852–1956	12,435	4,685,953	817	97,283	173	23,194	140,166,665

[1] Includes recoverable metal content of gravel washed (placer operations), old tailings re-treated, ore milled, and ore shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] Figure not available.

percent of capacity, and about 240 workers were employed. The company reported shipments of more than 24,000 tons of ferroalloys and 28,000 tons of carbide in 1956. Three electric furnaces produced ferromanganese and ferrosilicon, used in making iron and steel, and a fourth produced calcium carbide—a source of acetylene used in oxyacetylene torches for welding and cutting and a raw material for synthesis of many organic chemicals.

Ferronickel production at the smelter of Hanna Nickel Smelting Co., Riddle (Douglas County), totaled 12,378 short tons (a 63-percent increase) containing 5,691 short tons of nickel. Feed for the four electric furnaces was derived from ore deposits on top of nearby Nickel Mountain. The company installed the last two in 1956. The third furnace was placed in operation in February and the fourth in April; smelting was begun in the first two furnaces in 1954. Consumption of ore by the smelter, which was shut down over a month beginning August 1 by a strike of the United Steelworkers of America, was 494,212 short tons containing 1.47 percent nickel.

Gold.—Although 60 percent higher than in 1955, gold output in the State remained low. Over three-quarters of the State supply came from gold ore extracted from the Boaz Mining Co. Buffalo mine (Grant County). The bulk of this ore was milled at the property; concentrate and remaining crude ore were shipped to the smelter. Recovery of small quantities of gold was reported from Baker, Curry, Jackson, Josephine, Malheur, Umatilla, and Wheeler Counties.

TABLE 9.—Gold produced at placer mines, 1947–51 (average) and 1952–56, by classes of mines and methods of recovery

Class and method	Mines producing [1]	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	
				Total	Average per cubic yard
Surface placers:					
Gravel mechanically handled:					
Bucketline dredges:					
1947–51 (average)	2	3,325,140	9,252	$323,792	$0.097
1952	1	2,548,700	4,571	159,985	.063
1953	1	2,176,000	6,935	242,725	.112
1954	1	1,382,000	4,685	163,975	.119
1955					
1956					
Dragline dredges: [2]					
1947–51 (average)	5	437,830	2,150	75,243	.172
1952	1	5,000	27	945	.189
1953					
1954	1	3,000	11	385	.128
1955					
1956					
Nonfloating washing plants: [3]					
1947–51 (average)	3	27,380	238	8,330	.304
1952	1	(4)	5	175	
1953					
1954	2	2,610	44	1,540	.590
1955 [5]			22	770	
1956	2	1,500	26	910	.607
Gravel hydraulically handled:					
1947–51 (average)	17	63,090	316	11,053	.175
1952	9	27,600	147	5,145	.186
1953	9	27,500	209	7,315	.266
1954	16	101,300	170	5,950	.059
1955	8	24,400	103	3,605	.148
1956	[6] 8	50,990	288	10,080	.198
Small-scale hand methods: [7]					
1947–51 (average)	7	10,370	200	7,014	.676
1952	13	15,200	146	5,110	.336
1953	10	9,800	138	4,830	.493
1954	[8] 5	12,400	60	2,100	.169
1955	12	8,400	64	2,240	.267
1956	5	3,020	40	1,400	.464
Underground placers (drift):					
1947–51 (average)	1	360	9	315	.875
1952					
1953	1	450	7	245	.544
1954	1	80	22	770	9.625
1955	1	150	14	490	3.267
1956					
Grand total placers:					
1947–51 (average)	35	3,864,170	12,165	425,747	.110
1952	25	2,596,500	4,896	171,360	.066
1953	21	2,213,750	7,289	255,115	.115
1954	26	1,501,390	4,992	174,720	.116
1955	21	32,950	203	7,105	.216
1956	15	55,510	354	12,390	.223

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Includes all placer operations using dragline excavator for delivering gravel to floating washing plant.
[3] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[4] Data not available.
[5] Includes commercial gravel plant that produced gold from gravels. Byproduct gold is included with gold recovered, but material treated and average value per cubic yard refer only to straight gold dredging.
[6] Includes bucketline dredges, for which Bureau of Mines is not at liberty to disclose output.
[7] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms dip boxes, pans, etc. "Wet" method used exclusively in Oregon.
[8] Includes suction dredge, for which Bureau of Mines is not at liberty to disclose output.

TABLE 10.—Mine production of gold, silver, copper, and lead in 1956, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer [1]	Fine ounces	Value	Fine ounces	Value
Baker	8	2	309	$10,815	943	$853
Curry			5	175	1	1
Douglas	1				1	1
Grant	2	2	2,158	75,530	12,555	11,363
Jackson	2	5	121	4,235	18	16
Josephine	2	4	114	3,990	21	19
Malheur		1	9	315	2	2
Umatilla			1	35		
Wheeler		1	21	735	1	1
Total	15	15	2,738	95,830	13,542	12,256

County	Copper		Lead		Total value
	Pounds	Value	Pounds	Value	
Baker	900	$383			$12,051
Curry					176
Douglas	400	170			171
Grant	3,500	1,487	10,000	$1,570	89,950
Jackson					4,251
Josephine	9,200	3,910			7,919
Malheur					317
Umatilla					35
Wheeler					736
Total	14,000	5,950	10,000	1,570	115,606

[1] Excludes itinerant prospectors, "snipers," "higher-graders," and others who gave no evidence of legal right to property.

TABLE 11.—Mine production of gold, silver, copper, and lead in 1956, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Lode ore:						
Dry gold	11	1,923	2,379	13,334	2,300	9,400
Copper	4	68	5	157	11,700	600
Total lode material	15	1,991	2,384	13,491	14,000	10,000
Gravel (placer operations)	15	[1]	354	51		
Total, all sources	30	1,991	2,738	13,542	14,000	10,000

[1] 55,510 cubic yards.

The old mining camp of Bourne (Grant County) was the scene of some activity in 1956. The quartz-gold mines—Columbia, Tabor Fraction, E & E, North Pole, and Villiard—were leased by the Sunshine Mining Co. of Kellogg, Idaho. No economic mineralization was found, and the company subsequently abandoned the project. Gold mining in the area dates back to about 1861.

TABLE 12.—Mine production of gold, silver, copper, and lead in 1956, by types of material processed and methods of recovery, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Lode:				
Amalgamation	154	43		
Concentration, and smelting of concentrates	1,735	12,313	2,200	9,400
Direct smelting	495	1,135	11,800	600
Total lode	2,384	13,491	14,000	10,000
Placer	354	51		
Grand total	2,738	13,542	14,000	10,000

TABLE 13.—Mine production of gold, silver, copper, and lead in 1956, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Lode material (short tons)	Gold (lode and placer) [2] (fine ounces)	Silver (lode and placer) [3] (fine ounces)	Copper (pounds)	Lead (pounds)	Total value
	Lode	Placer [1]						
Baker County:								
Cracker Creek	3	1	348	187	916	100		$7,417
Upper Burnt River	1	1	30	22	3			773
Virtue	1		50	74	6			2,595
Auburn, Baker, Greenhorn, Sparta [4]	3		117	26	18	800		1,266
Curry County: Sixes River				5	1			176
Douglas County: Tiller-Drew	1		1		1	400		171
Grant County: Granite, North Fork John Day and Quartzburg [4]	2	2	1,417	2,158	12,555	3,500	10,000	89,950
Jackson County:								
Applegate	1		2	16	3			563
Gold Hill	1	2	1	19	2			667
Ashland and Upper Applegate [4]		3		86	13			3,021
Josephine County:								
Galice, Grants Pass and Wolf Creek [4]		3		91	10			3,194
Greenback, Grave Creek and Illinois River [4]	2	1	25	23	11	9,200		4,725
Malheur County: Marmon Basin		1		9	2			317
Umatilla County: North Fork John Day		[5]		1				35
Wheeler County: Spanish Gulch		1		21	1			736
Total	15	15	1,991	2,738	13,542	14,000	10,000	115,606

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Source of gold: 2,384 ounces from lode mines and 354 ounces from placers.
[3] Source of silver: 13,491 ounces from lode mines and 51 ounces from placers.
[4] Combined to avoid disclosing individual company confidential data.
[5] Includes production from property not classed as a mine.

Iron Ore.—About 1,000 tons of activated limonite was produced by James Orr, Orr Engineering & Chemical Co., Portland, for use as a desulfurizing agent in manufactured gas. The material was mined and treated at company facilities northwest of Portland in Columbia County and used by the Portland Gas & Coke Co., and by gas plants in Seattle, Tacoma, and Bremerton, Wash. Demand for limonite for this purpose decreased owing to the introduction of natural gas in the Northwest.

Lead.—The small tonnage of lead credited to Oregon was recovered as a byproduct from gold ore mined by Boaz Mining Co. at the Buffalo mine (Grant County).

Manganese.—A small quantity of manganese ore was shipped to the Government, Butte (Mont.), Low-Grade Manganese-Stockpile Depot. Kenneth Cross shipped the ore from the Ranes mine in Baker County. Shipments to low-grade manganese stockpiles are not included in State production totals until the material is removed for commercial use.

Mercury.—The comparative stability and continued high price of mercury again resulted in a large increase in production. The 1956 output of 1,893 flasks valued at $492,029 was 79 percent above the 1955 total of 1,056 flasks valued at $306,610. The value of output in 1956 was based on an average New York price of $259.92 per flask. The 1956 total was the highest since 1945, the last peak production year during World War II.

Through 1956 Oregon mines yielded more than 95,000 flasks of mercury (76-pound flasks) valued at over $12 million. Output of the liquid metal was begun in the State at least by 1882, when production of 50 flasks was reported. Output of mercury remained small through World War I and until 1927, when more than 2,000 flasks was produced. The major contributors to the total output in these years were the Black Butte mine in Lane County, the Opalite and Bretz mines in Malheur County, and the Horse Heaven mine in Jefferson County. In 1937, the Bonanza mine (Douglas County), after a period of low, intermittent output, began substantial production, and by 1939 the mine was the second ranking domestic producer. The peak production years for Oregon were 1940 and 1941; over 9,000 flasks was produced from 23 mines in 1940 and approximately the same quantity from 21 mines in 1941.

The bulk of the 1956 output was derived from the Bonanza mine (Bonanza Oil & Mine Corp.) and the Horse Heaven mine (Cordero Mining Co.). Activities leading to the reopening and initial production in the latter part of the year of the Bretz mine (Arentz-Comstock Co.) and the Black Butte mine (Mercury & Chemicals Corp.) also accounted for a substantial part of the total output. Both the Bretz and Black Butte mines yielded a substantial output in previous years but were closed because of low market prices for mercury. Reopening of the Black Butte mine involved considerable rehabilitation of old underground workings and construction of a new surface plant, including erection of a Gould rotary furnace. A DMEA project was active at the property. Operations at the Bretz mine were unusual in that ore from the open pit received an initial concentration by flotation before being roasted in retorts. Data on operation of the flotation process in a continuous circuit were developed at the Federal Bureau of Mines Northwest Electrodevelopment Experiment Station at Albany under a cooperative agreement with the company.

Nickel.—Nickel ore was produced by the Hanna Coal & Ore Corp., from its open-pit mine at the top of Nickel Mountain near Riddle in Douglas County. The quantity of ore carried by aerial tram down the mountain to the smelter of the Hanna Nickel Smelting Co. was

increased to meet requirements resulting from installation of two new furnaces in the smelter; the total output was 437,316 short tons of ore averaging 1.57 percent nickel. Operations at the mine were at a standstill for about a month in the early fall when mine workers, numbering about 50, observed picket lines established during a strike at the smelter. In addition to the ore utilized at the smelter, ore was shipped to Santa Rosalia, Mexico, for experimental use in the production of nickel matte at a smelter operated by Compania Minera Santa Rosalia.

Exploratory work with two churn drills was conducted throughout 1956, according to a report by the company; 182 holes were drilled to an average depth of 60 feet on 200-foot centers over the entire ore body. Most of the ore mined during the year was derived from bench and road development in the western half of the formation area. Land clearing was completed over the whole ore body, and a permanent haulage road was built near the top of the mountain.

Silver.—Byproduct silver was recovered at many Oregon gold mines. Increased gold output was reflected in a 54-percent gain in silver output. The Buffalo mine, operated by Boaz Mining Co., accounted for over 90 percent of the silver produced in 1956.

Tungsten.—Production of tungsten ore and concentrate continued to be limited. Output in 1956 was about the same as in 1955. One small shipment was made to a California purchaser from a property in Jackson County.

Uranium.—The Lakeview Mining Co. White King mine (Lake County) shipped 400 tons of ore in 1956, compared with 300 tons in 1955. The ore, derived from surface exposures, was shipped to the Vitro Uranium Co. processing plant at Salt Lake City, Utah. Work on a 300-foot, 2-compartment shaft was begun and by the end of the year had reached a depth of about 70 feet. The company planned to sink a larger shaft on the east end of the property after completion of core drilling, which late in the year totaled about 150,000 feet. Drilling to a depth of 800 feet had outlined mineralization about 600 feet wide and 800 feet long, averaging about 0.4 percent uranium oxide. Ore was found on 3 horizons; the upper horizon was about 65 feet thick, and the 2 lower horizons were about 10 to 20 feet thick. Two additional horizons were encountered at greater depth at the east end of the property. Exploration conducted by the company at the nearby Lucky Lass claims was less successful. Prospecting and exploration activity continued in other areas in the State.

Zirconium and Titanium.—Production of zirconium sponge was resumed at Albany (Linn County) in the spring of 1956, when the Wah Chang Corp., working under an Atomic Energy Commission (AEC) contract, took over control of certain facilities at the Federal Bureau of Mines Northwest Electrodevelopment Experiment Station. The facilities, owned by the AEC and located on Bureau grounds, had been operated by the Bureau since the late 1940's until they were closed in mid-1955 by the AEC. Production of hafnium sponge was continued by the Bureau of Mines, using hafnium oxide evolved as a coproduct in the Wah Chang operations. The entire output of zirconium and hafnium was consigned to the AEC.

The Wah Chang Corp., in addition to operating the AEC-owned facilities under contract, also began constructing its own plant for producing zirconium at a 45-acre site north of Albany. Oregon Metallurgical Corp. began operations early in the summer at its new $750,000 plant on the south edge of the city. The company produced titanium and zirconium ingot from purchased sponge metal.

MINERAL FUELS

Carbon Dioxide.—Recovery of carbon dioxide from mineral waters, as reported by the Gas-Ice Corp. of Portland, increased 5 percent over 1955. The company processed the carbon dioxide to dry ice at its plant near Ashland (Jackson County) and operated a similar plant at Klickitat, Wash.

Coal.—Coal production in Oregon dropped to a new low in 1956. The only active operation was the Madrona mine of Lowes Mandrones Coal Mining Co. near Molalla (Clackamas County). The South Slough mine of the Gibbs Coal Co. in Coos County was closed throughout 1956. A coal prospect being developed by Gerald Rannells near Powers (Coos County) was acquired for further development by the Pacific Power & Light Co. of Portland.

In August the Pacific Power & Light Co. began exploring the Eden Ridge coalfield to prove and develop this deposit of high-volatile-C, bituminous-grade coal as a source of energy for a 100,000-kw. steam-electric generation plant. The Eden Ridge field is near the south fork of the Coquille River in southeastern Coos County and northern Curry County. An article published in 1956 reviews development of the Eden Ridge coalfield and the companion hydroelectric plant by the Pacific Power & Light Co.[12]

Petroleum and Natural Gas.—Activity in petroleum exploration during 1956 was below that in 1955. Seven new drilling permits were issued in 1956 compared with 12 in 1955. Drilling permits were issued to the Riddle Gas & Oil Producers of Oregon, Ltd.; Sunray Mid-Continent Oil Co. (Columbia County); Oroco Oil & Gas Co. (Malheur and Harney Counties); Seneca Oil, Gas, & Development Co. (Grant County); Big Red Uranium Co. (Umatilla County); and Standard Oil Co. of California (Gilliam County).

Delivery of natural gas from fields in New Mexico and Colorado was begun in August through the pipeline facilities of the Pacific Northwest Pipeline Corp. Arrival of natural gas in the State affected the use of oil for industrial purposes. Large industrial operations, such as cement plants, brickkilns, sugar refineries, pulp and paper mills, plywood driers, and metallurgical plants, were shifting or planned to shift to natural gas. Construction of the West Coast Transmission Co., Ltd., pipeline from the Peace River fields of Canada, which was planned to connect with the pipeline system of the Pacific Northwest Pipeline Corp. at Sumas, Wash., continued throughout the year. The project was scheduled for completion in 1957 and would double the capacity of the natural-gas pipeline system in the Pacific Northwest.

[12] Mason, R. S., Eden Ridge Coal To Be Investigated: Oregon State Dept. of Geol. and Min. Ind., The Ore.-Bin, vol. 18, No. 11, August 1956, pp. 67–69.

REVIEW BY COUNTIES

Baker.—Production of metals in Baker County remained low in 1956, as in 1955, owing to cessation of operations by Powder River Dredging Co. in September 1954. The output of gold—the major metal produced in the county in 1956—was only 309 ounces compared with more than 5,000 ounces in 1954. Small quantities of gold and associated silver were recovered at lode mines in Auburn, Cracker Creek, Greenhorn, Sparta, Upper Burnt River, and Virtue districts. Norman Gardner Round Top mine (Virtue district) and Kenneth Grabner Bald Mountain mine (Cracker Creek district) were the principal producers. Gold ore shipped to the Tacoma smelter from the latter mine supplied the bulk of the silver recovered in the county, whereas most of the copper came from a property operated by E. L. Pickles of Richland. In the Cracker Creek district, Baker Dredging Co. produced a quantity of gold and some silver in July—the only

TABLE 14.—Value of mineral production in Oregon, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Baker	(1)	(1)	Cement, stone, sand and gravel, gold, silver, copper, clays.
Benton	$259,622	$377,249	Sand and gravel, stone, clays.
Clackamas	5,466,527	6,485,302	Cement, sand and gravel, stone, clays.
Clatsop	138,233	290,465	Stone.
Columbia	324,334	429,997	Stone, sand and gravel, iron ore (limonite).
Coos	661,200	1,684,398	Chromite, stone, sand and gravel.
Crook	331,561	273,856	Stone, sand and gravel, mercury.
Curry	100,385	91,511	Chromite, sand and gravel, stone, gold, silver.
Deschutes	976,564	1,195,744	Diatomite, pumice, stone, sand and gravel.
Douglas	2,859,423	4,140,753	Nickel, sand and gravel, mercury, stone, chromite, copper, silver.
Gilliam	(1)	128,412	Sand and gravel, stone.
Grant	164,032	373,746	Chromite, sand and gravel, gold, silver, lead, copper.
Harney	57,640	34,053	Stone, pumice, sand and gravel.
Hood River	111,403	82,150	Stone, sand and gravel.
Jackson	3,154,159	3,330,672	Cement, stone, sand and gravel, clays, carbon dioxide, gold, chromite, tungsten, silver.
Jefferson	183,867	206,762	Mercury, stone.
Josephine	890,216	936,027	Chromite, stone, sand and gravel, gold, copper, clays, silver.
Klamath	484,100	389,636	Stone, sand and gravel, clays.
Lake	76,580	234,327	Stone, sand and gravel, mercury.
Lane	2,601,105	2,029,907	Sand and gravel, stone, mercury.
Lincoln	606,830	355,917	Stone.
Linn	585,045	615,949	Sand and gravel, stone, clays.
Malheur	1,041,027	637,258	Sand and gravel, stone, mercury, clays, gold, silver.
Marion	529,616	454,375	Sand and gravel, stone, clays.
Morrow	139,137	77,574	Stone.
Multnomah	2,911,222	2,596,652	Sand and gravel, stone, clays.
Polk	275,783	778,553	Do.
Sherman	1,276,500	274,922	Stone, sand and gravel.
Tillamook	180,606	418,033	Sand and gravel, stone, clays.
Umatilla	622,408	836,376	Sand and gravel, stone, gold.
Union	335,802	320,991	Stone, sand and gravel, clays.
Wallowa	258,008	133,928	Stone, sand and gravel.
Wasco	309,307	188,732	Sand and gravel, stone.
Washington	1,349,758	810,489	Sand and gravel, stone, clays.
Wheeler	21,106	736	Gold, silver.
Yamhill	198,247	324,677	Sand and gravel, stone, clays.
Undistributed [2]	3,386,592	3,812,592	
Total [3]	31,736,000	34,011,000	

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes value of stone, gem stones, sand and gravel and mercury that cannot be assigned to specific counties and values indicated by footnote 1.
[3] Total adjusted to eliminate duplicating value of clays and stone.

sizable placer output in the county. In 1956, as in 1955, manganese ore was shipped from the Ranes mine. Kenneth Cross, the operator in 1956, shipped ore to the Government Butte (Mont.) Low-Grade Stockpile Depot.

Cement, stone, sand and gravel, and clays were the principal nonmetal commodities produced in Baker County in 1956. Oregon Portland Cement Co. continued producing portland cement at its plant at Lime; the output was slightly above that in 1955. The company mined and processed limestone and shale to meet raw-material requirements for the plant. National Industrial Products Corp. operated a limestone quarry near Durkee. Most of the production was sold to sugar refineries, papermills, and cement plants; smaller quantities were used at metallurgical plants and foundries. Construction of a 2-kiln lime plant for the Chemical Lime Co., northwest of Baker, was continued in 1956, and the plant was scheduled for completion in mid-1957. Blue Granite monumental stone was quarried from the Haines granite quarry by the Northwestern Granite Co. Logsdon Sand & Gravel Co. produced building and road gravel from its plant near Baker, and contractors for the State highway department supplied gravel and stone for road building and maintenance. Crushed stone for road surfacing and maintenance was supplied to the Bureau of Public Roads by contractors. Petrified-wood gem stones were collected in the county in 1956.

Benton.—Sand and gravel, stone, and miscellaneous clay were nonmetal commodities produced in Benton County. Sand and gravel for building and road use was processed by four commercial operators, and output was considerably above that in 1955. Output was recorded for Beaton Sand & Gravel Co., Builders Supply Co., Corvallis Sand & Gravel Co., and Tri-County Rock Co. Crushed stone for use as riprap and roadstone was produced by S. W. Groesbeck and Corvallis Sand & Gravel Co., respectively. Contractors supplied basalt to the State highway department for road use. Corvallis Brick & Tile Co. produced heavy clay products from clay obtained from a pit near Corvallis, and Monroe Clay Products Co. operated its claypit and brick kiln at Monroe. Production of clay in the county was slightly above that in 1955. A few purple-agate gem stones were collected by H. H. Jenne of Bend.

Clackamas.—Clackamas County ranked first in Oregon in value of nonmetals produced in 1956. Output of cement, sand and gravel, stone, and clays valued at more than $5 million was reported. Oregon Portland Cement Co. continued to produce portland cement at its Oswego plant. During the year a new kiln placed in operation by the company brought to three the number operating at the Oswego plant. Limestone was supplied from the company limestone quarry at Dallas (Polk County).

The county ranked second in production of sand and gravel in the State, owing to a combined output of more than 1 million tons by 10 commercial operators. Portland Gravel Co. and Portland Road & Driveway Co. were the leading producers of sand and gravel in the county. County road crews and contractors supplied the county highway department with road surfacing and maintenance materials, and contractors furnished crushed stone and road gravel to the State highway department. Crushed basalt for road surfacing and main-

tenance was supplied to the Bureau of Public Roads by contractors, and basalt for use as riprap was furnished under contract to the United States Army Corps of Engineers. Weyerhaeuser Timber Co., from a quarry near Molalla, obtained and crushed basalt for forest access roads. Needy Brick & Tile Co. and Hubbard Clay Works, both of Hubbard, and Molalla Brick & Tile Co., Molalla, mined clays for processing into heavy clay products.

The Madrona mine of Lowes Mandrones Coal Mining Co. of Molalla was the only active coal mine in the State. Production was small. Agate and jasper gem stones were recovered in the Sunflower Flats area south of Mount Hood.

Clatsop.—Astoria Crushed Rock Co. and Rock Creek Crushed Rock Co., both of Astoria, produced crushed stone for concrete and roadstone. Three contractors supplied basalt for road building and maintenance and a small quantity to the State highway department for riprap.

Columbia.—Limonite deposits near Scappoose were the source of iron oxide mined and treated by Orr Engineering & Chemical Co. of Portland and marketed to manufactured-gas plants in Portland and in Seattle, Tacoma, and Bremerton, Wash. The product was used as a sulfur-removing agent in purifying the gas.

Two commercial operators produced building and road gravel and railroad ballast. Parker Schram Co. produced railroad-ballast gravel and stock-car sand for the Spokane, Portland & Seattle Railway Co. The railroad company and Goodat Crushed Rock Co. quarried and crushed basalt for riprap and roadstone, respectively. Contractors supplied crushed stone to the State highway department and to the United States Army Corps of Engineers for road use and riprap. County road crews crushed and processed basalt for road material and riprap. C. K. Williams & Co. obtained crude iron oxide pigments (limonite) from a deposit near Scappoose. The material was shipped to out-of-State consumers for use in paints. Orr Engineering & Chemical Co. made iron oxide pigments at the company plant at Scappoose. Sunray Mid-Continent Oil Co., Los Angeles, Calif., applied for a permit to drill five stratigraphic coreholes near Scappoose.

Coos.—Value of mineral production in Coos County increased considerably over 1955 owing to inclusion of the value of chromite concentrate produced in 1955 and 1956 by Pacific Northwest Alloys, Inc. This output came from low-grade concentrate produced and stockpiled for the Government during World War II. The stockpile at Coquille was beneficiated under Government contract by electromagnetic- and electrostatic-separation methods. Upgraded concentrate was shipped to a company plant at Mead, Wash., for conversion to ferrochromium. (See Chromium in commodity section.) A small quantity of newly mined chromite was produced. Ore and concentrate were shipped to the Government Grants Pass (Oreg.) Purchase Depot by O. K. Coster and C. C. Wikstrom from the Rock Creek and Foster Creek properties.

Hillstrom Rock Quarry, Inc. (Coos Bay) and Bandon Rock Co. (Bandon) crushed basalt for road building and maintenance. Contractors supplied the State highway department with basalt and gravel for road use and with a small quantity of riprap. Coos County

Highway Department crews produced roadstone and riprap and processed gravel for paving and road use. Sand and gravel was produced by E. E. Benham, Coquille; and Rogers & Kuni, Coos Bay. Fierke Sand & Gravel Co. processed sand and gravel for use by the Southern Pacific Railway Co. from an operation near Hauser. The South Slough mine of the Gibbs Coal Co. (Coquille) was inactive. Development at the Peacock coal mine was taken over from Gerald Rannells at the beginning of the year by Pacific Power & Light Co. of Portland. The company began extensive exploration of the Eden Ridge coalfield to develop this deposit as a source of energy for a proposed 100,000-kw. steam-electric generating plant near the Eden Ridge field.

Crook.—Four operators produced small quantities of mercury from properties in Crook County. Owen Pigmon produced a few flasks of the liquid metal during cleanup operations preparatory to abandoning the New Amity mine. Other operators were the Eickemeyer Bros. at their Maury Mountain mine, Frank Reid at the Round Mountain No. 2 mine, and Towner Motor Co. at the Lost Cinnabar No. 1 mine.

The Cinder Hill Co. of Redmond crushed and prepared cinders for use on roads and driveways and for railroad ballast. The company also crushed basalt for roadstone and riprap. Crushed cinder was supplied to the State highway department by Cartwright Construction Co. for road maintenance, and Knorr Sand & Gravel Co. and Prineville Sand & Gravel Co. produced building, paving, and road sand and gravel. Agate and thunder-egg gem stones were recovered near Prineville.

Curry.—One of the largest chromite operations in the State was active in Curry County. The McCaleb mine and mill of B. A. and R. E. McCaleb ranked third (under Wm. S. Robertson in Josephine County and Comstock Uranium-Tungsten Co., Inc., in Grant County) in quantity and value of chromite produced in 1956. The McCaleb mine was worked under contract by Ralph and Katie Kaiser. Howard Beasley produced and shipped a substantial tonnage of concentrate from the Sourdough property. Other active properties were the Rosie Chrome (L. E. Chesser and Fred Baumgartner) and the Fourth of July (Fred Gardner & Sons). A small quantity of chromite ore was also shipped by Gus Kelly. One placer operation was reported; a few ounces of gold and silver were recovered from glacial till by ground sluicing at the Frank C. Lawrence Thompson Flat placer.

Sand and gravel and stone were the only nonmetals produced in the county in 1956. Brookings Red-E-Mix Construction Co. produced building and road gravels; City Sand & Gravel Co. (Gold Beach) produced building sand and road gravel; and Warren Northwest, Inc., crushed and prepared paving and road gravel from portable plants near Port Orford and Brookings. Contractors supplied the State highway department with paving and road gravel and a small quantity of crushed basalt.

Deschutes.—Diatomite continued to be the most valuable nonmetal produced in the county. Great Lakes Carbon Corp., Dicalite Division, contined to mine and prepare diatomite from its pit west of Terrebonne. Central Oregon Pumice Co. and Lloyd A. Williamson (both of Bend) mined and prepared pumice, chiefly for use as concrete aggregate. The companies marketed the material throughout the

Pacific Northwest, British Columbia, and northern California. Deschutes Concrete Products Co. (Redmond) reported its pumice pit inactive in 1956. Sand and gravel was processed into building and road materials by the Bend Aggregate & Paving Co., and gravel for road use and fill was produced by Warren Northwest, Inc., and the Great Northern Railway Co., respectively. Allum Bros. supplied crushed basalt to the State highway department for road use, and contractors supplied cinder to the State highway department and the Bureau of Public Roads.

Douglas.—The principal mineral industry of Douglas County centered about operations of the Hanna Coal & Ore Corp. and the affiliated Hanna Nickel Smelting Co. at Riddle. Both concerns were subsidiaries of the M. A. Hanna Co. Nickel ore from an open pit near the top of Nickel Mountain was moved by aerial tram down the mountainside to the smelter, where it was smelted in electric furnaces to produce ferronickel. Output from the smelter rose substantially in 1956, owing to installation of two additional electric furnaces. A strike of workers at the smelter halted operations from August 1 through the early part of September. Picket lines were observed by workers at the mine, and over 450 smelter and mine employees were idle. The dispute arose when the union contract expired before labor and management were able to agree on wage increases and side benefits. (See Ferroalloys and Nickel in commodity section).

The Bonanza mine of Bonanza Oil & Mine Corp. near Sutherlin was the only mercury producer in the county and the principal producer in the State. A total of 11,903 tons of ore fed into the oil-fired Gould rotary furnace yielded nearly 1,000 flasks of mercury. The company reported that a D-type retort was installed at its surface plant for use in final cleanup and that an extensive DMEA program was completed at the mine with favorable results in 1956. Exploration totaled 3,568 feet of drifting, raising, and crosscutting and extension of the No. 40 winze from the 1,150 to the 1,260 level. Drifting on the 1,150 and 1,260 levels disclosed strong vein structures, and 500 feet of drifting was begun on the 1,150 level to undercut a favorable ore zone on the 830 level.

Two chromite operations were reported in the county. Dorothy Kartes and T. M. Petrie shipped ore to the Government stockpile at Grants Pass from the Nickel Mountain and Yellow Jacket mines, respectively. A. N. Moore shipped a small quantity of copper ore containing silver to the Tacoma smelter from the Cougar mine, 4 miles southwest of Drew.

Sand and gravel and stone were the principal nonmetals produced in 1956. Five commercial operators processed sand and gravel to building and road materials. Umpqua River Navigation Co., Roseburg Sand & Gravel Co., Whipple Logging Co., and J. D. Walling were the major producers. The State highway department and county road department contracted for their requirements of road-building and maintenance gravel. J. D. Walling of Sutherlin operated a portable crushing plant and prepared basalt for roadstone, riprap, and railroad ballast. A small quantity of limestone for agricultural use was produced by the Yount Lime Co., Roseburg. Five contractors supplied crushed basalt to the State highway department, and two contractors furnished the Bureau of Public Roads with crushed basalt

for road surfacing. Crushed stone for use by the Douglas County Road Department was supplied from county-operated crushers.

Gilliam.—Sand and gravel and stone were the only mineral commodities produced in Gilliam County. Vernie Jarl contracted to supply crushed stone to the State highway department, and county road crews supplied paving and road gravel. In December the Standard Oil Co. of California obtained a permit to drill a deep stratigraphic hole near Condon.

Grant.—Grant County again ranked second in the quantity and value of chromite produced in Oregon, after dropping to third place behind Curry County in 1955. The leading producer was Comstock Uranium-Tungsten Co., Inc., at the Haggard-New mine. The company exposed high-grade ore by means of a 330-foot development drift in the latter part of 1955. A substantial quantity of concentrate and some ore was trucked to the Grants Pass depot from the Ward & Zero property, operated by Wm. Gardner. Other producing properties included the Twin Ridge (Freeman and Miller), Dunn (Albert Dunn), Hopeful and Red Hill (Arthur Moothart), Lost Buck (C. B. Short and B. A. Bailey), and Dry Camp (W. A. and J. I. Stinnett).

The Boaz Mining Co. Buffalo mine in Granite district continued to provide the bulk of the gold, silver, and lead and part of the copper produced in Oregon. The output of 169 tons of concentrate containing about 1,700 ounces of gold and over 12,000 ounces of silver was slightly higher than that in 1955. In the Quartzburg district Kenneth Watkins shipped copper ore containing some gold, silver, copper, and lead to the Tacoma smelter. Small quantities of gold were recovered from the Davis Creek and Dixie Trail placers by H. L. Bruneau and from the Morning Star placer by Tom Jackson.

The John Day Gravel Co. (John Day) mined building sand and gravel, and E. H. Itschner Co. (Molalla) produced paving and road gravel. Petrified wood was obtained by collectors in Grant County in 1956. In November the Seneca Oil, Gas, & Development Co. of John Day was issued a permit for oil-well test drilling.

Harney.—Stone, sand and gravel, pumice, and cinder for highway use were the principal nonmetals produced in Harney County. Burns Sand & Gravel Co. prepared a small quantity of gravel. Harney Concrete Tile Co. (Burns) mined crude pumice for use as ballast and prepared pumice for use as concrete aggregate. Pit-run and crushed cinder was produced for the State highway department by Babler Bros., Inc. In October the State issued a permit for test drilling to Oroco Oil & Gas Co. of Payette, Idaho.

Hood River.—Jerry's Sand & Gravel Co. produced building sand and gravel from a pit near Cascade Locks. The Hood River County Road Department crushed basalt for road building and maintenance.

Jackson.—The small output of gold and silver in Jackson County in 1956 came from the Berton Peak (George Tucker) and Winkler (W. R. Winkler) lode mines in the Applegate and Gold Hill districts, respectively, and from placer operations in the Ashland district (W. T. Grossman), Gold Hill district (George W. Brewer and K. G. Kincaid), and Upper Applegate district (Everett Adams and O. N. Snavely). Three operators produced small quantities of chromite concentrate. The concentrate was shipped to the Government stock-

pile depot by Chester Z. Ball and J. W. Kruse (Blackboy Nos. 1, 2, and 3), McCaleb and Kaiser (Wonder), and Loren Schmid (Schmid). Roy Parmenter shipped a small quantity of tungsten concentrate to a California buyer.

Output of cement, stone, sand and gravel, clay, and carbon dioxide was valued in excess of $3 million in 1956. As in 1954 and 1955, Jackson County ranked second in the State in total value of nonmetals production. Ideal Cement Co., Pacific Division, operated its portland-cement plant at Gold Hill. The plant was supplied with limestone and shale from the company-operated Marble Mountain quarry (Josephine County) and the Gold Hill shale quarry (Jackson County), respectively. County road department crushers supplied stone for road building and maintenance. The State highway department contracted for crushed basalt for highway needs, and the Bureau of Reclamation contracted for a small quantity of basalt for riprap. Medford Concrete Construction Co., Inc., and M. C. Lininger & Sons (both of Medford) processed sand and gravel for building, paving, and road uses. Jackson County road crews produced prepared and pit-run sand for road use, and two contractors supplied the State highway department with road gravel. Bristol Silica Co. quarried and crushed quartz near Rogue River. The quartz was marketed for abrasive and filter purposes and for making ferrosilicon. Production increased over that in 1955. The company also quarried and crushed granite, which was marketed for chicken grit.

The Gas-Ice Corp. continued to recover natural carbon dioxide from water wells near Ashland. The operation, the only one of its kind in the State, reported a slightly higher output in 1956 than in 1955.

Jefferson.—The only metal ore produced in Jefferson County came from the Horse Heaven mercury mine, 45 miles west of Madras, operated by Cordero Mining Co. The company mined and processed 9,355 tons of ore, containing an average of 0.25 percent mercury, in a 25-ton rotary furnace. Recovery of more than 700 flasks made the mine the second-ranking source of mercury in the State.

The Bureau of Reclamation (Deschutes Project) contracted for rock fill from the R. A. Heintz Construction Co. Babler Bros., Inc., crushed basalt to supply the road building and maintenance requirements of the State highway department.

Josephine.—Josephine County again ranked first in the State in the quantity and value of newly mined chromite. The entire output was shipped to the Government Grants Pass (Oreg.) Purchase Depot. The output totaled 5,786 short tons, a considerable increase over the 1955 figure (3,284 tons). The Oregon Chrome mine—owned and operated by Wm. S. Robertson—continued to be the major producer in the county and State, shipping crude lump ore and fines. J. G. Gallaher, at a mill at Wilderville, produced concentrate from low-grade material from the Oregon Chrome mine. Substantial quantities of chromite were shipped by Fred Langley and C. W. Dean from the Lucky Hunch mine, discovered in 1956, and by M. J. McShane and M. E. Adams from the Black Prince mine. C. E. Nichols also shipped ore from the Black Prince mine. Other producing properties included the Black Hawk (Pat Arnot), Paradise No. 2 (Ashland Mining Co), Deep Gorge (J. N. Grissom), Chrome King No. 1 (Roy Hansen and Lewis & Calhoun), Lucky Star (Lewis & Calhoun), Esterly (Black

Sheep Mining Co.), Rancheree (E. K. McTimmonds), Lucky L & R (R. W. Radcliffe), Crown Chrome (Carl Stevens), and Shady Cove (George Tulare).

Copper ore shipped from the Fall Creek mine by J. W. Pressler comprised a large part of the small output of copper in Oregon. Gold and silver were recovered from this ore and from ore shipped by Frank E. Gelhous to the Tacoma smelter. Quentin Stone recovered gold and some silver at the Last Chance placer in the Galice district. The Blue Channel placer—operated by M. H. Davis in the Wolf Creek district—also yielded gold and silver.

Rogue River Sand & Gravel Co., Grants Pass Sand & Gravel Co., Mark Axtell, and M & M Sand & Gravel Co., all of Grants Pass, processed sand and gravel for building and road use. F. L. Sommers supplied road gravel to the State highway department under contract. Ideal Cement Co., Pacific Division, obtained limestone from its Marble Mountain quarry for use at the company cement plant at Gold Hill, (Jackson County). C. R. O'Neil supplied crushed roadstone to the State highway department. A small quantity of clay was mined for use by the Macfarlane Brick Plant at Grants Pass.

Klamath.—Stone, sand and gravel, and clays were produced in the county. Warren Northwest, Inc., crushed basalt for roadstone, and contractors supplied the State highway department and the Bureau of Reclamation with road metal and riprap, respectively. Contractors also supplied crushed cinder for State highway use. Sand and gravel for buildings and roads was prepared by O. A. McCord and Farmers Sand & Gravel Co., both of Klamath Falls. The Great Northern Railway Co. produced gravel for railroad ballast. Klamath Falls Brick & Tile Co., at its plant at Klamath Falls, produced structural clay products from locally mined clays and clay from Lincoln, Calif., purchased by the company to supplement the local supply. Output of clays in 1956 was larger than in 1955.

Lake.—A small quantity of mercury was recovered by M. M. Stalnaker at Glass Buttes, about 50 miles west of Burns. After the discovery of commercial uranium deposits near Lakeview in mid-1955, Lakeview Mining Co. proceeded rapidly with development of the White King and Lucky Lass properties, sites of the original discoveries. A second shipment of ore—the first was made in October 1955—was made in August to Vitro Uranium Co., Salt Lake City, Utah. The company drilled extensively at the properties and made aerial surveys of surrounding areas. Construction of a 300-foot, 2-compartment shaft was begun at the White King mine. (See Uranium in commodity section.)

Allum Bros. and the Lake County Highway Department crushed basalt for county roadwork. Two contractors (Allum Bros. and A. C. Compton Co.) produced crushed basalt for the State highway department. Crushers operated by county highway department crews prepared gravel for paving and road use. A. M. Matlock of Eugene reported a small output of sodium carbonate from potholes in the Alkali Lake area. A little obsidian (volcanic glass) was collected near Glass Buttes as gem material.

Lane.—Mercury & Chemicals Corp. began producing mercury late in 1956 at the old Black Butte mine, 16 miles south of Cottage Grove, the only metal-mining operation in the county. The mine was

active before 1900, and production was reported in 1908–09 and during World War I. The bulk of the mercury was produced during continuous operation from 1927 through 1942, when the mine was closed. Over 15,000 seventy-six pound flasks of mercury has been recovered at the property, with a reported value of nearly $1.5 million. In 1956 the Mercury & Chemicals Corp. leased the mine with an option to purchase it. The company completed preparatory work in November, including erection of a 70-ton-per-day, oil-fired Gould rotary kiln and 24 upright cast-iron condensers, and at the end of the year had furnaced nearly 2,300 tons of ore. About 30 workers were employed. In November the firm was awarded a $62,340 DMEA contract for exploring the deposit.

Silicon metal was produced by National Metallurgical Corp. at its plant at Springfield.

Sand and gravel output in Lane County totaled over 1 million tons in 1956. Production was attributed to 13 commercial operators. The county, which ranked first in value of sand and gravel output in 1955, dropped to third place in 1956. Crushers operated by the county highway department and contractors supplied gravel for use on county roads. Contractors supplied the State highway department with gravel for road construction and maintenance, and C. B. White contracted to supply road-construction gravel to the United States Army Corps of Engineers.

Stone was the only other nonmetal produced in 1956. Basalt was quarried and crushed by five commercial operators; production was used for roadstone, riprap for flood control, and railroad ballast. Ten contractors supplied the crushed stone required by the Lane County engineer, the Bureau of Public Roads, and the United States Army Corps of Engineers. Eight other contractors supplied the State highway department with roadstone and a small quantity of riprap.

Lincoln.—Yaquina Head Quarries (Newport) produced crushed basalt for roadstone riprap. Crushed basalt for road use also was prepared by L. R. Kauffman, Waldport; and Calkins Crushing Co., Ocean Lake. Contractors furnished roadstone (basalt) for highway construction and maintenance to the State highway department.

Linn.—A vigorous mineral-processing industry was born in Linn County in 1956 as a result of research at the Federal Bureau of Mines Northwest Electrodevelopment Experiment Station in Albany. A project, begun in 1945 to develop a process to produce zirconium of high purity, was completed under the technical leadership of Dr. W. J. Kroll, a noted metallurgist from Luxembourg, to the extent that zirconium of the quality sought by AEC could be produced at a reasonable price. The Commission provided funds for a plant that applied the reduction techniques to produce zirconium pure enough to be soft for rolling into sheet and to resist the corrosion encountered in atomic piles and powerplants using fissionable fuels. For several years the Albany Station was the one source of zirconium meeting the rigid specifications required for developing the AEC program for atomic weapons and atomic fuels. The plant capacity was increased twice; $3 million was spent for facilities, and the operating budget was $2 million a year. Over 1 million pounds of zirconium was shipped to fabricators of atomic reactors and engines using atomic fuel

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before private producers were able to supply metal that would meet the rigid specifications demanded by AEC.

In 1955 operation of the plant by the Bureau of Mines was terminated, and it was idle until reopened in 1956 by the Wah Chang Corp. under contract with AEC. Later in 1956, Wah Chang expanded capacity by building additional similar facilities on the north edge of the city. Albany was selected because of the availability of scientific and technically trained manpower, electric energy, and suitable plant sites.

A new company, Oregon Metallurgical Corp., formed early in the year, moved rapidly ahead with construction of a plant on the south edge of the city to produce zirconium and titanium ingot from imported zirconium and titanium-sponge metal. The plant began to operate in the summer of 1956.

A hafnium compound—byproduct of the Wah Chang zirconium operations—was converted to hafnium metal by the Bureau of Mines under contract with AEC, and research on production and utilization of these and other metals was continued at the Bureau of Mines Albany laboratory.

Sand and gravel, stone, and clay valued at more than $600,000 were produced in Linn County in 1956. Output of sand and gravel was below the 1955 figure. Sand and gravel from commercial operations was used chiefly for roads and buildings. County crews, contractors, and commercial suppliers furnished the Linn County Highway Department with sand and gravel for roadwork, and the State highway department contracted for a small quantity of road gravel. Harbert Bros. and Floyd Graham Construction Co. produced riprap from basalt for use in river revetments by the United States Army Corps of Engineers. Brownsville Sand & Gravel Co. reported output of roadstone. Contractors supplied crushed stone to the State highway department, Linn County Highway Department, and Bureau of Public Roads. Locally mined clay was processed into heavy-clay products by the Albany Brick & Tile Co. at its Albany plant.

Malheur.—After extensive preparatory work, the Arentz-Comstock Mining Venture began operating the old Bretz mercury mine on the Oregon-Nevada border near McDermitt, Nev., on December 1 and produced considerable mercury by the end of the year. The company mined 22,700 tons of crude ore from open pits. A method of recovery was used that was considered an unusual departure from the more common method of feeding crushed, crude ore directly into a furnace or retort. Concentrate from a 150-ton-per-day flotation plant, comprising a Dorr classifier, 6 Denver flotation cells, a thickener, and a filter, was fed into 2 Pacific Foundry D-retorts. The Bretz mine was formerly one of the larger mercury producers in the State; over 12,000 flasks of mercury was recovered from 1931 to 1942, when operations were last reported.

A few ounces of gold and silver were produced from the O. K. placer on Shasta Creek in the Mormon Basin district by Elton B. Taylor during test work in the summer.

The N. A. Toole Construction Co. produced paving and road gravel at a portable plant near Ontario; Gravel Products Co. prepared building sand, and building, paving and road gravels; and C. E.

Leseberg crushed gravel for road and paving use. Crews of the county highway department supplied their own road-gravel requirements, and contractors produced road and surfacing materials for the State Highway Department and the Bureau of Public Roads. The State contracted for crushed basalt for road surfacing and maintenance and for a small quantity of riprap. Oregon Clay Products, Inc., of Vale, mined clay for use in building brick. In September a permit for test drilling was issued to Oroco Oil & Gas Co. of Payette, Idaho. Agate and petrified wood were obtained by gem-stone collectors in the county.

Marion.—Sand and gravel was processed for building and road purposes by four commercial operators in 1956. The Marion County Highway Department contracted for road gravel, and county road crews dug a quantity of pit-run gravel. The State highway department was supplied with sand and gravel for highway construction and maintenance by three contractors. Oregon Tuff Stone Co., Inc., obtained volcanic-tuff building stone from the company quarry southeast of Sublimity. County-operated crushers prepared stone for road surfacing and maintenance. The Donald Brick & Tile Co. of Donald mined clay for use in building brick and tile and draintile.

Morrow.—County-operated crushers prepared basalt for county road use, and the State highway department obtained crushed stone for road maintenance from two contractors. Collectors reported obtaining thunder-egg gem stones in Morrow County in 1956.

Multnomah.—With the exception of the relatively new mineral-processing industries in Douglas (nickel), Lane (silicon), and Linn (hafnium, titanium, and zirconium) Counties, Multnomah County continued to be the center of mineral-processing activity in the State. Reynolds Metals Co. produced aluminum from imported alumina at Troutdale throughout the year and embarked upon a large expansion program. In Portland, calcium carbide was produced by Pacific Carbide & Alloys Corp. and Union Carbide & Carbon Corp.; ferromanganese, ferrosilicon, and calcium carbide were produced by Electro Metallurgical Co.; caustic soda and chlorine were manufactured by Pennsylvania Salt Manufacturing Co.; and Oregon Steel Mills, operating electric furnaces and a rolling mill, produced steel products.

Multnomah County ranked fourth in the State in total value of nonmetallic-mineral output. Sand and gravel, stone, and clays were the principal nonmetals produced in 1956. In addition, perlite, shale, soapstone, and vermiculite obtained from out-of-county and out-of-State sources were processed by firms within the county. The county ranked first in the State in production of sand and gravel; 9 companies processed more than 2.5 million tons. County crews produced prepared and pit-run road gravel, and contractors supplied sand and gravel to the State highway department and the city of Portland. Joe Marston operated the Rocky Butte quarry and produced rough-dimension basalt for use as tunnel lining. Output from this quarry was higher than in 1955. Basalt for road metal was used by the Multnomah County Highway Department and the State highway department, and a small quantity of riprap was produced by contractors for the United States Army Corps of Engineers and the State highway department.

Two of Oregon's largest brick plants were situated in the county. Columbia Brick Works, at its plant near Gresham, produced face and common brick and structural tile, and the Sylvan Brick Co. of Sylvan produced building brick. Smithwick Concrete Products Co. expanded shale mined in Washington County at its Portland plant. The expanded product was used as lightweight aggregate in building blocks and tile and brick. Pacific Stoneware Co. processed clays for flowerpots. Supreme Perlite Co. operated its perlite-expanding plant at North Portland. Crude perlite from Nevada was expanded at the Portland plant for marketing throughout the Pacific Northwest. Vermiculite-Northwest, Inc., processed crude vermiculite from Montana at its exfoliation plant. Stauffer Chemical Co. and Miller Products Co. ground and processed soapstone, mined in Washington, for use in insecticides. The glass-container manufacturing plant of Owens-Illinois began operations in 1956, and the first delivery of glass containers from the plant was made in August. Raw materials used at the plant were from out-of-State sources.

Polk.—Two companies processed gravel for paving and road use, and the State highway department contracted for surfacing and maintenance gravel. Polk County Lime Co. (Dallas) operated a limestone quarry and crusher near Dallas, and Oregon Portland Cement Co. obtained limestone from the company-owned quarry near Dallas for use at the Oswego cement plant, Clackamas County. Riprap was supplied to the United States Army Corps of Engineers under contract. Monmouth Brick & Tile Co. of Monmouth mined clay for processing into building brick and draintile. Production increased slightly over that in 1955.

Sherman.—The Sherman County Road Department and Roy L. Houck & Sons produced crushed basalt for roadstone, and Vernie Jarl supplied crushed stone and road gravel to the State highway department. Basalt for riprap was quarried by contractors for the United States Army Corps of Engineers.

Tillamook.—Dolan Construction Co. of Tillamook processed gravel for road metal and railroad ballast. County highway-department crews produced gravel for road building and maintenance, and three contractors furnished the State highway department with crushed road gravel. Tillamook Clay Works mined clay and produced heavy clay products at its plant southeast of Tillamook. An increase was reported in clay output over that in 1955.

Umatilla.—A small quantity of gold recovered by Bill Hekkala while prospecting in 1955 was the only metal production credited to the county in 1956.

Four companies produced sand and gravel for building and road use, and O. O. Felthouse of Hermiston produced engine and stock-car sand. The county road department reported output of prepared and pit-run road gravel, and a small quantity of gravel was obtained under contract. Four contractors supplied the State highway department with paving and road gravel. Umatilla County Road Department crews crushed stone for road and riprap use, and five contractors crushed basalt for State highway construction.

The Big Red Uranium Co., Vancouver, Wash., received a permit to drill an exploratory oil well.

Union.—The State highway department awarded Arthur Simonsen & Co. of Baker a contract for production of crushed stone and cinders for highway construction and maintenance. The county highway department produced pit-run gravel for highway use, and Cartwright Construction Co. and Arthur Simonsen & Co., under contract to the State, supplied crushed and pit-run gravel for road and paving purposes. La Grande Brick Co. mined clay for building brick and tile. The mineral output of the county was about the same as in 1955.

Wallowa.—Stone and sand and gravel were the only nonmetals produced in the county in 1956. Wallowa County road crews crushed stone for use on county roads, and C. C. Meisel supplied road gravel. Limestone for use at calcium carbide plants and for agricultural use was obtained by Greely Lime Co. from its Black Marble quarry near Enterprise; production was reported slightly higher than in 1955.

Wasco.—Harvey Machine Co. completed financial and contractual arrangements and began construction work on a multi-million-dollar, 54,000-ton-annual-capacity, aluminum-reduction plant on a 500-acre site near The Dalles. The large quantities of electric power required by the plant were to be provided through BPA-constructed transmission lines extending from the Big Eddy switching station. Production of aluminum was expected to begin late in 1957.

Sand and gravel and stone were the only nonmetals produced in Wasco County. The Dalles Concrete Products Co., The Dalles Sand Co., and The Dalles Ready-Mix produced sand and gravel for building and road construction. In addition, The Dalles Concrete Products Co. produced masonry sand and gravel for filter purposes. United Construction Co. supplied a small quantity of road gravel for State highway work, and contractors supplied the United States Army Corps of Engineers with gravel for use at The Dalles Dam site.

C. M. Thomas produced crushed basalt for road use, and the State highway department and the United States Army Corps of Engineers contracted for roadstone and riprap, respectively. The Rainbow Rock Co. (D. G. Madden & R. O. Burke) quarried a varicolored volcanic tuff from the Rainbow Rock quarry near Maupin. The quarried material was split into blocks and marketed as a decorative building stone.

Washington.—Principal nonmetals produced were sand and gravel, stone, and clays. Two companies supplied paving, road, and building gravels and a small quantity of building sand, and the State highway department contracted for road and paving gravels. E. C. Hall Co., using a portable plant, produced crushed stone for highway construction. County road crews crushed basalt for roadstone and riprap, and the State highway department contracted for a small quantity of basalt for road maintenance. Scholls Tile Co., Hillsboro, and O. K. Brickyard, Sherwood, mined clay for use in draintile and building bricks, respectively; production was substantially the same as in 1955. Northwest Aggregates, Inc., operated a shale pit and expanding plant near Banks and produced expanded shale for use as lightweight aggregate. Smithwick Concrete Products Co. operated the Vernonia pit and shipped expanded-shale to the company aggregate plant at Portland, Multnomah County. Production of raw shale was slightly below that in 1955.

Wheeler.—A small quantity of gold and silver produced by E. O. Waterman from the Waterman placer in the Spanish Gulch district from April to November was the only mineral production reported in Wheeler County in 1956.

Yamhill.—Grand Island Sand & Gravel Co. (Dayton) produced sand and gravel for building and road use. Contractors supplied road-gravel requirements of State and county highway crews. O. C. Yokum and Amity Sand & Gravel Co. crushed stone for paving and road surfacing. The latter company also produced riprap. Three contractors supplied the State highway department with crushed stone for road use, and a fourth operator furnished a small quantity of riprap. McMinnville Brick & Tile Co. (McMinnville) and Willamina Clay Products Co. (Willamina) mined clay for heavy clay products.

The Mineral Industry of Pennsylvania

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Pennsylvania Bureau of Topographic and Geologic Survey.

By Robert D. Thomson [1] and Mary E. Otte [2]

PENNSYLVANIA mineral production in 1956 totaled $1 billion—an increase of $119 million (12 percent) over 1955. Of the 25 mineral commodities produced in 1956, 16 increased in value of output. In order of decreasing value, bituminous coal, anthracite, cement, stone, petroleum, natural gas, and clays were the more important economically. In 1956, 72 percent of the value of Penn-

TABLE 1.—Mineral production in Pennsylvania, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement:				
Portland—376-pound barrels	45,526,877	$132,965,136	49,526,640	$153,505,926
Masonry—do	2,562,701	9,003,906	2,437,168	8,881,539
Clays	4,019,909	12,413,093	[3] 4,412,550	[3] 23,781,929
Coal:				
Anthracite	26,204,554	206,096,662	28,900,220	236,785,062
Bituminous	85,713,456	440,451,700	90,286,692	479,437,406
Cobalt (content of concentrate)—pounds	478,840	(3)	533,329	(3)
Gem stones	(4)	60	(4)	100
Gold (recoverable content of ores, etc.)—troy ounces	1,610	56,350	(3)	(3)
Iron oxide pigment (crude)	519	6,714	600	6,600
Lime	1,424,051	17,631,795	1,443,430	18,282,135
Natural gas—million cubic feet	99,172	29,652,000	104,508	33,652,000
Natural-gas liquids:				
Natural gasoline—thousand gallons	4,305	281,000	4,081	251,000
LP-gases—do	995	90,000	1,127	99,000
Peat	23,277	219,628	20,498	213,509
Petroleum (crude)—thousand 42-gallon barrels	8,531	30,200,000	8,230	35,718,000
Sand and gravel	13,312,971	20,511,847	14,047,068	21,320,981
Silver (recoverable content of ores, etc.)—troy ounces	10,379	9,394	(3)	(3)
Slate	186,035	4,421,298	153,824	4,193,559
Stone	44,437,623	[5] 68,918,111	[6] 44,912,987	[6] 73,830,720
Sulfur (recoverable elemental sulfur)—long tons	7,738	263,370	11,350	386,296
Tripoli	[5] 1,090	[5] 5,400	1,030	6,650
Value of items that cannot be disclosed: Copper, iron ore, mica, oystershell (1956), pyrites, sericite, schist stone (dimension basalt 1956), and values indicated by footnote 3		15,819,073		16,201,938
Total Pennsylvania [7]		[8] 969,910,000		1,088,867,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers), except that fuels are strictly production.
[2] Excludes kaolin; value included with items that cannot be disclosed.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Weight not recorded.
[5] Final figure. Supersedes figure given in commodity chapter.
[6] Excludes certain stones, value for which is included with items that cannot be disclosed.
[7] The total has been adjusted to eliminate duplicating the value of clays and stone in manufacturing lime and cement.
[8] Revised figure.

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sylvania's mineral output was attributable to fuels, 26 percent to nonmetals, and 2 percent to metals.

Production of one or more mineral commodities was reported in every county except Pike. Major producing counties (in order of decreasing value) were Washington, Luzerne, Northampton, Schuylkill, Cambria, Greene, and Allegheny. Washington County was the leading producer of bituminous coal, Luzerne of anthracite, Northampton of cement, Montgomery of stone, Clearfield of clays, Bucks of sand and gravel, and Centre of lime.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Anthracite.—Anthracite output in Pennsylvania in 1956 increased 10 percent in tonnage and 15 percent in value over 1955. The average value per net ton increased from $7.86 in 1955 to $8.19 in 1956. Similar to the trend in 1955, the percentage of anthracite produced underground decreased from 55 percent to 52. Output from strip pits represented 29 percent of the total output, remaining approximately the same as in 1955. Production from culm banks and dredges totaled 19 percent compared with 15 in 1955.

Luzerne County again led in anthracite production, with 34 percent of the tonnage and 38 percent of the value. Producers in Luzerne and Schuylkill Counties supplied 65 percent of the total tonnage and 67 percent of the total value. Other productive counties were Carbon, Columbia, Dauphin, Lackawanna, Lancaster, Lebanon, Northampton, Northumberland, Snyder, and Sullivan. Berks County was the only county in which anthracite was produced in 1955 and not in 1956.

The fatality rate for the anthracite industry was slightly better in 1956. Fifty-six deaths were reported in 1956—7 percent lower than in 1955. Fatal and nonfatal injuries totaled 3,316 in 1956, compared with 3,090 in 1955. Injury rates in 1956 were 1.30 per million man-hours for fatal injuries and 75.80 per million man-hours for nonfatal injuries. Injury rates per million tons were 1.96 for fatal and 114.07 for nonfatal injuries. These injury rates were based on a total of 25,800 men working 43,010,000 man-hours to produce 28,578,000 short tons.

Bituminous Coal.—The production of bituminous coal in Pennsylvania—by far the most important single mineral commodity in the State (comprising 44 percent of the total State value)—increased 5 percent in tonnage and 9 percent in value compared with 1955. The average value per ton in 1956 was 17 cents greater than in 1955, totaling $5.31.

Bituminous coal was produced at underground, strip, and auger mines. In all, 997 underground mines, with a production of 1,000 tons or more, represented 74 percent of the total output. Of the total underground production, 97 percent was cut by machine, including the 26 percent mined by continuous miners, while the remainder was cut by hand or shot from the solid. Locomotives, shuttle cars, rope hoist, animals, and mother conveyors were used for underground haulage. Ninety-one percent of the underground output was loaded mechanically. Mobile loaders were the primary moving device—

loading into shuttle cars (67 percent), into mine cars (30 percent), and onto conveyors (3 percent). During the year there were in operation 478 shuttle cars, 254 mine cars, and 37 conveyors. Preparation plants active in 1956, totaled 140; they produced 50 million short tons of clean coal, of which 93 percent came from underground mines and 7 percent from strip mines. Of the total production mechanically cleaned, 89 percent was wet washed (15 percent by jigs and 74 percent by other wet methods) and 11 percent cleaned by pneumatic methods.

In all, 680 strip mines were active during the year producing 24 million short tons of coal. The average value per ton for strip mine coal was $3.90. In 1956 electric, diesel-electric, diesel, and gasoline power shovels and draglines were used. Of the 1,443 shovels and draglines in operation in 1956, 1,072 were power shovels, of which 1,002 had a capacity of less than 3 cubic yards, 63 of 3 to 5 cubic yards, 4 of 6 to 12 cubic yards, and 3 of over 12 cubic yards. The draglines totaled 371, of which 176 were less than 3 cubic yards capacity; 132, 3 to 5; 59, 6 to 12; and 4, over 12 cubic yards.

Less than 1 percent of Pennsylvania's bituminous-coal production came from 33 operating auger mines. The average price for coal produced from auger mines was $3.33.

In all, 52 fatal and 2,420 nonfatal injuries were reported for bituminous-coal mines operating in Pennsylvania in 1956. The injury rate for fatal injuries was 0.61 per million man-hours and 0.58 per million short tons, compared with 28.54 for nonfatal injuries and 27.10, respectively. The average number of men working in bituminous-coal mines in 1956 was 47,400 working 10,697,000 man-days or 84,790,000 man-hours to produce 89,300,000 short tons.

Coke and Coal Chemicals.—The work stoppage in the steel industry from July 1 to August 5 adversely affected coke-oven operations in Pennsylvania in 1956, with production increasing only 1 percent. However, Pennsylvania ranked first in quantity and total value for both beehive and oven coke produced in the United States, accounting for 27 percent of the output from slot-type ovens and 81 percent from beehive ovens. Fourteen plants, operating 3,976 slot-type ovens, carbonized 27,929,000 net tons of coal to produce 19,098,000 net tons of oven coke. A total of 3,203,000 net tons of coal was carbonized in 7,873 beehive ovens to produce 2,006,000 net tons of beehive coke. The average value for oven coke was $16.58 compared with $13.82 for beehive coke. Coke produced in Pennsylvania was shipped to blast-furnace plants, foundries, producer-gas plants, water-gas plants, other industrial plants, and for residential heating. Ninety-six percent of the coke was consumed at blast furnaces and 1 percent by foundries.

Over 289 billion cubic feet of coke-oven gas was produced in Pennsylvania coke ovens in 1956. Of this total, coke producers used 38 percent in heating the ovens, 4 percent under boilers, and 53 percent in steel or allied plants. Four percent of the gas was sold, and the remainder was waste gas. The 14 active plants produced 573 million pounds of ammonia as sulfate and 636,000 pounds as liquor. Also produced was 268 million gallons of coke-oven tar and 88 million gallons of crude light oil from which was made benzene, toluene, xylene, and solvent naphtha.

Peat.—Pennsylvania dropped from fifth to sixth place among the 17 peat-producing States in 1956, with a total yield of 20,000 short tons valued at $214,000. Output of peat in 1956 decreased 12 percent in tonnage and 3 percent in value below 1955. Varieties of peat produced were humus, moss, and reed sedge. Luzerne County ranked first in production, followed by Mercer and Erie Counties.

Petroleum and Natural Gas.—A total of 378 wells, exclusive of those drilled for gas storage and secondary-recovery purposes, was completed in Pennsylvania in 1956.[3]

Of these, 185 gas wells, 19 oil wells, and 47 dry holes were drilled in the shallow-sand belt of western Pennsylvania. In 1956, 127 deep wells (Middle Devonian or deeper) were completed; 81 of the deep wells were gas, and 46 were dry holes.

The 185 new shallow-sand gas wells had an initial open-flow capacity of 86,913 million cubic feet per day, compared with a capacity of 53,468 for the 214 gas wells completed in 1955. The 19 new shallow-sand oil wells completed in 1956 had a total initial production of 53.4 barrels per day as compared with an initial production of 80 barrels for the 17 new oil wells completed in 1955. The greatest activity in the shallow-sand gas belt occurred in Armstrong County, where 78 new wells (all gas) were completed; 64 of them were hydraulically fractured. In all 43 wells were completed in Jefferson County, 27 in Westmoreland, 23 in Indiana, 16 in each of Clarion and Forest, 14 in McKean, 9 in Washington, 6 in each of Allegheny and Butler, 5 in Fayette, 2 in each of Clearfield, Greene, and Potter, and 1 each in Elk and Erie.

Of the 143 deep sand wells drilled, 81 were gas wells, 46 dry holes, and 16 for gas storage. The most activity was in the Meade field and surrounding area in Erie County, where 35 gas wells and 17 dry holes were drilled. Five gas wells and three dry holes were drilled in the Glenlick pool of northeastern Clinton and adjacent southeastern Potter County. Four dry holes and 10 wells for gas storage also were drilled in Potter County. Drilling activity in Clearfield County was centered in 3 areas; 22 gas wells and 4 dry holes were drilled in the Rockton field, 6 gas wells and 1 dry hole in the Reed-Deemer field, and 1 wildcat well about 7 miles northeast of the Rockton field.

Most activity in Indiana County was in the Jacksonville field, where four gas wells were drilled. Two other gas wells were completed in this county, one in Armstrong Township and the other in Brush Valley Township. Drilling occurred in the southwestern corner of Jefferson County in the Reed-Deemer field, and a new dry hole was completed in Gaskill Township. In Elk County 1 gas well was completed in the Benezette-Driftwood field, and 4 gas wells and 2 dry holes were completed in the Hicks Run Pool area. The first wildcat well in southern Westmoreland County was completed, and production was begun in the St. Boniface Chapel Pool area. Drilling also occurred in 10 other counties, with 4 dry wells completed in Crawford, 2 in Bradford, and 1 each in Bedford, Centre, Lackawanna, Lawrence, McKean, Mercer, Snyder, and Tioga.

The proved recoverable crude-oil reserve in Pennsylvania was estimated at 132 million barrels as of January 1, 1957—8 million

[3] Lytle, W. S., Developments in Pennsylvania in 1956: Bull. Am. Assoc. Petrol. Geol., vol. 41, No. 6, June 1957, pp. 1010–1020.

TABLE 2.—Natural-gasoline and cycling plants in 1956

(Daily capacity in gallons)

Company	Location	County	LP-gas mixture	Natural gasoline and other products	Total	Status	Type
Biery & Breene	Venus	Venango		80	80	Operating	Complete.
Equitable Gas Co	Rogersville	Greene		10,000	10,000	do	Absorption.
The Mars Co	Kane	McKean		2,000	2,000	do	Do.
Do	Oil City	Venango		2,000	2,000	do	Do.
Do	Van	do	3,000	7,500	10,500	do	Do.
Pennsylvania Gas Co	Sheffield	Warren		4,000	4,000	do	Do.
The Peoples Natural Gas Co	Brave	Greene		20,000	20,000	do	Do.
Quaker State Oil Refining Co	Noblestown	Allegheny		300	300	do	Complete.
Do	do	do		700	700	do	Do.
Waverly Oil Works Co	McDonald	Washington		533	533	do	Do.
Do	do	do		733	733	do	Do.
Total			3,000	47,846	50,846		

TABLE 3.—Capacity of petroleum refineries and cracking plants in 1956

(Barrels per day)

Company	Location	County	Type of plant	Crude oil capacity			Cracked gasoline capacity		
				Operating	Shut down	Building	Operating	Shut down	Building
East:									
Atlantic Refining Co	Philadelphia	Philadelphia	Complete	148,000			34,300		
Gulf Oil Corp	Girard Point	do	Skimming, cracking, and lube.	183,000	[1] 39,000		48,840	[1] 4,600	1,650
Sinclair Refining Co	Marcus Hook	Delaware	Skimming and cracking	102,000		12,000	40,600		
Sun Oil Co	do	do	Complete	145,000			58,100		
West:									
Franklin Refinery Division of L. Sonneborn Sons, Inc.	Franklin	Venango	Skimming and lube	1,650					
Kendall Refining Co	Bradford	McKean	Complete	4,800					
Pennsylvania Refining Co	Karns City	Butler	Skimming and lube	2,000			2,200		
Pennzoil Division of South Penn Oil Co.	Rouseville	Venango	Complete	10,000	3,000		3,413	[2] 2,068	1,995
Quaker State Oil Refining Corp	Emlenton	do	do	2,540			1,592		
Do	Farmers Valley	McKean	do	4,000			2,500		
United Refining Co	Warren	Warren	do	8,500	[1] 1,500		4,600		2,500
Valvoline Oil Co. Division of Ashland Oil & Refining Co.	Freedom	Beaver	Skimming and lube	5,500					
Wolf's Head Oil Refining Co., Inc	Reno	Venango	Complete	2,500			1,460		
Total				619,490	43,500	12,000	197,605	6,668	6,145

[1] Equipment considered inoperable without extensive reconditioning.
[2] Includes 1,432 barrels daily considered inoperable.

barrels less than was reported for 1955. Gas producers in Pennsylvania estimated reserves of January 1, 1957, as totaling 760 billion cubic feet—6 billion feet greater than was reported on January 1, 1956.

Natural-Gas Liquids.—Natural-gas liquids were produced in Pennsylvania in 1956 with a 2-percent decrease in output from 1955. Eleven natural-gasoline and cycling plants were active in 1956, with a capacity (as of January 1, 1956) of 48,000 gallons a day for natural gasoline and other products and 3,000 for LP-gas mixture. Ninety-five percent of the capacity was designated as absorption and 5 percent as compression. Reserves of natural-gas liquids (includes condensate, natural gasoline, and liquefied petroleum gases), as of January 1, 1957, were estimated to total 3.1 million barrels—an increase of 76,000 barrels over that reported at the end of 1955.

Thirteen petroleum refineries were active in Pennsylvania in 1956, with an operating capacity of 619,000 barrels per day and an additional 44,000 barrels not in operation and 12,000 to be built during 1956. Capacity of plants for producing cracked gasoline in Pennsylvania, as of January 1, 1956, totaled 198,000 barrels per day operating, 7,000 shut down, and 6,000 to be built

NONMETALS

Cement.—The cement industry in Pennsylvania in 1956 again set a new record, with shipments totaling 52 million barrels valued at $162 million. The industry followed a national trend and increased 8 percent in quantity and 14 percent in value over 1955. Demand was high during the year, and the cement industry continued expansion on the strength of the increasing demands by the construction industry for cement. Cement prices were increased by Pennsylvania producers on January 1 and October 1, with increases ranging from $0.15 to $0.25 a barrel.

Pennsylvania ranked first in the United States in the production of cements, with 16 percent of the total shipments of cement produced in 1956.

Seventeen companies were active in eight counties. A total of 24 plants produced portland cement in 1956, with 11 plants in Northampton County, 5 in Lehigh County, 2 each in Allegheny and Lawrence Counties, and 1 each in Berks, Butler, and York Counties. Lehigh and Northampton Counties continued to be the largest centers of production, supplying 67 percent of the portland-cement shipments in 1956. Capacity at the 24 plants was reported to be 53 million barrels—63 percent by the dry process and 37 percent by the wet process. The industry reported consuming 1.1 billion kilowatt-hours of electrical energy, of which 720 million kilowatt-hours was purchased from public-utility companies.

Of the plants producing portland cement, 21 also produced masonry cement.

Clays.—Industry established an alltime high in the production of fire clay and miscellaneous clay from Pennsylvania pits in 1956. Pennsylvania ranked second in the United States in the production of fire clay and sixth in miscellaneous clay. The output of fire clay in 1956 was 13 percent greater in tonnage and 75 percent greater in

TABLE 4.—Shipments of portland cement, 1955–56, by counties

County	1955		1956	
	Barrels	Value	Barrels	Value
Lehigh	8,005,405	$23,098,410	8,700,326	$26,513,074
Northampton	22,874,741	66,864,557	24,728,213	76,401,740
Allegheny, Lawrence, Butler	9,664,645	27,301,954	10,629,275	32,590,052
Berks, Montgomery, York	4,982,086	15,700,215	5,468,826	18,001,060
Total	45,526,877	132,965,136	49,526,640	153,505,926

value compared with 1955 and was 237,000 and $6.4 million greater than the previous high in 1951. Production of miscellaneous clay also increased, showing an 8-percent growth in tonnage and 202 percent in value (in certain instances value for processed clay was used). The 1956 production for miscellaneous clay was 20,000 tons and $3.6 million greater than the 1951 previous high. The increased output of the clay industry was due principally to increased demand for refractory materials by the steel industry, glass industry, and foundries and a greater use of clays in the production of cement, heavy clay products, and lightweight aggregate.

Fire clay was used principally in producing firebrick and block and heavy clay products, with smaller quantities used in producing miscellaneous refractories, art pottery, and flowerpots. The majority of the miscellaneous clay was used in producing heavy clay products and portland cement. Smaller quantities of miscellaneous clay were used in manufacturing art pottery, high-grade tile, refractories for foundry and steel works, lightweight aggregate, and filler for linoleum and paint.

TABLE 5.—Clays sold or used by producers in 1955–56, by kinds and uses, in short tons

Use	Fire clay		Miscellaneous clay	
	1955	1956	1955	1956
Refractories:				
Bauxite, high-alumina brick	(1)	8,463		
Firebrick and block	[2] 967,328	1,089,738		
Fire clay mortar	29,811	27,631		
Foundries and steelworks	118,086	136,753	(1)	(1)
Miscellaneous refractories	139,604	158,672		
Heavy clay products	902,563	995,360	1,503,611	1,571,625
Paint fillers or extenders			380	360
Lightweight aggregate			117,308	(1)
Cement	[2] 29,521		170,478	204,668
Undistributed	[3] 12,375	[3] 26,369	[4] 28,844	[4] 192,911
Total	2,199,288	[5] 2,442,986	1,820,621	1,969,564

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes kaolin.
[3] Includes fire clay for art pottery and stoneware, high-alumina brick, and glass refractories.
[4] Includes miscellaneous clay for art pottery and stoneware, high-grade tile, foundries and steelworks, linoleum and oilcloth, miscellaneous filler, lightweight aggregate, and other uses.
[5] Incomplete total, excludes kaolin.

TABLE 6.—Clays sold or used by producers in 1956, by counties

County	Short tons	Value	Types of clay
Adams	68,100	$34,050	Miscellaneous clay.
Allegheny	145,860	(1)	Do.
Armstrong	227,962	2,621,549	Fire clay.
Beaver	630,375	2,395,042	Fire clay, miscellaneous clay.
Blair	19,796	176,688	Do.
Butler	19,809	(1)	Do.
Cambria	69,109	582,283	Do.
Centre	96,866	976,741	Fire clay.
Chester	58,241	(1)	Miscellaneous clay.
Clarion	126,979	1,316,686	Fire clay, miscellaneous clay.
Clearfield	630,209	5,589,316	Do.
Clinton	30,779	193,604	Do.
Columbia	14,800	(1)	Miscellaneous clay.
Fayette	169,832	1,401,025	Fire clay, miscellaneous clay.
Greene	4,062	(1)	Miscellaneous clay.
Indiana	34,139	153,625	Fire clay.
Luzerne	49,905	49,905	Miscellaneous clay.
Lycoming	360	6,455	Do.
Montgomery	78,672	106,186	Fire clay, miscellaneous clay.
Schuylkill	104,711	(1)	Miscellaneous clay.
Washington	52,938	69,813	Do.
Westmoreland	25,427	(1)	Fire clay, miscellaneous clay.
Undistributed [2]	1,753,619	8,108,961	
Total [3]	4,412,550	23,781,929	

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes tonnage and value for counties that must be concealed as indicated by footnote 1 and for the following counties: Berks, Bucks, Carbon, Dauphin, Elk, Huntingdon, Jefferson, Lancaster, Lawrence, McKean, Northumberland, Snyder, Somerset, and York.
[3] Incomplete total; excludes kaolin.

Kaolin was used in producing portland cement and firebrick and block, with use in producing cements being more important.

Lime.—Production of lime in 1956 continued to increase, gaining 1 percent in quantity and 4 percent in value. This rise in Pennsylvania was due largely to the increased demand for lime for use in the chemical and industrial industries and as refractory material. The sale of lime for agricultural and building purposes declined during the year. Of the 19 lime-producing counties in the State, Centre County continued to lead (producing one-half of the total value of lime for the State), with Chester, Lancaster, Lebanon, Montgomery, and York Counties having an output of over $1 million each. Of the total lime sold or used, 80 percent was in the form of quicklime and dead-burned dolomite and 20 percent in hydrated form.

Mica.—Output of mica increased in 1956 in both tonnage and value compared with 1955. The mica was mined and processed near Glenville and marketed as ground mica for use in manufacturing paints and rubber and as a coating on welding rods.

Nitrogen Compounds.—Two atmospheric nitrogen (anhydrous ammonia) plants were in production in Pennsylvania in 1956. Both plants used byproduct hydrogen from petroleum refining to produce synthetic anhydrous ammonia. The Atlantic Refining Co. operated a plant at Point Breeze (Philadelphia County), having a daily capacity of 100 tons of ammonia. The Sun Oil Co. began operations in February at its Marcus Hook plant. Daily production of ammonia was 300 tons per day. In mid-April the plant was closed by an explosion, and it was estimated that repairs would take 6 months.[4]

[4] Oil Paint and Drug Reporter, Anhydrous Ammonia Unit Explodes at Marcus Hook: Vol. 169, No. 17, Apr. 23, 1956, p. 5.

TABLE 7.—Lime sold by producers, 1947–51 (average) and 1952–56, by uses

Year	Agricultural		Building		Chemical and industrial		Refractory		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	134,697	$1,467,807	113,840	$1,553,032	813,460	$8,638,222	(1)	(1)	1,061,997	$11,659,061
1952	131,007	1,463,596	123,049	1,675,987	768,319	8,228,875	180,606	$2,473,755	1,202,981	13,842,213
1953	116,863	1,367,594	114,839	1,575,387	865,747	9,766,852	237,851	3,300,281	1,335,300	16,010,114
1954	129,146	1,537,849	120,661	1,697,895	816,044	9,753,519	15,732	217,047	1,081,583	13,206,310
1955	118,274	1,430,454	118,727	1,529,627	1,083,043	13,178,612	104,007	1,493,101	1,424,051	17,631,795
1956	229,348	3,156,710	110,344	1,456,088	1,103,738	13,669,337	(2)	(2)	1,443,430	18,282,135

[1] Refractory lime included with "Chemical and industrial."
[2] Refractory lime included with "Agricultural."

TABLE 8.—Lime sold or used by producers, 1955–56, by counties

County	1955		1956	
	Short tons	Value	Short tons	Value
Armstrong	788	$8,846	884	$10,185
Bedford	3,991	57,170	(1)	(1)
Blair			192	1,638
Dauphin			70,893	686,491
Franklin	2,513	21,987	2,305	20,745
Lebanon	244,111	2,749,585	165,418	1,737,841
Lycoming	800	6,400	1,400	11,200
Montgomery	74,079	1,150,083	71,782	1,077,063
Montour			60	378
Northumberland	550	4,276	485	4,000
Snyder	2,593	18,593	1,959	13,844
Somerset	1,563	9,378		
York	(1)	(1)	142,424	2,136,327
Undistributed [2]	1,093,063	13,605,477	985,628	12,582,423
Total	1,424,051	17,631,795	1,443,430	18,282,135

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes tonnage and value for counties that must be concealed as indicated by footnote 1 and for the following counties: Butler, Centre, Chester, Fulton (1956), Juniata (1956), Lancaster, and Mifflin.

Pyrite.—A smaller quantity of pyrite was produced in 1956 by the Bethlehem Steel Co. at Cornwall (Lebanon County). The pyrite concentrate produced at the Lebanon Concentrator was shipped to Wilmington (Del.), where cobalt was recovered and pyrite sinter produced.

Pyrophyllite (Sericite Schist).—Output of sericite schist in 1956 increased in both tonnage and value. Output came from the open-pit mine operated by Summit Mining Corp. in Adams County. The sericite schist, after processing, was used as a carrier in insecticide chemicals, as a filler in asphaltic compounds, and in joint-filler cements. The company installed a new Hardinge disk mill, completing the construction on October 1, thus giving the company two mills.

Roofing Granules.—Two plants were operated by The Funkhouser Co. for the production of roofing granules. A plant at Delta (York County) produced roofing granules and flour from slate quarried nearby. A second plant at Charmian in Adams County, processed basalt into roofing granules and stone flour. A portion of the granules and flour produced at the Delta plant was exported.

Sand and Gravel.—The Pennsylvania sand and gravel industry overcame the decline that occurred in 1955 and showed a 6-percent increase in tonnage and 4-percent rise in value. Increased demand for sand and gravel as construction and building materials and use in State highways stimulated the growth of the industry in 1956.

Sand was sold for nine major uses, of which glass sand, paving sand, fire or furnace sand, and ground sand increased in the quantities sold or used. Molding-, building-, grinding-, and engine-sand sales decreased. Sand for use in blasting and filtering was not sold in 1956.

Gravel was used for four major applications, of which building, paving, and railroad ballast increased in tonnage.

In 1956 both sand and gravel was produced for use by Government agencies, while in 1955 only gravel was produced. Overall demand for sand and gravel was good in 1956, but wages and cost of supplies

increased, while value per ton decreased. In certain sections of the State, particularly the northeast, State highway construction of the turnpike resulted in increased demand, while in other areas demand was lower due to a slight decrease in the building activity. The average selling price for sand increased $0.13 per ton for fire sand to $0.90 for grinding sand and as high as $1.59 for ground sand. However, building sand decreased $0.11 per ton and paving sand $0.18. The average value for railroad gravel increased $0.09, while building gravel decreased $0.04 and paving gravel $0.14.

Commercial production of sand and gravel was reported in 41 counties in 1956. Bucks, Armstrong, and Lycoming Counties were the principal producing areas for commercial sand and gravel. Government-and-contractor production was reported in Lawrence, Monroe, and Philadelphia Counties. A total of 99 percent of the commercial production of sand and gravel was washed or otherwise processed before marketing. Of the commercial sand production, 24 percent was transported by railroads and 47 percent by trucks. About 11 percent of the gravel was transported by railroads and 47 percent by trucks.

Slate.—The slate industry in Pennsylvania in 1956 ranked first in the United States in total value of production and third in total tonnage, representing 24 percent of the Nation's tonnage and 36 percent of the total value. Production in Pennsylvania followed the national trend in 1956, decreasing 17 percent in tonnage and 5 percent in value. The market for electrical slate, roofing slate, and slate granules dropped substantially during 1956, and there was also a slight

TABLE 9.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand:				
Molding and fire or furnace	521,044	$1,233,081	(1)	(1)
Building	3,823,809	5,094,580	3,817,152	$4,660,060
Paving	2,073,476	2,850,744	2,245,280	2,990,176
Engine	127,148	302,837	(1)	(1)
Filter	420	1,260		
Other [2]	1,001,339	3,111,164	1,827,094	5,628,849
Total sand	7,547,236	12,593,666	7,889,526	13,279,085
Gravel:				
Building	3,659,166	5,093,197	4,039,259	5,471,500
Paving	1,823,028	2,529,653	1,934,265	2,413,949
Railroad ballast	79,988	51,981	103,163	76,579
Other	131,663	200,942	57,605	35,228
Total gravel	5,693,845	7,875,773	6,134,292	7,997,256
Total sand and gravel	13,241,081	20,469,439	14,023,818	21,276,341
GOVERNMENT-AND-CONTRACTOR OPERATIONS				
Sand: Paving			9,300	16,740
Gravel: Paving	71,890	42,408	13,950	27,900
Total sand and gravel	71,890	42,408	23,250	44,640
Grand total	13,312,971	20,511,847	14,047,068	21,320,981

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Includes glass, grinding and polishing, blast, other uses and ground sand.

TABLE 10.—Sand and gravel sold or used by producers, 1955–56, by counties

County	1955		1956	
	Short tons	Value	Short tons	Value
Armstrong	(1)	(1)	1,339,083	$2,436,281
Beaver	472,848	$699,133	437,872	453,279
Bedford	9,644	22,953	10,770	25,525
Bucks	5,173,952	7,529,929	4,585,135	5,705,930
Butler	104,987	138,982	(1)	(1)
Cambria			3,500	10,500
Carbon	267,971	392,907	269,593	389,859
Crawford	117,249	126,768	134,535	160,505
Cumberland	(1)	(1)	92,195	136,188
Dauphin	97,192	95,032	44,577	42,374
Elk	40,235	24,338		
Erie	172,070	208,769	130,312	168,459
Fayette	260,000	656,000	190,457	446,804
Forest	61,035	79,805	103,050	150,977
Franklin	153,955	224,390	143,198	209,542
Luzerne	362,561	428,530	468,763	554,573
Lycoming	833,023	608,260	847,649	630,090
Mercer	223,973	360,864	267,217	381,092
Monroe	38,512	54,433	205,942	330,338
Montgomery	10,000	25,060	11,000	26,050
Northampton	281,173	336,157	(1)	(1)
Northumberland	(1)	(1)	8,014	9,900
Philadelphia	599,200	339,747	625,325	429,412
Schuylkill	165,723	382,538	215,768	545,487
Somerset	2,292	6,694	(1)	(1)
Wayne	(1)	(1)	40,142	60,059
York	65,561	104,689	(1)	(1)
Undistributed [2]	3,799,815	7,665,869	3,872,971	8,017,757
Total	13,312,971	20,511,847	14,047,068	21,320,981

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes tonnage and value for counties that must be concealed as indicated by footnote 1 and for the following counties: Allegheny, Berks, Blair, Bradford, Chester (1956), Clearfield, Columbia, Huntingdon, Lancaster, Lawrence, McKean, Mifflin, Venango, Warren, Westmoreland (1955), and Wyoming.

decrease in the use of slate as flagging stone. Demand for structural and sanitary slate, blackboard slate, school slates, and slate flour increased sharply, with a slight increase in the use of slate for billiard tables. No slate was reported sold for making grave vaults and covers in 1956.

Employees of the Capital Slate Co., Inc. (East Bangor), were on strike from June to October. No other strikes were reported; however, various companies reported increased wages. Quarries were operated in 1956 in Lehigh, Northampton, and York Counties; Northampton County supplied 79 percent of the value of production. Sixteen operators were active in producing slate in 1956—14 in Northampton County and 1 each in Lehigh and York Counties.

Stone.—Production of stone in Pennsylvania in 1956 increased 1 percent in tonnage and 7 percent in value compared with 1955. Sandstone, granite, basalt, limestone, and miscellaneous stone were produced in 45 of the 67 counties; of the total value, sandstone represented 10, basalt 8, and limestone 81 percent.

Sandstone was marketed as both dimension and crushed stone, showing a combined total increase of 26 percent in tonnage and 71 percent in value compared with 1955. Higher material, wage, and labor costs, contributed to the large increase in selling price. About 64 percent more dimension sandstone was produced and marketed in Pennsylvania at a 37-percent increase in selling price. Dimension sandstone was prepared as rough construction, rubble, rough archi-

tectural, dressed, and curbing and flagging stone. All use categories except dressed stone increased in both tonnage and value over 1955. Increased use of concrete and concrete blocks for outside facings had some effect on the demand for dressed stone.

Crushed sandstone was prepared and sold as riprap, concrete aggregate, roadstone, railroad ballast, and refractory material and for other uses. Crushed sandstone for use as concrete aggregate, road material, and refractory material was the only crushed stone for which increases were reported in 1956. Demand for ganister rock for making silica brick and furnace linings was down during July and August because of the steel strike but quickly regained its usual status. In certain areas slag has become a material competitive to sandstone used as concrete aggregate and roadstone.

As in 1955, only dimension granite was sold from the granite processed in Pennsylvania. In 1956, it decreased 20 percent in tonnage and increased 15 percent in value. The granite was utilized as building stone and memorial stone and for granite surface plates. One quarry each in Bucks, Delaware, and Montgomery Counties was active in 1956.

Basalt decreased in tonnage in 1956 compared with 1955. Both dimension and crushed basalt was marketed in 1956. Crushed basalt decreased 5 percent in tonnage but increased 10 percent in value. Demand was greater in 1956 than in 1955 for all use categories except for road material and railroad ballast. The increased value was attributed principally to the higher cost of material and labor, thus requiring a higher selling price. Dimension basalt was marketed as stone for rough construction, and the crushed stone was marketed as riprap, concrete aggregate or roadstone, and railroad ballast and for other miscellaneous uses, principally roofing granules. Basalt was produced from quarries in Adams, Berks, Bucks, Chester, Delaware, and Montgomery Counties, with Delaware County being the principal area for basalt production.

The output of dimension limestone in 1956 decreased 41 percent in production and 45 percent in value, compared with 1955. The stone was produced in Bucks, Chester, and Lancaster Counties and used as rubble and rough construction stone.

Crushed limestone increased 0.5 percent in tonnage (223,078 short tons) and 3 percent ($1,507,053 value) in value. The limestone was used as concrete aggregate, fluxing agent, riprap, and railroad ballast and for agricultural purposes and miscellaneous uses. Limestone as riprap, concrete aggregate, and soil conditioner increased in tonnage and value. Despite the work stoppage in the steel industry, use of limestone as flux decreased only 6 percent in tonnage and 2 percent in value. Overall, increases in wages and in the resultant selling prices contributed to the increased value of production.

Miscellaneous stone was produced from quarries in Pennsylvania and processed and marketed as both dimension and crushed stone. Output of the dimension-stone industry decreased in both tonnage and value; the decrease in rough construction material caused a decrease in tonnage. The decreased value of curbing and flagging stone contributed substantially to the drop in total value. Both tonnage and value for crushed miscellaneous stone increased more

TABLE 11.—Stone sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Dimension stone:				
Building stone	224,232	$912,635	172,413	$1,114,847
Monumental stone	378	55,325	168	24,115
Curbing and flagging	13,711	292,859	(1)	(1)
Total dimension stone	238,321	1,260,819	172,581	1,138,962
Crushed and broken stone:				
Riprap	85,752	144,754	262,089	382,834
Concrete, road stone, and railroad ballast	15,575,172	23,314,077	17,502,458	26,668,680
Furnace flux (limestone)	9,950,775	16,714,426	9,365,869	16,314,675
Refractory	334,908	2,019,891	367,700	4,122,215
Agricultural	712,029	2,300,887	759,365	2,610,549
Other uses	17,540,666	[2] 23,163,257	16,482,925	22,592,805
Total crushed and broken stone	44,199,302	[2] 67,657,292	44,740,406	72,691,758
Grand total	44,437,623	[2] 68,918,111	[3] 44,912,987	[3] 73,830,720

[1] Included with "Building stone" to avoid disclosing individual company confidential data.
[2] Revised figure.
[3] Excludes dimension basalt.

TABLE 12.—Stone sold or used, 1955–56, by counties

County	1955		1956	
	Short tons	Value	Short tons	Value
Allegheny	(1)	(1)	9,280	$31,442
Bedford	23,865	$62,390	(1)	(1)
Berks	2,414,747	3,146,268	2,192,384	2,832,145
Blair	536,805	1,068,855	(1)	(1)
Bucks	697,483	1,269,313	745,468	1,370,960
Butler	2,452,797	4,443,739	(1)	(1)
Cambria	5,000	13,750		
Centre	2,223,352	3,786,956	2,148,594	3,641,169
Chester	1,389,214	2,171,530	2,059,717	3,139,266
Clinton	151,958	213,492	158,134	236,808
Cumberland	531,810	914,671	594,146	1,013,487
Dauphin	1,342,482	2,149,426	1,351,944	2,298,394
Fayette	324,181	769,751	(1)	(1)
Franklin	380,997	605,035	439,426	702,703
Fulton	65,428	85,924	100,312	152,847
Huntingdon	349,045	1,304,607	(1)	(1)
Indiana	2,200	9,900	1,810	8,145
Juniata	89,616	286,502	(1)	(1)
Lancaster	1,717,028	2,747,208	1,827,280	3,005,250
Lawrence	3,273,959	5,338,034	3,287,899	5,561,574
Lebanon	2,445,651	3,859,376	(1)	(1)
Lehigh	2,760,563	3,014,849	2,362,481	2,384,814
Lycoming	315,936	558,830	357,682	583,692
Mercer	(1)	(1)	500	2,500
Montgomery	5,168,336	8,219,101	4,689,348	7,770,243
Montour	393,350	536,821	(1)	(1)
Northampton	6,880,654	6,891,767	6,066,925	5,540,291
Perry	17,917	32,447	46,943	94,353
Potter	7,438	171,761	(1)	(1)
Schuylkill	11,376	17,064	(1)	(1)
Snyder	79,703	131,866	(1)	(1)
Susquehanna	3,414	59,238	(1)	(1)
Union	181,900	308,650	(1)	(1)
Washington	4,884	34,150		
Wayne	116,515	186,424	131,592	239,698
York	2,348,211	4,159,418	2,363,575	4,016,227
Undistributed [2]	5,729,808	[3] 10,348,998	13,977,547	29,204,712
Total	44,437,623	[3] 68,918,111	[4] 44,912,987	[4] 73,830,720

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes tonnage and value for counties as indicated by footnote 1 and the following counties: Adams, Armstrong, Carbon (1956), Delaware, Luzerne, Mifflin, Monroe, Northumberland, Philadelphia (1955), Somerset, Westmoreland, and Wyoming (1956).
[3] Revised figure.
[4] Incomplete total; excludes certain stones to avoid disclosing individual company confidential data.

than 100 percent, principally because of the increased demand for this material as concrete aggregate and road material. Producers of miscellaneous stone were active in Bucks, Lycoming, Montgomery, Potter, and Westmoreland Counties. Compared with the 1955 production locations, miscellaneous stone was produced also in Fayette County but not in Lycoming or Westmoreland Counties.

Sulfur.—Output of byproduct sulfur increased both in tonnage and value in 1956 with Pennsylvania ranking fifth in the nation. The elemental sulfur was recovered at the Sinclair Refining Co. Marcus Hook refinery as brimstone.

Tripoli.—Pennsylvania was 1 of the 3 States producing tripoli in 1956 ranking third, with a production of 1,000 tons. The output of rottenstone decreased slightly whereas value increased 23 percent. The ground material was used as an abrasive in such compounds as buffing compounds, metal polish, and cleaning and scouring soaps and as a filler.

METALS

Iron Ore.—Iron-ore production in Pennsylvania in 1956 was retarded by a steel strike from July 1 to August 5. All the iron ore was produced at the underground Cornwall mine and shipped by rail to the Lebanon concentrator. Magnetite, copper pyrite, and iron pyrite in the ore were recovered at the Lebanon beneficiation plant, where iron concentrate, copper concentrate, and pyrite concentrate were produced. The copper concentrate was transferred primarily to a smelter at Laurel Hill, N. Y., for recovering copper, gold, and silver. The pyrite concentrate was processed further to recover cobalt and pyrite sinter. Underground development at the Cornwall mine in 1956 consisted of extending the incline shaft 2,100 feet, advancing 5,000 feet of drift and 1,500 feet of tunnel, and diamond drilling 52,500 feet. All of the iron ore was used for pig iron and steel.

Construction was begun by Dravo Corp. on the Nation's largest sintering plant at Saxonburg, Pa. The multimillion-dollar facility was being built for United States Steel Corp. The initial capacity for the sintering plant was to exceed 15,000 tons of iron ore sintered a day. The Saxonburg plant just north of Pittsburgh will process iron ore shipped from the Mesabi range and from the United States Steel Corp. new mines in Venezuela. Each of the 3 sintering machines will be 8 feet 3 inches wide, 200 feet long, and about 50 feet high.[5]

The first shipment of nickel was made from National Lead Co. Crum Lynne (Pa.) refinery. This refinery was operated by National Lead Co. and produced metallic nickel under a government contract. Nickel oxide sinter from the Government-owned facility in Nicaro, Cuba, was used as a raw material. The nickel was sold for the production of stainless and other nickel bearing steels.[6]

Pig Iron and Ferrous Scrap.—Production of pig iron in Pennsylvania in 1956 totaled 20,450,000 net tons. Despite a decrease of 150,155 short tons of pig iron produced in 1956, consumption of scrap in making pig iron increased 458,482 short tons. In all, 38,207,026 net

[5] Blast Furnace and Steel Plant, Construction of Sintering Plants Started: Vol. 14, No. 8, August 1956, p. 948.
[6] Oil Paint and Drug Reporter, National Lead Ships First Nickel from Refinery at Crum Lynne, Pa.: Vol. 170, No. 10, Sept. 3, 1956, p. 5.

tons of metalliferous materials, 17,027,748 tons of coke, and 8,006,628 tons of flux were consumed in producing pig iron. Metalliferous materials consumed per ton of pig iron produced in 1956 totaled 1.853—slightly less than in 1955.

Consumption of pig iron and ferrous scrap in Pennsylvania in 1956 increased less than 1 percent (308,327 short tons) compared with 1955. Open-hearth furnaces continued to be the leading consumer of both pig iron and ferrous scrap, consuming 87 percent of the total pig iron used and 76 percent of the total scrap used.

TABLE 13.—Consumption of pig iron and ferrous scrap in 1955–56, by type of furnace, in short tons

Type of furnace and raw material	1955	1956
Open-hearth furnaces:		
Pig iron	18,071,822	17,883,714
Scrap	13,929,937	14,166,691
Total	32,001,759	32,050,405
Bessemer converters:		
Pig iron	671,189	716,047
Scrap	125,837	79,586
Total	797,026	795,633
Electric steel furnaces:		
Pig iron	20,503	26,715
Scrap	1,752,251	1,897,991
Total	1,772,754	1,924,706
Cupola furnaces:		
Pig iron	328,134	346,810
Scrap	754,079	767,346
Total	1,082,213	1,114,156
Air furnaces:		
Pig iron	52,402	54,812
Air furnaces—Continued		
Scrap	151,105	163,476
Total	203,507	218,288
Blast furnaces:		
Pig iron		
Scrap	1,450,662	1,532,895
Total	1,450,662	1,532,895
Ferroalloy furnaces:		
Pig iron		
Scrap	276	334
Total	276	334
Miscellaneous uses:		
Pig iron	[1] 1,456,223	1,422,020
Scrap	[2] 85,242	[2] 99,552
Total	1,541,465	1,521,572
Total Pennsylvania:		
Pig iron	20,600,273	20,450,118
Scrap	18,249,389	18,707,871
Total	38,849,662	39,157,989

[1] Includes direct castings and small quantity used in crucible furnaces.
[2] Includes small quantity used in crucible furnaces.

REVIEW BY COUNTIES

Adams.—The Hanover quarry operated by Bethlehem Limestone Co. west of Hanover in Adams County yielded limestone, which was crushed at the local plant for use as blast-furnace flux, road material, railroad ballast, agricultural purposes, and stone sand and for cement manufacture. Quantities of the crushed stone were sold under contract to nearby Government agencies. Basalt was produced by The Funkhouser Co. from an open quarry and underground mine east of Charmian in Adams County. Crushed basalt was sold for use as roofing granules and stone flour.

Sericite schist was produced by Summit Mining Corp. from an open pit near Bendersville, ground at its local mill, and sold for use as filler in asphalt products, insecticides, and joint cement.

Miscellaneous clay, used in manufacturing heavy clay products, was recovered from open-pit mines by Alwine Brick Co., New Oxford, and Gettysburg Drain Tile Works, Gettysburg.

TABLE 14.—Value of mineral production in Pennsylvania, 1955–56, by counties [1] [2] [3]

County	1955	1956	Minerals produced in 1956 in order of value
Adams	(4)	(4)	Stone, sericite schist, clays.
Allegheny	$58,081,078	$64,536,756	Coal, cement, clays, sand and gravel, stone.
Armstrong	10,197,169	15,915,421	Coal, clays, sand and gravel, stone, lime.
Beaver	4,225,167	4,687,410	Clays, coal, sand and gravel.
Bedford	551,195	2,083,765	Stone, coal, lime, sand and gravel.
Berks	8,913,688	9,671,278	Cement, stone, clays, sand and gravel, oystershell.
Blair	2,143,001	2,453,437	Stone, coal, clays, sand and gravel, lime.
Bradford	(4)	(4)	Sand and gravel, coal.
Bucks	8,821,242	7,120,640	Sand and gravel, stone, clays.
Butler	15,737,558	16,751,886	Coal, cement, stone, lime, sand and gravel, clays.
Cambria	63,592,999	68,839,370	Coal, clays, sand and gravel, crude iron oxide pigments.
Cameron	335,560	(4)	Coal.
Carbon	14,576,629	15,866,478	Coal, stone, sand and gravel, clays.
Centre	14,266,587	16,623,942	Lime, coal, stone, clays.
Chester	3,439,493	4,635,706	Stone, lime, sand and gravel, clays.
Clarion	8,578,848	14,236,105	Coal, clays.
Clearfield	(4)	(4)	Coal, clays, sand and gravel.
Clinton	2,635,528	2,745,587	Coal, stone, clays.
Columbia	6,648,621	6,186,419	Coal, sand and gravel, clays.
Crawford	126,768	160,505	Sand and gravel.
Cumberland	(4)	1,149,675	Stone, sand and gravel.
Dauphin	3,038,855	4,641,527	Stone, coal, clays, sand and gravel, lime.
Delaware	(4)	(4)	Stone, sulfur.
Elk	(4)	(4)	Coal, clays.
Erie	(4)	(4)	Sand and gravel, peat.
Fayette	41,341,340	35,322,678	Coal, clays, stone, sand and gravel.
Forest	79,805	150,977	Sand and gravel.
Franklin	844,648	932,990	Stone, sand and gravel, lime.
Fulton	(4)	399,014	Coal, stone, lime.
Greene	65,628,367	68,823,643	Coal, clays.
Huntingdon	4,315,318	5,848,287	Sand and gravel, stone, coal, clays.
Indiana	28,480,723	36,557,072	Coal, clays, stone.
Jefferson	(4)	(4)	Coal, clays.
Juniata	286,502	554,045	Stone, lime.
Lackawanna	22,017,503	28,612,975	Coal.
Lancaster	5,323,416	6,131,612	Stone, lime, coal, sand and gravel, clays.
Lawrence	17,474,987	18,978,581	Cement, stone, coal, clays, sand and gravel.
Lebanon	20,917,678	20,130,548	Iron ore, copper, stone, lime, cobalt, pyrite, gold, coal, silver.
Lehigh	26,604,947	(4)	Cement, stone, slate, oystershell.
Luzerne	87,818,001	91,793,125	Coal, stone, sand and gravel, peat, clays.
Lycoming	[5] 1,411,770	1,493,880	Sand and gravel, stone, coal, lime, tripoli, clays.
McKean	599,095	820,155	Clays, coal, sand and gravel.
Mercer	2,859,077	3,015,701	Coal, sand and gravel, peat, stone.
Mifflin	(4)	(4)	Sand and gravel, stone, lime.
Monroe	(4)	(4)	Sand and gravel, stone.
Montgomery	14,501,384	(4)	Stone, cement, lime, clays, sand and gravel.
Montour	536,821	(4)	Stone, lime.
Northampton	73,568,907	83,082,046	Cement, slate, stone, sand and gravel, coal.
Northumberland	21,418,663	26,593,629	Coal, clays, stone, sand and gravel, lime.
Perry	32,447	94,353	Stone.
Philadelphia	368,747	429,412	Sand and gravel.
Potter	171,761	(4)	Stone.
Schuylkill	53,565,714	69,799,731	Coal, sand and gravel, stone, clays.
Snyder	262,133	388,141	Clays, stone, coal, lime.
Somerset	15,326,200	22,474,172	Coal, clays, stone, sand and gravel.
Sullivan	63,426	57,042	Coal.
Susquehanna	59,238	(4)	Stone.
Tioga	421,032	486,275	Coal.
Union	308,650	(4)	Stone.
Venango	(4)	(4)	Coal, sand and gravel.
Warren	(4)	(4)	Sand and gravel.
Washington	94,690,663	95,669,087	Coal, clays.
Wayne	(3)	299,757	Stone, sand and gravel.
Westmoreland	20,377,543	20,937,309	Coal, stone, clays.
Wyoming	(4)	(4)	Sand and gravel, stone.
York	11,201,555	12,527,337	Cement, stone, lime, slate, clays, sand and gravel, mica.
Undistributed	[5] 111,121,721	178,157,713	
Total	[5] 969,910,000	1,088,867,000	

[1] Pike County is not listed, because no production was reported.
[2] Excludes value of production for LP-gases, natural gas, natural gasoline, and petroleum by counties, but value is included with "Undistributed."
[3] Excludes value of clays and stone used in the manufacture of lime and cement.
[4] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[5] Revised figure.

Allegheny.—The major portion of bituminous coal mined in Allegheny County in 1956 was from underground mines, with smaller quantities from strip and auger mines. Leading producers were: Allegheny-Pittsburgh Coal Co., William Aloe Coal Co., Butler Consolidated Coal Co., Campbell Coal Co., Duquesne Light Co., Greensburg-Connellsville Co., Harmar Coal Co., National Mines Corp., Pittsburgh Coal Co., and Republic Steel Corp.

Universal Atlas Cement Co., a subsidiary of United States Steel Corp., operated its cement plant at Universal, producing air-entrained and non-air-entrained Types I–II, portland-pozzolan, waterproof-portland, and mortar cements by the wet process. Pittsburgh Coke & Chemical Co., Green Bag Cement Division, produced cement from its plant at Neville Island. Portland-pozzolan and waterproof-portland cements were manufactured by the wet process.

Production of miscellaneous clay was utilized for manufacturing heavy clay products by Bridgeville Brick Co., Bridgeville; Van Ormer Brick Co., Inc., Pitcairn; M. Lanz Brick & Tile Co., Pittsburgh; Milliken Brick Co., Inc., Wilkinsburg; and Allegheny Brick Co., Creighton.

Sand & Gravel, Inc., operator of a dredge on the Allegheny River near Pittsburgh, recovered and processed building and paving sand and gravel. James H. McCrady, Jr. (Harmarville), produced and processed molding sand and a quantity of unwashed road sand. Keystone Sand & Gravel Co. (Pittsburgh) and Frank Bryan, Inc. (McKees Rocks), produced washed sand usable as building sand and sold the material to the United States Army Corps of Engineers (Pittsburgh) for use in repairing dams and locks.

Malli Mines (Jefferson Borough) produced miscellaneous irregular dimension sandstone for use in construction work, and Francis Matesia (Bridgeville) produced dimension sandstone for use as rubble.

Panacalite Perlite Co. (Pittsburgh) processed expanded perlite for use as plaster aggregate and Perlite Manufacturing Co. (Carnegie) for use as plaster and concrete aggregate and for miscellaneous industrial uses. Both companies purchased crude perlite from mines in Western United States.

Armstrong.—Production of bituminous coal reported in Armstrong County was mined from underground, strip, and auger mines. Leading producers were: Allegheny River Mining Co., B. & V. Coal Co., J. Russell Cravener Coal Co., Freebrook Corp., Hawk Bros. Contracting Co., Leechburgh Mining Co., M. & E. Coal Co., Inc., Powell Coal Co., Taylor Bros., and West Freedom Mining Co.

In terms of value, Armstrong County was the second leading clay-producing county in the State in 1956. Five operators of underground mines produced plastic fire clay used primarily for manufacturing refractories and heavy clay products and a smaller quantity of mortar. Producers were Kittanning Refractories, Inc., Continental Clay Products Co., and Haws Refractories Co., all at Kittanning; Kittanning Brick Co., Adrian; and Harbison-Walker Refractories Co., Pittsburgh. Freeport Brick Co. (Freeport) produced flint fire clay from an underground mine for use in manufacturing refractory firebrick and block. Worthington Ceramics Co. (Worthington), produced plastic fire clay from an open pit, which was sold for use in manufacturing heavy clay products, and Graff-Kittanning

Clay Products Co. (Worthington) produced plastic fire clay from an open pit for use at the local company plant for making sewer pipe and wall coping.

Sand and gravel recovered from a dredging operation along the Allegheny River near Ford City by J. K. Davison & Bro. was sold for use as construction and paving material. Glacial Sand & Gravel Co. (Cowansville) produced and marketed prepared building and paving sand and gravel and gravel for use as railroad ballast. Allegheny Sand & Loam Co. (Leechburg) produced sand and prepared it for use as fire or furnace sand, and Lee Don, Inc., Manorville Sand Division (Manorville), produced building sand and gravel and paving sand.

Michigan Limestone Division, United States Steel Corp., operated the Kaylor underground mine south of East Brady in Armstrong County, producing limestone for use as blast-furnace flux and road material, for agricultural purposes, and in manufacturing cement. A quantity of stone was sold to Government agencies as highway material. C. D. McCanna Plant crushed limestone produced from an underground mine at Kittanning, for use in making lime.

Hydrated lime, produced and marketed for agricultural purposes, was reported by C. D. McCanna Lime Plant, Walter Hershberger, and Robert E. Toy, all near Kittanning.

Beaver.—Beaver County ranked first in the State in 1956 in the production of clays. The leading producers of 13 reporting companies were: McLain Fire Brick Co., Division of H. K. Porter Co., Inc., Beaver; Eastvale Clay Products Co., Beaver Falls; Standard Clay Manufacturing Co., and Colonial Clay Products Co., both at Fallston; Ralph A. Veon, Inc., Darlington and New Galilee; Pen-Hio Clay Co., Cannelton; McQuiston Coal Co., Darlington; Negley Fire Clay Co. and New Castle Refractories Co., both at New Galilee; and Davis Coal Co., Beaver County, west of Negley, Ohio. Fire clay of the flint and burley type and miscellaneous clay were sold or used mainly for manufacturing heavy clay products, refractory firebrick and block, refractories for foundries, and use at steelworks. A quantity of the clay was used for the manufacture of art pottery, flower pots, glaze slip, and in pouring channels.

Ten leading producers of bituminous coal in Beaver County were: Oscar Brown, Colonial Gas Coal Co., Courtney Coal Co., Dow-Lin Coal Co., C. J. Lundy Mining Co., Negley Fire Clay Co., North Sewickley Coal Co., Sunnyside Coal Mining Co., Tasa Coal Co., and R. A. Veon. Underground, strip, and auger mines were operated in the county.

Beaver Sand Co. (Beaver) produced washed sand and gravel for construction use. Shippingport Sand & Gravel Co. operated a dredge and fixed plant near Shippingport, producing prepared sand and gravel for building and paving purposes.

Bedford.—New Enterprise Stone & Lime Co., Inc., operated a limestone quarry and crushed the stone at the Aschom plant (Everett) for use as road material. Quantities of crushed limestone also were sold to Government agencies as road material. Ganister rock sold or used for manufacturing silica brick and furnace or converter lining was quarried by Leap Ganister Rock Co. (Madley).

Leading producers of bituminous coal in Bedford County were: Ark Coal Co., Bunker Hill Coal Co., Fry Coal & Stone Co., Ellsworth Douglas, Helen Coal Co., Hickory Hill Coal Co., Kenneth G. Richards, Tenley Coal Co., Top Coal Co., and Ralph Wills. Coal was mined from underground and strip operations.

Quicklime was produced and sold for agricultural purposes by J. Mason Kerr, operator of the Gravel Pit Kilns near Hyndman. New Enterprise Stone & Lime Co., Inc., produced hydrated lime as agricultural, chemical, and industrial lime at it Aschom plant at Everett.

Feight Bros. (Everett) produced sand and washed it at a local preparation plant for use as building material.

Berks.—Allentown Portland Cement Co. operated quarries at Evansville and Oley, producing crushed limestone and cement rock utilized at the Evansville No. 1 plant for manufacturing portland cement (Types I–II, Type III, air-entrained, and non-air-entrained) and mortar cement.

Eastern Lime Corp. reported output of crushed limestone from the Hinterleiter quarry and crusher at Kutztown for road material and agricultural purposes. This company also began developing a new stone quarry and plant at Oley, to begin production in 1957. Crushed limestone, usable as road material and railroad ballast, was produced from a quarry by Berks Products Corp. (Reading). Some of the stone was sold to local Government agencies. E. J. Breneman, Inc., operated a quarry and plant at Sinking Spring, producing crushed limestone for road material, and sold a major portion under contract to local Government agencies. The John T. Dyer Quarry Co. operated 3 quarries—1 each at Monocacy, Birdsboro, and Robeson—producing crushed basalt for use as road material, railroad ballast, and riprap. Stowe Trap Rock Co. (Douglassville) produced crushed basalt for use as road material and railroad ballast.

Miscellaneous clay was produced by Glen-Gery Shale Brick Corp. from open-pit mines at Wyomissing and Shoemakersville, for use in manufacturing heavy clay products.

John H. Gring (Sinking Spring) produced building sand and gravel and paving gravel for use by local builders. Building sand and gravel was produced and sold by Schildt Bros. (Temple).

Reading Poultry Feed Co. (Reading) crushed oystershell for use as mineral food and poultry grit.

Blair.—Limestone was quarried, crushed, and sold primarily as road material by Chimney Rocks Lime & Stone Co., Hollidaysburg; Eldorado Stone Co., Altoona; and New Enterprise Stone & Lime Co., Inc., Roaring Spring and Hollidaysburg. Several producers marketed the limestone to local Government agencies for use as road material. Sproul Lime & Stone Co. (Claysburg) sold pulverized agricultural limestone. General Refractories Co. (Claysburg) and J. L. Hartman Co., operator of the Sara Furnace quarry (Sproul), produced and ground quartzite for making silica brick. Basalt Trap Rock Co. produced quartzite from its quarry at Williamsburg for use as railroad ballast, road material, and riprap.

Producers of bituminous coal in Blair County in 1956 were: Burkhart Coal Co., Cavalier Coal Co., Margaret Heston, Lawrence Sherbine, and Stone Bridge Coal Co. Both underground and strip mines were operated.

Kaolin, produced by Grannas Bros. from the No. 1 open-pit mine near Williamsburg, was sold for use in manufacturing fire brick and block. Miscellaneous clay was produced by Blair Clay Products, Inc. (Altoona) and used for making building brick. Woodbury Clay Co. (Williamsburg) produced and sold plastic fire clay for making mortar, and Harbison-Walker Refractories Co. (Oreminea) produced plastic fire clay for use in manufacturing firebrick and block.

General Refractories Co. (Frankstown) reported producing gravel as building material. Frankstown Sand Supply and George G. Trude (both at Frankstown) produced and sold washed sand for building purposes.

A quantity of hydrated lime for agricultural use was manufactured and sold by Chimney Rocks Lime & Stone Co. (Hollidaysburg).

Bradford.—Karl D. Shiner (Towanda, Wysox Township), the only producer of sand and gravel in Bradford County, reported output of sand and gravel washed and screened at a local processing plant for use as building and paving material. A small quantity of unwashed bank-run gravel was sold for miscellaneous uses.

Bituminous coal was mined from a strip mine by Paul Percival, the only producer of coal in Bradford County.

Bucks.—Bucks County continued to lead in sand and gravel production in the State in 1956 but showed a slight decrease in production and value compared with 1955. Eight companies reported production of sand and gravel, output of which was sold primarily for structural and paving material. Producers were: Amico Sand & Gravel Co., Fallsington; Durnan & Good and Frank Casilio & Sons, Upper Black Eddy; Warner Co., Van Sciver and Dredge Franklin plants, Silvi Sand & Gravel Co., and the Brennan Sand Co., Tullytown; Riegelsville Sand & Gravel Co., Riegelsville; and A. L. Lewis, New Hope.

Bituminous Service Co. (Buckingham) and New Hope Crushed Stone Lime Co. (New Hope), recovered limestone from quarries and crushed the stone at local plants for road material. New Hope Crushed Stone Lime Co. sold some of the material to Government agencies for local Government projects. Edward Karpinski produced dimension limestone for use as rubble, from the Karpinski quarry at Janney Station. Production of basalt from the Rock Hill quarry at Quakertown by The General Crushed Stone Co. was crushed for use as road material and railroad ballast. A quantity of road material was sold to various Government agencies. David D. Derstine, east of Telford in Bucks County, quarried and crushed basalt for road material.

Coopersburg Granite Co. produced dressed dimension granite from a quarry near Coopersburg, marketed under the trade name "American Premier Blue-Black Granite," for use as granite surface plates. Miscellaneous dimension stone as rough and dressed building stone, and crushed stone as road material was recovered from the Edison quarry, Edison, and crushed at the local plant by C. Bucciarelli & Sons. A. & L. Kauffman operated the Rushland quarry, Rushland; George Wiley, Wiley's quarry (blue stone), Point Pleasant; and Samuel M. Yoder Estate operated the Blooming Glen Stone Crushing Works and quarry at Blooming Glen. All produced crushed miscellaneous stone for road material.

Quakertown Brick & Tile Co., Inc. (Quakertown), reported output of miscellaneous clay for use in the manufacture of standard size building brick.

Hyzer & Lewellen (Southampton) imported crude vermiculite from Africa and processed the material at its exfoliating plant for use in manufacturing packaging acids, plaster, house insulation, and concrete.

Butler.—Production of bituminous coal in Butler County was mined by underground, strip, and auger methods. Leading producers were: Allison Engineering Co., Chutz Bros., Grove City Construction Co., Grubbs Construction Co., Kerry Coal Co., Miller & McKnight Coal Co., Sunbeam Coal Corp., Tri County Fuel Co., West Freedom Mining Co., and Winters & Evans.

Penn-Dixie Cement Corp. produced limestone from its underground mine at West Winfield and utilized the crushed stone at the No. 9 plant for the manufacture of cement. Portland cement of the non-air-entrained Types I–II and III, and masonry cement were produced and marketed by this company.

Grove City Limestone Co. recovered limestone from a quarry and crushed the stone at the local Branchton plant for road material and agricultural purposes. Michigan Limestone Division, United States Steel Corp., mined limestone from the Annandale underground mine and crushed the stone at Boyers for use as blast-furnace flux, road material, and railroad ballast and in manufacturing cement. Both companies sold road material to Government agencies.

Hydrated lime manufactured and sold for agricultural use, sewage treatment, and water purification and quicklime for use in open-hearth and electric furnaces, were produced by Mercer Lime & Stone Co., Inc., near Branchton.

Production of building sand and gravel, from a pit and fixed plant at Slippery Rock, was reported by H. W. Cooper. Harold M. Martsolf reported no production of sand and gravel in 1956, as he was erecting a new plant near Portersville (Muddy Creek Township).

D. B. Boosel operated an open-pit mine near Slippery Rock, producing plastic fire clay sold for use in manufacturing refractories; and Scott Borland mined miscellaneous clay from an open-pit mine at Mars, used for making heavy clay products.

Cambria.—The major portion of bituminous coal mined in Cambria County in 1956 was from underground mines, with smaller quantities from strip and auger mines. Some leading producers were: Barnes & Tucker Co., The Berwind White Coal Mining Co., Bethlehem Limestone Co., Bethlehem Steel Co., Bird Coal Co., Eastern Gas & Fuel Association (Coal Division), Johnstown Coal & Coke Co., Pennsylvania Coal & Coke (Penn Texas Division), Rich Hill Coal Mining Co., Sterling Coal Co., and Vinton Coal & Coke Co.

Triangle Clay Products Co. (Johnstown) produced miscellaneous clay from an open pit, and Patton Clay Manufacturing Co. (Patton) produced fire clay from an underground mine. Both companies used the clay for manufacturing heavy clay products. Hiram Swank's Sons, Inc., operated the Swank No. 24 underground mine at South Fork, producing flint fire clay used for manufacturing refractory sleeves, nozzles, and stoppers. The Blandburg Frick No. 2 underground mine near Dean, operated by Harbison-Walker Refractories

Co., yielded plastic fire clay used for manufacturing glass refractories.

Nicosia Stone Quarry produced a quantity of building sand and gravel from a pit and fixed plant at Johnstown.

Lanzendorfer Trucking Co. produced and marketed crude iron oxide pigments of the yellow sulfur mud variety from its No. 31 mine near Twin Rocks for use as paint pigments.

Cameron.—Bituminous coal, the only mineral commodity produced in Cameron County in 1956, was recovered from stripping operations by Rydesky Mines and by S. Brake Slyder.

Carbon.—A total of 10 companies reported production of anthracite in Carbon County in 1956. Producers were: A. R. Chamberlain Coal Co., Coaldale Mining Co., Inc., Glen Alden Corp., Gravine Coal Co., Jackson Coal Co., Lehigh Valley Coal Co., Panther Valley Coal Co., Spearhead Mining Co., Valley Stripping Corp., and Wat-Rap Coal Co. Underground mines, strip pits, and culm banks were operated in this county for anthracite.

North American Refractories Co., the only producer of stone in Carbon County, recovered ganister rock from the Little Gap quarry (Palmerton), crushing and using the stone in producing silica brick.

Alliance Sand Co. operated its pit and fixed plant near Palmerton, producing washed sand for use as building and paving material, fire or furnace sand, and engine sand. Butz Lumber Co. reported the output of washed sand, for use as building material, from a pit and fixed plant near Palmerton. Wagner Sand Co. produced building sand and paving sand and gravel from a pit east of Hazleton in Carbon County.

Panther Valley Coal Co., Inc. (Lansford), produced miscellaneous clay as a byproduct of anthracite mining and sold the clay for use in manufacturing lightweight aggregate.

Centre.—Three companies manufactured lime in Centre County. Standard Lime & Cement Co. (Pleasant Gap) produced only quicklime; National Gypsum Co. and Warner Co. (both of Bellefonte) produced both quicklime and hydrated lime. Primary uses of lime were for agricultural lime, various chemical and industrial limes, and as a building material.

Bituminous coal produced in Centre County was mined from underground and strip mines. Ten leading producers were: Robert Bailey, R. S. Carlin, Inc., Cherry Run Coal Mining Co., Inc., Elliot Coal Mining Co., H. & R. Coal Co., Morgan Coal Co., Penbrook Contracting Corp., River Hill Coal Co., Rice Bros. Coal Co., and C. J. Semple.

Limestone was recovered in 1956 in Centre County from 2 underground mines and 4 quarries. Limestone was produced from underground mines by Warner Co., Bellefonte Division, Bellefonte, and the crushed stone was marketed mainly as road material, railroad ballast, and dust for coal mines and for manufacturing lime and glass. Standard Lime & Cement Co. (Pleasant Gap) produced crushed limestone for use as stone sand and manufacturing lime. Limestone recovered from four quarries was sold or utilized primarily for road material and blast-furnace and open-hearth flux, by Whiterock Quarries, Pleasant Gap; National Gypsum Co., Bellefonte; Neidigh Bros. Limestone Co., Inc., State College; and Valley View Lime Co., Marion Township.

McFeely Brick Co. produced quartzite from its Port Matilda quarry and shipped the stone by railroad to its Latrobe plant for making silica brick. This firm sold its operation to General Refractories Co. (Philadelphia) in February 1956.

Harbison-Walker Refractories Co. operated the Blair open-pit mine, producing plastic fire clay. General Refractories Co. (Orviston) produced flint fire clay from an underground mine, and J. H. France Refractories Co. (Snow Shoe) produced flint fire clay from an open pit. The total production of the three companies was used for manufacturing refractory firebrick and block.

Chester.—W. E. Johnson, Inc., operated a quarry and crusher at Paoli, producing dimension limestone for use as rough construction stone and crushed limestone for road material. A quantity of road material was sold to local Government agencies. Warner Co. produced limestone from its Cedar Hollow quarry and crushed the stone at Devault, for use as blast-furnace flux, road material, agricultural purposes, and chemical uses and in manufacturing lime. Valley Forge Stone Co. (Malvern) produced crushed limestone from a quarry and crusher for use as blast furnace flux and road material. Bradford Hills Quarry, Inc., quarried limestone and crushed the stone at the Downingtown plant for use as road material, and sold some to local Government agencies.

Black diabase dimension stone recovered from a quarry at Saint Peters by French Creek Granite Co. was sold for use as building material. Basalt, quarried and crushed by Keystone Trappe Rock Co. (Cornog) and V. DiFrancesco & Sons (Devault), was sold primarily for use as road material and railroad ballast. Both companies sold stone as road material to various Government agencies. Dimension sandstone was quarried by Abram T. Minor from the Avon-Grove quarry, and Alfred V. Moulder, Avondale Colonial quarry, both at Avondale; and Albert Rotunno, Rotunno quarry, West Grove. The stone was sold or used by the producers as rough construction stone, rubble, building stone, and curbing and flagging stone.

The only producer of lime in Chester County was Warner Co. from its Cedar Hollow plant near Devault. Output of hydrated lime was sold principally as mason lime and quicklime for use as agricultural lime, in sewage treatment, and in manufacturing magnesite.

A. T. Harris Sand Co. operated a quarry and crusher at Honey Brook, producing ground sand for foundry uses.

Miscellaneous clay recovered from open pits by Phillip D. Cope (Lincoln University) was utilized for manufacturing flowerpots, and clays produced by McAvoy Vitrified Brick Co. (Phoenixville) were used for manufacturing common building brick.

Clarion.—Leading producers of bituminous coal in Clarion County were: Allison Engineering Co., H. N. McNutt Coal Co., Mac Coal Co., Mays Coal Co., E. M. Reed Contracting Co., Inc., Harold A. Siegel Coal Co., W. Pershing Stahlman Coal Co., Inc., W. P. Stahlman, G. I. Stiles & Co., and Zacherl Coal Co. Coal was mined from strip, underground, and auger mines.

Eight companies operated open-pit and underground clay mines, producing flint and plastic fire clay and miscellaneous clay, sold or used by producers for manufacturing refractory firebrick and block, mortar, and heavy clay products. Clay producers were: Niles Fire

Brick, Division Mexico Refractories Co., Lucinda Clay Co., Harbison-Walker Refractories Co., and J. F. Eiswerth Estate, all near Lucinda; New Bethlehem Tile Co., Climax Fire Brick Co., and Frank B. Pope Co., all at New Bethlehem; and McLain Fire Brick Co. (Division of H. K. Porter Co., Inc.), St. Charles.

Clearfield.—Leading producers of bituminous coal in Clearfield County in 1956 were: Robert Bailey, Benjamin Coal Co., Bradford Coal Co., Earl M. Brown Co., Cambria Clearfield Mining Co., Diamond T. Strip Mining Corp., The Morrisdale Coal Mining Co., Moshannon Smithing Coal Corp., Penbrook Contracting Co., and Shawville Coal Co. Bituminous coal was produced from underground, strip, and auger mines; the majority of the coal came from stripping.

Clearfield County was the leading clay-producing county in Pennsylvania in 1956, with 23 percent of the total value of clay output. Eighteen underground and open-pit clay mines were operated by 15 companies producing plastic and flint fire clay and miscellaneous clay. The clay was sold or used by the producers, mainly in manufacturing refractory firebrick and block and heavy clay products. Ten leading clay producers, in order of importance, were: Harbison-Walker Refractories Co., various mines in Clearfield County; General Refractories Co., Clearfield; Williamsgrove Clay Products Co., Inc., Bigler; North American Refractories Co., Curwensville; Hiram Swank's Sons, Inc., Boardman; W. K. Turner & Sons, Wallaceton; Blair Clay Products, Inc., Curwensville; Robinson Clay Products Co. of Pa., Clearfield; Falls Creek Refractories Co., Curwensville; and Laclede-Christy Co., Division of H. K. Porter Co., Inc., Henderson, Wallaceton, Clearfield, Osceola Mills, and Bigler.

Clearfield Limestone Corp. began a new sand and gravel operation near DuBois in February 1956. Quantities of paving gravel were recovered by this company, although adverse weather conditions affected installation of the plant and production of sand and gravel.

Exfoliated vermiculite was produced by Harbison-Walker Refractories Co. at one of its brick plants at Clearfield, utilizing the material for the manufacture of insulating firebrick.

Clinton.—Leading producers of bituminous coal in Clinton County in 1956 were: Joseph Antosh, Harry Batschelet Estate, Martin & Philip Barnyak, C. V. Fink & Son, R. C. Gillen, Parsons Bros., John E. Teeter, Thomson Coal Co., D. G. Wertz Coal Co., and Frank Winkelman. Bituminous coal was produced from underground, strip, and auger operations.

Lycoming Silica Sand Co. operated the Salona quarry and plant at Salona, producing crushed limestone usable as road material and railroad ballast.

North American Refractories Co. produced plastic fire clay from an underground mine near Lock Haven and flint fire clay from an open-pit mine near Renovo. All material was used for manufacturing refractory fire brick and block and a small quantity of mortar. Mill Hall Clay Products, Inc. (Castanea), produced miscellaneous clay from an open pit for use in making heavy clay products. Kelsey Mining Co. (Lock Haven) reported production of diaspore-type fire clay from an open pit, sold for manufacturing refractory high-alumina brick.

Columbia.—Output of anthracite in Columbia County was reported by operators of underground mines, strip pits, culm banks, and dredges. Ten of the leading producers were: Coates Coal Co., Hazlebrook Coal Co., L. & M. Coal Co., Miller Coal Co., Pine Ridge Mining Co., Raven Run Coal Co., Reading Anthracite Co., Sanchez Construction Co., Sullivan Trail Coal Co., and Susquehanna Collieries Division of The M. A. Hanna Co.

Bloomsburg Sand & Gravel Co. (Bloomsburg) recovered sand and gravel from a pit and processed the material at its local plant for use as building material.

Lloyd E. Eister produced miscellaneous clay from an open pit near Briar Creek for use in manufacturing heavy clay products.

Crawford.—W. L. Dunn (Cochranton) reported output of bank-run sand and gravel washed and screened at a local processing plant and marketed for use as paving material. Meadville Supply Co. produced washed building sand and gravel and a quantity of unwashed gravel for miscellaneous uses, from a bank and local plant at Saegertown. Conneaut Lake Sand & Gravel (formerly Sand & Gravel Supply) produced bank-run sand and gravel processed for use as building sand and gravel and paving sand and a quantity of unwashed gravel for building and paving material at Conneaut Lake. Fairfield Sand & Gravel Co. (Cochranton) produced sand for building and paving purposes, as well as molding sand.

Cumberland.—Locust Point Stone Quarries produced crushed limestone from a quarry and plant at Mechanicsburg, for use as road material and for agricultural purposes. Crushed limestone was recovered from quarries, for use as road material, by Valley Quarries Inc., Shippensburg; R. W. Smith & Son, Bowmansdale; and Hempt Bros., Camp Hill.

R. A. Bender & Son (Mount Holly Springs) and C. & L. Goodhart (Walnut Bottom) recovered sand from pits and processed the material for use as building sand at the local company plants. Hempt Bros. reported producing washed paving sand and gravel at its pit and plant at Camp Hill.

Kaolin, sold for use in making portland and other hydraulic cements, was recovered by Philadelphia Clay Co. from an open pit near Mount Holly Springs.

Dauphin.—Bethlehem Limestone Co. recovered limestone from a quarry at Steelton, crushing the stone at its local plant for use as blast-furnace flux, road material, railroad ballast, and stone sand and in refractories. Hoffman Bros. & Wilson, Inc., operated the Elder quarry at Harrisburg, producing limestone crushed for use as road material. Both companies sold crushed stone under contract to Government agencies. H. E. Millard Lime & Stone Co. produced limestone from its underground mine west of Palmyra in Dauphin County, crushed for use as blast-furnace flux, road material, railroad ballast, and agricultural purposes. Quantities of limestone were utilized at the company Swatara plant for manufacturing cement and quick and hydrated lime.

Seven companies produced anthracite in Dauphin County in 1956. Producers were: Dayton Breaker, Howard Koppenhaver, Reed & Weist, Rhoades Construction Co., Spring Glen Coal Co., Upper Dauphin Coal Co., and Wisconsino Washery, Inc. Underground

mines, strip pits, culm banks, and dredges were operated by these producers.

Bethlehem Limestone Co. produced miscellaneous clay from an open pit near Steelton and sold the material for use in manufacturing refractories for foundries and steelworks, and covering for underground pipelines. Glen-Gery Shale Brick Corp. (Harrisburg and Middletown) produced miscellaneous clay and used it for manufacturing building brick.

F. H. Downey, Inc., operated a dredge on the Susquehanna River near Harrisburg and produced molding sand. Paving sand and gravel was recovered from a pit and fixed plant by Highspire Sand & Gravel Co., Ltd. (High Spire).

Delaware.—Two stone quarries and plants operated by The General Crushed Stone Co. (Glen Mills) and V. DiFrancesco & Sons (Llanerch) yielded crushed basalt for use as road material and railroad ballast. Both companies sold stone to adjacent Government agencies for various uses. Lima Building Stone Quarry, Inc. (Lima), quarried irregular-shaped dimension granite for use as construction material. Dimension sandstone for use as rough construction and rubble, was produced by Media Quarry Co. (Media).

Sinclair Refining Co. produced brimstone as a byproduct in the liquid purification of gas by the Claus-type process at its Marcus Hook Refinery (borough of Trainor).

Crude perlite from Western United States was purchased by Perlite Products Co., processed at its local expanding plant at Primos, and sold for use in plaster, concrete, refractories, and horticultural products.

Elk.—Bituminous coal produced in Elk County was mined from underground, strip, and auger operations. Leading producers of bituminous coal were: Betta & Meixel, Blue Valley Coal Co., Brandy Camp Coal Co., Hard Coal Co., W. C. Miller, New Shawmut Mining Co., Perry & Vonslander, P. & N. Coal Co., Inc., Walburn Coal Co., and Wabash Ridge Corp.

Saint Marys Sewer Pipe Co. (St. Marys) produced plastic-type fire clay from an open pit, utilized at the local plant for making heavy clay products. Wm. J. Meyer produced plastic-type fire clay from an open pit near St. Marys and sold it for use in manufacturing firebrick.

Erie.—Peerless Mineral Products Co. reported production of unwashed molding sand from a pit near Springfield. Wagner Concrete Building Products (Erie) produced a quantity of prepared gravel for miscellaneous uses and sold its operation to A. Duchini Co. in December 1956. Building sand and gravel was mined by North Girard Concrete Works (Lake City). Nickel Plate Sand & Gravel Co. (near Fairview) recovered washed sand and gravel for use as construction and paving material and unwashed bank gravel for miscellaneous uses.

Reed-sedge and humus peat was produced by Corry Bog, Inc., from a bog near Corry.

Fayette.—Bituminous coal was produced in Fayette County from underground, strip, and auger mines—the major portion from strip mines. Leading producers were: Bridgeview Coal Co., Davidson-Connellsville Coal & Coke Co., Eastern Gas & Fuel Associates, Coal

Division; Eberly Coal & Coke Co., Latrobe Construction Co., Marsolino Construction Co., Menallen Coke Co., National Mines Corp., Republic Steel Corp., and United States Steel Corp.

Robert N. Matthews (Uniontown) reported production of plastic and flint fire clay; Big Savage Refractories, Division of Mexico Refractories Co. (Ohiopyle), plastic fire clay; and Harbison-Walker Refractories Co. (Ohiopyle), flint fire clay. Material from these three companies was sold or used by the producers for the manufacture of firebrick and block. Layton Fire Clay Co. (Layton) produced miscel laneous clay from open-pit and underground mines and utilized its production in manufacturing heavy clay products.

Output of limestone from the Lake Lynn quarry by Vesco Corp. was crushed at a portable plant for use as road material and dust for coal mines and for agricultural purposes. Crushed sandstone usable for road material was produced from a quarry and crusher by Connellsville Bluestone Co. near Scottdale. Quantities of the material were sold to State and local Government agencies. General Refractories Co. produced ganister rock from the Childs quarry at Layton, moving it by tramway to a nearby plant for use in manufacturing silica brick.

Sand and gravel washed and screened for building and paving purposes was recovered by dredging at Point Marion by McClain Sand Co.

Forest.—Tionesta Sand & Gravel mined building sand and gravel, paving sand, and gravel for miscellaneous uses from a pit at Tionesta and washed and screened the material at a local plant.

Franklin.—Crushed limestone sold primarily for use as road material, and railroad ballast and for agricultural purposes was recovered by 6 operators of 7 quarries and crushing plants. Producers were: New Enterprise Lime & Stone Co., Inc., Dry Run; Fry Coal & Stone Co., Williamson and Zullinger; Pinola Lime Co., Shippensburg; Valley Quarries, Inc., Chambersburg; and Baer & Martin, Orrstown. Quantities of limestone were sold under contract to Government agencies for road material.

Mount Cydonia Sand Co., Inc., and Caledonia Sand Co. (both near Fayetteville) produced washed sand from pits and fixed plants for use as building material. E. L. Dayhoff & Sons recovered a quantity of paving sand.

Frank L. Heinbaugh operated the Blue Spring Lime plant at Mercersburg and produced quicklime for agricultural purposes.

Fulton.—Rockhill Coal Co., the only producer of bituminous coal in Fulton County, mined coal from a strip operation.

Limestone was produced by H. B. Mellott Estate, Inc., from the Charleton quarry (Warfordsburg) and the Morton quarry (Big Cove Tannery). The limestone was crushed and sold for road construction and agricultural purposes. Quantities of the road material were sold under contract to Government agencies.

Quicklime was produced and sold for agricultural purposes by John P. Martz & Son (Hustontown).

Greene.—Major production of bituminous coal in Greene County was mined from underground mines, with a small quantity from strip mines. Leading producers were: The Buckeye Coal Co., Crucible Steel Co. of America, Duquesne Light Co., Emerald Coal & Coke

Co., Jimmie's Coal Co., Jones & Laughlin Steel Corp., Mather Collieries, Rosedale Coal Co., Rosedale Mining Co., and United States Steel Corp.

Miscellaneous clay, recovered from an open pit near Waynesburg by Greene County Brick & Stone Co., was used for manufacturing heavy clay products.

Huntingdon.—Fire or furnace sand and a quantity of sand for miscellaneous uses was produced by Alexandria Fire Clay Co. from a pit and local plant at Alexandria. Pennsylvania Glass Sand Corp. operated a quarry and crusher at Mapleton Depot, recovering sand for use as glass sand, molding sand, grinding and polishing sand, and engine sand and for miscellaneous uses. In addition, ground sand was produced primarily for use in making enamel, foundry molds, glass, and pottery and as an abrasive in a filler.

Tyrone Lime & Stone Co. quarried limestone from the Stover quarry east of Tyrone in Huntingdon County and crushed it at a local plant for use as road material and for agricultural purposes. Limestone recovered from a quarry at Union Furnace by Warner Co., Bellefonte Division, was crushed at a local plant and marketed for use as riprap, road material, and railroad ballast. New Enterprise Stone & Lime Co., Inc. (McConnellstown), quarried and crushed limestone for road material and sold a quantity under contract to Pennsylvania Department of Highways. Output of ganister rock, crushed for use in manufacturing silica brick, was quarried by Harbison-Walker Refractories Co. (Mount Union) and North American Refractories Co. (Three Springs).

Leading producers of bituminous coal in Huntingdon County in 1956 were: Ace Coal Co., Allen Coal Co., Kenneth Crotsley, Adam J. Black, Helm Coal Co., L. M. Hutcheson, Ramper & Schank, Warren L. Reed, Rockhill Coal Co., and Wrays Hill Coal Co. The coal was mined from underground and stripping operations.

Alexandria Fire Clay Co. produced and sold plastic fire clay recovered from an open pit near Alexandria.

Indiana.—The major output of bituminous coal produced in 1956 in Indiana County was from underground mines, followed by strip and auger mines, in order of importance. Leading producers were: Arcadia Co., Inc., Clearfield Bituminous Coal Corp., Conemaugh Mining Co., Crichton Coal & Coke Co., H. & H. Coal Co., Imperial Coal Corp., Morrisdale Coal Mining Co., P. & N. Coal Co., Pine Township Coal Co., Joseph Ragalini, and Rochester & Pittsburgh Coal Co.

Hiram Swank's Sons, Inc., produced plastic fire clay from the Swank No. 6 underground mine near Clymer and utilized the clay for manufacturing pouring refractories such as sleeves, nozzles, stoppers, etc.

Smicksburg Lime (Smicksburg) mined a small quantity of crushed limestone from an underground mine for agricultural purposes.

Jefferson.—Leading bituminous-coal producers in Jefferson County were: Anita Coal Mining Co., Gregg & Riddle Coal Co., Knisley Coal Co., F. A. Lorenzo, Rudolph Lundblad, Northwestern Mining & Exchange Co., P. & N. Coal Co., St. Marys Sewer Pipe Co., Spencer & Marsh Coal Co., Inc., and Worthville Coal Co. The coal was mined from underground and stripping operations.

Hanley Co. produced plastic fire clay from an underground mine near Summerville, and The Brockway Clay Co. (Brockway) produced plastic fire clay and miscellaneous clay. The entire output of clays was used in manufacturing heavy clay products. Flint fire clay was recovered from an underground mine near Brookville by Henry O'Neill & Co. and marketed for use in the manufacture of refractory firebrick and block.

Juniata.—Limestone quarried and crushed principally for road construction was produced by W. N. Quigley (Mifflintown) and Juniata Limestone Co. (McAlisterville). National Refractories Division, Mexico Refractories Co. quarried ganister rock and utilized the crushed stone in manufacturing silica brick at its Van Dyke plant (Thompsontown).

Fulkroad Lime Quarry (near Mifflintown) produced a small quantity of quicklime for agricultural purposes.

Lackawanna.—Anthracite (the only mineral commodity produced in Lackawanna County in 1956) was mined from underground mines, strip pits, and culm banks. Leading producers were: Bellevue Coal Co., DeAngelis Coal Co., DeAngelis Supreme Anthracite Co., Gillen Coal Co., Hudson Coal Co., Moffat Coal Co., Northwest Coal Co., Perry Construction Co., Turnpike Coal Co., and Village Slope Coal Co.

Lancaster.—Limestone was recovered from 15 quarries operated by 13 companies in Lancaster County in 1956. Two of the companies—J. C. Showalter (Blue Ball) and L. F. Zook & Sons (Bareville)—produced dimension limestone as rough construction stone and crushed limestone as road material. Crushed limestone, principally for use as road material and stone sand, for agricultural purposes, and for manufacturing lime was produced by The J. E. Baker Co., Bainbridge; Binkley & Ober, Inc., East Petersburg; David M. Burkholder, Martindale; Erbs Limestone Quarry, Lititz; J. Miller Eshleman, Landisville; A. G. Kurtz & Sons, Inc., Denver; Landis Stone Meal Co. and Heisey Bros., both at Rheems; Ivan M. Martin, Inc., Blue Ball; D. M. Stoltzfus & Son, Inc., Quarryville and Talmage; and Bradford Hills Quarry, Inc., Lititz, and west of Morgantown in Lancaster County.

The J. E. Baker Co. manufactured dead-burned dolomite at its Billmyer plant near Bainbridge and marketed it as refractory material. Amos K. Stoltzfus produced quicklime for agricultural purposes at the Maxwell Hill plant 2 miles west of Morgantown.

Anthracite was recovered in Lancaster County by dredging operations.

Milton Grove Sand, Inc. (Milton Grove), and Hempt Bros. (Elizabethtown) recovered sand from pits and processed it for use as paving material.

Miscellaneous clay, utilized entirely for the manufacture of heavy clay products, was recovered from open pits by Glen-Gery Shale Brick Corp., Ephrata, and Lancaster Brick Co., Lancaster. Plastic fire clay was recovered from an open pit near Narvon by Whitaker Clay Co. and marketed for use in the manufacture of high-alumina refractories.

Lawrence.—The Bessemer Limestone & Cement Co. cement plant at Bessemer produced air-entrained Types I–II, non-air-entrained Types I–II, Type III, portland-pozzolan, and waterproof-portland cement. Mortar cement also was produced and marketed under the

trade name "Bessemer Mortar." Medusa Portland Cement Co. produced cement from its plant at Wampum. Production consisted of Types I–II, and Type III, waterproof-portland cement, and "Brikset" mortar cement.

A quarry and crusher operated by Michigan Limestone Division, United States Steel Corp., at Hillsville produced crushed limestone for use as blast-furnace and open-hearth flux and road material and for manufacturing cement. Crushed limestone for use as road material and in manufacturing cement was produced by The Bessemer Limestone & Cement Co. from a quarry and crusher at Bessemer. New Castle Lime & Stone Co. worked its quarry and crusher at Mahoning Township, producing crushed limestone usable for road construction, agricultural purposes, and dusting for coal mines. Medusa Portland Cement Co. recovered limestone from its quarry and crushed the stone at its plant at Wampum, for manufacturing cement.

Bituminous coal produced in Lawrence County was obtained from underground and strip mines. Leading producers were: Ambrosia Coal & Construction Co., Bessemer Limestone & Cement Co., Clark & Kechmar Coal Co., Corry Excavating & Mining Co., Dodds Coal Co., J. H. Filby Coal Co., Ivywood Coal Co., Keystone Valley Coal Co., Lake Erie Mining Enterprises, Inc., and West Freedom Mining Co.

Keystone Sand & Gravel Co. (New Castle) operated an open-pit mine producing miscellaneous clay and marketed it for use in manufacturing refractories. Plastic fire clay and miscellaneous clay were recovered from open pits by Metropolitan Brick, Inc. (near Bessemer), and Fenati Brick Co., Inc. (New Castle), for use in manufacturing heavy clay products.

Sand and gravel recovered from a pit at West Pittsburgh by Mahoning Valley Sand Co. was processed at the local plant for use as construction and paving material, and a quantity of gravel for fill. Superior Sand & Supply Co. reported output of paving sand and gravel from a pit and plant near Eastbrook. United States Army Corps of Engineers (Philadelphia), purchased a quantity of sand and gravel from commercial producers for use in concrete construction.

Zonolite Co. produced crude vermiculite from mines in Western United States and imported a quantity from South Africa, producing exfoliated vermiculite at its plant at Ellwood City.

Lebanon.—Lebanon was the only county in the State in 1956 in which metallic ores were produced. The Cornwall mine and Lebanon concentrator plant operated by Bethlehem Cornwall Corp., a subsidiary of Bethlehem Steel Co., yielded magnetite iron ore from which gold, silver, copper, cobalt, and pyrite were recovered as byproducts.

Of the 6 companies producing crushed limestone in Lebanon County, 3 reported output for road material only—Fiala Crushed Stone Corp. and Becker Bros. (both of Annville) and Pennsylvania Aggregates, Inc. (Cornwall). Calcite Quarry Corp. produced crushed limestone usable as flux, and road material from a quarry and crusher near Lebanon. H. E. Millard Lime & Stone Co. produced (from its quarry and crusher at Annville), crushed limestone sold for use as blast-furnace flux, road material, and soil conditioner and for manufacturing cement. This company also sold a quantity of limestone

to Government agencies for road construction. Crushed limestone was recovered by Fiala Crushed Stone Corp. from the White Hall quarry at Annville for use in open-hearth plants and in manufacturing cement. North American Refractories Co. operated the Womelsdorf quarry and plant, producing crushed ganister rock for manufacturing silica brick.

The only producer of lime in Lebanon County was H. E. Millard Lime & Stone Co. Quick and hydrated lime was manufactured at the Annville plant and marketed primarily as mason lime and agricultural lime, for use in open-hearth and electric furnace linings and for water purification.

Dredging operations were the only source from which anthracite was recovered in Lebanon County.

Lehigh.—Four companies reported manufacturing cement in Lehigh County from cement rock and limestone produced from company-owned quarries or purchased from other stone producers. Cement manufacturers were: The Whitehall Cement Manufacturing Co., Cementon; Coplay Cement Manufacturing Co., Coplay; Giant Portland Cement Co., Egypt; and Lehigh Portland Cement Co., Ormrod and Fogelsville. The major portion of the cement produced was air-entrained and non-air-entrained Types I–II and Type III portland cements and mortar cement, all by the dry process.

Production of crushed limestone from a quarry and crusher at Ormrod, for use in road construction, was reported by Lehigh Stone Co. Quantities of the material were sold to local Government agencies.

Slate quarried in Lehigh County in 1956 was sold for a variety of uses, primarily for roofing, structural, and sanitary products, blackboards, and flagging stone. The only producer of slate was Penn Big Bed Slate Co., Inc., near Slatington.

Robert A. Reichard, Inc. (Allentown), crushed oystershell for use as poultry grit.

Pennsylvania Perlite Corp., at its expanding plant near Allentown, produced expanded perlite for use in the manufacture of plaster aggregate, concrete aggregate, and industrial aggregates.

Luzerne.—Luzerne County in 1956 was by far the largest anthracite-producing county in the State. Ten of the larger producers were: John G. Connell, Glen Alden Corp., Hudson Coal Co., Jeddo-Highland Coal Co., Kehoe-Berge Coal Co., Knox Coal Co., Lehigh Valley Coal Co., Number Fourteen Coal Co., Payne Coal Co., and Susquehanna Collieries Division of The M. A. Hanna Co. The coal was produced at underground mines, strip pits, culm banks, and dredges.

Dimension sandstone, recovered from a quarry at White Haven by Hayes Bros. Stone Co., was sold or used as rubble, dressed architectural stone, and flagging stone. The General Crushed Stone Co. (White Haven) quarried and crushed sandstone for use as road material and railroad ballast. A small quantity of dimension sandstone for use as rubble and of crushed sandstone for use as riprap and road material was recovered from the North Mountain quarry in Sweet Valley by Coon Certified Concrete. The General Crushed Stone Co. and Coon Certified Concrete marketed sandstone to various Government agencies.

Seven companies were active in Luzerne County in 1956, producing sand and gravel for use as paving and building material, as engine sand, and as sand for miscellaneous uses. Producers were: Airport Sand & Gravel, Wyoming; American Asphalt Paving Co., Chase (Jackson Township); Glendale Sand & Stone Co., Avoca; Frank B. Sgarlat Estate, Kingston; Honey Hole Sand & Stone Co. and Herman Cunfer, both of Hazleton; and White Haven Lumber Co., White Haven. A large tonnage of sand and gravel was sold to local Government agencies for use in highway construction.

Blue Ridge Soil Pep Co., Inc., recovered humus peat and Pennsylvania Peat Moss, Inc., recovered moss and humus peat, both from bogs near White Haven.

Miscellaneous clay, recovered from an open pit near Hazleton by Hazleton Brick Co., was utilized in manufacturing building brick.

Lycoming.—J. A. Eck & Sons, Inc., and Lycoming Silica Sand Co. recovered sand and gravel from pits in Montoursville and processed the material at local plants for construction and paving purposes. Lycoming Silica Sand Co. also produced molding sand, sand for use in anthracite preparation, and paving sand.

Muncy Lime Products produced a quantity of crushed limestone from its Chippewa quarry and plant at Muncy for manufacturing agricultural lime. Lycoming Silica Sand Co. produced limestone, crushed for use as road material and agricultural purposes, from the Lime Bluff quarry and plant near Muncy and the Pine Creek quarry and plant near Jersey Shore (purchased from Pine Creek Lime & Stone Co. in February 1956). Callahan & Haines Stone Co. produced miscellaneous dimension stone as flagging stone from a quarry and plant at Slate Run. John T. Morgan (also of Slate Run) reported a small quantity of dimension sandstone for flagging stone.

Small quantities of bituminous coal were produced from 4 underground mines and 1 strip pit by O. R. Corson, J. F. Emig, Fisher & Smith Coal Corp., Kaznowski & Kaznowski, and Thomas Bros.

Keystone Filler & Manufacturing Co. (Muncy) and Penn Paint & Filler Co. (Antes Fort) produced and prepared rottenstone by crushing, drying, and pulverizing. Both companies sold the material for use as abrasive and filler.

Keystone Filler & Manufacturing Co. (Muncy) marketed its production of miscellaneous clay as a paint filler.

McKean.—Kaul Clay Products Co. produced plastic fire clay from its pit at Clermont for use in manufacturing hot-tops for steel mills and heavy clay products. Plastic and burley-type fire clays produced by Kness Bros. (Mount Jewett) were marketed for use in manufacturing refractories. Miscellaneous clay produced by Hanley Co. (Lewis Run) was utilized by the company for use in manufacturing heavy clay products.

Three operators of strip mines in McKean County produced bituminous coal. Producers were: Bowland Contractors, Kaul Clay Products Co., and P. & K., Inc.

Sand (mined by C. L. McGavern, Jr., from a pit and plant at Eldred) was processed and sold as molding sand.

Mercer.—Underground and strip mines were operated in Mercer County as sources of bituminous coal. Producers were: Coyer Coal Mines, Estate of Geo. Bobo, Bowie Coal Co., The Buckeye Coal Co.,

Center Coal Co., C. A. Fisher Mining Co., Thomas B. Mathieson, Mercer Coal Producing Co., Earl M. Reed Coal Co., and Turner Bros. Construction Co.

Sand and gravel was recovered from pits by four producers and processed for various uses, principally as paving and building material and sand for fill. Producers were: Robert L. Seger, West Middlesex; Seidle Sand & Gravel Co., Mercer; Transfer Sand & Gravel, Transfer; and Sharon Builders Supply Co., Mercer County. White Rock Silica Sand Co. operated the Whiterock quarry and preparation plant at Greenville, producing ground sand principally as filler sand, foundry sand, and beach sand and for use on golf courses.

D. M. Boyd and Moore's Peat Humus Co. (both near Leesburg) and Arthur Minshull (Jackson Center) all recovered humus-type peat from bogs.

Welty M. Smeltzer recovered dimension sandstone from the Rock Kastle quarry north of Volant in Mercer County. The stone was used for interior and exterior decorating; some of the stone is found with flower patterns and in multicolored stone in red, soft pink, yellow, brown or chocolate and some in mottled beige with dark stripes.

Mifflin.—Miller Silica Sand Co. operated a pit and fixed plant near Burnham, producing sand for molding and building material and engine sand and for miscellaneous uses. Pennsylvania Glass Sand Corp. produced sand from an open pit and processed it at a local plant at McVeytown for use as glass sand, molding sand, grinding and polishing sand, and engine sand and for miscellaneous uses. James R. Kline's Sons recovered sand by dredging along the Juniata River near Lewistown for building and paving material.

Bethlehem Limestone Co. reported output of crushed limestone from its quarry and crusher at Naginey, marketed principally for use as blast-furnace flux, roadstone, and stone sand. A portion of the material was sold under contract to Government agencies for road construction. Output of quartzite from a quarry at Hawstone was utilized by Haws Refractories Co. for producing silica brick at the company plant.

Quicklime (manufactured and sold as agricultural lime) and hydrated lime for use in making silica brick were reported by Lewistown Lime Co. from its plant near Reedsville. Harry T. Ehrenzeller (McVeytown) produced quicklime for agricultural uses.

Monroe.—Coolbaugh Sand & Stone, Inc. (Tobyhanna), operated a pit and plant, producing sand and gravel for building and paving purposes. Sheesley Minerals, Inc., recovered sand from a pit and prepared it at its Kunkletown plant for use as paving and road sand. Both companies sold the entire output, the major portion to the Pennsylvania Department of Highways for road construction. Steward White and Clyde White (Stroudsburg) produced a quantity of building sand. United States Army Corps of Engineers (Philadelphia), purchased a quantity of sand and gravel as concrete aggregate from commercial producers.

Crushed limestone marketed entirely for road construction, was produced from a quarry and crusher by T. P. Rogers Stone Co. (Stroudsburg). This quarry and plant was sold to Hamilton Stone Co. in July 1956. Hamilton Stone Co. also operated a quarry and

plant at Bossardsville, producing crushed limestone for use as road material and in cement manufacture.

Montgomery.—Montgomery County continued in 1956 to rank first in stone output, although production and value decreased compared with 1955. Crushed limestone was produced by Stowe Trap Rock Co. (Oreland) for use as riprap, road material, and railroad ballast. Glasgow, Inc. (Conshohocken) and Bradford Hills Quarry, Inc. (Norristown), produced crushed limestone for road construction. G. & W. H. Corson, Inc., and Bethlehem Limestone Co. operated a quarry and crusher at Plymouth Meeting and Bridgeport, respectively, producing and marketing crushed limestone for blast-furnace and open-hearth flux, road material, and stone sand and in manufacturing lime. R. K. Kibblehouse produced basalt from a quarry and crusher at Perkiomenville for use as road material and marketed quantities to State and local Government agencies.

Rough and dressed dimension basalt for use as building material and crushed and broken basalt for railroad ballast were recovered at Montgomeryville by Montgomery Stone Co., Inc. Marcolina Bros., Inc., operated the Hillcrest quarry (Cheltenham Township), utilizing its production of irregular dimension granite for construction work. M & M Stone Co. quarried argillite-type miscellaneous stone for use as road material from a quarry at Harleysville. A. Manero & Sons (Glenside) produced silica rock from the Cove Hill quarry, as rough and dressed building stone. Fire Stone Products Co., Inc. (Glenside), quarried dimension quartzite for rough architectural blocks and crushed stone for furnace or converter lining. William Bambi & Sons (Norristown) produced dimension sandstone sold for use in rough construction work. Crushed sandstone usable for road material was produced and sold by Irvin B. Gill (Collegeville).

Allentown Portland Cement Co. produced cement rock and limestone at its quarry at West Conshohocken for use in manufacturing cement at the No. 2 plant. Production consisted of Types I–II, air-entrained, and non-air-entrained portland cements and some mortar cement.

Corsons Lime plant (Plymouth Meeting) was operated by G. W. H. Corson, Inc., for manufacturing lime. Quicklime and hydrated lime were produced and marketed for use as building lime, refractory material, and various chemical and other industrial limes.

Both miscellaneous and fire clays were produced from five open-pit mines; miscellaneous clay was the more important commodity. Robinson Clay Product Co. (near Pottstown) produced both plastic fire clay and miscellaneous clay for use in manufacturing heavy clay products. Other producers included The Keller-Whilldin Pottery Co., North Wales; Norristown Brick Co., and Harry R. Shaffer, both at Norristown; and Lansdale Brick Products Co., Lansdale. The output of these four companies was utilized for manufacturing art pottery, flowerpots, glaze slips, and heavy clay products.

Wm. Bambi & Sons, Inc., produced washed sand for use as building material from a pit and local plant at Norristown.

Refractory & Insulation Corp. produced expanded perlite at its expanding plant at Port Kennedy and utilized the perlite for manufacturing industrial insulation material.

Keasbey & Mattison Co. (Ambler) and Philip Carey Manufacturing Co. (Plymouth Meeting) processed raw dolomite, producing magnesium carbonate, magnesium oxide, and magnesia insulation.

Montour.—Limestone was recovered fom the Grovania quarry and crushed at the local plant by Mausdale Quarry Co. (Danville) and Lycoming Silica Sand Co. (from the Milton quarry and plant east of Milton, in Montour County), primarily for road construction. The Milton quarry was purchased from Narehood Bros., Inc., in May 1956. Both producers sold some of the material to Government agencies for road construction.

A small quantity of burned lime for agricultural uses was produced and sold by Glen H. Follmer near Washingtonville.

Northampton.—Northampton remained the leading cement-producing county in Pennsylvania in 1956 and showed a large increase in tonnage and value compared with 1955. Ten companies reported manufacturing cement from cement rock and limestone, either purchased or quarried at local company quarries. Producers were: Alpha Portland Cement Co., Martins Creek; Dragon Cement Co. and Universal Atlas Cement Co., both of Northampton; Hercules Cement Corp., Stockertown; Keystone Portland Cement Co., Bath; Lehigh Portland Cement Co., Sandts Eddy; Lone State Cement Corp. and Nazareth Cement Co., both of Nazareth; National Portland Cement Co., Bethlehem; and Penn-Dixie Cement Corp. plant No. 4 at Nazareth, plant No. 5 at Bath, and plant No. 6 at Penn Allen. The major output from these companies was comprised of Types I–II, Type III, both air-entrained and non-air-entrained portland cements and smaller quantities of masonry cements.

Production of slate in Northampton County in 1956 contributed a major portion of Pennsylvania's output and of Northeastern States production. Leading producers of slate were: Diamond Slate Co., Inc., Stephens-Jackson Co., Doney Slate Co., and Anthony Dally & Sons, Inc., all of Pen Argyl; D. Stoddard & Sons, Inc., and Albion Vein Slate Co., both of Plainfield Township; Parsons Bros. Slate Co., and General Slate Co., both of Windgap; North Bangor Slate Co., Bangor; and Capitol Slate Co., Inc., East Bangor. The processed slate was marketed for a variety of uses, primarily for roofing, blackboards and bulletin boards, structural and sanitary products, and billiard-table tops.

Crushed limestone for use as road material, railroad ballast, and stone sand was recovered from a quarry at Bethlehem by Bethlehem Steel Co. The Trumbower Co., Inc., produced limestone from a quarry and crushed the stone at Nazareth for road construction.

Sand and gravel was produced by open-pit methods by W. J. Lowe & Sons (Martins Creek) for use as concrete aggregate and by Portland Sand & Gravel Co. (Portland) for use as building and paving material. Portland Sand & Gravel Co. also produced gravel for railroad ballast, and a portion of its production was produced under contract to local Government agencies for use in road construction.

Anthracite in Northampton County was recovered by dredges.

Northumberland.—Ten leading anthracite-producing companies in Northumberland County were: Boslego Coal Co., C. & F. Trucking & Loading Contractors, C. & J. Coal Co., M. & B. Coal Co., Raven Run

Coal Co., Reading Anthracite Co., Sayre Contracting Co., Stevens Coal Co., Susquehanna Collieries Division of The M. A. Hanna Co., and West Cameron Coal Co., Inc. Coal was produced from underground mines, strip pits, culm banks, and dredges.

Three producers of clays operated open pits in Northumberland County, producing miscellaneous clay, used in manufacturing heavy clay products and as a filler in making linoleum, oilcloth, and phonograph records. Companies active during the year were Watsontown Brick Co., Watsontown Mineral Products Co., and Glen-Gery Shale Brick Corp. (all at Watsontown).

Limestone, recovered from a quarry at Herndon by Eugene Meckley, was crushed at a local plant and sold for road construction and agricultural purposes. Susquehanna Quarry Co. (Dalmatia) produced crushed traprock sold as riprap, concrete aggregate, roadstone, and railroad ballast. Quantities of road material were sold to local Government agencies.

M. E. Wallace Co. (Sunbury) produced molding sand from a pit and local plant. Wilsons Sand Plant (Milton) produced washed sand for building and miscellaneous uses.

Burned lime produced by Clyde Starook near Sunbury was sold for use as agricultural lime and marketed within a 50-mile radius.

Perry.—Bradford Hills Quarry, Inc. (Newport), reported output of crushed limestone from a quarry and crusher for use as road material. A quantity was sold to local Government agencies for road construction.

Philadelphia.—The Liberty Corp. operated a dredge on the Delaware River near Philadelphia and sold the washed and screened sand and gravel for use as building material. A quantity of the gravel also was sold to local Government agencies. United States Army Corps of Engineers (Philadelphia) purchased a quantity of sand and gravel from commercial producers for use in concrete construction.

Atlantic Refining Co. recovered hydrogen sulfide as a byproduct in the liquid purification of gas at its plant in Philadelphia.

Potter.—Oswayo Flag Stone Co. (Oswayo) reported a quantity of miscellaneous dimension stone recovered from its quarry, and sold for use as flagging stone. Dimension sandstone for use in rough construction and as architectural and flagging stone was quarried by Penn Kress Flagstone Co., Inc., Austin.

Schuylkill.—Anthracite in Schuylkill County was mined from underground, strip-pit, culm-bank and dredge operations. Leading producers were: Capparell Stripping & Construction Co., Carbonizing Coal Co., Coaldale Mining Co., Inc., Gilberton Coal Co., Locust Creek Co., Inc., Mammoth Coal Co., Reading Anthracite Co., Saint Clair Coal Co., Stevens Coal Co., and Tunnel Ridge Coal Co.

Refractory Sand Co., Inc. (near Andreas), mined and processed sand usable for paving, fire, or furnace sand and for miscellaneous uses.

Huss Contracting Co. took over operation of the Andreas Quarry Co. quarry at Andreas in April 1956, producing crushed limestone for use as road material. Crushed quartzite for manufacturing silica brick was mined by Harbison-Walker Refractories Co. from a quarry at Andreas.

Auburn Brick Co. produced miscellaneous clay from an open pit at Auburn and utilized it for manufacturing heavy clay products.

Coaldale Mining Co. operated underground and open-pit mines at Coaldale, producing miscellaneous clay marketed for use in manufacturing lightweight aggregate.

Snyder.—Miscellaneous clay produced by Glen-Gery Shale Brick Corp. (Beavertown) and Paxton Brick Co. (Middleburg) was utilized by the companies in manufacturing heavy clay products.

John C. Stahl acquired ownership during 1956 of a quarry and crusher at Middleburg, formerly operated by National Limestone Quarry; production consisted of crushed limestone for use as road material and agricultural purposes. Limestone recovered from a quarry by Carton Comfort (Mount Pleasant Mills) was crushed and marketed for use in the manufacture of lime.

A small quantity of "burned" lime for agricultural purposes was produced and sold by Carton Comfort at Freeburg.

A small quantity of anthracite produced from dredging operations was reported in Snyder County.

Somerset.—Bituminous coal was mined in Somerset County by underground and stripping methods. Leading producers were: Bird Coal Co., Costantino Coal Co., Cambria Fuel Co., Croner, Inc., Loyal Hanna Coal & Coke Co., Ponfeigh Smokeless Coal Co., Pine Hill Smokeless Coal Co., The Berwind-White Coal Co., Reitz Coal Co., and the Saxman Coal & Coke Co.

Fire clay used in manufacturing refractories and heavy clay products was recovered from underground and open-pit mines by W. S. Compton Brick Co., Inc., Salisbury; Otto Brick & Tile Works, Springs; Hiram Swank's Sons, Inc. (Swank Mines Nos. 15 and 23), Holsopple; and General Refractories Co. Neilan Engineers (Shanksville) produced flint fire clay from an open pit and sold the clay for manufacturing refractories.

Somerset Limestone Co., Inc., produced crushed limestone obtained from the Bakersville quarry at Somerset for road construction. Keystone Lime Co. produced limestone from an underground mine and quarry at Springs for agricultural purposes and as an asphalt filler. Friedens Block Co. (Somerset) quarried a small quantity of sandstone crushed for miscellaneous uses; this company sold its operation to Union Mining Co. in August 1956.

Sand only was produced in Somerset County by Boswell Sand Co. (near Jenners, Boswell Borough), for paving use, and by Union Mining Co. (Somerset) for building material and fire or furnace sand. Friedens Block Co. (Somerset) and Robert D. Shaulis (Boswell) also produced small quantities of building sand.

Sullivan.—Bliss Coal Co.—the only mineral-producing company in the county—reported a quantity of anthracite from a stripping operation.

Susquehanna.—Edwin J. Evans (Lenox Township) and H. V. Hartley (Lenoxville) quarried dimension sandstone for use as rubble and flagging stone. Keelor Supply Co. (Royal) produced crushed sandstone for road material and sold a quantity to local Government agencies. Three companies quarried dimension sandstone (bluestone) for use as flagging stone: Gordon E. Jackson, New Milford; Wade H. Swingle, Jr., Harford; and Lee A. Wilbur Flagstone Co., Kingsley. J. G. Robinson purchased sandstone from various stone producers in Susquehanna County and processed it at the Fort

Washington (Montgomery County) plant. The prepared stone was sold for flagging.

Tioga.—Bituminous coal (the only mineral commodity produced in Tioga County in 1956) was mined from underground and strip mines. Leading producers were: Fall Brook Coal Mining Co., Guy Coal Co., E. M. Hart & Son, Walter Hunter, Jones & Brague, Martin & Lawson, Stempeck Coal Co., Sterling Coal Co., and Joseph & James Williams.

Union.—Production of crushed limestone was reported by Faylor Lime & Stone Co. from a quarry and crusher at Winfield and marketed for use as road material and agricultural purposes and by John L. Iddings (Mifflinburg) for road construction. Both producers sold a portion of the road material to Government agencies.

Venango.—Leading producers of bituminous coal in Venango County in 1956 were: Bowie Coal Co., Boyles Coal & Supply Co., W. G. Brown Coal Co., C. & M. Contracting Co., Penn Grove Coal Co., Persch Bros. Coal Co., Earl M. Reid Coal Co., Glenn Surrena, Tasa Coal Co., and A. P. Weaver & Sons. The coal was produced at underground and strip mines.

Sand production was reported by Industrial Silica Corp. (Utica); it was prepared at a local plant for use as molding sand. Oil City Sand & Gravel Co. (Oil City) recovered building and paving sand and gravel by dredging and sold a quantity of it to the Pennsylvania Department of Highways for road construction. Rybak Kraft, Inc. (Cooperstown), produced washed and screened sand for use in manufacturing concrete blocks and sold a quantity of unscreened paving gravel to a local Government agency. This company only operated 6 months during the year owing to the cold weather.

Warren.—Building and paving sand and gravel were recovered from an open pit and processed at a local plant by General Concrete Products near Warren. Walter Schatzle (Warren) produced a quantity of building sand and gravel and gravel for use as a rough filler.

Washington.—Washington County was the leading bituminous coal-producing area in the State in 1956. The major portion of the coal recovered was from underground mines, followed by strip and auger mines. Leading producers were: Bethlehem Steel Co., C. & J. Coal Co., Harmon Creek Coal Corp., Jones & Laughlin Steel Corp., Mathies Coal Co., National Steel Corp., Ontario Mining Co., Pittsburgh Coal Co., Republic Steel Corp., and United States Steel Corp.

Miscellaneous clay for use in manufacturing heavy clay products was mined from open pits by Monongahela Clay Products Co., Monongahela; and Westmoreland Clay Products Co. and Donley Brick Co., both near Washington.

Wayne.—Wayne Concrete & Sand Works produced crushed sandstone for use as road material from a quarry and plant at Lake Ariel.

A pit near Lake Ariel, operated by Wayne Concrete & Sand Works, yielded sand and gravel prepared at the local plant for use as building and paving material. A quantity of sand for bridge construction was sold to Pennsylvania Department of Highways.

Westmoreland.—Ten leading producers of bituminous coal in Westmoreland County were: Allegheny Pittsburgh Coal Co., Bowman Coal Co., Delmont Fuel Co., Eagle Coal Co., Jamison Coal & Coke Co., Marco Coal Co., Pine Run Co., Stewart Coal & Coke Co.,

Westmoreland Coal Co., and Wyatt-Seanor Coal Co. The major production of the bituminous coal came from underground mines followed by strip and auger mines.

Lynn Quarry (Rostraver Township) yielded miscellaneous dimension stone sold as flagging stone. Dimension sandstone, sold for rubble, was recovered from quarries by Ray Branthoover and J. C. Beaumont, both north of Belle Vernon in Westmoreland County. Eidemiller Enterprises, Inc. (Greensburg), produced crushed sandstone from blue rock, and Latrobe Construction Co. produced crushed sandstone from the Barbara quarry at Latrobe; both sold the stone for road material.

Westmoreland Clay Products Co. produced miscellaneous clay for use in manufacturing heavy clay products from its open pit near Youngwood. Regional Refractories, Inc., operated its open pit near Youngwood, producing plastic fire clay for use in manufacturing refractory firebrick and block.

Wyoming.—Two commercial producers of sand and gravel—East Falls Sand & Gravel (near Tunkhannock) and Wyoming Sand & Stone Co. (Falls) operated pits and preparation plants, washing and screening the material for building and paving uses. Wyoming Sand & Stone Co. also prepared engine sand. Both companies sold quantities of sand and gravel to Pennsylvania Department of Highways and local Government agencies for road construction.

J. G. Robinson purchased sandstone from various stone producers in Wyoming County and processed the stone at the Fort Washington (Montgomery County) plant. The prepared stone was sold as flagging stone.

York.—Medusa Portland Cement Co. reported output of cement manufactured at its York plant. Portland cement Types I–II, Type III, waterproof-white, and gray and quantities of masonry cement were marketed under the trade names of "Brikset" and "Stoneset."

Nine stone producers were active in York County in 1956, reporting output of crushed limestone sold or used primarily as road material and riprap, for agricultural purposes, and in manufacturing glass, lime, and cement. Producers were: The J. E. Baker Co., Botts; National Gypsum Co., Standard Concrete Products Co., Medusa Portland Cement Co., White Pigment Corp., York Stone & Supply Co., and Eli Z. Zinn, Inc., all of York; Thomasville Stone & Lime Co. and Lincoln Stone, Inc., both of Thomasville.

The York plant of National Gypsum Co. was active during the year, producing both quicklime and hydrated lime, manufactured for a variety of uses, including agricultural lime, insecticides, disinfectants, paper, sewage treatment, and water purification. The J. E. Baker Co. produced dead-burned dolomite at its York plant near Botts for use as refractory material.

The Funkhouser Co. (Delta) was the only slate producer in York County in 1956. The slate was crushed and ground at its local mill and sold as granules and flour.

Production of miscellaneous clay from open-pit mines was utilized by Glen-Gery Shale Brick Corp. for manufacturing heavy clay products at its York Colonial Division plant and Spring Garden Division plant (both near York).

Sand and gravel for use as paving material was recovered from a pit near York Haven by Pennsylvania Supply Co. Neuman Sand & Supply Co. produced sand from a pit and preparation plant at York, principally as building sand, with smaller quantities as molding and fire or furance sand.

General Mining Associates operated an open-pit mine and plant near Glenville, producing and grinding mica, which was utilized in making paints, rubber (mold lubricants), and welding rods.

The Mineral Industry of the Commonwealth of Puerto Rico, the Panama Canal Zone, and the Virgin Islands

The Puerto Rico portion of this chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Mineralogy and Geology Section, Commonwealth of Puerto Rico.

By W. G. Diamond [1] and Mort D. Turner [2]

A RECORD high in value of mineral production was established in Puerto Rico in 1956 for the second consecutive year with $16.4 million. This exceeds by $1.5 million the previous mark set in 1955.

The first concession to drill for oil in Puerto Rico was granted in 1956. The Economic Development Administration of Puerto Rico made geological and geophysical studies which indicated that there may be oil in the southern part of the island. Although no petroleum or natural gas was produced in Puerto Rico, 2 refineries were operating in 1956—the Commonwealth Oil Refining Co. 23,520-barrel-per-day plant at Ponce and the Caribbean Refining Co. 13,500-barrel-per-day

TABLE 1.—Mineral production in possessions of the United States, 1955–56, by individual minerals [1]

Possession and mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Canal Zone:				
Sand and gravel	35,910	$47,229	40,095	$48,673
Stone (crushed) [2]	169,485	239,280	177,250	229,750
Total Canal Zone		287,000		278,000
Puerto Rico:				
Cement—376-pound barrels	4,116,739	12,506,784	4,254,701	14,064,982
Clays	136,563	121,753	142,666	129,166
Lime	10,392	254,121	(3)	(3)
Salt (common)	10,496	112,399	9,936	101,243
Sand and gravel	433,017	678,761	183,046	191,485
Stone	1,783,910	2,515,760	2,076,453	2,555,585
Value of items that cannot be disclosed: Certain nonmetals				194,941
Total Puerto Rico [4]		14,917,000		16,395,000
Virgin Islands: Basalt	875	4,900	11,591	31,983

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Includes basalt.
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] The total has been adjusted to eliminate duplication in value of clays and stone.

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plant at San Juan; both processed Latin-American crude. Commonwealth Oil Refining Co. announced an expansion program to increase its daily crude topping capacity to 55,000 barrels by late 1957.[3]

The investigation of nickel-cobalt-bearing laterite deposits was conducted by the Federal Bureau of Mines in cooperation with the Commonwealth of Puerto Rico. The project included mapping, systematic drilling by power auger, sampling of hole sections, and chemical and mineralogical analysis of the samples. No metals were mined in Puerto Rico in 1956.

TABLE 2.—Average unit value of mineral commodities in the Canal Zone, Puerto Rico, and the Virgin Islands, 1952–56 [1]

Area and commodity	1952	1953	1954	1955	1956
Canal Zone:					
Basalt, crushed and broken ..... short ton	$1.77	$1.35	$1.31	$2.02	$1.84
Sand and gravel ..... do	.94	1.11		1.32	1.21
Stone, miscellaneous, crushed ..... do				1.10	1.00
Puerto Rico:					
Cement ..... 376-pound barrel	2.63	2.56	2.62	3.04	3.31
Iron ore ..... long ton	5.75	5.75			
Lime ..... short ton	22.74	21.46	23.67	24.45	19.41
Salt ..... do	9.64	9.60	11.20	10.71	10.19
Sand ..... do	1.21	1.05	1.07	1.27	.76
Gravel ..... do	1.81	1.13	2.53	1.72	1.51
Stone:					
Basalt ..... do	1.55				
Granite, crushed and broken ..... do	1.00	1.00			
Limestone:					
Crushed and broken ..... do	2.74	1.90	[2] 1.37	[2] 1.37	[2] 1.21
Dimension ..... do	1.60	2.04	2.12	2.18	1.90
Sandstone, crushed and broken ..... do			2.13		
Miscellaneous stone:					
Crushed and broken ..... do	2.33	1.70	2.42		
Dimension ..... do			1.09		
Virgin Islands: Stone, miscellaneous, crushed and broken ..... short ton	4.02	4.25	4.35	5.60	2.76

[1] For greater detail on prices, by grades and markets, see vol. I, Minerals Yearbook, 1956.
[2] Includes limestone used for cement and lime.

REVIEW BY MINERAL COMMODITIES

Cement.—In 1956 cement remained the most important mineral commodity, with production comprising 86 percent of the island's total mineral value. Portland-cement shipments increased slightly as industrial construction continued active. Ponce Cement Corp. put a bulk cement carrier into operation to carry cement between Ponce and Port Everglades, Fla. The ship, reportedly the first vessel to be equipped with mechanical devices utilizing air slides instead of screw-type conveyors to carry cement to the hoppers, can transport approximately 9,000 long tons of cement, which can be unloaded in 16 hours.[4]

Clays.—Clay was used primarily in the production of cement in 1956. Miscellaneous clay and plastic-fire clay used to manufacture heavy clay products were produced near Carolina in San Juan District. Miscellaneous clay used to make commercial studio pottery, was produced in Hato Rey in San Juan District. Total production was slightly greater than in 1955.

[3] Petroleum Week, vol. 1, No. 24, Dec. 23, 1955, p. 20.
[4] Pit and Quarry, vol. 49, No. 4, October 1956, p. 48.

Lime.—The 1956 output of lime was slightly less than 1955. The raw-sugar industry continued as the principal market for lime produced from very pure limestone. Lime was produced in Humacao and Mayaguez Districts.

TABLE 3.—Portland cement produced and shipped in Puerto Rico, 1947–51 (average), 1952–56, and total 1939–56, in 376-pound barrels

Year	Production (barrels)	Shipments		
		Barrels	Value	
			Total	Average per barrel
1947–51 (average)	2, 793, 182	2, 800, 220	$7, 589, 397	$2. 71
1952	4, 088, 199	3, 994, 483	10, 517, 894	2. 63
1953	3, 655, 614	3, 641, 135	9, 335, 421	2. 56
1954	3, 600, 064	3, 682, 187	9, 663, 445	2. 62
1955	4, 193, 592	4, 116, 739	12, 506, 784	3. 04
1956	4, 234, 284	4, 254, 701	14, 064, 982	3. 31
1939–56	40, 749, 653	40, 675, 856	109, 051, 803	2. 68

Salt.—The 1956 production of salt in Puerto Rico totaled 10,000 tons valued at $101,000. All production occurred in Mayaguez District by the evaporation of sea water.

Sand and Gravel.—Sand and gravel was obtained from rivers and beaches in all parts of the island and was used mainly in construction as concrete aggregate. High-silica sand was produced for use by the glass and ceramic industries and as an abrasive in the polishing of imported marble.

Stone.—Dimension limestone was quarried in 5 of the 7 districts in 1956. Tonnage and value were less than in 1955. Crushed limestone was produced in each of the 7 districts, with output and value greater than in 1955. Dimension stone was used in rough construction and as rubble, and crushed stone was used mainly for aggregate.

TABLE 4.—Stone sold or used by producers in Puerto Rico, 1952–56

Year	Dimension limestone		Crushed limestone		Other stone [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1952	13, 684	$21, 866	605, 830	$1, 659, 910	69, 806	$125, 612	[2] 689, 320	[2] $1, 807, 388
1953	16, 552	33, 733	631, 848	1, 203, 503	[3]	[3]	[2] 648, 400	[2] 1, 237, 236
1954	99, 889	211, 476	[4] 1, 639, 684	[4] 2, 252, 812	12, 423	28, 539	[2] [4] 1, 751, 996	[2] [4] 2, 492, 827
1955	86, 077	187, 842	[4] 1, 697, 833	[4] 2, 327, 918	----------	----------	[4] 1, 783, 910	[4] 2, 515, 760
1956	75, 168	142, 626	[4] 2, 001, 285	[4] 2, 412, 959	----------	----------	[4] 2, 076, 453	[4] 2, 555, 585

[1] Includes basalt, granite, sandstone, miscellaneous stone.
[2] Excludes crushed basalt (1952), crushed granite and miscellaneous stone (1953), and crushed sandstone (1954).
[3] Figure withheld to avoid disclosing individual company confidential data.
[4] Includes limestone for cement and lime.

REVIEW BY DISTRICTS

Aguadilla.—Limestone and sand and gravel were produced in Aguadilla District in 1956. Limestone was crushed for use as concrete and road metal by General Builders Supplies, Inc., Rafael Falcon, Luis Viera, and Victoria Medina. Dimension limestone was quarried by Eugenio Natali and Rafael Falcon. Sand and gravel for molding, building, and paving was obtained by F. J. Rosello, General Builders Supplies, Inc., and Luis Bobadilla.

Arecibo.—Pedro Vega Santos quarried dimension limestone for rough construction purposes. Crushed limestone was produced by Severo O'Neil, Cantera De Casanovas, and Pedro Vega Santos. Compania de Ing y Contratistas produced paving gravel and crushed limestone. Rosario Rosario obtained gravel for paving purposes.

Guayama.—Cantera Bobadilla and Jose Rodriguez quarried and crushed limestone. Francisco Navarro produced crushed limestone and building sand and gravel. Limestone was used for concrete and road metal.

Humacao.—Limestone was quarried for use in manufacturing lime by Planta de Cal "Hicaco," Inc. Crushed limestone for concrete and road metal was produced by Ramon Rivera Figueroa, Mateo Perez Sanjurjo, Fajardo Sugar Co., and Cantera Perez. Cantera Perez also produced dimension limestone for use in rough construction and as rubble.

TABLE 5.—Value of mineral production in Puerto Rico, by Districts, 1955–56

District	1955	1956	Minerals produced in 1956 in order of value
Aguadilla	$125,632	$218,706	Stone, sand and gravel.
Arecibo	68,613	141,298	Do.
Guayama	142,559	41,140	Do.
Humacao	412,163	189,411	Lime, stone.
Mayaguez	497,275	607,764	Stone, salt, lime, sand and gravel.
Ponce	7,908,072	8,330,023	Cement, stone, sand and gravel.
San Juan	5,453,189	6,866,697	Cement, stone, sand and gravel, clays.
Undistributed	309,232	----------	
Total	14,917,000	16,395,000	

Mayaguez.—Salt was produced from sea water by Puerto Rico Salt Works, Inc., at Boqueron, Providence, and Cabo Rojo; Carlos M. Ramirez Acosta at Saline Fortuna; Salina del Papayo, Inc.; and Productos Salinos, Inc. Liborio Lopez Sanchez produced glass and other sands; dimension limestone for rubble; and crushed limestone for concrete and road metal, riprap, and for the South Puerto Rico Sugar Co. to use in refining sugar and producing lime. Demetrio Rodriguez quarried dimension limestone for use in rough construction and as rubble. Leading crushed limestone producers included Waldemar Bravo, Cantera Bernat, Julio Agrait, and Cantera Santos. Conrado Forestier produced miscellaneous stone. Sucesion Lluberas obtained building and other sands and paving gravel from local deposits.

Ponce.—Portland cement was produced from local limestone quarries by the Ponce Cement Corp. at its Ponce plant. Jose A. Vallejo produced paving and other gravel and crushed limestone for concrete and road metal. Cement Products Corp., Ismael Torruellas, and Antonio Padilla quarried and crushed limestone for concrete and road metal.

San Juan.—Puerto Rico Cement Corp. quarried limestone for production of portland cement at its Guaynabo plant. Undressed dimension limestone was quarried by Cantera Ferrer for rough architectural purposes and Federico Gonzalez for rough construction purposes. Puerto Rico Clay Products, Inc., obtained shale and plastic fire clay from local deposits for manufacturing heavy clay products. The Puerto Rico Pottery produced miscellaneous clay for manufacturing studio pottery. Crushed limestone was produced for concrete and road metal. Leading producers included Cantera Diaz, Ramos Hermanos, Inc., Xavier Zequeira, Cantanen Hnos., and J. Ortiz Toro.

PANAMA CANAL ZONE

The mineral industry of the Canal Zone includes the production of stone and sand and gravel. Total value of mineral production in 1956 was less than 1955 production, mainly owing to the lower unit value of stone in 1956.

REVIEW BY MINERAL COMMODITIES

Basalt.—Basalt was quarried and crushed for concrete and road metal by the Panama Canal Co.

Sand and Gravel.—Panama Sand Co. produced sand from local deposits for building and paving.

Stone.—The United States Army—Caribbean quarried and crushed miscellaneous stone for concrete, road metal, and riprap.

TABLE 6.—Crushed basalt and miscellaneous stone sold or used by producers in the Panama Canal Zone, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	99,540	$155,760	1954	187,446	$245,170
1952	86,000	152,000	1955	169,485	239,280
1953	171,908	231,752	1956	177,250	229,750

TABLE 7.—Sand and gravel sold or used by producers in the Canal Zone, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	38,560	$49,840	1954		
1952	56,600	53,000	1955	35,910	$47,229
1953	85,914	95,500	1956	40,095	48,673

VIRGIN ISLANDS

The mineral industry of the Virgin Islands is limited to the production of stone.

REVIEW BY MINERAL COMMODITIES

Basalt.—Basalt was quarried and crushed on St. Croix Island by the Government of the Virgin Islands, Hams Bay Crushing plant, and Springfield Crushing plant and used for concrete and road metal.

TABLE 8.—Crushed miscellaneous stone sold or used by producers in St. Croix Island, Virgin Islands, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	6,635	$14,550	1954	[1] 3,939	$17,134
1952	3,800	16,150	1955	[1] 875	4,900
1953	10,789	45,853	1956	[1] 11,591	31,983

[1] Basalt.

The Mineral Industry of Rhode Island

By Joseph Krickich[1] and Geraldine C. Slaypoh[2]

THE MINERAL output of Rhode Island decreased 11 percent in value in 1956 compared with 1955. The decline was primarily due to limited highway construction by Government-and-contractor operations with a resulting drop in paving sand and gravel production. Sand and gravel, stone, and graphite, in order of decreasing value, were the only mineral commodities produced during 1956. Production was recorded in all counties except Bristol. Providence County continued as the major mineral-producing area.

TABLE 1.—Value of mineral production in Rhode Island, 1955–56, by counties[1]

County	1955	1956	Minerals produced in 1956 in order of value
Kent	$499,761	$570,382	Sand and gravel.
Newport	(2)	63,320	Sand and gravel, stone.
Providence	1,152,137	953,222	Sand and gravel, stone, graphite.
Washington	(2)	40,160	Sand and gravel.
Undistributed	182,586		
Total	1,834,000	1,627,000	

[1] No production was reported from Bristol County.
[2] Value included with "Undistributed."

REVIEW BY MINERAL COMMODITIES

NONMETALS

Graphite.—Natural amorphous graphite was recovered from a former meta-anthracite coal mine in Providence County. The graphite was used in preparing foundry facings and paint pigments.

Sand and Gravel.—The production and value of sand and gravel declined 33 percent and 16 percent, respectively, in 1956 as compared with 1955 owing to fewer Government contracts for road construction. During 1956 the production of paving, molding, structural, fire or furnace, and other sand, as well as paving, structural, and other gravel, was reported from various operations in the State. Kent County yielded 48 percent of the total sand and gravel production in the State and replaced Providence County as the largest sand and gravel producing area. During the year Government-contract operators were active only in Providence County.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.
[2] Statistical clerk, Region V, Bureau of Mines, Pittsburgh, Pa.

Stone.—Granite, limestone, and miscellaneous stone continued to be the varieties of stone produced in Rhode Island. During 1956 decline in demand for crushed stone as concrete aggregate and roadstone brought a moderate decrease in Rhode Island stone production. In addition to the production of crushed stone for concrete aggregate and roadstone, stone was quarried for metallurgical, agricultural, and other uses. Three quarries were in operation during the year; 2 in Providence County and 1 in Newport County.

REVIEW BY COUNTIES

Kent.—Sand and gravel was the only mineral commodity produced in Kent County in 1956 and was used principally for structural and paving purposes. Producers were Rhode Island Sand & Gravel Co. and Luigi Vallone, Inc., Warwick; Whitehead Bros., Washington; Barber Sand & Gravel, Coventry; and John J. McHale & Sons, Inc., General Road Trucking, and Pawtucket Ready Mix.

Newport.—Callan Construction Corp. produced paving sand and gravel from a fixed preparation plant near Portsmouth. The company was idle during part of the year. From an open stone quarry near Middletown, Peckham Bros. Co., Inc., produced a conglomerate used as concrete aggregate and roadstone.

Providence.—Graphite, sand and gravel, and stone were produced in Providence County in 1956. Producers of sand and gravel were M. A. Gammino Construction Co. and A. Cardi Construction Co., Inc., both of Cranston; Del Bonis Sand & Gravel, Knightsville; Courtois Sand & Gravel Co., Central Falls; Tasca Sand & Gravel Co., Smithfield; Town Line Sand & Gravel, Slatersville; Valley Cement Block Co., Providence; Cormier Sand & Gravel Co.; Izzo Construction Co.; Mack Construction Co.; Morse Sand & Gravel Co.; and Silvestri Bros. Also, sand and gravel was produced under contract to the Division of Roads and Bridges, Department of Public Works of the State of Rhode Island.

Limestone for blast-furnace flux, agricultural purposes, filter beds, and cement was obtained from the Conklin quarry of the Conklin Limestone Co., Inc., near Lincoln. Fanning & Doorley Construction Co., Inc., Berkeley, produced crushed granite for concrete and road material.

Graphite Mines, Inc., continued to operate its natural amorphous graphite mine.

Washington.—The only mineral commodity produced in Washington County in 1956 was sand and gravel. Building and paving sand and gravel were produced by Louis B. Shaeffer and South County Sand & Gravel Co., both near Peace Dale; Elisha Taylor, West Kingston; and E. R. Viera.

The Mineral Industry of South Carolina

This chapter has been prepared under a cooperative agreement for the collection of mineral data, between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of South Carolina.

By James L. Vallely [1] and Laurence L. Smith [2]

SOUTH CAROLINA mineral production was valued at $21.3 million in 1956—an increase of $1.1 million (6 percent) above 1955. Initial production of monazite and titanium concentrates, with gains in cement, sand and gravel, and stone, contributed the increased production value. Barite, kyanite, and vermiculite also added to the increase; clays were substantially the same as in 1955, and mica production declined.

TABLE 1.—Mineral production in South Carolina, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	1,086,492	$5,463,179	1,087,408	$5,450,685
Mica (sheet)—pounds	909	9,309	5,400	13,784
Sand and gravel	3,126,952	2,677,054	3,228,740	2,925,902
Stone	3,455,388	4,920,697	[2] 3,304,484	[2] 4,285,383
Titanium concentrates			2,592	326,283
Value of items that cannot be disclosed: Barite, cement, kyanite, mica (scrap), rare-earth-metals concentrates (1956), stone (crushed limestone and dimension granite, 1956) and vermiculite		7,390,538		8,950,180
Total South Carolina [3]		20,197,000		21,342,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes crushed limestone and dimension granite, value for which is included with "Items that cannot be disclosed."
[3] Total adjusted to eliminate duplicating value of clays and stone.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Knoxville, Tenn.
[2] State geologist, South Carolina Geological Survey, Columbia, S. C.

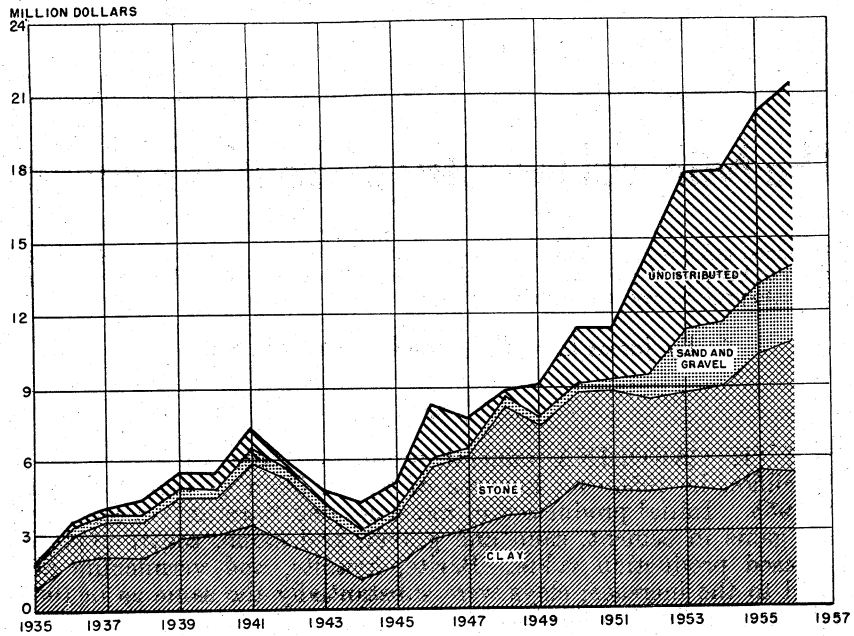

FIGURE 1.—Value of clay, stone, sand and gravel, and total value of mineral production of South Carolina, 1935–56.

TABLE 2.—Average unit value of mineral commodities produced in South Carolina, 1948–51 (average), and 1952–56

Commodity	1948–51 (average)	1952	1953	1954	1955	1956
Barite short ton	$7.51	$7.00	$6.00	$6.00	$5.93	$20.00
Cement 376-pound barrel	2.58	2.75	2.80	2.82	2.85	3.09
Clays:						
Fire short ton	3.38	2.42	2.90			
Kaolin do	12.53	12.64	12.87	12.32	12.18	12.05
Miscellaneous do	.86	.93	.84	.83	1.13	1.05
Kyanite do	33.32	40.00	40.00	38.25	45.00	40.68
Mica:						
Scrap do				25.00	24.71	25.49
Sheet pound				16.44	10.24	2.55
Sand and gravel:						
Gravel short ton	.93	.79	1.16	1.30	1.23	1.29
Sand do	.48	.86	.57	.61	.52	.58
Stone:						
Granite (dimension) do	34.29	39.39	39.39	16.15	21.34	21.34
Granite (crushed) do	1.31	1.31	1.35	1.37	1.33	1.30
Limestone (crushed) do	1.49	1.59	1.54	2.00	1.54	1.10
Miscellaneous stone (crushed) short ton	.65	.65				
Vermiculite do	10.71	12.58	13.08	13.05	12.92	12.88

Employment and Injuries.—Reports submitted to the Bureau of Mines by producers indicate that employment in the mineral industries increased 14 percent over that in 1955. Employment more than doubled at nonmetal mines, declined 34 percent at quarries and mills, and increased 7 percent at sand and gravel mines.

Injuries were the same as in 1955. The frequency rate decreased 13 percent at nonmetal mines but increased 6 percent at quarries and mills. No fatal injuries occurred, compared with 1 in 1955.

TABLE 3.—Employment in the mineral industries, 1955–56

Industry	1955			1956 [1]		
	Men working daily	Average active days	Man-days worked	Men working daily	Average active days	Man-days worked
Nonmetal mines	237	261	61,761	580	269	155,730
Quarries and mills	550	261	143,727	349	270	94,382
Sand and gravel mines [2]	287	256	73,405	322	245	78,839
Metal mines	66	154	10,165			
Total	1,140	254	289,058	1,251	263	328,951

[1] Preliminary figures.
[2] Excluding Government-and-contractor operations.

TABLE 4.—Injuries in the mineral industries, 1955–56

Industry	1955				1956 [1]			
	Fatal	Nonfatal	Total	Injuries per million man-days	Fatal	Nonfatal	Total	Injuries per million man-days
Nonmetal mines		16	16	259		35	35	225
Quarries and mills	1	32	33	230		23	23	244
Metal mines		1	1	98				
Sand and gravel mines [2]								
Total	1	49	50	232		58	58	232

[1] Preliminary figures.
[2] Not canvassed.

REVIEW BY MINERAL COMMODITIES

METALS

Titanium.—Ilmenite and rutile concentrates were produced for the first time in South Carolina when Marine Minerals, Inc., began dredging [3] on Horse Creek near Aiken in 1955. Initial shipments were made in 1956, and ilmenite and rutile concentrates combined totaled 2,592 tons, valued at $326,000.

Rare-Earth-Metals Concentrates.—Monazite concentrate was produced as a coproduct with ilmenite and rutile concentrates by Marine Minerals, Inc., at the Horse Creek dredge and mill near Aiken.

NONMETALS

Barite.—Industrial Minerals, Inc.—the only barite producer in the State—increased output at the Kings Creek mine.

Cement.—Carolina Giant Cement Co. operated its portland-cement plant at Harleyville (Dorchester County) throughout the year. Production was 1 percent above 1955.

Clays.—Clay production, including that used in cement, remained substantially the same as in 1955.

Kaolin for china, fillers, etc., increased 4 percent in tonnage and 2 percent in value. Refractory-kaolin production decreased 21 and 44

[3] Lenhart, Walter B.. Rare Mineral Recovery Is the Main Business: Rock Products, vol. 9, No. 59, September 1956, pp. 52–69.

percent in tonnage and value, respectively. Total kaolin production was 2 percent higher in tonnage and rose 1 percent in value from 1955.

Miscellaneous clay, including clay used in cement, declined 1 percent in tonnage and 8 percent in value.

TABLE 5.—Clays sold or used by producers, 1947–51 (average) and 1952–56, by kinds

Year	Kaolin		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	300,031	$3,642,122	(1)	(1)	[2] 812,757	[2] $4,083,001
1952	322,778	4,079,112	616,953	$577,899	[2] 947,278	[2] 4,675,261
1953	327,594	4,213,431	621,554	544,415	[2] 964,356	[2] 4,801,921
1954	327,259	4,030,377	808,760	671,650	1,136,019	4,702,027
1955	383,402	4,668,598	703,090	794,581	1,086,492	5,463,179
1956	391,724	4,719,087	695,684	731,598	1,087,408	5,450,685

[1] Figure withheld to avoid disclosing individual company confidential data. Included with "Total."
[2] Includes a small quantity of fire clay.

TABLE 6.—Kaolin sold or used by producers, 1955–56, by uses

Use	1955	1956	Use	1955	1956
	Short tons	Short tons		Short tons	Short tons
Pottery and stoneware:			Miscellaneous:		
Whiteware, etc.	13,884	14,080	Chemicals	1,000	1,000
Kiln furniture: Saggers,			Insecticides and fungicides	(1)	33,102
pins and stilts	1,261	(1)	Plaster and plaster		
Architectural terra cotta	2,500	2,327	products	7,689	7,517
Rubber	221,806	221,133	Absorbent uses	(1)	1,500
Refractories:			Other	108,560	90,741
Fire brick and block	15,261	12,619			
Fire-clay mortar	11,441	7,705	Total	383,402	391,724

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."

Kyanite.—Commercialores, Inc., at the Henry Knob mine in York County, was the only kyanite producer in South Carolina in 1956.

Mica.—Production of sheet mica in 1956 was 5,400 pounds valued at $14,000 compared with 900 pounds valued at $9,300 in 1955. Sheet mica was sold to the Government (GSA) Spruce Pine, (N.C.) Purchase Depot. Scrap-mica production declined 10 percent in tonnage and 7 percent in value from 1955. Production was reported from Abbeville, Anderson, Cherokee, Greenville, Lancaster, Oconee, and Saluda Counties.

Sand and Gravel.—Production of sand and gravel for sale or use by producers in 1956 was 3.2 million tons valued at $2.9 million—an increase of 3 percent in quantity and 9 percent in value. Sand rose 5 percent in tonnage and 16 percent in value; gravel increased only 1 percent in quantity but 6 percent in value. Twenty-eight commercial producers were active in 15 counties during the year. In addition, the South Carolina State Highway Department produced paving sand from 15 counties, totaling 38,000 tons valued at $15,000, compared with 30,000 tons valued at $9,000 in 1955.

TABLE 7.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	405,546	$191,438	1954	2,813,750	$2,550,260
1952	1,048,099	892,312	1955	3,126,952	2,677,054
1953	2,975,608	2,564,484	1956	3,228,740	2,925,902

TABLE 8.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Structural	1,755,109	$1,267,467	[1] 1,018,419	[1] $529,997
Paving	849,002	916,079	1,173,246	1,090,541
Engine sand	22,528	22,713	[2]	[2]
Molding sand	9,266	6,950		
Other	491,047	463,845	1,037,075	1,305,364
Total	3,126,952	2,677,054	3,228,740	2,925,902

[1] Structural sand only; structural gravel included with "Other."
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Other."

Stone.—Total stone production in 1956 increased 16 percent in tonnage and 8 percent in value. Crushed granite rose 5 percent in quantity and 3 percent in value; dimension-granite production was substantially the same as in 1955. Limestone production, which included for the first time lime rock used in manufacturing cement, more than doubled from 1955 and increased in value 63 percent.

Granite was quarried in 5 counties: Fairfield, Lexington, Pickens, Richland, and Spartanburg. Cherokee and Dorchester counties produced limestone.

TABLE 9.—Crushed stone sold or used by producers, 1947–51 (average) and 1952–56

Year	Granite		Limestone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	2,165,641	$2,820,663	[1]	[1]	[1]	[1]
1952	2,648,284	3,456,684	266,095	$424,195	[2] 2,914,839	[2] $3,881,178
1953	2,660,989	3,587,827	252,871	388,543	2,913,860	3,976,370
1954	2,812,196	3,863,270	38,000	76,000	[3] 2,861,953	[3] 4,233,270
1955	3,146,989	4,172,329	[1]	[1]	[1]	[1]
1956	3,304,484	4,285,383	[1]	[1]	[1]	[1]

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes a small quantity of miscellaneous stone.
[3] Incomplete figure; excludes a small quantity of miscellaneous stone.

TABLE 10.—Crushed granite sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Concrete, roadstone, screenings	2,454,759	$3,365,337	2,704,589	$3,819,944
Railroad ballast	519,269	696,662	[1]	[1]
Other	172,961	110,330	599,895	465,439
Total	3,146,989	4,172,329	3,304,484	4,285,383

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other."

Vermiculite.—Crude-vermiculite production was 3 percent above 1955 in both tonnage and value. Zonolite Co. was the principal producer; Alabama Vermiculite Co. and American Vermiculite Co. mined smaller tonnages. The production came from Laurens County. Zonolite Co. also operated an exfoliating plant at Travelers Rest. Shipments of exfoliated vermiculite were 12 percent higher than in 1955.

REVIEW BY COUNTIES

Mineral production was recorded in 32 of the 46 counties in South Carolina. Aiken and Dorchester Counties furnished more than 50 percent of total mineral-production value; Fairfield, Lexington, Richland, Marlboro, and Pickens Counties each produced more than $1 million, following in that order. Other important producing counties were Cherokee, Lancaster, Laurens, Spartanburg, Sumter, and York.

TABLE 11.—Value of mineral production in South Carolina, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Abbeville	(2)	(2)	Mica.
Aiken	$4,671,429	$5,292,240	Kaolin, titanium concentrates, monazite, sand and gravel, miscellaneous clay.
Anderson	(2)	1,757	Mica, sand and gravel.
Bamberg	(2)	(2)	Sand and gravel.
Calhoun	55	65	Do.
Charleston	(2)	(2)	Do.
Cherokee	(2)	(2)	Limestone, barite, sand and gravel, mica.
Chester	580	900	Sand and gravel.
Chesterfield	(2)	289,402	Do.
Dorchester	(2)	(2)	Cement, limestone, miscellaneous clay, sand and gravel.
Fairfield	(2)	(2)	Granite, miscellaneous clay.
Florence	(2)	(2)	Sand and gravel.
Greenville	(2)	45,082	Sand and gravel, mica.
Greenwood	27,000	27,186	Miscellaneous clay.
Horry	(2)	(2)	Sand and gravel.
Jasper	(2)	(2)	Do.
Kershaw	45	2,000	Do.
Lancaster	(2)	(2)	Mica, miscellaneous clay.
Laurens	(2)	(2)	Vermiculite.
Lee	25	----	
Lexington	(2)	(2)	Granite, sand and gravel.
Marion	(2)	24,034	Miscellaneous clay, sand and gravel.
Marlboro	(2)	(2)	Sand and gravel, miscellaneous clay.
Oconee	2,822	3,538	Sand and gravel, mica.
Orangeburg	925	400	Sand and gravel.
Pickens	(2)	(2)	Granite.
Richland	1,014,266	1,113,551	Granite, miscellaneous clay, kaolin, sand and gravel.
Saluda	(2)	(2)	Mica.
Spartanburg	(2)	(2)	Granite, sand and gravel.
Sumter	(2)	(2)	Sand and gravel.
Union	7,188	100	Do.
York	(2)	(2)	Kyanite, sand and gravel.
Undistributed	14,472,665	14,541,745	
Total	20,197,000	21,342,000	

[1] The following counties are not listed because no production was reported: Allendale, Barnwell, Beaufort, Berkeley, Clarendon, Colleton, Darlington, Dillon, Edgefield, Georgetown, Hampton, McCormick, Newberry, and Williamsburg.

[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Abbeville.—L. C. Clinkscales mined and sold hand-cobbed mica to the Government (GSA) Spruce Pine (N. C.) Purchase Depot.

Aiken.—Aiken ranked as the second most important mineral-producing county in the State; production, valued at $5.3 million, increased 13 percent over 1955, owing principally to initial production of heavy mineral concentrates and greater sand and gravel output.

Marine Minerals, Inc., began dredging at its Horse Creek mine in 1955 and in 1956 shipped monazite, ilmenite, and rutile concentrates.

The following 6 companies produced kaolin at 10 mines: Bell Clay Co. (Batesburg mine), Dixie Clay Co. (McNamee mine), J. M. Huber Corp. (Barden and Paragon mines), International Clay Co., National Kaolin Products Co. (Aiken mine), and Southeastern Clay Co. (Toole, Rodgers, Johnson and Flock mines). Georgia-Carolina Brick Co. mined shale for use in manufacturing heavy clay products. Augusta Sand & Gravel Co. and Perry Minerals Co., Inc., produced sand and gravel. The latter company production was obtained as a byproduct in dredging and concentrating heavy-mineral sands at the Horse Creek mine. The South Carolina State Highway Department mined paving sand for its own use.

TABLE 12.—Kaolin sold or used by producers in Aiken County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	298,795	$3,829,588	1954	307,816	$3,973,970
1952	311,512	4,034,048	1955	356,911	4,575,877
1953	327,594	4,213,431	1956	370,858	4,667,001

Anderson.—Jesse D. Holland mined sheet mica, and the State highway department mined a small quantity of paving sand.

Bamberg.—Colleton Sand & Silica Co. mined and marketed building sand. Production was estimated to equal that in 1955.

Calhoun.—The State highway department produced a small quantity of paving sand.

Charleston.—Edisto Sand & Gravel Co. mined building sand, and the Sandrying Co. produced silica fillers.

Cherokee.—Industrial Minerals, Inc., mined barite at Kings Creek. Campbell Limestone Co. quarried crushed limestone at Blacksburg for concrete aggregate, roadstone, and agricultural stone. Paul K. Hines produced hand-cobbed mica. Jobe Sand Co. and the State highway department mined engine and paving sand, respectively.

Chester.—A small quantity of paving sand was produced by the State highway department.

Chesterfield.—W. R. Bonsal Co. and the State highway department produced sand and gravel for structural and paving uses.

Dorchester.—Dorchester County led South Carolina in value of mineral products and gained 5 percent over 1955. Carolina Giant Cement Co. mined clay and limestone and manufactured portland

cement at its Harleyville plant. Salisbury Brick Corp. mined clay for use in manufacturing heavy clay products at Summerville. Volunteer Portland Cement Co. took over the Carolina Cement & Lime Co. at the end of 1955 and continued to produce agricultural limestone in 1956. Hayes Sand Co. and Murray Sand Co. mined structural sand for the first time in 1956.

Fairfield.—The county ranked third in value as a mineral producer in South Carolina. Richland Shale Products Co. mined shale for use in its clay-products plant. Palmetto Quarries Co. crushed granite for railroad ballast and stone sand, and Rion Crushed Stone Corp. crushed granite for concrete and roadstone. Winnsboro Granite Co. was the only producer of dimension granite in the State.

Florence.—Sand was the only mineral produced in Florence County. Producers were: Coastal Sand Co. (Johnsonville), structural and paving sand; and Thomas Wall Sand Co. (Marion), structural sand only.

Greenville.—Southern Mining Co. produced hand-cobbed mica from the Briggs mine valued at $11,300. Five operators produced sand totaling 76,000 tons valued at $34,000. E. C. Cooper Sand Co. (Easley) and R. G. Garrison and Rogers Sand-Stone Co (Greenville) mined structural sand; James F. Zupan (Greenville), produced structural and paving sand; and the State highway department produced paving sand.

Greenwood.—Angus Brick & Tile Co. and Southern Brick Co. mined 101,000 tons of miscellaneous clay for heavy clay products.

TABLE 13.—Miscellaneous clay sold or used by producers in Greenwood County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	70,750	$58,156	1954	84,000	$63,000
1952	69,275	52,956	1955	100,000	27,000
1953	65,000	49,662	1956	100,690	27,186

Horry.—The Dobbs Co. dredged building sand at Myrtle Beach, and E. P. Pitts Co. produced sand from the Pitts mine at Nichols; production was more than 40 percent above 1955.

Jasper.—Deerfield Sand Co. was the only mineral producer in the county in 1956.

Kershaw.—The State highway department produced 2,500 tons of paving sand.

Lancaster.—Ashe Brick Co. produced clay at its Van Wyck pit for use in its brick plant, and The Mineral Mining Corp. mined and processed sericite (scrap mica) near Kershaw.

Laurens.—Vermiculite was the only mineral produced in Laurens County in 1956. The Zonolite Co. was the principal producer; others were the Alabama Vermiculite Co. and the American Vermiculite Co.

Lexington.—Production of sand in 1956 was 580,000 tons—8 percent lower in tonnage than in 1955. Ninety-three percent of the total tonnage was marketed as building and paving sand, the remainder composing blast, fire or furnace, engine and filter sands, and fertilizer filler. Producers were: Capitol Sand Co., Columbia Silica & Sand Co., Foster Bros. Dixiana Sand Co., and Southern

Silica Mining & Mfg. Co., all of Columbia; Southeastern Sand Co., Cayce; and the State highway department. Weston and Brooker Quarry Co. produced crushed granite at the Cayce quarry. Production was substantially the same as in 1955.

TABLE 14.—Sand sold or used by producers in Lexington County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)	203,151	$101,695	1954	576,970	$276,129
1952	240,322	132,431	1955	633,528	256,750
1953	632,497	295,528	1956	579,838	254,629

Marion.—J. D. Murchison mined miscellaneous clay for building brick at Pee Dee. Sandy Bluff Sand Co. produced building sand at Mullins.

Marlboro.—Cheraw Brick Works, Inc., and Palmetto Brick Co. (both of Cheraw) mined 143,000 tons of miscellaneous clay for use in their brick plants. Becker County Sand & Gravel Co. produced sand and gravel for railroad ballast, building, and paving uses. Lawrence Stone & Gravel Co. mined building sand.

Oconee.—Swain Black (Shirley mine) and Benny Mason (Kelly mine) produced a small amount of sheet mica. The State highway department mined paving sand.

Orangeburg.—The State highway department mined a small quantity of paving sand.

Pickens.—Campbell Limestone Co. crushed granite at the Beverly quarry for concrete aggregates, roadstone, and riprap; production was somewhat below that in the peak year 1955.

Richland.—Clay production declined 14 percent in tonnage and 28 percent in value from 1955. Carolina Ceramics, Inc., and Columbia Pipe Co. mined kaolin and miscellaneous clay for use in firebrick, building brick, and other heavy clay products. R. M. Stork Fire Brick Works mined and used kaolin, and the Guignard Brick Co. mined and used miscellaneous clay. Harrison Sand Corp. mined structural sand, and Strickland Sand Pit mined sand for structural and paving uses. Palmetto Quarries Co. surpassed its previous peak production of 1954 and crushed granite for aggregates, roadstone, and railroad ballast.

Saluda.—Kings Mountain Mica Co., Inc., produced scrap mica from a mica-schist deposit, which was mined out and abandoned at the end of the year.

Spartanburg.—Campbell Limestone Co. crushed granite at the Pacolet quarry for riprap, railroad ballast, concrete, and roadstone. The State highway department produced 2,000 tons of paving sand.

Sumter.—Becker Sand & Gravel Co. again increased its annual production of sand and gravel at the Camden mine, and the State highway department mined a small tonnage of paving sand.

Union.—The only mineral production in the county in 1956 was 200 tons of paving sand mined by the State highway department.

York.—Commercialores, Inc., mined kyanite at the Henry Knob mine near Clover. The State highway department mined 1,000 tons of paving sand.

The Mineral Industry of South Dakota

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the South Dakota State Geological Survey.

By D. H. Mullen [1]

SOUTH DAKOTA mineral production in 1956 was valued at $41.8 million, a gain of 3 percent over 1955, continuing a steady upward trend for the fifth consecutive year. As in 1955, the nonmetals composed over half (51 percent) of the value. Metals, of which gold and silver represented 99 percent, accounted for 48 percent and fuels less than 1 percent.

Gains were recorded in value of gold, iron ore, cement, clays, feldspar, gem stones, gypsum, lime, mica, petroleum, and stone. Conversely, the value of beryl, columbite-tantalite, silver, sand and gravel, and coal declined.

The completion of the uranium-processing mill at Edgemont by Mines Development, Inc., was of major importance. The mill

TABLE 1.—Mineral production in South Dakota, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate—gross weight	294	$157,046	195	$94,830
Clays	(2)	(2)	[3] 201,129	[3] 201,129
Coal (lignite)	25,782	90,240	24,519	89,761
Columbium-tantalum concentrate—pounds	5,638	9,584	237	403
Feldspar—long tons	42,164	267,286	45,226	288,843
Gem stones	(4)	7,400	(4)	10,000
Gold (recoverable content of ores, etc.)—troy ounces	529,865	18,545,275	568,523	19,898,305
Gypsum	12,592	16,369	15,794	63,176
Iron ore (usable)—long tons, gross weight	2,048	(2)	22,146	100,456
Mica:				
Scrap	1,322	26,853	1,268	31,224
Sheet—pounds	4,854	21,383	12,494	57,053
Sand and gravel	13,537,801	10,096,828	12,539,000	8,423,050
Silver (recoverable content of ores, etc.)—troy ounces	154,092	139,461	136,118	123,194
Stone	2,262,246	5,679,444	2,200,421	5,724,758
Value of items that cannot be disclosed: Bentonite (1956) cement, lime, petroleum, and values indicated by footnote 2	----------	6,114,433	----------	7,547,393
Total South Dakota [5]	----------	40,526,000	----------	41,797,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers); value of uranium ore is excluded.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[3] Excludes bentonite; value included with "Value of items that cannot be disclosed" to avoid disclosing individual company confidential data.
[4] Weight not recorded.
[5] Total adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.

began operation in July and processed ores from Wyoming as well as South Dakota. A Defense Minerals Exploration Administration (DMEA) contract to explore the Teepee uranium prospect was approved.

Exploration for petroleum was at a higher rate than in 1955, but no new discoveries were made.

Employment in the mining industry remained constant at 2,500 men from 1954 through 1956. Contract-construction employment, which included (in part) contractors engaged in producing raw materials such as sand and gravel and crushed stone for road construction and similar projects, as well as building and other contractors, increased from 9,700 in 1954 to 10,000 in 1956.

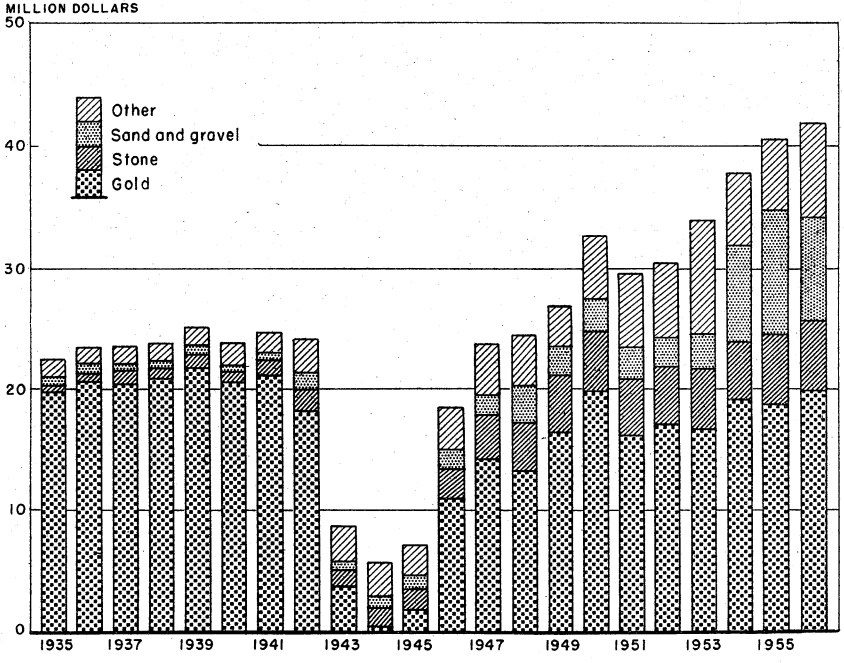

FIGURE 1.—Value of gold, dimension and crushed stone, sand and gravel, and total value of mineral production in South Dakota, 1935–56.

REVIEW BY MINERAL COMMODITIES

METALS

Beryllium.—Beryllium concentrate (beryl) was recovered by hand cobbing from pegmatite dikes in Custer and Pennington Counties as a coproduct of feldspar and mica mining. Production in 1956 was 195 tons—a 34-percent decrease compared with 1955. The Government purchased 57 percent of the output through the GSA Custer (S. Dak.) Purchase Depot for stockpiling. Gladys Wells McKinley (Custer) purchased the remainder for resale to consumers. Pennington County produced 52 percent and Custer County 48 percent of the

total. Sales were reported by 108 companies, individuals, and combinations of individuals—79 in Custer County and 29 in Pennington County.

The Federal Bureau of Mines Rapid City Experiment Station continued to study methods of separating beryl, columbite-tantalite, and mica from pegmatite rock.

Columbium (Niobium) Tantalum.—Production of columbite-tantalite concentrate again declined in 1956. There was little or no output after purchases for the stockpile ceased when the quota established by the Congress was filled in 1955. On July 19, 1956, the Domestic Tungsten, Asbestos, Fluorspar, and Columbium-Tantalum Purchase Act of 1956 was signed by the President and the measure (S. 3982) became Public Law 733, 84th Congress, 2d session. The act provided for purchasing 250,000 pounds of columbium-tantalum-bearing concentrate at the same price and meeting the same specifications as were in effect December 1, 1955. Passage of the act did not result in immediate resumption of operations, and production in 1956 was 237 pounds—a decline of 96 percent compared with 1955. Sales were reported by 3 producers in Custer County and 1 in Pennington County.

Gold and Silver.—The Homestake Mining Co. and the Bald Mountain Mining Co. in Lawrence County, the only producers of gold and silver, furnished 99 percent of the value of all metals produced and 48 percent of the value of mineral production of South Dakota. Output of gold increased 7 percent and silver decreased 12 percent in 1956 compared with 1955. Homestake Mining Co. retained its position as the leading gold producer in the Nation.

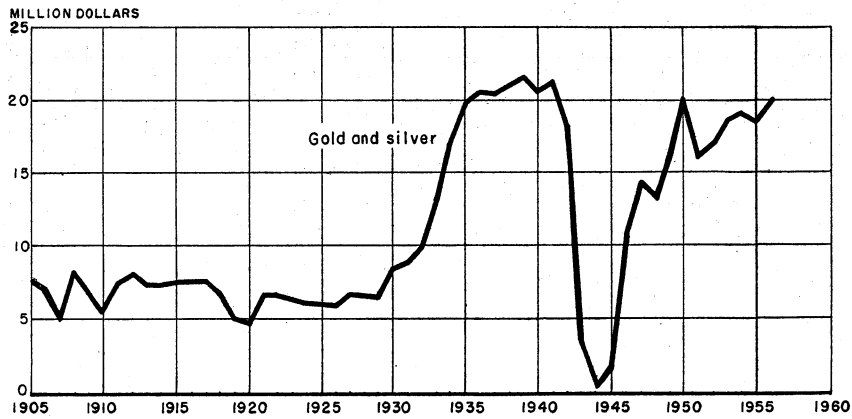

FIGURE 2.—Total value of mine production of gold and silver in South Dakota, 1905–56.

Iron Ore.—Iron ore from deposits on Strawberry Hill in Lawrence County was used in cement. Earlier, a deposit near Nemo, also in Lawrence County, was used for the same purpose. Ore from Strawberry Hill is softer, more easily crushed, higher grade, and more suitable for use in cement than that from Nemo, which is relatively hard

TABLE 2.—Mine production of gold and silver in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Month	Gold (fine ounces)	Silver (fine ounces)
January	41,057	9,965	August	50,601	11,681
February	42,337	10,546	September	50,725	12,030
March	45,294	11,293	October	46,554	10,318
April	44,671	10,924	November	50,761	11,497
May	47,109	12,322	December	46,123	10,718
June	51,727	12,512			
July	51,564	12,312	Total	568,523	136,118

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total 1876–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	4	1	1,146,487	455,158	$15,930,537	119,483	$108,137
1952	6		1,324,817	482,534	16,888,690	132,102	119,559
1953	4		1,479,802	534,987	18,724,545	138,642	125,478
1954	2		1,600,784	541,445	18,950,575	151,407	137,031
1955	2		1,665,341	529,865	18,545,275	154,092	139,461
1956	2		1,743,173	568,523	19,898,305	136,118	123,194
1876–1956			[3]	25,979,446	690,877,819	10,997,785	8,085,466

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)			6	$1,998	10	$2,462	$16,043,134
1952			2	644			17,008,893
1953			10	2,620			18,852,643
1954							19,087,606
1955							18,684,736
1956							20,021,499
1876–1956	106	$36,466	497	71,752	265	56,406	699,127,909

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailing or slime re-treated, and ore or old tailing shipped directly to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

TABLE 4.—Gold and silver bullion produced at mills by amalgamation, 1947–51 (average) and 1952–56

Year	Material sold or treated (short tons)	Gold in bullion (fine ounces)	Silver in bullion (fine ounces)	Year	Material sold or treated (short tons)	Gold in bullion (fine ounces)	Silver in bullion (fine ounces)
1947–51 (average)	1,033,934	306,556	76,292	1954	1,485,226	363,831	80,168
1952	1,209,926	328,844	64,584	1955	1,550,116	379,249	76,312
1953	1,368,059	365,442	74,608	1956	1,627,719	404,525	80,044

and difficult to crush. Production in 1956 was 22,146 long tons, more than a 10-fold increase over 1955.

Uranium.—Exploration, development, and production of uranium ores in Fall River County continued throughout 1956. Uranium-

TABLE 5.—Gold and silver bullion produced at mills by cyanidation, 1947–51 (average) and 1952–56

Year	Material treated (short tons)			Gold in bullion (fine ounces)	Silver in bullion (fine ounces)
	Crude ore	Sands and slimes	Total		
1947–51 (average)	111,502	1,033,625	1,145,127	148,570	42,763
1952	114,863	1,209,884	1,324,747	153,690	67,183
1953	111,676	1,368,059	1,479,735	169,542	63,434
1954	115,558	1,485,226	1,600,784	177,614	71,239
1955	115,225	1,550,116	1,665,341	150,616	77,780
1956	115,454	1,627,719	1,743,173	163,998	56,074

bearing material was found in Custer and Pennington Counties, and some ore was produced. Exploration of uraniferous lignite beds in Harding County continued, and a small tonnage was shipped for test purposes. Although research continued on the problem of extracting uranium from the lignites, no economically suitable method had been developed by the end of the year. Exploration was done by rotary drilling (3,044 holes; 226,449 feet), wagon drilling (2,000 feet), drifting and crosscutting (3,480 feet), sinking and raising (481 feet), and stripping (5,000 cubic yards). Most of the exploration was in Fall River County, followed by Custer, Meade, and Harding Counties.

Mines Development, Inc., completed its 300-ton-a-day mill at Edgemont and began operations early in July.

Lucius Pitkin, Inc., operated the buying station at Edgemont as agents for the Atomic Energy Commission (AEC) from January 1 until July 1, when Mines Development, Inc., assumed operation of the facility. The AEC continued to investigate raw-materials resources from its suboffice at Rapid City.

From July 1, 1955, to June 30, 1956, 23,884 tons of uranium ore averaging 0.19 percent uranium oxide was delivered to the buying station from South Dakota operations. The calculated value (f. o. b. mine value equivalent of base price plus grade premium plus development allowance—AEC Circular 5, revised) was $328,861. Because of incomplete figures for the calendar year 1956, this value was not included in the mineral production of the State shown in table 1.

Experiments to develop a method for extracting uranium from uraniferous lignite were made by the AEC at Grand Junction, Colo., where a pilot plant was built. The uranium minerals were readily leached with sulfuric acid, but filtering of the residue by conventional milling methods presented a major problem, as yet unsolved. Further work was directed toward a process consisting of roasting the lignite at a temperature of 1,200° to 1,500° F. to remove interfering tars and oils and leaching the residue with acid to remove the uranium. Results of the work were not available at the end of the year.

A contract for exploring the Teepee uranium project in Fall River County was executed between DMEA and Uranium Research & Development Co. The amount of the contract was $29,140, of which the Government supplied 75 percent.

NONMETALS

Cement.—The South Dakota Cement Plant at Rapid City, Pennington County, produced general-use and moderate-heat (types I and II), high-early-strength (type III), and high-sulfate-resistance (type V) portland cements; and masonry cement. Portland-cement clinker was used as a base in masonry cement. Shipments of portland cements and masonry cement in 1956 increased 11 and 1 percent, respectively, compared with 1955. The average price of portland and masonry cements in 1956 was $2.98 and $3.73 per barrel, respectively, compared with $2.84 and $3.56 in 1955.

Clays.—Bentonite was mined by one company in Butte County. Two plants at Belle Fourche processed crude bentonite, mainly from deposits in Crook County, Wyo. The processed product was utilized for rotary-drilling mud, in foundries and steel plants, as briquet binders, in animal feed, insulation, insecticides, concrete admixture, and filter-aids, and for export.

Miscellaneous clay was mined in Butte County for building brick, tile, and other heavy clay products and in Pennington County for cement and lightweight aggregate.

Production in 1956 increased 40 percent in quantity and 64 percent in value compared with 1955. A report [2] described the expansion of clays and shales from North and South Dakota.

Feldspar.—Feldspar (the major mineral product in most pegmatites) was mined in Custer and Pennington Counties. Nine operations, producing over 1,000 tons each, represented 64 percent of the total production. The remainder was produced by 118 companies, individuals, and combinations of individuals. The bulk of the output was produced and/or purchased by the Consolidated Feldspar Department, International Minerals & Chemical Corp., for grinding at its mills at Custer and Keystone, and at Denver, Colo. Production in 1956 increased 7 percent in quantity and 8 percent in value compared with 1955.

Ground feldspar from the mills at Custer and Keystone was used in pottery, glass, enamel, and soaps and abrasives.

Gem Stones.—Varieties of gem stones, including rose quartz, agatized and petrified wood, jasper, and agates, were collected in various areas of Custer and Pennington Counties. Prices varied from $0.50 a pound for rose quartz and jasper to $5 a pound for Fairburn agates. Most of the output was used for souvenirs and specimens; the better grades of agate were sold to polishers. Reported production in 1956 was 36 percent greater than that reported in 1955.

Gypsum.—Gypsum used in portland and masonry cements was mined from deposits in the Spearfish formation near Rapid City, Pennington County. Production in 1956 was 25 percent greater than in 1955.

Lime.—Quicklime, used within the State, for metallurgical purposes, was produced at Pringle, Custer County. Output in 1956 increased 11 percent compared with 1955.

Mica.—The quantity of sheet mica recovered from handcobbed mica in 1956 increased nearly threefold compared with 1955. Hand-

[2] Zetterstion, J. D., and Cole, W. A., Expansion of Clays and Shales from North and South Dakota: Bureau of Mines Rept. of Investigations 5202, 1956, 13 pp.

cobbed mica delivered to the Government Purchase Depot at Custer increased more than threefold over 1955. The recovery of block mica in 1956 was 5.64 percent compared with 7.16 percent in 1955. The recovery of Stained mica from total block mica processed increased from 40.06 percent in 1955 to 60.63 percent in 1956; during the same period the recovery of Good Stained and Better quality mica declined from 5.59 percent to 2.07 percent.

TABLE 6.—Production of hand-cobbed mica and yield of sheet mica, 1954–56

Year	Hand-cobbed mica	Total block mica recovered		Stained quality recovered		Good Stained and Better quality recovered	
	Pounds	Pounds	Percent of hand cobbed	Pounds	Percent of total block	Pounds	Percent of total block
1954	207,221	15,967	7.71	8,381	52.49	477	2.99
1955	64,673	4,633	7.16	1,856	40.06	259	5.59
1956	216,802	12,238	5.64	7,420	60.63	253	2.07

TABLE 7.—Mica sold or used by producers, 1952–56

	1952	1953	1954	1955	1956
Hand-cobbed mica, total: Pounds	84,846	227,847	207,221	64,673	216,802
Sheet mica:[1]					
Uncut larger than punch and circle:					
Pounds	490	921	332	221	256
Value	$6,580	$8,983	$3,056	$1,980	$2,010
Average per pound	$13.43	$9.75	$9.20	$8.96	$7.85
From hand-cobbed mica:					
Pounds	3,818	10,253	15,967	4,633	12,238
Value	$25,454	$68,369	$62,166	$19,403	$55,043
Average per pound	$6.67	$6.67	$3.89	$4.19	$4.50
Total:					
Pounds	4,308	11,174	16,299	4,854	12,494
Value	$32,034	$77,352	$65,222	$21,383	$57,053
Average per pound	$7.44	$6.92	$4.00	$4.41	$4.57
Scrap mica, total:					
Short tons	915	1,687	1,510	1,322	1,268
Value	$24,148	$27,388	$26,943	$26,853	$31.224
Average per ton	$26.39	$16.23	$17.84	$20.31	$24.62
Total sheet and scrap mica:					
Short tons	917	1,693	1,518	1,324	1,274
Value	$56,182	$104,740	$92,165	$48,236	$88.277

[1] Purchased by GSA Custer (S. Dak.) Purchase Depot.

Mica was produced by 60 operators; the majority were in Custer County. Full-trimmed sheet mica was produced by 7 operators in Custer County; 1 also produced hand-cobbed mica and 5 also produced hand-cobbed and scrap mica. Hand-cobbed mica was produced by 30 operators; 7 also produced hand-cobbed and scrap mica, and 16 also produced scrap mica. Six producers operated deposits in both Custer and Pennington Counties. Scrap-mica production in 1956 decreased 4 percent in quantity but increased 16 percent in value compared with 1955.

Sand and Gravel.—Sand and gravel produced from commercial and Government-and-contractor operations in 1956 declined 7 percent

compared with 1955. The greatest decline—13 percent—was in commercial operations. Production was reported in 45 counties; 31 counties reported commercial production and 42 counties reported Government-and-contractor operations. Paving and road construction consumed 91 percent of the total output; of this, 88 percent was by Government-and-contractor operators. These operations accounted for 81 percent of the total sand and gravel produced.

Leading commercial producers included Batie Gravel Co., Birdsall Sand & Gravel Co., Hallet Construction Co., Hills Materials Co., and Dean R. Rounds. Principal Government-and-contractor operators were G. H. Lindekugel & Sons, Mannerud Bros., A. W. Schnuerle Construction Co., Floyd Stapp Construction Co., and Weelborg Bros.

TABLE 8.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Class of operation and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building	487,503	$432,592	$0.89	465,000	$381,650	$0.82
Paving	490,734	131,859	.27	159,500	115,500	.72
Filter				(1)	(1)	
Railroad ballast				(1)	(1)	
Other				(1)	(1)	
Gravel:						
Building	336,276	213,458	.63	486,000	387,250	.80
Paving	1,349,441	570,083	.42	1,174,500	818,150	.70
Railroad ballast	85,785	32,544	.38	77,000	65,000	.84
Other	494	718	1.45	4,000	2,250	.56
Undistributed [1]				22,500	24,250	1.08
Total sand and gravel	2,750,233	1,381,254	.50	2,388,500	1,794,050	.75
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	270	600	2.22			
Paving	535,124	633,598	1.18	3,500	2,250	.64
Gravel:						
Building	364,435	60,408	.17	118,000	83,500	.71
Paving	9,887,739	8,020,968	.81	10,029,000	6,543,250	.65
Total sand and gravel	10,787,568	8,715,574	.81	10,150,500	6,629,000	.65
Grand total	13,537,801	10,096,828	.75	12,539,000	8,423,050	.67

[1] Figures that may not be shown separately are combined as "Undistributed."

Stone.—In 1956, 7 operators in Grant County and 1 operator in Hughes County produced dimension granite for use in buildings and monuments. This was a decline of 6 percent in quantity and 4 percent in value compared with 1955. Of the 1956 production, 87 percent was used for monuments and 13 percent for building work. Stone quarried by 4 companies was finished at Minnesota plants.

Crushed limestone for use as riprap, concrete aggregate, and road material and in sugar, lime, and cement was produced in Custer, Lawrence, and Pennington Counties. Production in 1956 increased 55 percent in quantity and 58 percent in value compared with 1955.

Concrete aggregate and road material consumed 57 percent of the total production, reflecting the growing use of crushed stone in place of gravel for these purposes.

Crushed sandstone for riprap, concrete aggregate, road material, railroad ballast, refractory stone, filter medium, and foundry sand; and for use in ferrosilicon was produced in Hanson and Minnehaha Counties. A small quantity was produced in Pennington County for use as a roofing material. Output in 1956 increased 25 percent in quantity and 19 percent in value compared with 1955.

Miscellaneous crushed stone was used for concrete aggregate and road material and was produced in Beadle, Meade, and Lawrence Counties; 94 percent was supplied by Government-and-contractor operations. Production in 1956 decreased 70 percent compared with 1955.

MINERAL FUELS

Coal (Lignite).—Coal (lignite) was produced at a strip mine in Dewey County. The entire output, which declined 5 percent in 1956 compared with 1955, was shipped to consumers by truck. Other mines in northwestern counties produced small quantities for local consumption.

Petroleum.—Production of crude petroleum in 1956 was derived from two wells in the Buffalo field in Harding County. Crude oil was transported by truck and railroad to the International refinery at Wrenshall, Minn. Production was slightly more than in 1955. Exploratory drilling increased in 1956; 37 wells were completed compared with 16 in 1955. None of the wells drilled in 1956 was successful; total drilling exceeded 100,000 feet. Three deep tests were completed in Harding County, and small quantities of oil were recovered in two wells. All were plugged and abandoned.

Geophysical (seismograph and gravimeter) work declined to 88 crew-weeks in 1956 compared with 128 crew-weeks in 1955. The major portion of the work was in Harding County (45 crew-weeks), followed by Meade County (14 crew-weeks), Fall River County (11 crew-weeks), and Perkins County (11 crew-weeks). Sun Oil Co. was the major operator, followed by Mobil Producing Co., The Texas Co., and Continental Oil Co.

REVIEW BY COUNTIES

Brookings.—Brookings County led the State in the production of sand and gravel. Brookings Sand & Gravel Co. and Grant Vanden-Berg produced building sand and gravel. Mannerud Bros. produced paving gravel for the State highway commission, and the county highway department produced paving sand.

Brown.—The county ranked second in the State in the output of sand and gravel. Scattergood Sand & Rock Co. produced building sand and John Schnuerle produced paving gravel. Paving gravel was produced for the State highway commission by the A. W. Schnuerle Construction Co. The county highway department produced paving sand and gravel and let contracts for paving gravel to W. Hodgeman & Son, Loomis Bros., and Herman Pickus.

Brule.—Ed Cox & Son produced paving gravel for the county highway department. Brule County ranked fifth in the State in the output of sand and gravel.

TABLE 9.—Value of mineral production (excluding uranium) in South Dakota, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Aurora	(2)	$29,000	Sand and gravel.
Beadle	$46,629	58,509	Sand and gravel, stone.
Bon Homme	18,100	18,000	Sand and gravel.
Brookings	122,783	396,000	Do.
Brown	30,084	347,250	Do.
Brule		(2)	Do.
Buffalo		4,000	Do.
Butte	1,340,389	(2)	Clays, sand and gravel.
Charles Mix	6,499	61,500	Sand and gravel.
Clark	14,997	61,250	Do.
Clay	12,629	44,000	Do.
Codington	199,632	316,500	Do.
Corson	1,800		
Custer	337,888	356,079	Feldspar, mica, beryl, lime, sand and gravel, stone, gem stones, columbium-tantalum.
Davison	32,961	34,750	Sand and gravel.
Day	22,538	36,500	Do.
Deuel	11,326	12,750	Do.
Dewey	90,240	89,761	Coal.
Douglas	15,505	35,000	Sand and gravel.
Edmunds	7,938		
Fall River	(2)	(2)	Sand and gravel.
Grant	2,405,455	2,381,950	Stone, sand and gravel.
Gregory	20,165	50,500	Sand and gravel.
Haakon	8,000		
Hamlin	83,539	59,250	Sand and gravel.
Hand	350	9,250	Do.
Hanson	359,566	499,804	Stone.
Harding	(2)	(2)	Petroleum.
Hughes	(2)	(2)	Sand and gravel, stone.
Hutchinson	26,499	40,500	Sand and gravel.
Hyde	894	7,500	Do.
Jackson	1,719		
Jerauld	(2)	19,750	Sand and gravel.
Kingsbury	45,093	(2)	Do.
Lake	76,985	189,250	Do.
Lawrence	18,741,872	20,250,192	Gold, silver, stone, iron ore, sand and gravel.
Lincoln	82,588	52,750	Sand and gravel.
Lyman	27,187		
Marshall	6,565	20,000	Sand and gravel.
McCook	21,880		
McPherson	1,189	(2)	Sand and gravel.
Meade	44,055	446,942	Sand and gravel, stone.
Miner	3,666	(2)	Sand and gravel.
Minnehaha	(2)	1,013,400	Stone, sand and gravel.
Moody	17,422	63,150	Sand and gravel.
Pennington	6,838,936	7,910,675	Cement, stone, sand and gravel, clays, feldspar, gypsum, beryl, mica, gem stones, columbium-tantalum.
Perkins	21,188	12,900	Sand and gravel.
Roberts	41,830	65,000	Do.
Spink	14,007	47,000	Do.
Stanley	39,500	(2)	Do.
Sully	20,600	72,750	Do.
Turner	39,938	73,750	Do.
Union	24,595	24,000	Do.
Walworth	24,250	23,750	Do.
Undistributed [3]	9,820,131	7,418,713	
Total [4]	40,526,000	41,797,000	

[1] The following counties are not listed because no production was reported: Bennett, Campbell, Faulk, Jones, Mellette, Potter, Sanborn, Shannon, Todd, Tripp, Washabaugh, Yankton, Ziebach.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes value of minerals that cannot be assigned to specific counties and value of minerals for counties indicated in the table by footnote 2.
[4] Total has been adjusted to eliminate duplicating value of raw materials used in manufacturing cement.

Butte.—Bentonite produced from pits near Belle Fourche was processed by American Colloid Co. Eastern Clay Products Department, International Minerals & Chemical Corp., processed bentonite from deposits in Crook County, Wyo., at its plant at Belle Fourche. Black Hills Clay Products Co. mined miscellaneous clay from the Fuson formation for building brick, tile, and other heavy clay products. The county highway department produced paving gravel. Shell Oil Co. drilled an oil well to a depth of 4,533 feet, at which point it was abandoned. Geophysical (seismograph) work was done by Sun Oil Co. (3 crew-weeks) and Continental Oil Co. (2 crew-weeks). The county ranked fourth in the State in the value of mineral production.

Codington.—This county ranked fourth in South Dakota in sand and gravel production. American Sand & Gravel Corp., Hallett Construction Co., and Zeller Concrete Materials Co. produced building sand and gravel. Zeller Concrete Materials Co. and the county highway department produced paving gravel.

Custer.—The mineral production of Custer County came almost entirely from numerous pegmatite dikes. The county ranked ninth in South Dakota in mineral-production value. The principal product was feldspar, which was produced by 93 operators, many of whom produced only a few tons. Abingdon Potteries, Inc., operated the White Elephant mine and purchased a small quantity of feldspar, all of which was shipped to its grinding plant at Abingdon, Ill. Consolidated Feldspar Department, International Minerals & Chemical Corp., operated several mines and purchased crude material from individual producers for grinding at its plant at Custer and at Denver, Colo. A fire on May 1 damaged the top 3 floors of the Custer plant, with an estimated loss of $20,000. Damages were not extensive enough to completely shut down the plant; and after emergency repairs and a revision of the flowsheet, the plant continued operations on a curtailed basis. The principal independent producers included William Gould, James Mayberry, John Phelps, R & N Mining Co., and Kenneth Spring.

Beryllium concentrate (beryl) was recovered from pegmatites. Production was reported by 79 companies, individuals, and combinations of individuals; all of it was sold to the Government through the GSA Custer (S. Dak.) Purchase Depot (57 percent) for stockpiling and to Gladys Wells McKinley (43 percent) for resale to consumers. Major producers were George C. Bland at the Bull Moose Lode, Beecher No. 3 Lode, Someday, Wells, and Pleasant Valley Lode mines; Consolidated Feldspar Department, International Minerals & Chemical Corp. at the Tin Mountain; Walter Hough & J. W. Judson at the High Climb Lode and Wood; Harold & Jim Kouba at the Tin Mountain; and John Roseberry at the Elk Horn. Columbite-tantalite concentrates were recovered by Mineral Mills, Inc., J. D. Long, and Squire Gamber. The entire production was sold through GSA at Custer.

Mica was produced by 43 operators: 1 produced only sheet mica, 1 produced sheet and hand-cobbed mica, 5 produced sheet, hand-cobbed, and scrap mica, 25 produced hand-cobbed mica, 6 produced hand-cobbed and scrap mica, and 5 produced only scrap mica. Sheet and hand-cobbed mica was sold to the Government GSA Custer (S. Dak.) Purchase Depot for processing. Scrap mica was sold to

grinders and to Gladys Wells McKinley for resale to grinders. Among the major producers of mica in Custer County were Roseberry & Martin which produced hand-cobbed mica at the Redbird mine; Lewis W. Collingwood, hand-cobbed mica at the Silver Dollar and Ann mines; Dale McDermond, hand-cobbed and scrap mica at the White Bear and Redbird mines; George R. Campbell, Sr., hand-cobbed and scrap mica at the New York mine; Dale D. Brown, sheet, hand-cobbed, and scrap mica at the Dilly Ridge mine; Walter W. Andre, hand-cobbed mica at the McArthur mine; and Eugene V. Schefeik, hand-cobbed and scrap mica at the Diamond Dick Lode.

Quicklime was produced by the Black Hills Lime Co. at Pringle for metallurgical purposes. Limestone for the plant was mined from a nearby quarry. Rose quartz, jasper, agate, and agatized wood were collected for sale to polishers and as specimens. F. R. Schultz Construction Co. produced paving gravel for the Federal Forest Service.

T. C. Eyres completed an oil well in the vicinity of the discovery by L. A. Helms in 1955. The well was abandoned at 1,378 feet in the First Leo sandstone. Pure Oil Co. completed 2 crew-weeks of seismograph work.

Black Hills Uranium Co. and Edgemont Mining & Uranium Corp. produced uranium ore at the Freezeout No. 2 mine, which was shipped to the Mines Development Inc. mill at Edgemont.

Dewey.—Dewey County Coal Co. produced coal (lignite) from a strip pit at Firesteel. This was the only coal mine in the State producing more than 1,000 tons.

Herndon Drilling Co. completed a wildcat well at 4,890 feet, at which point it was abandoned.

Fall River.—Construction of the Mines Development, Inc., 300-ton-a-day, uranium-processing mill at Edgemont was completed and began operating early in July. Operation of the AEC buying station was taken over by the corporation from Lucius Pitkin, Inc., on July 1. Completion of the mill stabilized mining operations to a considerable extent, and reported receipts of uranium ore at the mill exceeded 10,000 tons a month. A small quantity of uraniferous lignite was received from deposits in North and South Dakota for test purposes. The mill, the 11th in the United States and the 1st outside the Colorado Plateau area, used a sulfuric-acid leach and the resin-in-pulp ion-exchange process to recover the uranium. Outstanding features of the mill included an automatic control of the pH of the acid leach by recorder-controllers at any desired acidity, and control of solution flow by a distribution system that completely eliminated valves in the pipelines. A signal panel indicated the flow of solutions and provided a visual flowsheet at all times.

Exploration, consisting of drilling, sinking, raising, drifting, and stripping, continued. Rotary drilling was used extensively, and 1,951 drill holes totaling 122,748 feet were completed. Wagon drilling totaled 2,000 feet; 481 feet of shafts, raises, and winzes was completed; 3,080 feet of adits, drifts, and crosscuts was driven; and about 5,000 cubic yards of stripping was done. From July 1, 1955, to June 30, 1956, 21,728 tons of ore was delivered to the Edgemont buying station from deposits in Fall River County.

Shippers to the buying station during the fiscal year included Black Hills Uranium Co., from the Clara Belle group, Holdup group, Hot-

point No. 7, Kados No. 3, Yellow Cat No. 1, and Shamrock No. 4; Mining Research Corp., from the Gull Lease; Edgemont Mining Uranium Corp., from the Taylor No. 2, Trail Fraction, Freezeout, and Gould Lease; F. J. & F. Albright, from the Green Acres group; South Dakota Uranium & Mining Co., from the Too Late No. 2; Big Sioux Uranium & Minerals Co., from the Too Late No. 2 and Canyon; Lorenz Bros., from the Damsite group and Accidental No. 1; Roy E. Chord, from the Coal Canyon and Helen; Pictograph Mining Co., from the Pictograph and Marty Lease; McLeod Development, from the K–7; and Diamond Mining Co., from the King. A DMEA contract for exploration of the Teepee prospect by the Uranium Research & Development Co. was approved. The exploration, consisting of drilling, was done in October and November.

Eight exploratory oil wells were completed by Herndon Drilling Co. (1) and Pure Oil Co. (7). No data were released, and the wells were abandoned. Geophysical (seismograph) work was done by Ohio Oil Co. (9 crew-weeks), Pure Oil Co. (1 crew-week), and Shell Oil Co. (1 crew-week).

Batie Gravel Co. produced building sand and gravel, Oral Sand Co., building and paving sand and gravel, and Fall River Sand & Gravel Co. paving gravel.

Grant.—Production of dimension granite from Grant County quarries in 1956 decreased 6 percent in quantity and 4 percent in value compared with 1955. The county ranked third in South Dakota in the value of mineral production. Seven companies operated eight quarries, all near Big Stone City and Milbank. Rough stone produced by four companies was finished at plants in Minnesota.

Consolidated Quarries, Inc., operated a quarry at Milbank; the rough stone was finished at the plant at Sauk Rapids, Minn. Dakota Granite Co. operated the Dakota No. 1 and American Rose quarries at Milbank. The rough stone was finished for use in monuments and mausoleums and marketed as Dakota Mahogany, American Rose, and American Bouquet. Delano Granite Works, Inc., produced rough stone at its Milbank quarry and finished the stone at Delano, Minn., for use in buildings and monuments. Melrose Granite Co. operated the Melrose Russet quarry and finished the stone at its plant in St. Cloud, Minn., for use in monuments. North Star Granite Corp. produced rough stone at its Quarry No. 7 at Big Stone City. The rough stone (Dakota Mahogany) was finished at its plant at St. Cloud, Minn. Robert Hunter Granite Co., Inc., produced rough and finished stone for use in buildings and monuments at its quarry and plant at Milbank. The stone was marketed as Royal Purple. Steiner-Rausch Granite Co., Inc., operated its quarry and plant at Big Stone City. Rough, and dressed stone (Columbia or Carnelian Mahogany) was marketed for use in buildings and monuments.

Walter Lindberg produced paving sand; Torgrude Construction Co. and the county highway department produced paving gravel.

Hanson.—Spencer Quarries, Inc., produced crushed sandstone for riprap, concrete aggregate, and road material. Production in 1956 increased 34 percent in quantity and 39 percent in value compared with 1955. The county ranked sixth in the State in the value of mineral output.

Harding.—Harding County continued to be the only producer of crude oil in South Dakota. Production came from 2 wells in the Buffalo field and at about the same rate as in 1955. Sun Oil Co. drilled a deep-test well 8 miles northeast of the Buffalo field. Some free oil was recovered on a drill-stem test at 9,200–9,260 feet in the Red River formation, of Ordovician age; the well was abandoned at 9,365 feet. Ohio Oil Co. drilled a deep-test well in the northwestern corner of the county; it was abandoned at 8,894 feet in granite. Amerada Petroleum Corp. drilled a well in the southwestern corner of the county; the well, tested at 3,450 feet in the Newcastle formation of Cretaceous age, had no indications of oil and was abandoned. Geophysical (seismograph) work was done by Continental Oil Co. (10 crew-weeks), Mobil Producing Co. (18 crew-weeks), The Texas Co. (16 crew-weeks), and Sun Oil Co. (1 crew-week).

Exploration of uraniferous-lignite deposits continued, with 200 feet of rotary drilling and 3,500 cubic yards of stripping. Several hundred tons of uranium-bearing lignite was shipped to the Mines Development, Inc., mill at Edgemont for testing.

Lake.—Madison Sand & Gravel Co. produced building sand and gravel and paving gravel. Roger Jones produced paving gravel for the State highway commission. The county highway department produced paving gravel and awarded contracts for paving gravel to Walt Brownlee, J. F. Brunken & Son, Gustafson & Reynolds, and Roger Jones.

Lawrence.—Lawrence County led the State in the value of mineral output and continued to be the leading gold-producing district in the United States. Mineral production in 1956 was valued at $20.3 million—an 8-percent increase compared with 1955. The value of gold production increased 7 percent, iron ore tenfold, sand and gravel sixfold, and stone nearly threefold. The value of silver produced decreased 12 percent

The Homestake Mining Co., the leading gold producer in the United States, operated its mine and mill at Lead the entire year. The tons of ore milled increased 5 percent, and bullion sales increased 7 percent over 1955. Both mining and milling costs increased, the average being 6.7 cents a ton. Developed ore reserves declined 1.5 million tons, and the average value declined 5 cents a ton. The deep-level development continued, and crosscutting started from the No. 4 winze (sunk from the 5,000 level) on the 5,300 and 5,600 levels. The winze was bottomed on the 5,700 level. Development of the long-range ventilation program continued as planned.

A fourth ball-mill unit began operation in February and increased the annual tons of ore milled by 77,000. A wage raise of 7.5 cents an hour was granted and became effective January 1, 1956. An additional raise of 6 cents an hour was authorized, to become effective on January 1, 1957.

The Bald Mountain Mining Co. operated the Clinton, Portland, Dakota, Decorah, and Gold Bug mines and the 350-ton-a-day, all-sluice cyanide plant at Trojan. The tons of ore milled in 1956 increased less than 1 percent, but the value of bullion sales increased 6 percent compared with 1955. A higher gold content and lower silver content in the ore milled accounted for the increase in value.

TABLE 10.—Ore milled, receipts, and dividends, Homestake mine, 1952–56 [1]

Year	Ore milled (short tons)	Receipts for bullion product		Dividends
		Total	Per ton	
1952	1,209,884	$16,379,986	$13.5385	$3,717,168
1953	1,368,059	18,251,984	13.3415	4,018,560
1954	1,485,226	18,409,610	12.3951	4,018,560
1955	1,550,116	18,055,258	11.6477	4,018,560
1956	1,627,719	19,354,312	11.8905	4,018,560

[1] From 1876 to 1956, inclusive, this mine yielded bullion and concentrates that brought a net return of $619,315,031 and paid $194,813,674 in dividends.

Pete Lien & Sons produced iron ore at the Strawberry Hill Mining Co. mine for use in cement. Previous iron production had been from deposits near Nemo.

Cole Construction Co. produced paving sand and gravel and crushed limestone for riprap, concrete aggregate, and road material, and in sugar refining. Cole & McLaughlin produced paving gravel for the city of Lead and crushed limestone for concrete aggregate and road material. Floyd Stapp Construction Co. produced crushed miscellaneous stone for road construction. The county highway department produced crushed limestone for riprap.

Meade.—Hills Materials Co. produced building and paving gravel. A. W. Kost and Robert Strong produced paving gravel and crushed miscellaneous stone for concrete aggregate and road material for the county highway department. Henry, Hanson & Conlon Exploration Co. bored 9 rotary-drill holes for a total of 360 feet on the Lamberton property to explore for uranium ore. Thirteen wildcat oil wells were drilled—Continental Oil Co. (6), Phillips Petroleum Co. (4), and Herndon Drilling Co. (3)—for a total of 35,333 feet. All were dry holes and were abandoned. Geophysical (seismograph) work was done by the Sun Oil Co. (13 crew-weeks) and Kerr-McGee (1 crew-week).

Minnehaha.—Concrete Materials Co. produced crushed sandstone for riprap, concrete aggregate, road material, filter medium, and refractories. The company also produced building and paving sand and paving gravel. L. G. Everist, Inc., produced crushed sandstone for riprap, concrete aggregate, road material, railroad ballast, refractories, the manufacture of ferrosilicon, and for use in filters and foundries. Eagle Sand & Gravel Co. produced building sand and paving gravel. Frank E. Lacey produced paving gravel. Minnehaha County ranked fifth in the State in the value of mineral production.

Miner.—Weelborg Bros. produced paving gravel for the county highway department.

Pennington.—The value of mineral production from the mines and quarries in Pennington County in 1956 was $7.9 million, a gain of $1.1 million (16 percent) over 1955. Increases in value were recorded in cement, clays, feldspar, gypsum, mica, sand and gravel, and stone. The value of beryl and columbite-tantalite concentrates decreased. As in previous years, the county ranked second in the State in the value of its mineral output.

The South Dakota Cement Commission operated the South Dakota Cement Plant owned by the State at Rapid City. Shipments of portland cements (types I, II, III, and V) and masonry cements in 1956 increased 11 percent in quantity and 17 percent in value compared with 1955. The average price of portland cement was increased from $2.84 a barrel in 1955 to $2.98 in 1956. Masonry cement advanced from $3.56 a barrel in 1955 to $3.73 in 1956. The commission produces the limestone, shale, sand, and gypsum used at the plant from deposits near Rapid City. Iron ore from deposits in Lawrence County, used in the mix, was purchased from the producer. An additional kiln and grinding unit were installed at the plant, which increased the capacity 44 percent. Shipments in 1956 were mainly to consumers in South Dakota (72 percent), North Dakota (10 percent), and Nebraska (6 percent), with smaller amounts to Wyoming, Montana, Minnesota, Iowa, Colorado, Illinois, and Canada.

Beryllium concentrate (beryl), produced by 29 companies, individuals, and combinations of individuals accounted for 52 percent of the beryl output of South Dakota. It was sold to the Government (GSA) Custer (S. Dak.) Purchase Depot (55 percent) for stockpiling and to Gladys Wells McKinley (45 percent) at Custer for resale to consumers. Major producers were Dale McDermond at the Whitecap Lode; Consolidated Feldspar Department, International Minerals & Chemical Corp., at the Hugo; John Nickels, Jr., at the Star Lode; Keystone Feldspar & Chemical Co., at the Peerless; Black Hills Keystone Corp., at the Bob Ingersoll; and Harold Hall, at the Whitecap, Peerless, and Big Chief. Ira L. Babbington, the only producer of columbite-tantalite concentrate in the county, furnished 25 percent of the State output in 1956. Feldspar—the principal pegmatite mineral—was produced by 34 operators—19 of them produced only a few tons. Major operators were Consolidated Feldspar Department, International Minerals & Chemical Corp., Hough & Patterson, Keystone Feldspar & Chemical Co., and Jack Pendleton. All of the output was ground at Keystone and at Denver, Colo., by Consolidated Feldspar Department, International Minerals & Chemical Corp. The ground product was used in glass, pottery, enamel, soaps, and abrasives. Gem stones, chalcedony, jasper, agate, and agatized and petrified wood were collected by five operators in the Bad Lands in the eastern part of Pennington County.

Hand-cobbed and scrap mica was produced by 23 operators. The value of output in 1956 increased 21 and 31 percent, respectively, compared with 1955. Eight operators produced hand-cobbed mica, 13 produced scrap mica, and 2 produced both hand-cobbed and scrap mica. Hand-cobbed mica was sold to the Government (GSA) Custer (S. Dak.) Purchase Depot for processing and stockpiling of the strategic mica recovered. Scrap mica was sold to grinders and to Gladys Wells McKinley at Custer for resale to consumers. Major producers of hand-cobbed mica included Dale McDermond at the Whitecap, Clemadair Pepin at the Robertson, and Uranium & Allied Minerals, Inc. Principal producers of scrap mica were Black Hills Keystone Corp. at the Bob Ingersoll; Consolidated Feldspar Department, International Minerals & Chemical Corp., at the Hugo; Keystone Feldspar & Chemical Co., at the Peerless; and John Nickels, Jr., at the Star Lode.

Light Aggregates, Inc., mines shale from the Pierre formation near Rapid City for lighweight aggregate. The bloated product was used principally as aggregate in concrete blocks.

Base Central Mix Co. produced building sand and gravel. Birdsall Sand & Gravel Co. produced building and paving sand and gravel, and gravel for railroad ballast. Richard H. Christle, Peter Kiewit Sons' Co., and Pete Lien & Sons produced building gravel. F. R. Schultz Construction Co. produced paving gravel for the United States Forest Service. Pennington County Highway Department produced paving sand and awarded a contract to Floyd Stapp Construction Co. for paving gravel. L. G. Everist, Inc., Hills Materials Co., and Pete Lien & Sons produced crushed limestone for concrete aggregate and road material. Pete Lien & Sons produced riprap.

Reserve Drilling Co. drilled a wildcat well to a depth of 5,575 feet, where it was abandoned.

Stanley.—W. H. Noel Co. produced paving gravel for the State highway commission.

The Mineral Industry of Tennessee

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Tennessee Division of Geology.

By Avery H. Reed, Jr.[1] and William D. Hardeman, Jr.[2]

RECORD production of copper, zinc, cement, clays, mica, phosphate rock, pyrite, sand and gravel, stone, and bituminous coal highlighted the mineral industry of the State in 1956. Among the the States, Tennessee led in pyrite production and ranked second in producing phosphate rock.

The total value of mineral production reached a new high and represented a 15-percent gain over 1955 and a 30-percent increase over 1954.

The leading industries were coal mining, cement manufacture, stone quarrying, zinc and copper production, and phosphate-rock

TABLE 1.—Mineral production in Tennessee, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement:				
Masonry—376-pound barrels	794, 994	$2, 497, 287	705, 141	$2, 420, 648
Portland—do	8, 016, 859	21, 175, 825	8, 049, 701	23, 013, 979
Clays	1, 207, 613	4, 169, 885	1, 378, 512	4, 887, 609
Coal	7, 052, 844	28, 746, 574	8, 847, 770	35, 608, 736
Copper (recoverable content of ores, etc.)	9, 911	7, 393, 569	10, 449	8, 881, 650
Gold (recoverable content of ores, etc.)—troy ounces	221	7, 735	189	6, 615
Lead (recoverable content of ores, etc.)			5	1, 570
Lime	103, 257	1, 102, 005	124, 592	1, 436, 200
Manganese ore (35 percent or more Mn)—gross weight	15, 895	1, 280, 102	17, 821	1, 417, 096
Natural gas—million cubic feet	39	5, 000	45	6, 000
Phosphate rock—long tons	1, 465, 902	10, 526, 404	1, 685, 003	11, 643, 123
Sand and gravel	5, 136. 543	5, 814, 116	5, 629, 341	6, 480, 573
Silver (recoverable content of ores, etc.)—troy ounces	66, 619	60. 294	64, 878	58, 718
Stone	[2]14, 381, 481	[2]22, 276, 037	[2]15, 556, 194	[2]23, 796, 346
Zinc (recoverable content of ores, etc.)	40, 216	9, 893, 136	46, 023	12, 610, 302
Value of items that cannot be disclosed: Barite, fluorspar (1956), iron ore, mica (1956), petroleum, pyrite, and stone (granite, 1955, and crushed sandstone)		6, 994, 403		8, 771, 424
Total Tennessee [3]		119, 316, 000		137, 846, 000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Incomplete figure; excludes granite (1955) and crushed sandstone.
[3] Total adjusted to eliminate duplicating value of clays and stone.

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mining and processing. Pig iron and coke were produced at Rockwood, Chattanooga, and Nashville. The following were leading companies: Tennessee Copper Co. produced gold, silver, copper, lead, zinc, and pyrite; Penn-Dixie Cement Corp. operated 2 cement plants, 2 limestone quarries, and 1 clay mine; American Zinc Co. of Tennessee produced zinc and limestone; and Marquette Cement Mfg. Co. operated 2 cement plants, 2 limestone quarries, 1 clay mine, and 1 sand and gravel mine.

TABLE 2.—Average unit value of mineral commodities produced in Tennessee, 1947–51 (average) and 1952–56 [1]

Commodity	1947-51 (average)	1952	1953	1954	1955	1956
Barite (crude)—short ton	(2)	$12.95	$14.55	$16.31	$16.20	$13.93
Cement: Portland—376-pound barrel	$2.12	2.40	2.51	2.61	2.64	2.86
Masonry—do	(2)	(2)	(3)	(3)	3.14	3.43
Clays:						
Ball—short ton	11.13	12.98	12.52	12.84	13.13	13.42
Fire—do	6.96	9.57	11.36	11.36	11.36	-------
Fuller's earth—do	13.95	13.81	13.82	16.33	14.00	13.72
Miscellaneous—do	.80	1.00	.96	.85	.34	.32
Coal—do	5.23	4.85	4.60	3.96	4.08	4.02
Copper—pound	.22	.24	.29	.30	.37	.42
Granite, crushed—short ton	-------	-------	1.20	1.25	1.00	1.25
Iron ore—long ton	3.97	5.91	6.47	5.77	5.78	5.80
Lead—pound	.15	.16	.13	-------	-------	.16
Lime—short ton	9.32	10.03	10.29	12.04	10.67	11.53
Limestone:						
Crushed—do	1.25	1.25	1.24	1.23	1.18	1.22
Dimension—do	.92	1.84	.79	.94	.82	.82
Manganese ore—do	(2)	(2)	76.91	77.81	80.53	79.52
Marble:						
Crushed—do	5.12	7.50	5.57	10.15	12.76	13.46
Dimension—do	87.57	90.13	110.51	110.36	105.99	72.23
Natural gas—thousand cubic feet	.11	.10	.12	.11	.13	.13
Phosphate rock (sold or used)—long ton	6.65	7.49	7.55	7.06	7.40	7.69
Sand—short ton	1.30	1.25	1.26	1.35	1.30	1.33
Gravel—do	.87	.81	.89	1.07	1.01	1.01
Sandstone:						
Crushed—do	1.67	-------	5.84	14.36	3.68	3.48
Dimension—do	19.90	18.10	21.82	24.38	21.90	21.90
Stone, miscellaneous, crushed—do	-------	1.50	-------	-------	-------	-------
Zinc—pound	.14	.17	.11	.11	.123	.137

[1] For greater detail on prices by grades and markets, see volume I, Minerals Yearbook, 1955.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Not canvassed separately.

EMPLOYMENT AND INJURIES

Reports submitted to the Bureau of Mines indicate that employment in the mineral industries decreased 15 percent below 1955. Employment declined 39 percent at coal mines, increased 15 percent at quarries and mills, increased 16 percent at metal mines, increased 14 percent at nonmetal mines, and decreased 1 percent at sand and gravel mines.

Injury experience was considerably better than in 1955; the frequency rate decreased 27 percent below 1955. The frequency rate increased 80 percent at nonmetal mines, increased 16 percent at metal mines, decreased 42 percent at quarries and mills, and increased 2 percent at coal mines. Fourteen fatal injuries occurred, compared with 9 in 1955.

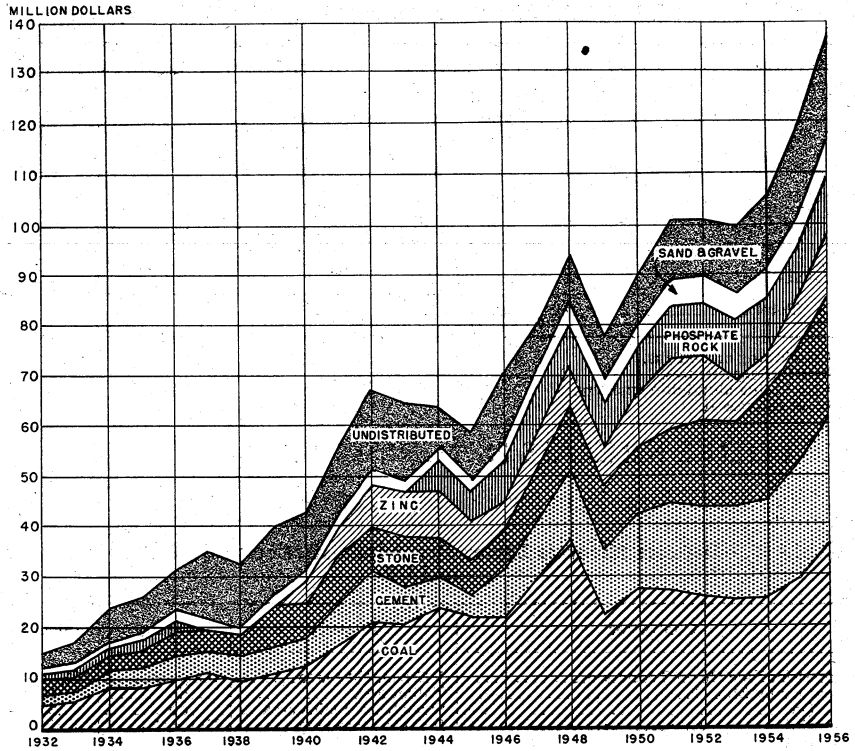

FIGURE 1.—Value of mineral production in Tennessee, 1932–56.

TABLE 3.—Employment in the mineral industries, 1955–56 [1]

Industry	1955			1956 [2]		
	Men working daily	Average active days	Man-days worked	Men working daily	Average active days	Man-days worked
Coke ovens and smelters	[3] 141	[3] 349	[3] 49,243	8,180	366	2,992,983
Coal mines	6,526	158	1,034,121	3,996	184	737,046
Quarries and mills	3,010	257	773,949	3,464	255	883,638
Metal mines	1,398	223	311,562	1,616	244	393,626
Nonmetal mines	695	214	148,383	795	233	185,399
Sand and gravel mines [4]	654	256	167,488	650	240	155,778
Total	[3] 12,424	[3] 200	[3] 2,484,746	18,701	286	5,348,470

[1] Excluding oil and gas.
[2] Preliminary figures.
[3] Excluding aluminum smelters.
[4] Excluding Government-and-contractor operations.

TABLE 4.—Injuries in the mineral industries, 1955–56 [1]

Industry	1955				1956 [2]			
	Fatal	Non-fatal	Total	Injuries per million man-days	Fatal	Non-fatal	Total	Injuries per million man-days
Coke ovens and smelters	(3)	[3] 5	[3] 5	[3] 102		99	99	33
Metal mines		39	39	125	1	56	57	145
Nonmetal mines		12	12	81		27	27	146
Quarries and mills	1	244	245	316	1	162	163	184
Coal mines	8	213	221	294	12	210	222	301
Sand and gravel mines [4]								
Total	[3] 9	[3] 513	[3] 527	[3] 273	14	554	568	106

[1] Excluding oil and gas.
[2] Preliminary figures.
[3] Excluding aluminum smelters.
[4] Not canvassed.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

Nine DMEA projects for zinc were active during the year.

TABLE 5.—Defense Minerals Exploration Administration projects for zinc, active in 1956

Contractor	Property	County	Amount [1]
American Zinc Co. of Tennessee	Jefferson City area	Jefferson	[2] $1,017,000
New Jersey Zinc Co.	Talbot area	do.	156,250
Do.	Strawberry Plains area	do.	228,350
Do.	Independence area	Hancock	107,150
Do.	Edison area	Hawkins	107,150
American Zinc Co. of Tennessee	Strawberry Plains area	Knox	768,170
New Jersey Zinc Co.	Big War Creek area	Hancock	107,150
National Lead Co.	Indian Creek area	Grainger	40,530
Do.	Thorn Hill area	do.	57,490

[1] Government participation, 50 percent.
[2] Completed.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Tennessee Copper Co., the only copper producer in the State, recovered copper concentrate from sulfide ore mined in Polk County; production increased 5 percent over 1955 to a new annual record.

Gold.—Tennessee Copper Co. recovered gold as a byproduct from smelting copper and zinc concentrates. Production decreased 14 percent below 1955.

Iron Ore.—Monroe Mining Co. mined brown iron ore in Monroe County; the ore was concentrated by log washing and sold to iron and steel plants at Rockwood. Rockwood Mining Co. mined red iron ore in Roane County for sale to iron and steel plants. The total production of iron ore decreased 13 percent below 1955.

Manganese Ore.—Metallurgical-grade (plus-35-percent Mn) manganese ore was mined by 9 producers in Carter, Johnson, and Unicoi Counties. Leading producers were Haile Mines, Inc., mines in Unicoi County and the Colitz Mining Co. operations in Johnson County. Shipments increased 12 percent over 1955. All ore was shipped to GSA stockpiles.

TABLE 6.—Production of manganese ore, 1947–51 (average) and 1952–56 (35-percent or more Mn)

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	77	(1)	1954	11,823	$919,949
1952	126	(1)	1955	15,895	1,280,102
1953	2,625	$201,898	1956	17,821	1,417,096

[1] Figure withheld to avoid disclosing individual company confidential data.

Silver.—Tennessee Copper Co. recovered silver as a byproduct from smelting copper and zinc concentrates produced in Polk County. Production decreased 3 percent below 1955.

Zinc.—American Zinc Co. of Tennessee, S. W. Forney, New Jersey Zinc Co., and Tennessee Coal & Iron Division of United States Steel Corp. recovered zinc from zinc ore mined in Jefferson and Knox Counties; Tennessee Copper Co. recovered zinc from copper-zinc ore mined in Polk County. New Jersey Zinc Co. was developing a new zinc mine in Hancock County. Production increased 14 percent over 1955 to a new annual record.

TABLE 7.—Mine production of recoverable gold, silver, copper, lead, and zinc 1947–51 (average) and 1952–56

Year	Gold		Silver		Copper	
	Fine ounces	Value	Fine ounces	Value	Short tons	Value
1947–51 (average)	180	$6,286	45,118	$40,833	6,785	$2,919,868
1952	241	8,435	57,569	52,103	7,620	3,688,080
1953	293	10,255	68,935	62,390	7,829	4,493,846
1954	218	7,630	60,759	54,990	9,087	5,361,861
1955	221	7,735	66,619	60,294	9,911	7,393,569
1956	189	6,615	64,878	58,718	10,449	8,881,650
1850–1956 (total)	23,000	(1)	3,582,700	(1)	464,400	(1)

Year	Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	
1947–51 (average)	81	$24,580	32,898	$9,378,258	$12,369,825
1952	18	5,796	38,020	12,622,640	16,377,054
1953	9	2,358	38,465	8,846,950	13,415,799
1954	----	----	30,326	6,550,345	11,974,826
1955	----	----	40,216	9,893,136	17,354,685
1956	5	1,570	46,023	12,610,302	21,558,855
1850–1956 (total)	16,000	(1)	1,208,000	(1)	398,378,000

[1] Included with "Total value."

NONMETALS

Barite.—In Monroe County, B. C. Wood and National Lead Co. mined barite, which was crushed or ground for well-drilling, glass, rubber, paint, and other uses.

Cement.—Portland cement was produced by 4 companies at plants in 6 counties. The leading producer was the Penn-Dixie Cement Corp. with plants in Marion and Sullivan Counties. Shipments increased slightly over 1955 to a new annual record. Masonry cement was produced by 4 companies in 5 counties; the leading producer was the Marquette Cement Mfg. Co. with plants in Davidson and Franklin Counties; total shipments were 705,000 376-pound barrels valued at $2,421,000.

TABLE 8.—Finished portland cement produced, shipped and in stock, 1947–51 (average) and 1952–56, in 376-pound barrels

Year	Production, barrels	Shipment from mills		Stocks at mills on Dec. 31
		Barrels	Value	
1947–51 (average)	6,522,388	6,538,975	$13,885,490	292,551
1952	7,439,873	7,428,604	17,834,060	388,290
1953	7,474,604	7,276,964	18,283,366	585,930
1954	7,523,507	7,569,279	19,734,262	540,158
1955	8,109,659	8,016,859	21,175,825	361,838
1956	8,386,173	8,049,701	23,013,979	476,314

Clays.—Ball clay was mined by 6 companies in 3 counties. The leading producer was United Clay Mines Corp., operating in Weakley County. Production increased 14 percent over 1955 to a new annual record, owing mainly to increased demand for whiteware. The clay was used in whiteware, floor and wall tile, firebrick and block, art pottery, kiln furniture, enamel, and other applications.

Two companies mined fuller's earth in Henry County for absorbent uses. Production expanded 42 percent over 1955 to a new annual record.

Seventeen companies mined miscellaneous clay in 11 counties. The leading producer was General Shale Products Corp., operating in

TABLE 9.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Ball clay		Fire clay		Fuller's earth		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	166,185	$1,832,958	27,939	$184,478	(1)	(1)	[1] 829,055	[1]$875,337	1,023,179	$2,892,773
1952	163,862	2,127,274	21,290	203,845	25,974	$358,752	831,113	829,272	1,042,239	3,519,143
1953	165,822	2,075,882	(2)	(2)	30,961	427,933	(2)	(2)	1,037,450	3,478,622
1954	194,072	2,491,229	15,437	175,364	27,532	449,480	778,215	664,879	1,015,256	3,780,952
1955	254,034	3,334,577	4,604	52,300	33,791	473,074	915,184	309,934	1,207,613	4,169,885
1956	290,092	3,892,709	-------	-------	48,000	658,500	1,040,420	336,400	1,378,512	4,887,609

[1] Fuller's earth included with miscellaneous clay.
[2] Figure withheld to avoid disclosing individual company confidential data.

TABLE 10.—Ball clay sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Whiteware	176,805	$2,270,728	197,408	$2,610,394
Floor and wall tile	41,893	573,940	52,576	727,639
Firebrick and block	12,581	176,141	(1)	(1)
Art pottery	8,579	125,178	(1)	(1)
Kiln furniture	8,282	118,614	(1)	(1)
Exports	550	5,214	800	8,000
Enamel	284	4,172	65	650
Heavy clay products	2,930	29,300		
Other uses	2,130	31,290	39,243	546,026
Total	254,034	3,334,577	290,092	3,892,709

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other uses."

Knox, Sullivan, and Washington Counties. Production increased 14 percent over 1955 to a new annual record. The clay was used for cement, heavy clay products, floor and wall tile, and lightweight aggregates.

Fluorspar.—Tennessee Mineral Co., composed of individuals from the Western Kentucky fluorspar district, reopened the old Lebanon mine and shipped Metallurgical-grade fluorspar to Marion, Ky.

Lime.—Three companies produced 125,000 tons of quicklime and hydrated lime in Knox County for building, agricultural, chemical, and industrial uses.

Mica.—After construction of Davy Crockett Lake by the Tennessee Valley Authority, silt was deposited in the lake at the mouths of the rivers that traversed the North Carolina mica district. This deposit of silt near the shoreline of the lake contained considerable quantities of finely divided mica. In 1956 the International Minerals & Chemical Corp. built a mill near the lake to recover scrap mica suitable for the ground-mica trade.

Perlite.—A plant in Nashville employing crude perlite from deposits in Western States produced expanded perlite for use mainly as a lightweight aggregate, replacing heavier materials in plaster and concrete.

Phosphate Rock.—Marketable phosphate rock was mined by 22 companies and individuals in 6 counties. Leading producers were the Monsanto Chemical Co. mines in Giles, Maury, and Williamson Counties, and the International Minerals & Chemical Corp. mines in Giles and Maury Counties. Marketable production increased 15 percent over 1955 to a new annual record.

Pyrite.—Tennessee led the Nation in producing pyrite. Tennessee Copper Co. recovered pyrite concentrate from sulfide ore mined in Polk County. Production increased 10 percent over 1955 to a new annual record. The concentrate was roasted, and the recovered gases were used in manufacturing sulfuric acid. The iron oxide was sintered for use by iron and steel plants.

TABLE 11.—Marketable production of phosphate rock, 1947–51 (average) and 1952–56

Year	Long tons	Value [1]	Year	Long tons	Value [1]
1947–51 (average) [2]	1,457,906	$9,682,971	1954	1,633,226	$11,743,012
1952	1,444,737	11,306,438	1955	1,465,902	10,526,404
1953	1,518,912	11,305,098	1956	1,685,003	11,643,123

[1] Estimated from value of sold or used.
[2] Includes small quantity of apatite from Virginia, 1947.

TABLE 12.—Phosphate rock sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Long tons	Value [1]	Long tons	Value [1]
Elemental phosphorus	1,220,473	$9,975,737	1,261,784	$10,987,824
Direct application to the soil	144,076	779,450	131,427	596,900
Triple superphosphate	[2] 209,628	[2] 1,132,118	[2] 163,577	[2] 712,634
Ordinary superphosphate	(2)	(2)	(2)	(2)
Stock and poultry feed	21,028	113,761	101,319	452,800
Fertilizer filler				
Other fertilizers	99,000	535,590		
Other uses	5,190	42,400	4,781	41,400
Total	1,699,395	12,579,056	1,662,888	12,791,558

[1] Estimated from company reports.
[2] Ordinary and triple superphosphates are combined.

Sand and Gravel.—Forty-two companies mined sand and gravel at 45 mines in 23 counties. Leading producers at the following places were Cumberland River Sand & Gravel Co., Davidson County; Memphis Stone-Gravel Co., Shelby County; Sangravl Co., Inc., Humphreys County; Dixie Sand & Gravel Corp., Hamilton County; and Marquette Cement Mfg. Co., Shelby County. The plants of these companies were at Nashville, Memphis, and Chattanooga. Total production increased 10 percent over 1955 to a new annual record.

TABLE 13.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	(1)	(1)	(1)	(1)	4,112,435	$4,321,116
1952	2,531,528	$3,156,770	2,641,873	$2,146,551	5,173,401	5,303,321
1953	2,603,874	3,288,086	2,627,455	2,341,601	5,231,329	5,629,687
1954	2,191,599	2,962,012	2,963,586	3,179,127	5,155,185	6,141,139
1955	2,159,480	2,816,761	2,977,063	2,997,355	5,136,543	5,814,116
1956	2,420,657	3,223,982	3,208,684	3,256,591	5,629,341	6,480,573

[1] Figure withheld to avoid disclosing individual company confidential data.

Stone.—Blue Ridge Stone Co. crushed 40,000 tons of granite in Carter County for concrete and roads.

Crushed linestone was produced by 81 operators at 109 quarries in 52 counties. The leading producers were Franklin Limestone Co.,

TABLE 14.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Sand:				
Structural	1,160,689	$1,465,103	1,248,234	$1,519,524
Paving	700,475	605,993	711,086	706,547
Molding	224,855	572,474	(1)	(1)
Engine	(2)	(2)	4,756	6,446
Railroad ballast	722	903	2,676	3,345
Other	(2)	(2)	453,905	988,120
Gravel:				
Paving	1,579,634	1,605,717	1,662,864	1,622,615
Structural	1,013,903	1,022,102	1,162,248	1,250,737
Railroad ballast	(2)	(2)	123,556	123,064
Other	260,000	260,000	260,016	260,175
Total	5,136,543	5,814,116	5,629,341	6,480,573

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other sand."
[2] Figure withheld to avoid disclosing indivudial company confidential data; included with "Total."

Davidson, Humphreys, and Williamson Counties; Lambert Bros., Inc., Blount, Davidson, Hawkins, Knox, and Sevier Counties; and Penn-Dixie Cement Corp., Marion and Sullivan Counties. Total production increased 8 percent over 1955 to a new annual record.

Davidson County Highway Department quarried a small quantity of dimension limestone for building stone.

Crushed marble was produced by 3 companies at 7 quarries in Blount and Knox Counties. The leading producer was John J. Craig Co. in Blount County. Total production increased 10 percent over 1955.

Dimension marble was quarried by 6 companies at 13 quarries in 4 counties. The leading producer was Gray Knox Marble Co. in Blount and Knox Counties. Total production expanded 44 percent over 1955 to the highest point in many years.

Ayers Mineral Co. and Turner Bros. Stone Co. produced crushed sandstone in Cumberland and Henderson Counties. Total production increased 2 percent over 1955.

Dimension sandstone was quarried by 9 producers in 5 counties; the leading company was Crab Orchard Stone Co., Inc., in Cumberland County. Total production declined 25 percent below 1955.

TABLE 15.—Crushed and broken stone sold or used by producers, 1947–51 (average) and 1952–56

	Limestone		Marble		Sandstone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average) [1]	7,740,425	$9,679,567	22,635	$109,989	(2)	(2)	[3] 7,763,060	[3] $9,789,556
1952 [1]	10,250,723	12,790,302	15,381	115,424	-------	-------	10,266,104	12,905,726
1953 [1]	10,373,162	12,870,198	31,142	173,398	1,222	$7,132	[3] 10,405,904	[3] 13,050,728
1954	13,878,172	17,090,152	17,620	178,789	4,496	64,544	[3] 13,900,288	[3] 17,333,485
1955	14,253,887	16,823,504	16,034	204,532	(2)	(2)	[3] 14,269,921	[3] 17,028,036
1956	15,390,818	18,743,973	17,663	237,823	(2)	(2)	[3] 15,408,481	[3] 18,981,796

[1] Except limestone for cement or lime.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Incomplete total; excludes sandstone, 1947–49 and 1955–56; and granite, 1953–56.

TABLE 16.—Crushed limestone sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Concrete and roads	10,265,850	$12,219,237	11,036,216	$13,296,425
Cement and lime	2,362,990	2,526,031	2,627,036	3,120,566
Agstone	671,570	919,397	815,589	1,112,065
Railroad ballast	588,207	579,584	461,182	441,112
Fluxing stone	72,249	97,238	89,770	121,736
Asphalt filler	13,573	32,865	(1)	(1)
Glass manufacture	38,485	75,338	35,485	72,552
Mineral food	7,000	10,500	21,000	84,000
Paper	(1)	(1)	10,418	15,862
Riprap	25,858	19,108	7,595	7,813
Rock dust for coal mines	500	2,500	3,000	14,100
Other uses	207,605	341,706	283,527	457,742
Total	14,253,887	16,823,504	15,390,818	18,743,973

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other uses."

TABLE 17.—Dimension stone sold or used by producers, 1947–51 (average) and 1952–56

Year	Limestone		Marble		Sandstone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	(1)	(1)	32,117	$2,790,769	(1)	(1)	(1)	(1)
1952	3,226	$5,926	42,940	3,870,006	46,769	$846,684	92,935	$4,722,616
1953	2,214	1,739	24,826	2,743,733	52,785	1,151,853	79,825	3,897,325
1954	4,292	4,015	27,611	3,047,135	65,996	1,608,881	97,899	4,660,031
1955	1,632	1,332	33,763	3,578,493	76,165	1,668,176	111,560	5,248,001
1956	1,848	1,509	48,577	3,508,648	57,288	1,254,393	107,713	4,764,550

[1] Figure withheld to avoid disclosing individual company confidential data.

TABLE 18.—Dimension marble sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Cubic feet	Value	Cubic feet	Value
Building stone:				
Interior, cut, dressed	106,562	$2,131,252	156,174	$2,250,043
Exterior, rough	108,169	344,846	(1)	(1)
Interior, sawed, dressed	56,909	488,619	(1)	(1)
Interior, rough	61,112	128,961	(1)	(1)
Other uses	64,461	484,815	415,318	1,258,605
Total	397,213	3,578,493	571,492	3,508,648

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Other uses."

MINERAL FUELS

Coal.—Coal was produced at 532 active mines in 17 counties; Marion, Anderson, and Campbell Counties were the chief producers. Leading companies were Wind Rock Coal & Coke Co. (Dean mine), Tennessee Products & Chemical Corp. (Reels Cove mine), and Clinchfield Coal Corp. (Meadow Creek mine). Production expanded 25 percent over 1955 to a new annual record for the State, owing mainly to the increased use of coal for power generation.

TABLE 19.—Production of coal, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	5,476,906	$28,656,884	1955	7,052,844	$28,746,574
1952	5,264,954	25,559,740	1956	8,847,770	35,608,736
1953	5,466,569	25,151,682			
1954	6,428,831	25,477,006	Total production (earliest records to date)	367,845,000	(1)

[1] Data not available.

Natural Gas.—Marketed production of natural gas was 45,000,000 cubic feet. Production from wells in Morgan and Scott Counties was 36,000 cubic feet, and from the Jamestown field in Fentress County 9,000 cubic feet.

Petroleum.—Twenty-one test wells were completed during the year. Total exploratory footage was almost 34,000 feet. Gas from 2 new wells was being used locally, and 1 small oil well was brought in.

TABLE 20.—Production of crude petroleum, 1950–56 [1]

(42-gallon barrels)

Year	Clay County	Fentress County	Pickett County	Scott and Morgan Counties	Other counties	Total
1950	767	1,128	504	9,682	266	12,347
1951	66	1,628	572	10,484	----------	12,750
1952	----------	483	336	10,647	3,311	14,800
1953	----------	3,683	1,457	10,115	1,063	16,318
1954	----------	3,392	1,555	7,073	780	12,800
1955	3,122	414	804	7,895	512	12,747
1956	1,276	484	636	6,278	----------	8,675

[1] Data from Tennessee Department of Conservation, Division of Geology.

REVIEW BY COUNTIES

Production was reported from 76 of the State's 95 counties. Leading counties were Polk, Knox, Marion, and Jefferson. In addition to the commodities described in detail in the following county listing, oil and gas were produced; and a small quantity of sand of undetermined county origin, was mined.

Anderson.—Thirty companies mined 1,757,000 tons of coal; leading companies were Wind Rock Coal & Coke Co. (Dean mine) and Mahan-Ellison Coal Corp. (Morco colliery). Ralph Rogers & Co., Inc., and Anderson County Highway Department crushed limestone for concrete and roads. Lake City Lightweight Aggregate Co. mined 30,000 tons of miscellaneous clay for lightweight aggregates.

Bedford.—Bedford County Highway Department and Shelbyville Limestone Co. crushed limestone for agstone, concrete, and roads.

Benton.—Camden Gravel Co., Hardy Sand Co. (Hardy and Silica mines), Hicks Sand Co., Kimballs Mineral Supplies, Inc., Porter-Warner Industries, Inc., and Tri-State Sand Co. mined glass, molding, paving, engine sand, and paving gravel; production was 371,000 tons.

Bledsoe.—Ten companies mined 39,000 tons of coal; the leading producer was J. R. Lovell Coal Co. (No. 1 Strip mine).

TABLE 21.—Value of mineral production in Tennessee, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value [2]
Anderson	(3)	(3)	Coal, limestone, miscellaneous clay.
Bedford	$147,017	(3)	Limestone.
Benton	679,789	$766,223	Sand and gravel.
Bledsoe	104,397	170,859	Coal.
Blount	(3)	(3)	Marble, limestone.
Bradley	(3)	270,000	Limestone.
Campbell	5,126,655	(3)	Coal, limestone, sand and gravel.
Cannon	34,500	(3)	Limestone.
Carroll	(3)	(3)	Ball clay.
Carter	475,607	664,978	Limestone, manganese ore, granite.
Claiborne	1,803,086	1,649,973	Coal.
Cocke	24,325	30,472	Limestone.
Coffee	(3)	(3)	Do.
Cumberland	2,223,519	1,756,640	Sandstone, coal, limestone.
Davidson	6,060,067	6,123,038	Cement, limestone, sand and gravel, miscellaneous clay, phosphate rock.
Decatur	(3)	(3)	Sand and gravel.
De Kalb	84,057	18,190	Limestone.
Dickson	(3)	(3)	Do.
Fayette	176,260	18,200	Sand and gravel.
Fentress	552,006	1,481,586	Coal, limestone,sandstone.
Franklin	(3)	(3)	Cement, limestone, sand and gravel, miscellaneous clay.
Giles	1,223,200	1,791,884	Phosphate rock, limestone, sand and gravel.
Grainger	34,395	44,553	Marble, limestone.
Greene	437,167	573,910	Limestone, sand and gravel, mica.
Grundy	1,041,436	1,704,187	Coal, limestone.
Hamilton	6,233,618	7,156,249	Cement, limestone, coal, sand and gravel, miscellaneous clay.
Hardeman	35,750	(3)	Sand and gravel.
Hawkins	199,166	42,141	Limestone.
Haywood	9,055	19,540	Sand and gravel.
Henderson	(3)	(3)	Sandstone.
Henry	(3)	(3)	Ball clay, fuller's earth.
Hickman	544,879	580,220	Phosphate rock.
Humphreys	(3)	(3)	Limestone, sand and gravel.
Jefferson	(3)	(3)	Zinc, limestone.
Johnson	903,805	1,067,078	Manganese ore, limestone.
Knox	14,503,649	15,780,700	Cement, zinc, limestone, marble, lime, sand and gravel, miscellaneous clay.
Lauderdale	6,168	17,900	Sand and gravel.
Lincoln	(3)	(3)	Limestone.
Loudon	126,848	154,953	Limestone, sand and gravel, miscellaneous clay.
Macon	65,895	(3)	Limestone.
Marion	(3)	(3)	Coal, cement, limestone.
Marshall	(3)	(3)	Limestone.
Maury	6,472,069	7,009,405	Phosphate rock, limestone.
McMinn	220,000	(3)	Limestone.
McNairy	28,055	57,840	Sand and gravel.
Meigs	157,500	(3)	Limestone.
Monroe	511,324	(3)	Barite, limestone, iron ore.
Montgomery	(3)	(3)	Limestone.
Morgan	1,662,517	1,904,092	Coal, sandstone.
Obion	40,730	46,866	Sand and gravel.
Overton	220,211	(3)	Coal, limestone.
Perry	(3)	(3)	Limestone, phosphate rock.
Pickett	15,840	----------	
Polk	(3)	(3)	Copper, pyrite, zinc, silver, gold, lead.
Putnam	(3)	(3)	Coal, limestone.
Rhea	273,412	227,956	Coal, sandstone, miscellaneous clay.
Roane	680,533	765,599	Limestone, iron ore, sandstone.
Robertson	(3)	(3)	Limestone.
Rutherford	165,100	264,980	Do.
Scott	2,062,354	2,171,408	Coal.
Sequatchie	1,086,121	(3)	Coal, limestone.
Sevier	329,992	179,709	Limestone.
Shelby	(3)	1,636,170	Sand and gravel, miscellaneous clay.
Smith	35,084	66,804	Limestone.
Stewart	9,050	----------	
Sullivan	(3)	(3)	Cement, limestone, miscellaneous clay, sand and gravel.
Sumner	286,075	250,637	Limestone, sand and gravel.
Tipton	(3)	(3)	Sand and gravel.
Unicoi	940,623	(3)	Manganese ore, sand and gravel, limestone.
Union	(3)	(3)	Marble.

See footnotes at end of table.

TABLE 21.—Value of mineral production in Tennessee, 1955–56, by counties [1]—Continued

County	1955	1956	Minerals produced in 1956 in order of value [2]
Van Buren	$389,359	$333,204	Coal.
Warren	257,700	(3)	Limestone.
Washington	(3)	(3)	Limestone, miscellaneous clay.
Wayne	14,700	(3)	Sand and gravel.
Weakley	(3)	(3)	Ball clay.
White	263,699	1,179,514	Coal, limestone.
Williamson	(3)	(3)	Phosphate rock, limestone.
Wilson	(3)	(3)	Limestone, fluorspar.
Undistributed [4]	60,337,636	79,868,342	
Total Tennessee	119,316,000	137,846,000	

[1] The following counties are not listed because no production was reported: Cheatham, Chester, Clay, Crockett, Dyer, Gibson, Hamblen, Hancock, Hardin, Houston, Jackson, Lake, Lawrence, Lewis, Madison, Moore, and Trousdale.
[2] Petroleum and natural gas not listed by counties as data are not available; value included with "Undistributed."
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[4] Includes value of petroleum and natural gas and values indicated by footnote 3.

Blount.—John J. Craig Co. (Crisp, Hamil, Lee, and Marmor quarries) quarried dimension marble for rough and dressed building stone, and for cut, dressed monumental stone. Lambert Bros., Inc. (Calderwood quarry), and Sam Lambert & Sons crushed 421,000 tons of limestone for concrete and roads. John J. Craig Co. crushed marble for terrazzo.

Bradley.—Bradley Limestone Co., Inc. (Welch quarry), crushed 220,000 tons of limestone for agstone, concrete, and roads.

Campbell.—Sixty-eight companies mined 824,000 tons of coal; leading producers were New Jellico Coal Co. (Blue Rose mine), and Stoney Fork Coal Corp. (Clinchmore mine). Campbell County Highway Department and Key Limestone Division crushed limestone for concrete and roads, agstone, and asphalt filler. Silica Sand Co., Inc., mined 51,600 tons of paving, grinding, and other sand.

Cannon.—S. N. McPherson (Norvell quarry) crushed limestone for concrete and roads.

Carroll.—Kentucky-Tennessee Clay Co. mined ball clay for whiteware, floor and wall tile, firebrick and block, and kiln furniture.

Carter.—Watauga Stone Co. crushed 387,000 tons of limestone for concrete and roads, railroad ballast, and agstone. Virginia Iron, Coal & Coke Co. (Stoney Creek mine) mined Metallurgical-grade manganese ore. Blue Ridge Stone Co. crushed 40,000 tons of granite for concrete and roads.

Claiborne.—Thirty-four companies mined 404,000 tons of coal; leading producers were Pruden Coal & Coke Co. (Jellico No. 7 mine) and Dippel & Dippel Coal Co. (Dippel Strip mine).

Cocke.—Cocke County Highway Department (Briar Thickett and Burnett quarries) crushed 19,000 tons of limestone for concrete and roads.

Coffee.—Ralph Rogers & Co., Inc., crushed limestone for concrete and roads.

Cumberland.—Crab Orchard Stone Co., Inc. (Peck quarry), Crossville Stone Co., Hembree Stone Co., Knoxville Building Stone Co., James E. Roberts, and Turner Bros. Stone Co., Inc., quarried 42,000

tons of dimension sandstone for rough architectural and dressed building stone and for flagging. Fourteen companies mined 88,000 tons of coal; leading producers were C & F Coal Co. (No. 3 Strip mine) and Carl Wenzel Coal Co. (Jewett Strip mine). Cumberland County Highway Department and Southern States Lime Mfg. Co. (Crab Orchard quarry) crushed 211,000 tons of limestone for riprap, fluxing stone, concrete and roads, railroad ballast, agstone, glass, paper, rock dust for coal mines, mineral food, and other uses. Turner Bros. Stone Co., Inc., crushed sandstone for refractories.

Davidson.—Marquette Cement Mfg. Co. produced masonry and portland cements at the Nashville mill throughout the year. Davidson County Highway Department, Eller & Olson Crushed Stone Co., Inc., Franklin Limestone Co. (Danley and Old Hickory quarries), and Lambert Bros., Inc. (Hermitage quarry), crushed 1,559,000 tons of limestone for riprap, fluxing stone, concrete and roads, railroad ballast, agstone, asphalt filler, and rock dust for coal mines. Cumberland River Sand & Gravel Co. and T. L. Herbert & Sons mined structural and paving sand and gravel. W. G. Bush & Co., Inc., and L. T. Lewis & Sons mined miscellaneous clay for heavy clay products. Harsh Phosphate Co. mined 7,000 tons of marketable phosphate rock for fertilizer filler. Davidson County Highway Department quarried 1,800 tons of dimension limestone for building stone.

Decatur.—Tinker Sand & Gravel Co. mined structural sand and gravel.

De Kalb.—De Kalb County Highway Department (Sligo quarry) crushed 36,000 tons of limestone for concrete and roads.

Dickson.—Duke Lime & Stone Co. crushed limestone for concrete and roads, agstone, and other uses.

Fayette.—Fayette County Highway Department mined 73,000 tons of paving gravel.

Fentress.—Twenty-four companies mined 351,000 tons of coal; leading producers were Bruns Coal Co., Inc. (Wilder Strip and Auger mines), and Ulysess Johnson Coal Co. (Horsepound No. 1 mine). Frogge & Williams, Inc. (Wright quarry), crushed 171,000 tons of limestone for agstone, concrete, and roads. Jones Stone Co. (Nash quarry) quarried 5,600 tons of dimension sandstone for rough architectural building stone.

Franklin.—Marquette Cement Mfg. Co. produced portland and masonry cements at the Cowan mill throughout the year. Cowan Stone Co. (Anderson and Cowan quarries), Franklin County Highway Department (Bostick quarry), and Marquette Cement Mfg. Co. crushed 667,000 tons of limestone for fluxing stone, concrete and roads, railroad ballast, agstone, glass, cement, and other uses. Estill Springs Sand-Gravel Co. and Sewannee Silica Sand Co. mined glass, molding, structural, paving, blast, engine, and filter sand and structural, paving, and other gravel. Marquette Cement Mfg. Co. mined miscellaneous clay for use in cement.

Giles.—International Minerals & Chemical Corp. (Wales mine), Lancaster & Trice, and Monsanto Chemical Co. mined 225,000 tons of marketable phosphate rock for direct application to the soil, elemental phosphorus, and pig-iron blast furnaces. Cedar Grove Lime Co. crushed limestone for agstone, concrete, and roads. Giles County Highway Department mined 135,000 tons of paving gravel.

Grainger.—Imperial Black Marble Co. quarried 740 tons of dimension marble for interior rough building stone. Grainger County Highway Department (Capps quarry) crushed 7,600 tons of limestone for concrete and roads. National Lead Co. participated in 2 DMEA projects for zinc ores, amounting to $98,020, of which the Government share was 50 percent.

Greene.—Agricultural Lime Co., Inc., Greene County Highway Department (Ratcliffe quarry), and Malone Bros. Co. crushed limestone for concrete and roads. Malone Bros. Co., Nolichuckey Sand Co., and John Paul Russell mined 168,000 tons of structural and paving sand and gravel. International Minerals & Chemical Corp. recovered scrap mica at a new processing plant from silt deposited in Davy Crockett Lake.

Grundy.—Eighteen companies mined 420,000 tons of coal; the leading producer was Whitwell Coal Corp. Viola White Lime Co. crushed 15,000 tons of limestone for agstone, concrete, and roads.

Hamilton.—Signal Mountain Portland Cement Division of General Portland Cement Co. produced portland and masonry cements at the Signal Mountain mill throughout the year. Chattanooga Rock Products Co. and Signal Mountain Portland Cement Division crushed limestone for concrete and roads, agstone, and railroad ballast. Twenty-five companies mined 150,000 tons of coal; the leading producer was Walden Ridge Coal Co. (No. 1 and No. 2 Strip mines). Dixie Sand & Gravel Co. mined structural and paving sand and gravel. B. Mifflin-Hood Co., Key-James Brick Co., and Signal Mountain Portland Cement Division mined miscellaneous clay for cement and heavy clay products and for floor and wall tile.

Hancock.—New Jersey Zinc Co. continued to develop its new zinc mine near Flat Gap and expected to start production in 1957. Development work included 787 feet of shaft sinking and 3,012 feet of drifting. New Jersey Zinc Co. started two DMEA projects for zinc ores.

Hardeman.—Saulsbury Sand Co. and Tri-State Sand Co. mined structural sand.

Hawkins.—Lambert Bros., Inc. (McCloud quarry), crushed 29,000 tons of limestone for concrete and roads. New Jersey Zinc Co. started a DMEA project for zinc ores.

Haywood.—Haywood County Highway Department mined 78,000 tons of paving gravel.

Henderson.—Ayers Mineral Co. crushed sandstone for foundry uses.

Henry.—Dixie Brick & Tile Co., Kentucky-Tennessee Clay Co., and H. C. Spinks Clay Co. (Como, Henry, and Puryear mines) mined ball clay for whiteware, floor and wall tile, firebrick and block, and kiln furniture. Southern Clay Co., Inc. (Porters Creek mine), and Tennessee Absorbent Clay Co. mined 48,000 tons of fuller's earth for absorbent uses.

Hickman.—M. C. Boyle Phosphate Co. (Dean's Switch mine), W. P. McClanahan & Co., Owens Agricultural Phosphate Co., and M. C. West (Highland mine) mined 80,000 tons of marketable phosphate rock for direct application to the soil and for elemental phosphorus.

Humphreys.—Franklin Limestone Co. (Rock Hill quarry) and Patterson Stone Co. crushed 407,000 tons of limestone for riprap, concrete and roads, railroad ballast, and agstone. Sangravl Co., Inc., mined structural and paving sand and structural, paving, and railroal ballast gravel.

Jefferson.—American Zinc Co. of Tennessee (Athletic, Grasselli, North Friends Station, and Young mines), New Jersey Zinc Co. (Jefferson City mine), and Tennessee Coal & Iron Division of United States Steel Corp. (Zinc Mine Works) recovered zinc from zinc ores; exploration and development work by the 3 operating companies (exclusive of DMEA projects) included 480 feet of shaft sinking, 348 feet of raising, 7,245 feet of drifting, 82,956 feet of diamond drilling, 6,513 feet of churn drilling, and 4,098 feet of long-hole drilling. American Zinc Co. of Tennessee completed a DMEA project for zinc ores, which was begun in 1954, amounting to $1,017,000, and started another project for $768,170. New Jersey Zinc Co. began 2 DMEA projects for zinc ores amounting to $384,600. American Zinc Co. of Tennessee and Tennessee Coal & Iron Division crushed limestone as a byproduct from zinc mines, and the White Pine Stone Co. crushed limestone at its new quarry; this material was used for concrete and roads, railroad ballast, agstone, etc.

Johnson.—B & T Mining Co., Colitz Mining Co., Michael J. Colitz, Laurel Mining Co., Lon Tester, and Valley Mining, Ltd. (Blackburn and King mines), mined 9,100 tons of Metallurgical grade manganese ore for sale to the Government. Maymead Lime Co. crushed limestone for agstone, and concrete and roads.

Knox.—Volunteer Portland Cement Co. produced portland and masonry cements at the Knoxville mill throughout the year. American Zinc Co. of Tennessee (Mascot No. 2 mine) and S. W. Forney recovered zinc from zinc ores; exploration and development by these companies included 1,746 feet of drifting and 79,228 feet of diamond drilling. American Zinc Company of Tennessee recovered crushed limestone as a byproduct from zinc mining. American Limestone Co. (Holston and Midway quarries), Burkhart Quarry Supplies, Inc., Knoxville Lime Mfg. Co., Lambert Bros., Inc. (Biagotti, Freeway, Kennedy, Knoxville, Neubert's, and Tecoa quarries), Oliver King Sand-Lime Co., Inc., Standard Lime & Cement Co., Volunteer Portland Cement Co., and Williams Lime Mfg. Co. produced crushed limestone. Production was 2,156,000 tons; the stone produced by these companies was used for concrete and roads, railroad ballast, agstone, cement, lime, terrazzo, concrete blocks, etc. Appalachian Marble Co. (Appalachian and Bond Pink quarries), Gray Knox Marble Co. (Gray Knox quarry), and Tennessee Marble Co. (Eagle quarry) quarried 17,500 tons of dimension marble for rough and dressed building stone and for cut, dressed monumental stone. Knoxville Lime Mfg. Co., Standard Lime & Stone Co., and Williams Lime Mfg. Co. produced 124,500 tons of lime for building, agricultural, chemical and industrial uses. Knoxville Sangravl Materials Co., and Oliver King Sand-Lime Co. mined structural, paving, grinding, engine, railroad ballast, and other sands and structural and paving gravels. Appalachian Marble Co. and Knoxville Crushed Stone Co. crushed 8,200 tons of

marble for terrazzo and other uses. Cherokee Shale Brick Co., General Shale Corp., Shalite Corp., and Volunteer Portland Cement Co. mined 193,000 tons of miscellaneous clay for cement, lightweight aggregates, and heavy clay products.

TABLE 22.—Crushed limestone sold or used by producers in Knox County, 1948–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1948–51 (average)[1]	(2)	$1,923,560	1954	1,997,365	$2,382,607
1952 [1]	1,725,685	2,251,609	1955	2,224,048	2,544,588
1953 [1]	1,291,678	1,801,016	1956	2,155,541	2,662,673

[1] Except for cement or lime.
[2] Figure withheld to avoid disclosing individual company confidential data.

Lauderdale.—Lauderdale County Highway Department mined 72,000 tons of paving gravel.

Lincoln.—Clark & Stephenson crushed limestone for concrete and roads.

Loudon.—Lenoir Asphalt Paving Co., Inc., and Loudon County Highway Department crushed 75,500 tons of limestone for concrete and roads. Brooks Sand & Gravel Co. mined 41,600 tons of structural sand and gravel. Old Hickory Brick Co. mined 15,000 tons of miscellaneous clay for heavy clay products.

Macon.—Dixon & Stubblefield (Langford quarry) crushed limestone for concrete and roads, agstone, and cement.

Marion.—One hundred and fifty-three companies mined 2,205,000 tons of coal; leading producers were Tennessee Products & Chemical Corp. (Reels Cove and Daus Mountain mines) and Tennessee Consolidated Coal Co. (Coal Valley mine). Penn-Dixie Cement Corp. produced portland cement at the Richard City mill throughout the year. Cureton Lime & Stone Co. (Ketchall quarry), Penn-Dixie Cement Corp., and Signal Mountain Cement Division of General Portland Cement Co. (Bennetts Lake quarry) crushed limestone for concrete and roads, agstone, and cement.

Marshall.—Lewisburg Limestone Co. crushed limestone for agstone, concrete, and roads.

Maury.—Armour Fertilizer Works (McKennon mine), International Minerals & Chemical Corp. (Mt. Pleasant mine), Monsanto Chemical Co., Presnell Phosphate Co., J. T. Prince, Tennessee Valley Authority, Victor Chemical Works, Virginia-Carolina Chemical Corp., and six other producers mined phosphate rock for ordinary and triple superphosphate, direct application to the soil, fertilizer filler, other fertilizers, phosphoric acid, and elemental phosphorous. Columbia Rock Products Corp. (Theta Pike quarry) crushed limestone for concrete and roads.

McMinn.—McMinn County Highway Department and Floyd D. Webb Stone Co. crushed limestone for agstone, concrete, and roads.

McNairy.—Worsham Bros. mined 107,000 tons of structural and paving sand and gravel.

Meigs.—Gil Crouch and Posey & Caldwell crushed limestone for agstone, concrete, and roads.

Monroe.—National Lead Co. (Jones, and Stevens & Ballard mines) and B. C. Wood (Roy mine) mined barite for well drilling, glass, rubber, paint, and other uses. Creighead Limestone Co., and Monroe County Highway Department (Tallent quarry) crushed 106,000 tons of limestone for concrete and roads. Monroe Mining Co. (Wilson mine) mined brown iron ore for blast-furnace use.

Montgomery.—Clarksville Stone Co. and Simpson Stone Co. crushed limestone for agstone, concrete, and roads.

Morgan.—Twenty-three companies mined 486,000 tons of coal; leading producers were Brushy Mountain Coal Mines (Petros No. 3 and No. 7 mines), Allen Bros. Coal Co. (No. 6 Strip mine), and W. R. Parton Coal Co. (No. 1 Strip mine). Jones Stone Co. quarried 4,700 tons of dimension sandstone for rough architectural building stone.

Obion.—Obion County Highway Department mined 127,000 tons of paving gravel.

Overton.—Fifteen companies mined 48,200 tons of coal; the leading producer was Redbud Coal Co. (No. 1 mine). Livingston Lime Co. (East and South quarries) crushed limestone for concrete, roads, and fertilizer filler.

Perry.—Charlie Elkins crushed 52,000 tons of limestone for agstone, concrete, and roads. Parish & Parish Mining Co. mined marketable phosphate rock for sale to other phosphate-rock companies.

Polk.—Tennessee Copper Co., the leading mineral-producing company in the State, produced mixed sulfide ore at the Boyd, Burra, Calloway, Eureka, and Mary mines; the ore, concentrated in two flotation mills, yielded copper, pyrite, and zinc concentrates; gold and silver were recovered as byproducts from smelting the copper and zinc concentrates; the pyrite concentrate was roasted, yielding liquid sulfur dioxide, for use mainly in manufacturing sulfuric acid, and iron oxide, which was sintered for use by iron and steel plants. Production of recoverable copper was 10,449 tons, a new annual record; pyrite increased 10 percent over 1955; production of recoverable zinc increased 10 percent over 1955; silver recovery was 64,878 fine ounces; gold recovery was 189 fine ounces; and production of recoverable lead was 5 tons. Exploration and development by the company included 14,531 feet of drifting and 12,949 feet of diamond drilling.

Putnam.—Three companies mined 180,000 tons of coal; the leading producer was Clinchfield Coal Corp. (Meadow Creek mine). Algood Limestone Co. (Poteet quarry) and Dixon-Stubblefield Limestone Co. (Monterey quarry) crushed limestone for concrete and roads.

Rhea.—Four companies mined 42,200 tons of coal; the leading producer was Richard Kirkwood Fuel Co. (No. 1 mine). Wayne French (Fulcher quarry) quarried 4,000 tons of dimension sandstone for rough architectural building stone. W. S. Dickey Clay Mfg. Co. (Graysville Clay mine) mined 30,800 tons of miscellaneous clay for heavy clay products.

Roane.—A. B. Long Construction Co. (Swan Pond quarry) and Rockwood Slag Products Co. crushed limestone for concrete and roads. Rockwood Mining Co. (New Chamberlain mine) mined red iron ore for blast-furnace use. Hughlen Henry Stone Co. quarried 560 tons of dimension sandstone for rough architectural building stone.

Robertson.—Porter Brown Limestone Co. crushed limestone for concrete and roads.

Rutherford.—Bilbrey Rock Co. crushed 212,000 tons of limestone for concrete and roads, agstone, and other uses.

Scott.—Thirty-seven companies mined 657,000 tons of coal; the leading producers were Straight Fork Coal Co. (Straight Fork mine), Ace Mining Co. (West No. 1 Strip mine), and Laddie Coal & Mining Co. (Lassie No. 1 mine).

Sequatchie.—Fifty-seven companies mined 352,000 tons of coal; leading producers were Bluff Coal Co. (Bluff mine) and Nick Istock Coal Co. (No. 2 Strip mine). Dunlap Stone Co. crushed limestone for concrete and roads.

Sevier.—Lambert Bros., Inc. (Sevier quarry), crushed 128,000 tons of limestone for concrete and roads.

Shelby.—Banks Bros., Inc., Cordova Sand & Gravel Co., R. P. Harris Gravel Co., Hollywood Sand & Gravel Co., Inc., Marquette Cement Mfg. Co., Memphis Stone & Gravel Co., J. A. Smith & Sons Construction Co., and Tennessee Gravel Co. mined 1,574,000 tons of structural, paving, grinding, and other sand and structural, paving, and other gravel. John A. Denie's Sons Co. and Moss Lightweight Aggregate Co. mined 124,000 tons of miscellaneous clay for lightweight aggregates and heavy clay products.

Smith.—Oldham Limestone Co. (Rome quarry) crushed 54,000 tons of limestone for riprap, agstone, concrete, and roads.

Sullivan.—Penn-Dixie Cement Corp. produced portland and masonry cements at the Kingsport Mill throughout the year. Penn-Dixie Cement Corp., Standard Crushed Stone Co. (New Kingsport quarry), and Sullivan County Highway Department (Boozy Creek, Muddy Creek, and Walnut Hill quarries) crushed 1,042,000 tons of limestone for cement, concrete, and roads. General Shale Products Corp. (Kingsport mine) and Penn-Dixie Corp. mined miscellaneous clay for cement and for heavy clay products. Afton Good mined 2,700 tons of structural sand.

Sumner.—Pilot Knob Limestone Co. and Ralph Rogers Co., Inc., crushed limestone for concrete and roads. Sumner County Highway Department mined 94,900 tons of structural gravel.

Tipton.—Owens Sand & Gravel Co and Smiley Sand & Gravel Co. mined structural and paving sand and gravel.

Unicoi.—Haile Mines, Inc. (Bumpass Cove mine), and Lewis Mining Co. mined Metallurgical-grade manganese ore. Brooks Sand & Gravel Co. mined 268,000 tons of structural and paving sands and structural, paving, and railroad-ballast gravels. Standard Crushed Stone Co. (Okalona quarry) crushed 45,000 tons of limestone for concrete and roads.

Union.—Tennessee Marble Co. (Luttrell quarry) quarried dimension marble for dressed building stone and for cut, dressed monumental stone.

Van Buren.—Ten companies mined 84,000 tons of coal; the leading producer was Henry Bros. Coal Co. (No. 1 Strip mine).

Warren.—McMinnville Rock Co., Inc., and Warren Limestone Co. crushed limestone for riprap, agstone, concrete, and roads.

Washington.—Washington County Highway Department crushed 198,000 tons of limestone for concrete and roads. General Shale Products Corp. (Johnson City mine) mined miscellaneous clay for heavy clay products.

Wayne.—Clifton Towing Co. mined structural sand and gravel.

Weakley.—Bell Clay Co. (Collins mine), Cooley Clay Co. (Greenfield mine), Kentucky-Tennessee Clay Co., H. C. Spinks Clay Co., and United Clay Mines Corp. (No. 6 mine) mined ball clay for whiteware, art pottery, enamel, floor and wall tile, firebrick and block, and kiln furniture.

White.—Seven companies mined 259,000 tons of coal; the leading producer was Bruns Coal Co., Inc. (De Rossett Strip and Auger mines). Sparta Limestone Co., Thompson-Weinman & Co., and White County Highway Department crushed limestone for whiting, agstone, concrete, and roads.

Williamson.—Monsanto Chemical Co. mined marketable phosphate rock for elemental phosphorus. Franklin Limestone Co. and Williamson County Highway Department crushed 325,000 tons of limestone for agstone, and concrete and roads.

Wilson.—Lebanon Limestone Co. and Marquette Cement Mfg. Co. (Martha quarry) crushed limestone for cement and for concrete and roads. Tennessee Mineral Co., composed of individuals from the Western Kentucky fluorspar district. reopened the old Lebanon mine and shipped Metallurgical-grade fluorspar to Marion, Ky.

The Mineral Industry of Texas

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and The University of Texas, Bureau of Economic Geology.

By F. F. Netzeband[1] and John T. Lonsdale[2]

THE ECONOMY of Texas owes much to its abundant reserves of minerals. In 1956 a record high value of $4.2 billion of mineral production in Texas was established as all sectors of the State's industrial and business environment continued to expand. Record highs likewise were achieved in employment, income, and sales (both wholesale and retail), as consumer and business confidence strengthened. Growth also was evidenced in the number of new establishments and in expansions to existing establishments especially in the petroleum, chemical, fabricated-metals, machinery, and transportation-equipment industries.

The ever-growing inter- and intra-state markets for oil and gas stimulated additional gains for Texas production. Texas oilfields produced a record 1.1 billion barrels of crude oil in 1956—5 percent greater than the previous 1955 record; Texas gasfields yielded a record 4.9 billion cubic feet of natural gas, 5.7 percent more than in 1955. To supply this record flow of "black gold," the industry completed 25,764 new wells (9 percent more than in 1955) and raised the total number of producing wells to 178,095. According to the American Petroleum Institute, this drilling activity helped to sustain the State's crude-oil reserve at 14,783 million barrels, representing nearly 50 percent of the Nation's total. The oil industry was able to increase its proved reserve at a higher rate than it produced during 1935–50. From 1950 to the present this rate has flattened out so that no radical change was evident in either production or reserves in 1950–56. While 1956 demand for refinery products improved generally over that in 1955, marked changes were noted in the demand pattern. Significant increases were realized for the higher octane motor fuels, for jet fuels, and for asphalts and road oils.

Natural-gas sales advanced nearly 8 percent over 1955 sales as demand rose for feed stock used in the petro-chemical industry, and for power and heat supplied to industry and to homes. The spectacular growth of the ethylene, polyethylene, and butadiene (rubber) industries of Texas was largely responsible for the 5-percent rise in gas marketed in the State.

The metal-mining and metallurgical industry maintained its firm position in the State and National economy. All commercial output of magnesium in the United States was produced in Brazoria County.

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TABLE 1.—Mineral production in Texas, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement:				
Masonry 376-pound barrels	817,253	$2,728,253	731,840	$2,625,510
Portland do	24,038,427	64,820,374	25,234,150	73,069,953
Clays	[2] 3,096,959	[2] 5,099,922	[2] 3,146,201	[2] 4,765,068
Copper	1	746		
Gem stones	[3]	115,000	[3]	115,000
Gypsum	1,349,434	4,219,652	1,156,956	3,623,005
Helium cubic feet	139,396,988	2,271,642	145,830,220	2,364,325
Iron ore (usable) long tons, gross weight	875,443	[4]	[4]	[4]
Lime	584,855	5,549,309	592,136	6,937,951
Natural gas million cubic feet	4,730,798	378,464,000	4,999,889	434,990,000
Natural-gas liquids:				
Natural gasoline and cycle products thousand gallons	2,987,808	206,506,000	2,964,609	216,378,000
LP-gases do	3,450,430	110,414,000	3,731,047	144,745,000
Petroleum (crude) thousand 42-gallon barrels	1,053,297	2,989,330,000	1,107,808	3,097,390,000
Salt (common)	3,583,242	12,867,094	3,962,778	14,369,558
Sand and gravel	31,518,123	28,480,350	29,335,697	27,212,554
Silver troy ounces	126	114		
Sodium sulfate	46,718	1,099,522	[4]	[4]
Stone	27,321,444	33,543,782	32,772,827	36,349,747
Sulfur:				
Frasch process long tons	3,766,882	105,128,170	3,437,061	91,026,388
Recovered elemental do	114,989	3,143,606	140,164	3,865,252
Talc and soapstone	35,064	213,366	41,332	244,368
Value of items that cannot be disclosed: Abrasive stone, native asphalt, bromine, feldspar, fuller's earth, graphite, lignite, magnesium chloride (for metal), magnesium compounds (except for metal), mercury, pumice, and values indicated by footnote 4		50,069,384		62,347,838
Total Texas [5]		3,993,310,000		4,211,282,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes certain clays, included with "Value of items that cannot be disclosed."
[3] Weight not recorded.
[4] Figure withheld to avoid disclosing individual company confidential data.
[5] Total has been adjusted to eliminate duplicating the value of clays and stone.

Brown-iron ores of Cass, Cherokee, and Morris Counties supplied a large part of the pig iron used by Texas manufacturing and fabricating industries. The State's 16 metallurgical plants continued to contribute significantly to the Nation's metal supply for such metals as aluminum, antimony, copper, lead, tin, and zinc.

The output of nonmetals reflected much of the counterbalancing influences of the State's 1956 construction industry. Notable gains occurred in the number of industrial, commercial, and public-works construction awards in contrast to the declining number of new starts in home building in 1956. Among the construction minerals, record high outputs were established for cement, clays, lime, and stone, while declines were reported for gypsum and sand and gravel. The output of salt and of sulfur increased, while sulfur shipments declined because of the more competitive and expanding Mexican sulfur industry. Consequently, domestic sulfur price was lowered during the year to meet this new competition.

In summary 1956 was a banner year for the Texas mineral industries. Output increased, employment and income rose, consuming and manufacturing industries expanded, and capital expenditures and bank credit grew. Likewise, demand trends showed that State markets were consuming greater amounts of the mineral output than hereto-

fore because of growths in population and in the number of new industries and businesses and to expansions of established industries.

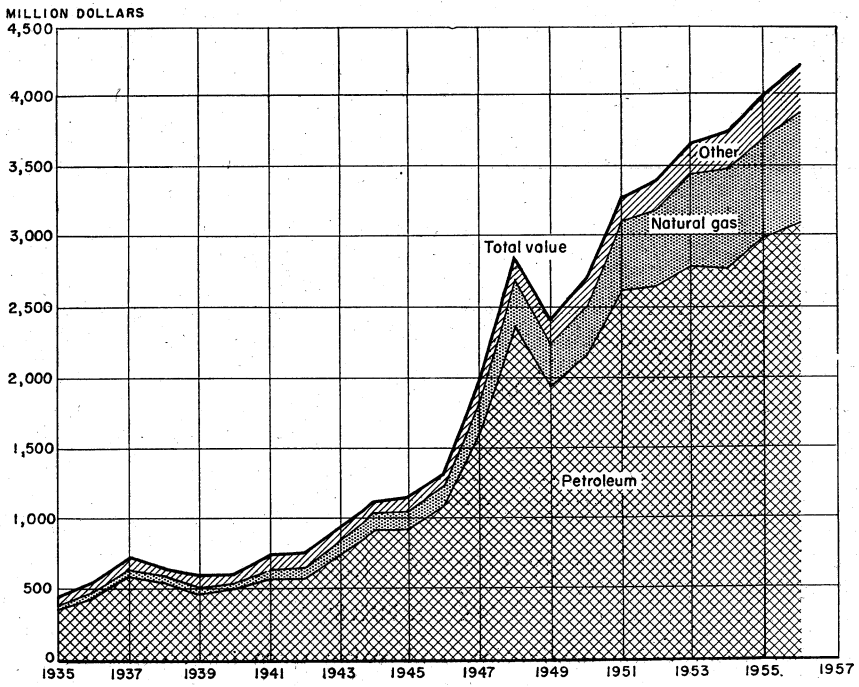

FIGURE 1.—Value of petroleum, natural gas, and total value of mineral production in Texas, 1935–56.

TABLE 2.—Average unit value of selected mineral commodities produced in Texas, 1952–56

Commodity	1952	1953	1954	1955	1956
Cement—376-pound barrel	$2.42	$2.53	$2.58	$2.70	$2.90
Gypsum (crude)—short ton	2.63	2.68	3.10	3.13	3.13
Helium—thousand cubic feet	13.10	13.40	16.94	16.30	16.21
Lime—short ton	9.31	9.21	9.90	9.49	11.72
Magnesium [1]—pound	.245	.266	.270	.295	.339
Mercury [2]—76-pound flask	199.10	193.03	264.39	290.35	259.92
Natural gas—thousand cubic feet	.062	.076	.085	.080	.087
Natural-gas liquids:					
Natural gasoline and cycle products—gallon	.073	.073	.073	.069	.073
LP-gases—do	.036	.039	.032	.032	.039
Petroleum—42-gallon barrel	2.58	2.73	2.84	2.84	2.83
Salt—short ton	1.67	1.76	3.25	3.59	3.63
Sand and gravel: Commercial—do	1.04	1.05	1.03	1.05	1.09
Silver [3]—troy ounce	.905+	.905+	.905+	.905+	.905+
Stone:					
Limestone:					
Crushed—short ton	1.14	.95	1.03	1.08	.94
Dimension—do	13.45	33.84	22.54	31.02	33.07
Miscellaneous: Crushed—do	.58	.54	.86	.97	.91
Sandstone:					
Crushed—do	.74	.54	.74	1.00	.96
Dimension—do	17.40	12.76	8.45	7.22	2.81

[1] Average quoted price f. o. b., Freeport, Tex.
[2] Average quoted price at New York.
[3] Treasury buying price for newly mined silver; 1952–56—$0.9050505.

Defense Minerals Exploration Administration (DMEA) Program.—The Big Bend Mining Co., Inc., continued a diamond-drilling project to explore for mercury and uranium in Presidio County, Tex., under a DMEA contract for $132,000 (Government participation, 75 percent).

TABLE 3.—Average employment, weekly hours worked, and weekly earnings in selected industries, 1955–56 [1]

Industry	Employment		Weekly hours worked		Weekly earnings	
	1955	1956	1955	1956	1955	1956
Manufacturing	446,100	471,900	42.1	41.4	$75.78	$80.32
Primary metals	25,900	26,300	41.2	40.0	86.52	87.60
Chemicals	43,400	46,100	42.5	42.8	89.68	97.16
Petroleum and coal products	47,600	47,800	40.4	40.4	99.38	107.06
Machinery (oilfield)	38,500	43,500	43.6	43.7	87.64	93.08
Transportation equipment	56,300	65,900	42.5	41.6	94.35	95.26
Nonmanufacturing	1,846,300	1,940,300				
Mining	125,500	132,100	44.2	43.6	96.80	100.72
Crude petroleum	117,700	124,100	44.1	43.5	98.34	102.23
Sulfur	7,800	8,000	39.9	40.3	85.39	90.68
Construction	158,800	163,100				

[1] Texas Employment Commission, in cooperation with U. S. Bureau of Labor Statistics, February and April 1957, 6 pp.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

New records for production and value were established by the mineral-fuels industries of Texas in 1956, reflecting the economic growth of the State and the Nation. The 1956 combined output of these industries—including crude oil, natural gas, natural-gas liquids, helium, and lignite—represented 93 percent of the State's total mineral value. Although the domestic oil industry experienced its biggest year in history, it took the Suez incident to relieve the oversupply situation, except for excessive gasoline stocks. For Texas alone, gasoline stocks rose 6.5 million gallons to 28.6 million from those of December 1955, according to the Railroad Commission of Texas. Stocks of all other products declined or approximated those of a year ago. Total domestic demand for all oil in 1956 was 9,228,000 barrels daily—4.1 percent higher than 1955; total exports were 16.6 percent greater.

Exploration for oil and natural gas continued to set records in 1956 as the industry was pressed to maintain its production-reserve ratio. This drilling activity led to important gas-distillate discoveries in the Ellenburger and Wolfcamp formations of West Texas, to oil discoveries on 2 more of the 18 known piercement salt domes in Wood and Anderson Counties of East Texas, and to discoveries in the Deep Edwards in Atascosa, McMullen, and La Salle Counties of Southwest Texas. Tidelands activity was devoted mainly to competition for leases by major producers and large independent producers.

In the tidelands 36 wells were drilled in 1956, making a grand total of 80 completions offshore. This grand total included 13 producing oil wells, 6 producing gas wells, 1 shut-in oil well, 17 shut-in gas wells,

and 43 dry holes. Offshore production approximated 200,000 barrels of oil and 133 million cubic feet of gas per year.

The total refining capacity of Texas increased 7 percent to 2.6 million barrels per stream-day in 1956 according to The Oil and Gas Journal. This added throughput capacity proved greater than the rise in effective products demand, because excessive gasoline stocks throughout the year resulted in curtailment of some refinery activity. During the latter part of the year the Middle East crisis did much to relieve this unbalanced supply-demand situation. Approximately 31,000 miles of trunk pipelines was in operation in 1956, according to the Railroad Commission of Texas—a moderate decline from the 1955 total mileage. In addition, the State had approximately 22,500 miles of gathering lines.

A notable development in the Gulf Coast area of the State was the 1,000 miles of pipelines built to supply fuel and products to the rapidly expanding petrochemical industry. The State had 50 common-carrier pipelines that performed both gathering and trunk services in 1956 compared with 43 in 1955. Yet, trunk-pipeline capacity to the Gulf coast terminals, particularly from the West Texas and Southeast New Mexico oilfields, proved inadequate during the Middle East crisis.

Output of helium and lignite increased, in line with the advancing national demand for basic raw materials.

Asphalt, Native.—Uvalde County supplied all the native asphalt produced in Texas in 1956; this output approximated that of 1955 and was used primarily for road surfacing.

Carbon Black.—The carbon-black industry of Texas recovered 989 million pounds valued at $68 million in 1956. This output—4 percent greater than in 1955—represented 58 percent of the entire domestic production. The industry consumed 154,580 million cubic feet of natural gas for an average yield of 2.04 pounds of material per thousand cubic feet of gas. Nearly 70 percent of the production was used as a filler and conditioner by the rubber industry. Considerable quantities also were used in the ink and paint industries.

Twenty-four carbon-black plants were active in 1956 (12 contact and 12 furnace type) compared with 25 in 1955. Plants in the Panhandle counties—Carson, Gray, Hutchinson, Moore, and Wheeler—supplied 56 percent of the State's output.

Helium.—Texas continued to be a principal domestic source of helium in 1956, with an output of 123 million cubic feet valued at nearly $2.0 million—1 percent greater than in 1955. Federal agencies, including the military establishment, the Weather Bureau, and

TABLE 4.—Helium production, 1955–56, by counties

County	1955		1956	
	Production (cubic feet)	Value	Production (cubic feet)	Value
Moore	89,336,700	$1,449,756	89,969,500	$1,458,676
Potter	32,491,167	534,090	[1] 33,054,983	535,920
Total	121,827,867	1,983,846	123,024,483	1,994,596

[1] Does not include 24,865,028 cubic feet of helium withdrawn from conservation well in Government-owned Cliffside gasfield.

the Atomic Energy Commission, consumed the major part of the 1956 output as they have for the past several years.

Lignite.—Lignite production in Texas was greater in 1956 than in 1955.

Natural Gas.—Marketed production of natural gas in Texas in 1956 was a record 5,000,000 million cubic feet valued at $435 million, an increase of nearly 6 percent compared with 1955 production. Of the total, 2,750,000 million cubic feet was consumed out-of-State, 2,324,000 million cubic feet marketed within the State, and 154,580 million cubic feet was used in manufacturing carbon black. Gas wells produced nearly 70 percent of Texas's natural gas and oil wells the remainder. An average of 12,600 gas wells was producing in 1956 compared with 11,400 wells in 1955 according to the Railroad Commission of Texas. Also, 1,765 of the 25,764 wells completed in Texas in 1956 were gas wells.

Natural-gas reserves were estimated to total 112,728,750 million cubic feet or 47 percent of the national reserve, according to the American Gas Association. Texas tideland fields were proving an enormous new gas reserve. Much of this potential remained to be proved, because the completed wells were shut in for lack of pipeline connections and because the strikes were not developed.

TABLE 5.—Marketed production of natural gas, 1947–51 (average) and 1952–56 [1]

Year	Million cubic feet	Value (thousand dollars)	Value per thousand cubic feet (cents)	Year	Million cubic feet	Value (thousand dollars)	Value per thousand cubic feet (cents)
1947–51 (average)	2,755,817	129,358	4.7	1954	4,551,232	386,855	8.5
1952	4,147,805	257,164	6.2	1955	4,730,798	378,464	8.0
1953	4,383,158	333,120	7.6	1956	4,999,889	434,990	8.7

[1] Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

Natural-Gas Liquids.—The natural-gas-liquids industry of the Nation, particularly those of Texas and Louisiana, faced a serious oversupply situation during most of 1956. LP-gas stocks at the end of 1956 at plant terminals and in underground storages were twice those reported at the end of 1955. PAD District 3, which includes Texas and Louisiana, had nearly 80 percent of all these LP-gas stocks. Natural-gasoline stocks also showed moderate gains, but these surpluses were not as serious to the industry as were LP-gas stocks.

Production of natural-gas liquids amounted to a record 18 million gallons per day—up 3.6 percent from the 1955 output. LP-gases represented 55 percent of this output; natural gasoline and cycle products supplied the remainder. In 1956, 204 natural-gasoline plants and 31 cycle plants were operating in Texas.

The 1956 prices for natural gasoline reflected the stock situation throughout the year. Average plant price for grade 26–70 natural gasoline was somewhat higher during the first quarter of 1956. Then, depressing influences from ever mounting stocks held prices to the summer range throughout the remainder of the year with the average

plant price closing at 4.29 cents. This was 0.34 cent a gallon less than the 1955 average.

The proved recoverable reserve of natural-gas liquids in Texas was estimated at 3,380 million barrels as of December 31, 1956, according to the Committee of Natural-Gas Liquid Reserves of the American Gas Association, 335 million barrels or 11 percent more than in 1955.

TABLE 6.—Production of natural-gas liquids, 1947–51 (average) and 1952–56

Year	Natural gasoline and cycle products		LP-gases		Total	
	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)
1947–51 (average)	2,060,261	151,985	1,418,773	51,562	3,479,034	203,547
1952	2,589,594	188,500	2,456,874	88,635	5,046,468	277,135
1953	2,750,370	200,479	2,777,880	109,131	5,528,250	309,610
1954	2,732,100	200,559	2,983,962	95,913	5,716,062	296,472
1955	2,987,808	206,506	3,450,430	110,414	6,438,238	316,920
1956	2,964,609	216,378	3,731,047	144,745	6,695,656	361,123

Petroleum.—The petroleum industry of Texas and of the Nation ended 1956 in an expansive mood, notwithstanding grave problems which were depressing oil markets. Texas oil problems included holding oil allowables to 190 operating days, compared with 194 in 1955; pipeline prorations by companies unable to absorb their share of oil nominations; the growing number of nonconnected wells, both oil and gas; and excessive stocks of both crude and products. Despite the oversupply situation, the petroleum industry of Texas established new operating records in 1956, reflecting the high-level economy of the State and of the Nation during the year.

Crude-oil output increased 5.2 percent to 1.1 billion barrels, and refinery throughout increased 7.2 percent to 3,031 barrels per day to satisfy the 5.6 percent rise in demand for domestic crude to an average of 7.15 thousand barrels per day.

The total crude-oil capacity of Texas refineries was 2,508,400 barrels per day; of this, 2,398,300 barrels capacity was operating as of January 1, 1957.

Crude-oil stocks as of December 1956, declined 5.2 percent to 94,440 thousand barrels from those of December 1955, and 4.6 percent lower than November 1956, stocks. This moderate drop was due to the temporary increase in crude exports to Europe brought about by the Suez incident.

The wholesale price index of petroleum and petroleum products was 120.9 for December 1956 compared with 115.6 for December 1955, according to the Bureau of Labor Statistics.

Crude oil was produced in 194 Texas counties, of which 116 reported more than 1 million barrels each. The 10 leading counties, in order of output, were Andrews, Ector, Gregg, Scurry, Rusk, Harris, Crane, Brazoria, Gaines, and Wood.

Texas had 178,095 producing oil wells at the end of 1956, an increase of 10,332 or 6.5 percent over 1955. Average daily production amounted

to 17.9 barrels per well in 1956, compared with 18.4 barrels per well in 1955. In 1956, 25,764 wells were completed in Texas—an increase of 9.4 percent over the 23,540 wells completed in 1955, according to the Railroad Commission of Texas. Of the total wells drilled during the year, 5,379 were wildcat wells, of which 564 were completed as oil wells, and 134 as gas wells, and 4,681 were dry holes. Of the 20,385 development wells drilled during 1956, 15,422 were completed as oil wells, 1,631 were completed as gas wells, and 3,332 were dry holes. This drilling campaign led to three important events: (1) An impressive number of good oil, gas, and distillate discoveries in the Ellenburger and the Devonian formations on the Central Basin Platform of West Texas, (2) oil strikes on 2 previously condemned salt domes in East Texas, and (3) 6 Deep Edwards strikes of the Lower Cretaceous trend in Southwest Texas.

TABLE 7.—Production of crude petroleum, 1947–51 (average) and 1952–56

Year	Thousand 42-gallon barrels	Value		Year	Thousand 42-gallon barrels	Value	
		At wells (thousand dollars)	Average per barrel			At wells (thousand dollars)	Average per barrel
1947–51 (average)	861,737	2,129,006	$2.47	1954	974,275	2,768,490	$2.84
1952	1,022,139	2,641,860	2.58	1955	1,053,297	2,989,330	2.84
1953	1,019,164	2,777,900	2.73	1956	1,107,808	3,097,390	2.80

The proved recoverable reserve of crude oil in Texas declined 150 million barrels to 14.8 billion barrels, according to the American Petroleum Institute. Oil discoveries from exploratory drilling added 164.5 million barrels to proved reserves, while development drilling added 762.9 million barrels. Texas had 48.6 percent of the total United States oil reserve and 50 percent of the total liquid-fuel reserve, which includes gas liquids.

Indicated demand for crude oil in Texas in 1956 amounted to 1,116 million barrels compared with 1,045 million barrels in 1955.

Crude-oil stocks in Texas as of December 31, 1956, amounted to 94.4 million barrels, of which 71.8 million barrels was in pipelines and tank farms, 6.8 million barrels was in lease tanks, and 15.8 million barrels was in storage at refineries.

TABLE 8.—Production and indicated demand of crude petroleum in 1956, by months

(Thousand barrels)

Month	Production	Indicated demand	Month	Production	Indicated demand
January	95,400	97,353	August	95,864	93,566
February	89,260	90,108	September	89,666	88,720
March	96,058	94,813	October	90,012	86,894
April	90,665	87,621	November	90,155	94,294
May	92,512	93,064	December	95,127	101,650
June	89,623	95,580			
July	93,466	92,304	Total: 1956	1,107,808	1,115,967
			1955	1,053,297	1,044,712

TABLE 9.—Sales of petroleum products, 1952–56

(Thousand barrels)

Product	1952	1953	1954	1955	1956
Gasoline	93,663	109,848	106,245	105,672	107,045
Kerosine	2,921	2,638	2,383	2,309	2,250
Range oil [1]	2,386	2,205	1,963	1,941	1,813
Distillate fuel oil	19,022	19,046	18,913	20,728	22,258
Residual fuel oil [2]	44,631	40,981	35,436	37,512	37,399

[1] Includes kerosine sold as range oil.
[2] Excludes crude oil used as residual fuel oil as follows: 1952—1,877, 1953—997, 1954—876, 1955—596, and 1956—484.

TABLE 10.—Runs to stills and output of refineries, in 1956, by months

(Thousand barrels)

Month	Runs			Output					
	Crude	Products	Rerun	Gasoline	Kerosine	Fuel oil		Jet fuel	Miscellaneous
						Distillate	Residual		
January	67,781	4,697	577	33,724	4,543	18,010	8,619	1,142	7,017
February	66,697	4,007	−1,184	31,077	4,311	17,505	8,314	1,379	6,934
March	69,822	4,731	−902	33,937	3,700	18,134	8,478	1,597	7,805
April	66,123	4,805	−211	33,306	3,091	17,104	8,195	1,137	7,884
May	71,287	4,944	−2,020	35,306	3,300	16,526	8,877	1,532	8,670
June	69,590	4,833	−1,017	35,371	3,017	16,861	8,553	1,355	8,249
July	67,789	5,170	−632	34,730	3,151	16,202	8,538	1,428	8,278
August	69,437	5,471	−311	35,685	3,644	17,079	8,252	1,638	8,299
September	66,786	5,266	−1,410	33,768	3,740	16,089	8,041	1,557	7,447
October	64,645	5,707	371	33,615	4,065	15,940	7,860	1,596	7,647
November	66,794	5,543	−2,100	32,485	4,322	16,362	8,148	1,593	7,327
December	69,085	5,809	−64	34,218	4,050	18,165	9,037	2,009	7,351
Total	815,836	60,983	−8,903	407,222	44,934	203,977	100,912	17,963	92,908

TABLE 11.—Stocks of crude petroleum at refineries, in pipelines, tank farms, and gathering systems in 1956, by months

(Thousand barrels)

Month	Refineries	Tank farms and pipelines	Lease tanks	Total
January	16,217	75,565	6,745	98,527
February	15,722	72,275	6,735	94,732
March	16,076	74,573	6,075	96,724
April	17,125	77,551	6,170	100,846
May	15,754	76,390	6,785	98,929
June	15,043	74,992	6,935	96,970
July	16,577	75,726	7,035	99,338
August	16,317	77,204	6,960	100,481
September	16,239	77,437	7,105	100,781
October	17,565	79,487	7,275	104,327
November	15,490	76,358	7,165	99,013
December	15,778	71,837	6,825	94,440

Texas had 56 oil refineries in 1956, with a total daily crude capacity of 2.5 million barrels. Most of this capacity was in the Gulf Coast region centering around Corpus Christi, Houston, and Beaumont areas. Refinery expansions and changes in methods and processes that occurred in 1956 are discussed in the County Review section.

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TABLE 12.—Stocks of refined products at refineries in 1956, by months

(Thousand barrels)

Month	Gasoline [1]	Kerosine	Fuel oil		Jet fuel	Natural gasoline	Miscellaneous products
			Distillate	Residual			
January	34,649	2,540	10,555	8,039	974	409	21,294
February	38,133	2,590	7,965	6,977	1,161	524	21,752
March	35,591	2,865	8,473	6,227	1,030	465	22,391
April	34,317	2,962	10,571	6,787	1,046	691	22,268
May	32,297	3,545	12,970	6,593	1,183	888	22,860
June	31,732	4,091	15,504	7,315	1,186	1,171	23,149
July	31,294	3,884	17,373	8,178	849	1,256	22,920
August	30,651	3,999	18,983	7,765	1,173	1,436	22,376
September	31,634	4,383	20,445	8,638	1,019	[2] 414	22,785
October	32,666	3,918	19,512	8,923	903	543	21,057
November	32,263	4,291	22,672	8,145	1,041	498	23,244
December	33,674	3,466	13,712	7,491	1,455	551	22,402

[1] Includes naphtha.
[2] An underground storage of liquefied gas formerly included in this table has been transferred to the natural-gas-liquids report.

TABLE 13.—Daily average production and runs to stills of petroleum in 1955–56

(Thousand barrels)

Month	1955		1956	
	Crude production	Runs to stills	Crude production	Runs to stills
January	2,971	2,049	3,077	2,187
February	2,966	2,151	3,076	2,300
March	2,996	2,127	3,099	2,252
April	2,993	2,052	2,925	2,204
May	2,833	2,056	2,984	2,300
June	2,725	2,058	2,891	2,320
July	2,720	2,065	3,015	2,187
August	2,722	2,120	3,092	2,240
September	2,784	2,045	2,892	2,226
October	2,888	2,055	2,904	2,085
November	2,989	2,191	2,908	2,227
December	3,048	2,166	3,069	2,229

Texas refineries charged 816 million barrels of crude oil to stills during the year, up roughly 52 million barrels from 1955. Refinery production increased from 814 million barrels in 1955 to 868 million barrels in 1956. The bulk of the increase was in gasoline output, up to about 407 million barrels compared with 372 million barrels in 1955. This increase in gasoline output prevented the industry from depleting these excessive stocks during the year.

METALS

Though iron ore, magnesium, and mercury were the only metals mined in Texas in 1956 and their value was small compared with the total mineral value of the State, there was an imposing array of metallurgical plants in the State which processed ores and other materials mined in other States and foreign countries.

A wide variety of metals or their compounds, was recovered at Texas plants. These included aluminum, antimony, cadmium, copper, gold and silver, iron, lead lithium (hydroxide), magnesium (both metal and compounds), tin, and zinc. Major markets for

metals produced in Texas, except iron, still were out of State even though the metals fabricating industry of Texas was growing rapidly.

Aluminum and Bauxite.—The aluminum industry of Texas, which began production in 1950 with a total yearly capacity of 57,000 tons, made the State the second ranking producer in the Nation in 1956, when the rated capacity reached 365,000 tons of metal yearly. Expansion programs of The Aluminum Company of America consisted of an alumina plant adjacent to the Point Comfort reduction works, deepening of a channel through Lavaca Bay to accommodate ore vessels that carry Surinam bauxite to the new alumina plant, and an $11 million expansion to the Point Comfort reduction works. The added facility at Point Comfort was to include a seventh potline, with an annual capacity of 20,000 tons of metal. Reynolds Metals Co. enlarged its La Quinta alumina plant near Corpus Christi at a cost of about $30 million. This was to provide an annual capacity of 548,000 tons of alumina (an increase of 185,000 tons) extension of the pier adjacent to the alumina plant, dredging of a channel for ore vessels, and added bauxite-storage facilities.

The price of aluminum metal opened 1956 at 24.4 cents a pound and rose to 25.9 cents in March and to 27.1 cents in August.

Antimony.—Antimony from ores and concentrates imported from Mexico and Bolivia was recovered at the Laredo smelter of National Lead Co. Smelter output in 1956 was greater than in 1955, commensurate with a modest rise in consumption. The principal uses for the metal were: Antimonial lead for batteries, bearing metals, and frits; and as pigment in ceramic enamels and paints and lacquers. The price of the domestic metal (f. o. b. Laredo, Tex.) remained unchanged at 33 cents a pound throughout 1956.

Copper.—Blister copper was produced at the El Paso copper smelter of the American Smelting and Refining Co. from ores and concentrates from Western States and foreign countries. Fire-refined copper and electrolytic-grade copper were produced at the Nichols refinery of Phelps Dodge Refining Corp. at El Paso.

Iron and Iron Ore.—The 1956 output of iron ore from open pits in Cass, Cherokee, and Morris Counties was somewhat larger than in 1955. The ore was shipped to one blast furnace in Daingerfield and to another in Houston. Both blast furnaces were basic units of integrated steel mills operated by Lone Star Steel Co. and Sheffield Steel Division of Armco Steel Corp. Ore from Mexico and from South America supplemented domestic ore as blast furnace feed. These blast furnaces and the steel mills operated above rated capacities in 1956 as demands for oil-country goods remained high. Construction of a $1 million heat-treating plant began during the first of the year at the Houston plant of Sheffield Steel Co.

Lone Star Steel Co. began construction of a fifth open-hearth furnace, which will add about 20 percent to its ingot capacity. The company mineral reserves were increased by the acquisition of additional iron-ore leases in Texas and of coal properties in Oklahoma.

Lead.—Lead ores and concentrates from Western States and from Mexico were processed into base bullion at the El Paso lead smelter of American Smelting and Refining Co. Seven secondary lead smelters in Texas also treated scrap material. Demand for antimonial lead for storage batteries was off considerably from 1955, and purchases for

Government stockpiling were much greater. The 1956 price of lead opened at 16 cents per pound, rose to 16.5 cents on January 4, and dropped back to 16 cents on January 13, where it remained for the rest of the year.

Magnesium.—Magnesium—the lightest of structural metals—was produced from sea water by Dow Chemical Co. Sea water contains an average of 0.13 percent magnesium and offers an unlimited reserve of this strategic metal. Dow Chemical Co. operated both its electrolytic plant at Freeport and the Government-owned plant at Velasco. A slight increase in demand in 1956 permitted Dow Chemical Co. to operate both plants at capacity. Both were closed by a 31-day labor strike in July and August.

The use of magnesium as an alloying constituent with aluminum and as a reducing agent to produce titanium increased during 1956. Appreciable quantities of the metal were likewise consumed in die-casting parts for automobiles, in business machines and handtools, and for cathodic protection of iron and steel in ships and marine equipment, in industrial boilers and in pipelines. The 1956 price of primary magnesium opened at 32.5 cents per pound, f. o. b. Velasco, Tex., rising to 33.75 cents per pound on April 16. It rose to 35.25 cents per pound on August 13 and remained at that price to the close of the year.

Manganese.—Imported manganese ore was smelted at the Houston plant of Tenn-Tex Alloy & Chemical Corp. to produce ferromanganese. The bulk of this alloy was used as an additive for the expanding Texas steel industry; the remaining minor quantity was shipped outside the State for similar uses.

Mercury.—Exploration and development programs for mercury in the Terlingua district accounted for a slight increase in recovery in 1956 over that of 1955. The price of mercury at New York opened the year at a range of $275–$279 a flask and, after moderate declines during the year, it closed at $255–$257, averaging $259.92 for the year.

Tin.—Output at the Longhorn tin smelter at Texas City amounted to 17,631 long tons of tin in 1956 compared with 22,329 long tons in 1955. This smelter continued as the only source of primary refined tin in the Western Hemisphere, and all of its production was consigned to Government stockpile.

Zinc.—A considerable part of the Nation's primary and secondary zinc-smelting capacity was in Texas. Three primary plants (2 horizontal retort and 1 electrolytic) processed foreign and Western States ores and concentrates; secondary smelters, in Fort Worth-Dallas and in the Houston-Beaumont areas, treated scrap material. Texas zinc smelters operated at near capacity as domestic consumption and Government acquisitions for stockpiling continued at high levels. Galvanizing and die casting remained the principal uses of zinc, accounting for 79 percent of the total slab zinc produced. Stocks of slab zinc at smelters increased during the year while consumer inventories declined.

The average 1956 zinc price, East St. Louis, was 13.5 cents per pound compared with 12.3 cents per pound in 1955. Zinc metal opened at 13.0 cents at the beginning of the year then rose to 13.5 cents on January 6, at which level it remained throughout the year.

Industry expansion included additions to the zinc fuming and other

facilities of the Corpus Christi electrolytic zinc smelter of the American Smelting and Refining Co. These new facilities raised the plant capacity to 100,000 tons of metal per year and were placed in operation in September. Installation of new mechanical charging machines on all furnaces of the Machovec retort smelter of the American Zinc Co. of Illinois at Dumas permitted about 30-percent increase in production.

Uranium.—Exploration programs by oil and mining companies led to discovery of considerable reserves of uranium ore in Karnes, Duval, and Gonzales Counties. The industry's pressing problem was whether the reserves warranted construction of a mill or a purchasing depot.

SECONDARY METALS

Iron and Steel Scrap.—Scrap was an important supply for the Texas iron and steel industry as evidenced by the fact that this industry consumed 2.1 percent of the Nation's scrap in 1956 but only 0.9 percent of the Nation's pig iron. Of the 1.7 million tons of ferrous scrap consumed within the State, the major part was purchased by the users from scrap dealers.

TABLE 14.—Consumption of ferrous scrap and pig iron, 1955–56

Year	Total scrap (short tons)	Pig iron (short tons)	Total scrap and pig iron (short tons)
1955	1,671,036	749,298	2,420,334
1956	1,704,464	675,432	2,379,896

Lead Scrap.—Texas had appreciable secondary lead-smelting capacity. These plants processed lead scrap, battery plates, bearing metal, and other alloys into refined and antimonial lead and alloys, such as babbitt and solder. Secondary lead smelters in Texas were: Houston Fishing Tackle Co., Magnus Metal Co., and Houston Lead Co., at Houston; Southern Lead Co. and National Lead Co., at Dallas; Magnus Metal Co. and National Metal & Smelting Co., at Fort Worth; Standard Electric Co., at San Antonio, and Wilkinson Bros. Smelting Co., at Laredo. Secondary lead represented 59 percent of the total domestic supply of lead in 1956.

NONMETALS

The 1956 value of nonmetal production approximated $288 million, or 7 percent of total mineral value. Eighteen nonmetal commodities were produced in 1956, the same as in 1955. The five principal commodities, in order of value, were: Sulfur, cement, stone, sand and gravel, and magnesium chloride (used for metal). Production increases were reported for 12 of these nonmetal commodities, declines were noted for 4, and 2 approximated their 1955 records.

Virtually all of the nonmetal minerals were produced for local markets because of their bulk weight and low unit price, the one major exception being sulfur. Industrial expansion, an expanded highway program augmented by funds of the Federal Aid Highway Act of 1956, and increases in defense operations in Texas all con-

tributed to the accelerated tempo of the construction industry. Texas—with 29,000 miles of the interstate National Highway system—received the second contract awarded under the Federal Aid Highway program. Federal funds amounting to $270 million were allocated for the interstate system with $122 million more granted for primary, secondary, and urban road systems under this program.

Abrasives (Grinding Pebbles).—Grinding pebbles from open pits in Travis County were recovered and prepared by Dezendorf Marble Co.

Barite.—Crude barite from foreign countries and other States was processed at grinding plants in Cameron, Harris, and Nueces Counties. Most of the material was prepared as a drilling mud for the oil and gas industry. Although the 1956 output approximated that in 1955, production might have been greater if a 5-week steel strike had not drastically reduced oil-country goods for drilling.

Bromine.—The 1956 output and value of bromine was greater than that of 1955 as the demand for ethylene-dibromide, a gasoline antiknock fluid, continued its upward trend. This increased demand was attributed to the higher compression engines and higher octane fuels of the automotive engines. Ethyl-Dow Chemical Co., the Nation's foremost producer of bromine, expanded its capacity by 20 percent.

Cement.—The Texas cement industry expanded its production and storage and handling facilities in 1956 to meet the growing demands of State industrial and highway construction. Output increased 4 percent to 26 million barrels in 1956; this was 91 percent of the installed capacity. All Texas cement plants were in or near large urban and industrial centers. Cement plants inland used limestone as the basic raw material; plants bordering the Gulf coast used shell because its bulk weight and relatively low unit value restricted the shipping distances to the proximity of the consuming markets. Intrastate markets consumed nearly 77 percent of the cement shipped in 1956; shipments to adjoining States made up the remainder.

There were 13 cement plants in Texas in 1956. One newcomer, Texas Portland Cement Co., built a $6-million, 540,000-barrel-annual-capacity plant at Orange. Initial production is expected in early 1957. Nine cement plants and 70 percent of the State capacity were in 6 inland counties; 4 plants, with 30 percent of the total cement capacity, were in two Gulf coast counties. Industry expansions occurring in 1956 are reported in the Review by Counties.

TABLE 15.—Portland cement produced and shipped, 1947–51 (average) and 1952–56

(376-pound barrels)

Year	Production (barrels)	Shipments		
		Barrels	Value	
			Total	Average per barrel
1947–51 (average)	15,279,207	15,160,409	$34,040,098	$2.25
1952	19,997,983	19,849,455	48,042,901	2.42
1953	19,253,677	19,140,193	48,497,762	2.53
1954	21,541,325	21,928,170	56,674,124	2.58
1955	24,241,443	24,038,427	64,820,374	2.70
1956	25,654,997	25,234,150	73,069,953	2.90

Clays.—The clay industry of Texas was an important segment of its economy. Although extensive deposits of common clay or shale are widely distributed over the State, only those deposits close to large metropolitan or industrial centers were exploited. Total clays production increased 2 percent compared with 1955; the value declined 7 percent. Miscellaneous or common clay provided 80 percent of the production, 32 percent of which was used in cement. Other important uses included the manufacture of building brick, heavy clay products, and lightweight aggregates. Fire clay was 15 percent of the total clays produced, and bentonite and fuller's earth made up the remainder. The bulk of the fire clay was used in heavy clay products, and smaller amounts were consumed in refractories, pottery, and stoneware. Bentonitic clays were used principally as a filtering medium for mineral and vegetable oils, as a component of drilling muds, and as an absorbent for insecticides.

Clays production was reported from 41 counties by 77 producers; 30 of these counties reported miscellaneous clay, 11 fire clay, 4 bentonite, and 2 fuller's earth. The five principal clay-producing counties, in the order of their output, were: Harris, Dallas, Eastland, Bastrop, and Bexar. The five leading producing companies were: Acme Brick Co., Texas Lightweight Aggregate Co., Featherlite Corp., American Aggregate Co., and Henderson Clay Products Co. Industry notes on expansions are reported in the County Review section.

TABLE 16.—Clays sold and used by producers, 1947–51 (average) and 1952–56, by kinds

Year	Bentonite		Fire clay		Fuller's earth	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	27,830	$252,924	270,338	$614,840	110,139	$1,390,140
1952	31,386	584,938	358,466	1,064,005	105,565	1,030,005
1953	47,887	670,300	356,211	915,575	106,437	1,277,670
1954	105,744	1,299,380	347,247	2,187,866	62,788	590,135
1955	155,128	1,461,873	437,595	1,068,664	(1)	(1)
1956	160,723	1,182,620	483,417	1,007,188	(1)	(1)

Year	Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value
1947–51 (average)	1,423,261	$1,446,638	1,831,568	$3,704,542
1952	1,573,603	1,791,234	2,069,020	4,470,182
1953	1,860,440	1,815,429	2,370,975	4,678,974
1954	1,885,145	2,924,643	2,400,924	7,002,024
1955	2,504,236	2,569,385	[2] 3,096,959	[2] 5,099,922
1956	2,502,061	2,575,260	[2] 3,146,201	[2] 4,765,068

[1] Figures withheld to avoid disclosing individual company confidential data.
[2] Incomplete total; excludes fuller's earth.

Feldspar.—The 1956 production of crude feldspar was greater than that of 1955. Production originated in three counties: Burnet, Gillespie, and Llano. The bulk of the material was ground and processed as a roofing material.

Fluorspar.—Fluorspar, imported principally from Mexico, was processed at several Texas mills for the metallurgical and chemical indus-

tries. Reynolds Metals Co. completed a mill at Eagle Pass to process Mexican ores for use in synthetic cryolite. The Reynolds Metals Co. used cryolite at its aluminum-reduction works in Alabama, Arkansas, Oregon, and Washington. Other fluorspar mills were at Houston in Harris County, at Flatonia in Fayette County, and at Marathon in Brewster County.

Gem Stones.—Collection, barter, preparation, and sale of gem stones by amateurs, hobbyists, and dealers continued to increase in 1956. The principal gem-type minerals found in Texas were: Agate, jasper, amethyst, apatite, chrysocolla, cinnabar, fluorite, garnet, obsidian, and opal. Search for these stones centered in Brewster, Culberson, Hudspeth, Jeff Davis, Mason, Webb, and Zapata Counties.

Graphite.—Graphite was mined from open pits in Burnet County in 1956.

Gypsum.—Gypsum mining in Texas in 1956 declined in both volume and value from the record high of 1955, even though building construction within the State remained at boom proportions. Production was reported from four counties—Fisher, Hardeman, Hudspeth, and Nolan. The bulk of the output was used in lath and wallboard; the remainder was used for building plaster. The Acme plant and quarry of Certain-Teed Products Corp. was sold during the year to Bestwall Gypsum Co. of Ardmore, Pa.

TABLE 17.—Gypsum mined, 1947–51 (average) and 1952–56

Year	Crude gypsum mined			Year	Crude gypsum mined		
	Short tons	Value			Short tons	Value	
		Total	Average per ton			Total	Average per ton
1947–51 (average)	956,341	$2,416,430	$2.53	1954	1,218,048	$3,773,230	$3.10
1952	1,021,161	2,682,019	2.63	1955	1,349,434	4,219,652	3.13
1953	1,067,854	2,860,633	2.68	1956	1,156,956	3,623,005	3.13

Lime.—Moderate expansion of the lime industry of Texas continued in 1956, as demand for building plaster and for chemical and industrial uses remained at high levels. Consumption by chemical and industrial users amounted to 92 percent of the total output in 1956 compared with 93 percent in 1955. Building plasters consumed most of the remainder. Lime production was reported from 7 counties by 9 producers; the 3 leading counties in the order of output being Comal, Nueces, and Harris. Limestone, as the basic raw material, was used for 56 percent of the production and shell was used in 44 percent. The bulk of the lime output (83 percent) was consumed within the State, and the major part of this production went to captive use. Most out-of-State shipments were sent to adjoining States.

The industry had 23 shaft kilns and 8 rotary kilns, with an annual capacity approximating 660,000 tons operating in 1956. Most kilns were fired by natural gas; the rest used byproduct coke as a fuel. The El Paso Building Materials Co. stopped operating its limestone

quarry because of mounting costs and foreign competition. Principal chemical and industrial uses were in the manufacture of lithium hydroxide, paper, and petrochemicals, as metallurgical lime for open hearth and electric furnaces, for water purification and softening, for sewage treatment, and in petroleum refining. One new use for lime in Texas was in producing lithium hydroxide.

TABLE 18.—Lime (quick and hydrated) sold by producers, 1947–51 (average) and 1952–56

Year	Quicklime (short tons)	Hydrated lime (short tons)	Total	
			Short tons	Value
1947–51 (average)	140, 565	54, 113	194, 678	$1, 840, 752
1952	209, 904	71, 700	281, 604	2, 622, 975
1953	256, 000	219, 569	475, 569	4, 380, 831
1954	306, 433	241, 003	547, 436	5, 421, 732
1955	307, 322	277, 533	584, 855	5, 549, 309
1956	349, 693	242, 443	592, 136	6, 937, 951

Lithium.—Lithium hydroxide was prepared at the San Antonio plant of American Lithium Chemicals, Inc. Lepidolite ores of Southern Rhodesia were the principal raw material of the plant.

Magnesium Compounds.—Magnesium compounds, as well as industrial chemicals, were produced at the Freeport plant of Dow Chemical Co. A $45-million expansion program, started at the Freeport works in 1956, included new plants to produce ethanolamines, synthetic glycerol, and acetylene; new pilot plants and laboratories; a 29-mile gas pipeline; and expansions or replacements to existing plants. Operations at both the Freeport and Velasco plants were halted by a labor strike during July and early August.

Natural Salines.—Sodium sulfate was recovered from well and dry-lake brines near Monahans in Ward County, Tex., in 1956.

Perlite (Expanded).—Although no crude perlite was produced in Texas in 1956, crude material from New Mexico and Colorado was expanded at 5 plants in 3 counties. The bulk of the expanded material was used as a lightweight aggregate in concrete for roof decks and as an aggregate in building plaster. All plants were located close to markets in or nearby large metropolitan and industrial areas.

Pumicite (Volcanic Ash).—Pumicite was produced from open pits in two counties in Texas in 1956. Principal uses were as a filler in floor tile, as an insulating medium, as an absorbent for oils and greases, and for acoustic plaster.

Salt.—Salt derived from the vast salt domes of the Gulf Coast and Coastal Plains, was a vital ingredient of the growing chemical industry. Production increased 11 percent compared with 1955. Over 90 percent of the production was brine from wells drilled to subsurface salt domes in 7 counties, the 3 principal producing counties being Brazoria, Duval, and Chambers. The bulk of the brine was used in chlorine and soda ash; other uses included paper and pulp manufacture, feed mixing, water softening, and the manufacture of other chemicals. Most of the salt was consumed within the State.

TABLE 19.—Salt sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1947–51 (average)	1,688,020	$2,613,824	$1.55	1954	2,864,312	$9,310,339	$3.25
1952	2,640,209	4,402,032	1.67	1955	3,583,242	12,867,094	3.59
1953	2,845,190	5,010,624	1.76	1956	3,962,778	14,369,558	3.63

Sand and Gravel.—The 1956 output and value of sand and gravel in Texas declined 7 and 4 percent, respectively compared with 1955, despite near-record activities of the State building and highway construction programs. Deposits of this material, extensive and widespread over most of Texas, are found most often along or adjacent to the larger streams. This widespread occurrence proved particularly beneficial to the State construction industry, because hauling distances limit the availability to this bulky and low-unit value commodity.

Production was reported from 101 of the 254 Texas counties, with commercial production supplying approximately 80 percent of the output and Government-and-contractor production the remaining 20 percent. Building and paving uses consumed 91 percent of the output; concrete aggregate 3 percent. Other uses were for manufacturing glass, for railroad ballast, engine, and molding sands, and for sand blasting, filtering, and grinding. Seventy-eight percent of all the sand and gravel produced was washed or otherwise prepared. Trucks handled 58 percent of the shipments; railroads 35 percent; and waterways 3 percent.

The average value of commercial sand and gravel in 1956 was $1.09 a ton; prepared material averaged $1.14 a ton, and pit-run material averaged 56 cents per ton. In 1955 prepared material averaged $1.11 per ton and pit-run material 55 cents per ton. The bulk of the Government-and-contractor material was produced for the Texas Highway Department.

TABLE 20.—Sand and gravel sold or used by producers, 1947–51 (average) and 1952–56

Year	Commercial		Government-and-contractor		Total sand and gravel		
						Value	
	Short tons	Value	Short tons	Value	Short tons	Total	Average per ton
1947–51 (average)	13,795,877	$13,135,979	2,163,053	$499,752	15,958,930	$13,635,731	$0.85
1952	15,998,314	16,602,593	2,663,089	672,662	18,661,403	17,275,255	.93
1953	11,866,963	12,426,922	3,234,263	418,639	15,101,226	12,845,561	.85
1954	23,136,286	23,892,530	3,179,349	948,281	26,315,635	24,840,811	.94
1955	24,973,270	26,303,453	6,544,853	2,176,897	31,518,123	28,480,350	.90
1956	23,311,118	25,511,901	6,024,579	1,700,653	29,335,697	27,212,554	.93

TABLE 21.—Sand and gravel produced in 1956, by uses

Use	Short tons	Value	
		Total	Average per ton
Sand:			
Engine sand	16,146	$12,406	$0.77
Glass sand	217,267	533,501	2.46
Molding sand	88,249	147,286	1.67
Paving sand	4,577,962	3,135,190	.68
Railroad-ballast sand	73,140	25,514	.35
Structural sand	5,404,531	5,065,266	.94
Other sand	982,083	776,460	.79
Value of items that cannot be disclosed [1]	146,896	914,125	6.22
Total	11,506,274	10,609,748	.92
Gravel:			
Paving gravel	11,070,016	8,442,282	0.76
Railroad-ballast gravel	214,409	165,057	.77
Structural gravel	5,638,511	6,991,103	1.24
Other gravel	906,487	1,004,364	1.11
Total	17,829,423	16,602,806	.93

[1] Includes blast sand and filter sand.

Stone.—The Texas stone industry expanded its production, storage, and handling facilities in 1956 to meet the mounting needs of the building- and highway-construction industries and of the cement industry. Output of stone, which included limestone and shell used for cement and lime, increased 20 percent to 32.8 million tons, and value increased 8 percent to $36.3 million. There were 7 kinds of stone: Basalt, caliche, granite, marble, limestone (shell excluded), rhyolite, and sandstone, produced in 68 counties. The five leading stone-producing counties, in order of output, were: Bexar, Wise, Dallas, El Paso, and Comal. The three leading counties producing shell were Chambers, Harris, and Nueces.

TABLE 22.—Stone sold or used by producers, 1952–56

Year	Limestone		Sandstone		Oystershell	
	Short tons	Value	Short tons	Value	Short tons	Value
1952	5,343,324	$6,634,047	879,561	$667,671	(1)	(1)
1953	6,251,667	6,404,938	(2)	(2)	(1)	(1)
1954	13,482,633	14,385,288	(2)	(2)	10,314,050	$12,193,316
1955	14,102,882	16,080,861	(2)	(2)	11,084,797	14,763,238
1956	18,706,005	18,357,047	1,286,476	1,244,414	12,017,878	15,483,005

Year	Miscellaneous		Total stone	
	Short tons	Value	Short tons	Value
1952	1,265,484	$739,670	[3] 7,604,468	[3] $8,664,633
1953	2,022,271	1,090,319	[4] 9,095,109	[4] 8,550,320
1954	1,297,563	1,111,646	[5] 25,840,338	[5] 29,343,684
1955	724,216	699,916	27,321,444	33,543,782
1956	700,490	635,887	[6] 32,772,827	[6] 36,349,747

[1] Data not available.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Includes 116,099 tons of granite, marble, and basalt valued at $623,245.
[4] Includes granite and marble.
[5] Excludes certain stone; Bureau of Mines not at liberty to publish.
[6] Includes 61,978 tons of basalt, granite, and marble valued at $629,394.

Stone accounted for 63 percent of the output and shell the remaining 37 percent. Limestone composed 90 percent of the stone output, and sandstone 6 percent; the remaining 4 percent was distributed among basalt, granite, marble, caliche, and rhyolite. Crushed stone represented 99 percent of the stone total production; crushed limestone was responsible for 90 percent of the total. The principal uses for crushed stone in 1956 were for road stone and concrete, for railroad ballast, and for cement and lime. Shell dredged from shallow bays along the Gulf coast of Texas and Louisiana totaled 12 million tons in 1956. Principal uses were in cement and lime, for concrete, and for chemicals.

Sulfur.—The year 1956 saw the sulfur industry of Texas continue its concerted effort to improve its reserve position as production reached a record. Output of native sulfur by the Frasch process was reported from 5 Gulf coast and Coastal Plain counties by 5 producers. Production of byproduct sulfur from the purification of natural and refinery gases was reported from 9 inland counties by 12 producers. Output of native sulfur (more than 96 percent of the total sulfur produced in the State in 1956) increased 9 percent to 4 million long tons. Shipments, however, declined nearly 9 percent to 3.4 million long tons. The domestic price of sulfur was lowered during the year to meet a similar price cut in foreign sulfur. This price cut caused a 13-percent reduction in the 1956 value. Texas Gulf Sulphur Co., the Nation's largest producer, was building a Frasch plant and developing a sulfur deposit at Fannett dome in Jefferson County. Special industry interest centered in tideland leases off Jefferson County, with active exploration anticipated during the ensuing year.

Principal nonacid uses of sulfur were in wood pulp, carbon bisulfide, dyes, and other chemicals. Principal uses for sulfuric acid were in fertilizers, chemicals, and organic pigments, in refining petroleum, and in the production of iron and steel.

TABLE 23.—Sulfur produced and shipped from Frasch mines, 1947–51 (average) and 1952–56

Year	Production (long tons)	Shipments		
		Long tons	Value	
			Total	Average per ton
1947–51 (average)	3,791,142	3,940,238	$74,084,052	$18.80
1952	3,784,595	3,691,724	78,910,000	21.37
1953	3,514,771	3,614,838	97,601,000	27.00
1954	3,505,087	3,474,477	92,791,821	26.71
1955	3,657,717	3,766,882	105,128,170	27.91
1956	3,994,393	3,437,061	91,026,388	26.48

Talc and Soapstone.—Talc and soapstone were produced in two counties in 1956. Output was somewhat greater than that of 1955.

Vermiculite (Exfoliated).—Vermiculite shipped in from other States was expanded by 4 plants in 3 counties. Principal uses of the exfoliated material were as a lightweight aggregate for plaster and concrete and as an insulative material.

Water.—Water was a major factor in the continued industrial growth of Texas and the Southwest; ability to meet this rising demand controls much of the industrial future of Texas. Before World War II, surface and underground water supplies were adequate for industrial, municipal, and irrigation requirements. In the face of burgeoning water requirements of the growing Texas economy and population, as well as impeding of the replenishment of reservoirs by a 4-year drought, existing water supplies over most of Texas appeared scarcely adequate. Fortunately, the north, east, and Gulf coast regions of Texas have surface water from rivers and lakes as a major source of supply; the west, southwest, and Panhandle regions, on the other hand, have no lakes or rivers of sufficient size, except the Canadian River, to bolster their underground water supply.

The ground-water level in these regions had dropped dangerously as irrigation projects increased, as waterflood projects of the oil industry rose, and as population growth and industry expansion mounted. State and Federal agencies were attempting to resolve part of this mounting problem of critical urban and industrial areas by constructing additional dams across the larger streams or by drawing upon reservoirs for lesser demands. One such solution—the Ferrells Bridge Dam and Reservoir in Morris County—will supply industrial and municipal water for the northeast Texas counties in the Daingerfield area. These solutions are only temporary at best, as current demand trends indicate that in the near future water requirements will transcend all available water supplies in critical areas.

REVIEW BY COUNTIES

Anderson.—Minerals produced in Anderson County included crude oil, natural gas, and natural-gas liquids valued at $17.8 million. The Permian Basin Pipeline Co. enlarged its Perchett field plant from 25 to 80 million cubic feet of gas per day. There were 4.3 million barrels of crude oil produced from 22 fields; 1 field produced more than 1 million barrels of crude and 51.2 billion cubic feet of natural gas in 1956. Fifty-nine exploratory wells, totaling 341,255 feet of drilling, resulted in 7 oil discoveries, 1 new oil pay, and 1 new gas pay. Natural-gas liquids were recovered at the Cayuga, Long Lake, and Royall-Cove cycling plants of Tidewater Associated Oil Co. and at the Ware plant of Sylvan S. Price.

Clay-Burn Tile Co. added two kilns and enlarged the storage area at its Palestine tile plant.

Andrews.—Andrews County, with a total mineral value of $192.4 million, had the second largest mineral value in the State in 1956. Natural-gas liquids were recovered at the Andrews and Fullerton gasoline plants of Phillips Petroleum Co., the Dollarhide plant of Pure Oil Co., and the South Fullerton, Midland, and the Three Bar plants of Stanolind Oil & Gas Co. El Paso Natural Gas Co. built 65 miles of gathering pipelines and a natural-gasoline plant to process 20 million cubic feet of gas per day. A $7 million building project at the Andrews plant of Phillips Petroleum Co. included a gas-absorption plant, booster station, gathering lines, and a sulfur plant. The sulfur plant will produce 600 long tons of sulfuric acid per day for use in the company's fertilizer plants.

TABLE 24.—Value of mineral production in Texas, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Anderson	$16,646,924	$17,819,500	Petroleum, natural gas, natural-gas liquids.
Andrews	156,800,567	192,356,826	Petroleum, natural gas, natural-gas liquids, recovered sulfur, stone.
Angelina	397,589	422,714	Clays, petroleum.
Aransas	11,498,065	10,641,237	Petroleum, natural gas, shell.
Archer	26,000,945	28,255,650	Petroleum, natural gas, natural-gas liquids.
Atascosa	18,189,867	22,514,377	Petroleum, natural-gas liquids, sand and gravel, natural gas.
Austin	7,905,645	8,535,293	Petroleum, natural gas, sand and gravel.
Bastrop	849,207	1,189,320	Petroleum, clays, natural gas.
Baylor	3,718,265	4,843,850	Petroleum, natural gas.
Bee	22,220,902	24,399,430	Natural-gas liquids, petroleum, natural gas, stone.
Bell	690,849	439,850	Sand and gravel, stone.
Bexar	14,851,845	15,483,997	Cement, petroleum, stone, sand and gravel, clays, natural gas.
Blanco	----------	65,527	Stone, sand and gravel.
Borden	18,700,086	25,369,850	Petroleum, natural gas.
Bosque	18,400	19,429	Sand and gravel.
Bowie	321,308	463,194	Sand and gravel, petroleum, natural gas.
Brazoria	212,432,604	224,773,958	Petroleum, natural-gas liquids, natural gas, magnesium chloride, bromine, Frasch sulfur, salt, magnesium compounds, sand and gravel.
Brazos	20,720	22,300	Natural gas.
Brewster	217,178	205,350	Mercury, clays, gem stones.
Briscoe	179,935	44,552	Clays, stone.
Brooks	17,289,453	20,385,150	Petroleum, natural gas, natural-gas liquids.
Brown	2,243,821	2,346,988	Petroleum, stone, natural gas, sand and gravel, clays.
Burleson	4,738	15,200	Petroleum.
Burnet	1,405,314	1,662,374	Stone, graphite, sand and gravel, feldspar.
Caldwell	8,599,443	9,131,250	Petroleum, natural gas.
Calhoun	11,792,721	14,019,757	Petroleum, natural gas, natural-gas liquids, shell, stone.
Callahan	9,172,876	11,289,450	Petroleum, natural gas.
Camp	793,104	651,750	Do.
Carson	20,534,245	22,564,092	Natural gas, petroleum, sand and gravel, natural-gas liquids.
Cass	3,460,155	6,797,595	Petroleum, natural-gas liquids, natural gas, iron ore.
Chambers	65,332,364	71,235,101	Petroleum, natural gas, natural-gas liquids, shell, brine, stone.
Cherokee	6,407,493	8,326,503	Petroleum, iron ore, clays, natural gas.
Childress	----------	11,847	Sand and gravel.
Clay	18,543,119	18,801,850	Petroleum, natural gas, natural-gas liquids.
Cochran	23,784,397	22,096,050	Do.
Coke	50,243,984	43,335,400	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Coleman	10,934,664	10,069,006	Petroleum, natural gas, sand and gravel, clays, natural-gas liquids.
Collin	90,581	112,970	Stone.
Collingsworth	157,613	177,550	Natural gas, sand and gravel, petroleum.
Colorado	23,476,410	25,970,043	Natural-gas liquids, natural gas, sand and gravel, petroleum.
Comal	2,807,084	2,729,254	Lime, stone, sand and gravel.
Comanche	470,383	393,250	Petroleum, natural gas.
Concho	74,922	89,250	Do.
Cooke	23,865,255	24,602,750	Petroleum, natural-gas liquids, natural gas, stone.
Coryell	122,334	161,920	Stone.
Cottle	42,866	103,915	Sand and gravel, petroleum, stone.
Crane	67,178,247	83,385,814	Petroleum, natural gas, recovered sulfur, natural-gas liquids, stone.
Crockett	26,407,583	27,869,350	Petroleum, natural gas, natural-gas liquids.
Crosby	629	119,700	Petroleum.
Culberson	61,690	15,834	Sand and gravel, natural gas, petroleum.
Dallas	21,158,769	20,070,883	Cement, sand and gravel, clays, stone.
Dawson	9,048,960	10,616,346	Petroleum.
Denton	1,243,348	898,393	Petroleum, sand and gravel, clays.
De Witt	12,797,666	12,409,797	Petroleum, natural-gas liquids, natural gas, stone.
Dickens	93,755	72,096	Petroleum, sand and gravel, pumicite, natural gas.
Dimmit	422,858	913,100	Petroleum.
Donley	178,376	3,953	Sand and gravel.
Duval	42,100,186	41,177,767	Petroleum, natural gas, natural-gas liquids, salt.
Eastland	3,667,177	3,420,290	Petroleum, natural gas, clays, natural-gas liquids, sand and gravel.
Ector	164,919,047	178,638,240	Petroleum, natural gas, natural-gas liquids, recovered sulfur, stone.
Edwards	2,940	----------	
Ellis	175,008	163,059	Clays, stone, petroleum.

See footnotes at end of table.

TABLE 24.—Value of mineral production in Texas, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
El Paso	$6,526,308	$6,746,982	Cement, stone, sand and gravel, lime, clays, gem stones.
Erath	148,309	150,950	Petroleum, natural gas.
Falls	67,858	86,272	Stone, petroleum, sand and gravel.
Fannin	27,260		
Fayette	2,094,204	2,134,662	Petroleum, clays, sand and gravel, stone.
Fisher	17,177,319	18,638,608	Petroleum, gypsum, natural gas, natural-gas liquids.
Floyd	38,893	41,550	Petroleum, sand and gravel, natural gas.
Foard	355,972	843,750	Do.
Fort Bend	48,696,901	47,589,750	Petroleum, sulfur, natural gas, salt, clays, sand and gravel.
Franklin	14,004,164	12,584,050	Petroleum, natural gas.
Freestone	1,693,738	1,774,622	Natural gas, petroleum, clays, stone, sand and gravel.
Frio	10,607,104	8,789,650	Petroleum, natural gas.
Gaines	64,451,846	72,801,822	Petroleum, natural gas, natural-gas liquids, recovered sulfur.
Galveston	34,899,126	30,813,818	Petroleum, natural gas, sand and gravel.
Garza	14,741,965	16,136,150	Petroleum, sand and gravel, natural gas.
Gillespie	70,093	74,778	Stone, soapstone, feldspar.
Glasscock	14,898,398	13,983,424	Petroleum, natural gas, sand and gravel.
Goliad	11,412,699	12,225,850	Petroleum, natural gas.
Gonzales	266,922	236,680	Petroleum, sand and gravel.
Gray	47,901,490	52,412,056	Petroleum, natural gas, sand and gravel, natura - gas liquids.
Grayson	27,819,337	32,251,050	Petroleum, natural gas, sand and gravel.
Gregg	150,706,676	147,798,950	Petroleum, natural gas, natural-gas liquids.
Grimes	99,152	99,550	Natural gas, petroleum.
Guadalupe	12,212,863	12,650,000	Petroleum, clays, natural gas.
Hale	7,214,690	7,246,537	Petroleum, natural gas, sand and gravel.
Hall	2,200		
Hamilton	143,133	290,041	Natural gas, sand and gravel, petroleum.
Hansford	2,549,814	3,398,950	Natural gas, petroleum, natural-gas liquids.
Hardeman	816,374	826,313	Gypsum, petroleum.
Hardin	40,286,232	36,709,493	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Harris	119,532,422	128,914,728	Petroleum, cement, natural-gas liquids, natural gas, salt, lime, sulfur, shell, sand and gravel, clays.
Harrison	17,426,803	19,550,864	Natural gas, natural-gas liquids, petroleum, lignite, clays, sand and gravel.
Hartley	2,563,980	2,951,100	Natural gas, petroleum.
Haskell	9,609,570	9,561,125	Petroleum, natural gas, sand and gravel.
Hays	155,000	223,005	Sand and gravel, stone.
Hemphill	20,797	18,300	Petroleum.
Henderson	9,341,985	9,471,517	Petroleum, natural-gas liquids, natural gas, clays.
Hidalgo	8,171,072	8,346,120	Natural gas, natural-gas liquids, petroleum, sand and gravel, clays.
Hill	55,556	187,371	Stone, sand and gravel.
Hockley	48,660,419	48,061,755	Petroleum, natural-gas liquids, natural gas, recovered sulfur.
Hood	10,294		
Hopkins	7,939,340	8,048,965	Petroleum, natural-gas liquids, natural gas, clays.
Houston	3,778,007	3,749,140	Petroleum, natural gas, natural-gas liquids, stone.
Howard	43,966,241	43,194,022	Petroleum, sand and gravel, natural gas, natural-gas liquids.
Hudspeth	702,995	718,641	Stone, talc, soapstone, gypsum, sand and gravel.
Hunt	69,629	441,300	Stone, petroleum.
Hutchinson	48,223,566	49,685,872	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Irion	142,223	560,300	Petroleum, natural gas.
Jack	23,193,962	20,780,850	Petroleum, natural gas, natural-gas liquids.
Jackson	45,935,015	50,314,270	Petroleum, natural-gas liquids, natural gas.
Jasper	843,206	846,012	Petroleum, natural gas, stone, clays.
Jeff Davis		9,930	Sand and gravel.
Jefferson	50,803,661	49,615,550	Petroleum, natural-gas liquids, Frasch sulfur, natural gas, recovered sulfur, sand and gravel, shell, clays.
Jim Hogg	4,221,292	5,412,850	Petroleum, natural gas.
Jim Wells	53,769,804	52,451,700	Petroleum, natural gas, natural-gas liquids.
Johnson	817,524	1,198,087	Stone, lime, sand and gravel.
Jones	23,536,573	20,923,313	Petroleum, sand and gravel, stone, natural gas, natural-gas liquids.
Karnes	14,210,249	15,254,297	Petroleum, natural-gas liquids, natural gas.
Kaufman	4,189,699	4,039,546	Petroleum, stone, natural gas.
Kenedy	992,524	1,260,600	Petroleum, natural gas, natural-gas liquids.
Kent	21,990,350	17,706,100	Petroleum, natural gas.

See footnotes at end of table.

TABLE 24.—Value of mineral production in Texas, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
Kimble	$8,229	$19,067	Sand and gravel, petroleum.
King	3,486,922	3,827,380	Petroleum, stone, natural gas.
Kleberg	15,606,209	17,231,293	Petroleum, natural-gas liquids, stone, natural gas.
Knox	3,121,266	2,882,178	Petroleum, natural gas, sand and gravel.
Lamar	14,050	14,050	Sand and gravel.
Lamb	622,544	1,224,100	Petroleum, natural gas.
Lampasas	33,750	30,000	Sand and gravel.
La Salle	440,573	1,053,200	Petroleum, natural gas.
Lavaca	19,827,600	21,995,100	Natural-gas liquids, natural gas, petroleum, stone.
Lee	3,596	6,400	Petroleum.
Leon	2,270,290	2,247,400	Natural gas, petroleum.
Liberty	55,437,563	53,913,820	Petroleum, Frasch sulfur, natural gas, natural-gas liquids, sand and gravel, stone.
Limestone	1,752,662	1,788,965	Petroleum, natural gas, stone, sand and gravel.
Lipscomb		6,200	Petroleum.
Live Oak	12,176,607	14,197,100	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Llano	80,944	84,740	Stone, feldspar.
Loving	4,891,630	4,454,850	Petroleum, natural gas.
Lubbock	2,179,522	2,578,596	Petroleum, sand and gravel, stone, natural gas.
Lynn	252,145	446,700	Petroleum, natural gas.
Madison	728,657	770,350	Natural gas, petroleum.
Marion	4,802,880	5,007,950	Petroleum, natural gas, natural-gas liquids.
Martin	1,722,597	1,832,150	Petroleum, sand and gravel, natural gas.
Mason		40	Gem stones.
Matagorda	36,249,860	38,335,280	Petroleum, natural gas, natural-gas liquids, shell.
Maverick	36,449	45,500	Petroleum, natural gas.
McCulloch	4,054	2,800	Petroleum.
McLennan	3,718,400	3,928,571	Cement, sand and gravel, stone, petroleum.
McMullen	3,679,018	3,759,150	Petroleum, natural gas.
Medina	85,103	155,100	Petroleum, clays.
Menard	494		
Midland	52,336,111	59,261,733	Petroleum, natural gas, natural-gas liquids, stone.
Milam	2,934,401	3,809,979	Lignite, petroleum, natural gas, sand and gravel.
Mitchell	5,190,486	7,109,748	Petroleum, sand and gravel, natural gas.
Montague	25,520,805	22,702,666	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Montgomery	43,881,953	44,891,266	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Moore	31,435,256	33,365,599	Natural gas, helium, natural-gas liquids, petroleum, recovered sulfur.
Motley	10,600	18,177	Sand and gravel.
Nacogdoches	1,509,081	1,607,650	Natural gas, clays, petroleum.
Navarro	8,358,816	8,179,445	Petroleum, clays, natural gas, stone, sand and gravel.
Newton	3,430,627	3,634,516	Petroleum, natural gas.
Nolan	27,294,207	34,325,968	Petroleum, cement, gypsum, natural gas, sand and gravel, natural-gas liquids, stone.
Nueces	80,120,762	83,124,238	Petroleum, natural-gas liquids, natural gas, cement, lime, shell, sand and gravel.
Ochiltree	105,030	1,047,600	Petroleum, natural gas.
Oldham	490,452	481,639	Sand and gravel, natural gas.
Orange	16,928,948	17,089,610	Petroleum, natural gas, stone.
Palo Pinto	1,152,062	1,085,696	Petroleum, clays, natural gas, sand and gravel, natural-gas liquids, stone.
Panola	55,562,256	61,807,280	Natural gas, natural-gas liquids, petroleum.
Parker	356,274	288,640	Clays, petroleum, natural-gas liquids, natural gas, stone.
Pecos	51,429,607	50,750,713	Petroleum, natural gas, natural-gas liquids, sand and gravel, stone, gem stones.
Polk	6,414,505	6,150,354	Petroleum, natural gas, stone, sand and gravel.
Potter	6,416,052	7,144,812	Natural gas, helium, sand and gravel, natural-gas liquids, petroleum.
Presidio	65,041	59,957	Mercury, sand and gravel.
Rains		13,700	Petroleum.
Reagan	48,147,569	51,459,346	Petroleum, natural-gas liquids, natural gas.
Red River	7,441	27,800	Petroleum.
Reeves	1,504,528	1,405,602	Petroleum, sand and gravel, natural gas, natural-gas liquids.
Refugio	70,378,573	72,755,150	Petroleum, natural gas, natural-gas liquids.
Roberts	4,772,828	4,844,650	Petroleum, natural gas.
Robertson	564,582	566,375	Sand and gravel, petroleum, natural gas.
Rockwall	332,664	151,438	Stone.
Runnels	21,071,577	18,673,900	Petroleum, natural-gas liquids, natural gas.
Rusk	88,750,559	85,438,820	Petroleum, natural gas, natural-gas liquids, clays.

See footnotes at end of table.

TABLE 24.—Value of mineral production in Texas, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value
San Jacinto	$2,477,240	$2,376,243	Petroleum, natural gas, sand and gravel.
San Patricio	53,375,158	52,698,196	Petroleum, natural gas, natural-gas liquids, sand and gravel, stone.
Schleicher	9,499,146	9,992,700	Petroleum, natural gas.
Scurry	118,265,860	129,380,150	Petroleum, natural gas, natural-gas liquids, sand and gravel.
Shackelford	8,333,299	8,376,474	Petroleum, natural gas, sand and gravel, natural-gas liquids.
Shelby	1,821,079	1,961,350	Natural gas, petroleum.
Sherman	9,952,932	10,701,300	Do.
Smith	5,714,787	6,398,125	Petroleum, natural-gas liquids, natural gas, sand and gravel, clays.
Somervell	6,351		
Starr	24,806,075	23,790,164	Petroleum, natural gas, natural-gas liquids, sand and gravel, pumicite, clays.
Stephens	9,146,053	10,843,900	Petroleum, natural gas, natural-gas liquids.
Sterling	2,215,216	2,513,750	Petroleum, natural gas.
Stonewall	27,351,645	30,326,314	Petroleum, natural gas, sand and gravel, natural-gas liquids.
Sutton	420,236	445,700	Natural gas, petroleum.
Swisher		3,370	Stone.
Tarrant	8,302,797	9,021,857	Cement, sand and gravel, stone.
Taylor	5,587,017	8,294,759	Petroleum, stone, sand and gravel, clays, natural gas.
Terrell		5,803	Stone.
Terry	20,609,212	21,824,750	Petroleum, natural gas.
Throckmorton	10,661,888	10,031,100	Do.
Titus	12,174,184	11,761,800	Do.
Tom Green	5,222,155	8,027,311	Petroleum, sand and gravel, natural gas.
Travis	2,557,187	1,348,590	Stone, lime, sand and gravel, petroleum, abrasives.
Trinity	14,200	15,300	Natural gas.
Tyler	4,058,061	4,103,364	Petroleum, natural-gas liquids, natural gas, stone.
Upshur	9,525,988	8,893,750	Petroleum, natural gas, sand and gravel.
Upton	59,365,727	61,264,577	Petroleum, natural-gas liquids, natural gas, stone.
Uvalde	2,413,212	2,547,354	Asphalt, basalt.
Van Zandt	29,160,347	29,552,732	Petroleum, salt, natural gas, natural-gas liquids.
Victoria	29,807,847	29,261,830	Petroleum, natural gas, sand and gravel.
Walker	218,100	242,716	Clays, petroleum.
Waller	32,243,754	36,623,272	Natural-gas liquids, petroleum, sand and gravel, natural gas.
Ward	35,766,344	36,928,890	Petroleum, natural gas, natural salines, natural-gas liquids, sand and gravel, stone.
Washington	903,526	852,350	Petroleum, natural gas.
Webb	6,232,826	5,763,532	Petroleum, sand and gravel, natural gas, clays.
Wharton	94,913,298	85,234,191	Sulfur, petroleum, natural gas, natural-gas liquids, sand and gravel.
Wheeler	4,849,496	4,994,520	Petroleum, natural-gas liquids, stone, natural gas.
Wichita	31,874,269	32,460,014	Petroleum, natural gas, natural-gas liquids, sand and gravel, stone.
Wilbarger	13,918,589	16,057,250	Petroleum, natural-gas liquids, natural gas.
Willacy	8,475,954	9,078,450	Petroleum, natural gas.
Williamson	976,145	988,639	Stone, lime, petroleum, sand and gravel, natural gas.
Wilson	1,488,118	2,396,117	Petroleum, clays, natural gas.
Winkler	48,663,274	50,254,413	Petroleum, natural gas, natural-gas liquids, recovered sulfur.
Wise	4,286,523	7,568,232	Petroleum, stone, natural gas, natural-gas liquids, clays, sand and gravel.
Wood	68,624,818	67,089,750	Petroleum, natural gas, natural-gas liquids.
Yoakum	57,636,817	58,310,284	Petroleum, natural gas, natural-gas liquids, salt.
Young	20,393,474	21,740,650	Petroleum, natural-gas liquids, natural gas.
Zapata	3,115,679	3,393,600	Petroleum, natural gas.
Zavala	89,068	124,740	Natural gas, sand and gravel, petroleum.
Undistributed [2]	[2] 7,273,965	22,751,526	Stone, sand and gravel, shell, gem stones, iron ore. Sand and gravel, stone.
Total	[3] 3,993,310,000	4,211,282,000	

[1] The following counties are not listed because no production was reported: Armstrong, Bailey, Bandera, Cameron, Castro, Dallam, Deaf Smith, Delta, Kendall, Kerr, Kinney, Mills, Morris, Parmer, Randall, Real, Sabine, San Augustine, San Saba, and Val Verde.

[2] Includes stone, sand and gravel, shell, gem stones, and iron ore that cannot be assigned to specific counties.

[3] Total value has been adjusted to eliminate duplicating value of clays and stone.

Angelina.—Production of 3,000 barrels of crude oil from 1 oilfield was reported in the county during 1956.

Bentonitic clay also was reported.

Aransas.—The oil and gas industry recovered 3.3 million barrels of crude oil from 68 oilfields and 16.9 billion cubic feet of natural gas in 1956. Wells completed by the oil and gas industry totaled 21 and resulted in 7 oil wells and 4 gas wells. Exploratory drilling totaled 91,509 feet and resulted in 1 gas discovery, a new oil pay, and 1 new gas pay.

Carbon black was recovered at 2 plants—1 contact and 1 furnace. Shell was dredged from the shallow bays bordering the county.

Archer.—Mineral output valued at $28.3 million included 9.9 million barrels of crude oil from 123 oilfields, 2 of which produced more than 1 million barrels each. Natural-gas output amounted to 4.7 billion cubic feet. Natural-gas liquids were recovered at the Holiday gasoline plant of Warren Petroleum Corp. Exploratory drilling, totaling 42 completions and 196,953 feet, proved 6 oil discoveries and 1 new oil pay.

Atascosa.—Crude oil, natural gas, natural-gas liquids, and sand and gravel valued at $22.5 million were reported from the county in 1956. During the year 6.5 million barrels of crude oil and 3.7 billion cubic feet of gas were produced from 48 oilfields. The Jourdanton gasoline plant of Humble Oil & Refining Co. processed gas from the Jourdanton field to recover natural-gas liquids.

Austin.—Paving sand and gravel was prepared by the Austin County Highway Department and by the District Engineer of Houston.

Three oilfields yielded 2.4 million barrels of crude oil. Natural-gas production amounted to 24.9 billion cubic feet.

Bastrop.—Fire clay used in manufacturing building brick and heavy clay products was mined by Elgin Butler Brick Co., Elgin Standard Brick Manufacturing Co., and Payne Brick Co.

Crude-oil output of 265,000 barrels from 10 oilfields was reported during the year. A small quantity of natural gas also was reported.

Baylor.—Crude oil and natural gas valued at $4.8 million were reported from Baylor County in 1956. Sixteen oilfields, 1 of which produced approximately 1 million barrels of crude, yielded a total of 1.7 million barrels of crude. Natural-gas output was 21 million cubic feet. Exploratory drilling, totaling 190,046 feet, resulted in 6 oil discoveries.

Bee.—Mineral output valued at $24.4 million included crude oil, natural gas, natural-gas liquids, and stone. Natural-gas liquids were recovered at the Burnell and North Pettus cycling plants of Stanolind Oil & Gas Co. and at a cycling plant of Gasoline Production Corp. Crude oil was processed at the Pettus refinery of Danaho Refining Co. The Bee County's 58 producing oilfields yielded 2.5 million barrels of crude oil. Natural-gas production was 53.4 billion cubic feet. Exploratory drilling totaled 213,166 feet and proved 3 oil discoveries, 5 gas discoveries, 4 new oil pays, and 5 new gas pays.

Crushed limestone, used for concrete aggregate and roadstone, was prepared by Heldenfels Bros. from a quarry near Beeville.

Bell.—Sand and gravel, used for building and paving and as railroad ballast, was prepared by the Belton Sand & Gravel Co., Inc., and

Little River Gravel Co. Crushed limestone, for concrete aggregate and roadstone, was quarried under contract for Division 9 of the Texas Highway Department.

Bexar.—Portland and masonry cements were produced at the San Antonio plant of Longhorn Portland Cement Co. and at the Cementville plant of San Antonio Portland Cement Co. Both companies quarried limestone from open pits for manufacturing cement products. Other limestone quarried from open pits was crushed and processed for use as aggregate in concrete, and road stone and railroad ballast by Colglazier Construction Co., by McDonough Bros., Inc., by Olmos use as aggregate in concrete, roadstone and railroad ballast by Colglazier Construction Co., by McDonough Bros., Inc., by Olmos Rock Products Corp., and by Division 15 of the Texas Highway Department. New crushing facilities to provide 300 tons per hour of crushed stone were added to the 3,000-ton per day crushing plant of McDonough Bros., Inc.

Fire clay, used to manufacture building brick and heavy clay products, was mined from open pits by the Alamo Clay Products Co. near Elmendorf and by the Southern Co. near Los Oya. Miscellaneous clay, used to produce lightweight aggregate, was mined from open pits by Barrett Industries of San Antonio and by Featherlite Corp. of San Antonio at Converse.

Sand and gravel, used principally for building and paving, was processed at fixed plants of Acme Gravel Corp., E. G. Beck & Sons, Osborn Sand Co., San Antonio Silica Sand Co., H. B. Zachry Co., and Harris Sand Pit.

Lithium ores from Southern Rhodesia were processed into lithium hydroxide and other lithium chemicals at the new San Antonio plant of American Lithium Chemicals, Inc.

Crude oil was processed at the San Antonio refinery of Monarch Refining Co. The oil industry produced 598,000 barrels of crude oil from 10 oilfields and 1 million cubic feet of natural gas. Forty-one exploratory wells—totaling 55,839 feet—resulted in 10 oil completions and 31 dry holes.

Blanco.—Crushed limestone for concrete aggregate and roadstone was produced under contract for Division 14 of the Texas Highway Department. Paving sand and gravel was produced at a portable plant near Johnson City by Weirich Bros.

Borden.—The oil and gas industry produced 8.8 million barrels of crude oil from 25 oilfields, 4 of which produced approximately 1 million barrels of crude each, and 9.1 billion cubic feet of natural gas. The combined value was $25.4 million. Exploratory drilling by the oil industry totaled 164,014 feet and resulted in 3 oil completions and 17 dry holes.

Bowie.—Two oilfields yielded 20,000 barrels of crude during 1956. Four exploratory wells totaling 17,871 feet; all proved dry.

Sand and gravel for building and paving and for railroad ballast was produced at the fixed plant of Gifford Hill & Co., Inc.

Brazoria.—The mineral industries of Brazoria County were first in total value in 1956. Output of 25.9 million barrels of crude oil from 62 oilfields, 5 of which produced more than 1 million barrels each, was reported. Natural-gas production amounted to 500.8 billion cubic feet. Natural-gas liquids were recovered at the Bayou gasoline plant of Phillips Petroleum Co., the Pledger plant of Humble Oil & Refining Co., and the Hastings and Old Ocean plants of Stanolind

Oil & Gas Co. Of 151 well completions, 40 were exploratory wells that totaled 387,987 feet and resulted in 2 oil discoveries, 1 gas discovery, 5 new gas pays, and 32 dry holes.

Bromine, used to manufacture ethylene dibromide, was recovered from sea water at the Freeport plant of Ethyl-Dow Chemical Co. The company expanded its ethylene dibromide production capacity 20 percent during 1956.

Magnesium chloride, used to produce magnesium metal and magnesium chemicals, was recovered from sea water at plants in Freeport and Velasco by Dow Chemical Co. Agreement on a 3-year, no-strike contract ended a month-long strike of 4,000 Dow employees, and provided a 5-cent-an-hour across-the-board pay raise added to a 6-percent raise agreed upon earlier. A $45 million expansion program was started at the Freeport works of Dow Chemical Co. in 1956. Facilities included new plants to produce acetylene, methyl-acetylene, ethanolamines and synthetic glycerol; pilot plants, laboratories, and administration building; a 29-mile gas pipeline; and expansions or modernizations of some existing plants. Salt in brine was recovered from wells by Dow Chemical Co. to be used in chemical processes.

Native sulfur was recovered by the Frasch process from the Hoskins mound dome of Freeport Sulphur Co., from Clemens dome of Jefferson Lake Sulphur Co., and from the Damon mound dome of Standard Sulphur Co.

Brazos.—During the year 323 million cubic feet of natural gas was produced.

A $1.8 million glass plant to produce 83 tons of single-and double-strength plate glass and crystal glass was under construction at Bryan by the Texas Glass Manufacturing Corp.

Brewster.—A carbonaceous shale was mined from open pits south of Alpine for use as a soil conditioner and fertilizer by Manning Minerals Corp. and by Soylaid, Inc.

Exploration for mercury deposits in the famous Terlingua district continued. Lone Star Mercury, Inc., engaged in drilling and development operations in Sections 44 and 57; Terlingua Mercury Corp. continued both surface and underground diamond drilling and underground exploration at its Fresno mine. Terlingua Mercury Corp. also explored its Campo de los Angeles property. Two additional 30-ton rotary furnaces were being installed by Lone Star Mercury, Inc.

Gem stones, mostly opals and various types of agate, were collected in the county by dealers and hobbyists.

Briscoe.—Fuller's earth was mined from open pits by the Silverton Clay Products for use in insecticides and fungicides and as an absorbent of mineral oils and greases. Crushed limestone, for concrete aggregate and roadstone, was quarried under contract for Division 25 of the Texas Highway Department.

Brooks.—Crude-oil output of 6.3 million barrels from 52 fields was reported in 1956. Natural-gas output amounted to 38.6 billion cubic feet. Carbon black was recovered at one contact-type plant. Exploratory drilling totaled 148,527 feet and proved 2 new oil pays and 4 new gas pays.

Brown.—Natural-gas liquids were recovered at the Rising Star gasoline plant of Rudco Oil & Gas Co. Seven oilfields yielded 565,000

barrels of crude. Marketed natural gas amounted to 1.6 billion cubic feet.

Ross & Son Construction Co. produced building sand and gravel at a fixed plant near Brownwood. Limestone was quarried and crushed for riprap, concrete aggregate, and railroad ballast by G. C. McBride Co. Clay, used in manufacturing heavy clay products, was produced from open pits by the Texas Brick Co.

Burnet.—Gravel for railroad ballast was produced by Texas Crushed Stone Co. Crushed limestone for concrete aggregate, roadstone, and railroad ballast was produced from open pits by Division 14 of the Texas Highway Department and by Houston Clinton Co.

Crushed and dimension granite were quarried in Marble Falls by Texas Granite Corp. for riprap and rough construction and finished architectural stone. Crude feldspar was mined from open pits by Dezendorf Marble Co. The Southwestern Graphite Co. mined graphite from open pits near Burnet. Crude vermiculite was expanded at the Burnet plant of Texas Vermiculite Co.

Caldwell.—Fifteen oilfields produced 3.3 million barrels of crude oil. One of these fields produced approximately 1 million barrels. Natural-gas production amounted to 4 million cubic feet.

Calhoun.—The Aluminum Company of America began constructing a seventh potline to cost $11 million at its Point Comfort reduction works. The sixth potline was completed earlier in the year. Construction of an alumina plant adjacent to the primary aluminum smelter also was begun during the year. The new plant will produce over 500,000 tons of alumina a year, with initial production anticipated by 1958. A navigation channel from the Gulf of Mexico to the alumina-plant site will permit 25,000-ton ore carriers to haul bauxite from South America directly to the plant. A nine-day labor strike at the Point Comfort plant was terminated with a new 3-year no-strike agreement. The company built an 8-inch, 20,000-foot aluminum gas-transmission line to serve its Point Comfort works.

Crushed sandstone for concrete aggregate and road stone was produced under contract for Division 13 of the Texas Highway Department. Shell was dredged from the shallow bays of Port Lavaca by Smith Bros. Dredging Co.

Natural-gas liquids were recovered by the Heyser gasoline plant of Humble Oil & Refining Co. The oil industry produced 2.4 million barrels of crude oil from 32 fields and 74.6 billion cubic feet of natural gas. Oilfield drilling consisted of 23 exploratory wells and 86 development wells. Exploratory drilling, totaling 194,970 feet, resulted in 1 oil discovery, 2 new oil pays, 1 gas discovery, 2 new gas pays, and 15 dry holes.

Callahan.—Mineral fuels valued at $11.3 million were reported in 1956. The oil and gas industry produced 4 million barrels of crude from 77 oilfields, 1 of which produced over 1 million barrels of oil, and 212 million cubic feet of natural gas. Crude oil was processed at the Baird refinery of Premier Oil Refining Co. of Texas.

Cameron.—The Port Isabel refinery of Delhi-Taylor Oil Corp. processed crude from oilfields in adjoining counties.

Crude barite, mostly from foreign sources, was ground at the Brownsville plant of Magcobar, Inc. Hidalgo Chemical Co. modernized its gas-synthesis plant at Brownsville. Ultimately the plant will

require 90 million cubic feet of natural gas per day to produce such chemicals as alcohols, aldehides, ketones, and acids.

Camp.—Three oilfields produced 232,000 barrels of crude during the year. Natural-gas output was 11 million cubic feet. The oil industry drilled 4 exploratory wells totaling 17,019 feet; all proved dry.

Carson.—Natural-gas liquids were recovered at the Cargray gasoline plant of the Dorchester Corp., the Bryan No. 17 plant of Shell Oil Co., and the Schafer plant of Skelly Oil Co. A 1,000-barrel-per-day combination catformer and unifying unit to upgrade gasoline was added to the Cargray plant of the Dorchester Corp. Carbon black was recovered at one contact plant in the county. Two oilfields yielded 3.8 million barrels of crude. Natural-gas production was 167.7 billion cubic feet.

District 4 of the Texas Highway Department acquired paving gravel under contract for use in paving and road surfacing.

Cass.—Crude-oil and natural-gas production, valued at $5.9 million, consisted of nearly 2 million barrels of crude oil and 5.4 billion cubic feet of natural gas. Natural-gas liquids were recovered at the Lodi gasoline plant of Breckenridge Gasoline Co. Of 54 well completions, 10 were exploratory wells resulting in one oil discovery and 2 new oil pays.

Brown iron ores were mined from open pits near Linden by the S. E. Evans Mining Co., Inc., under contract.

Chambers.—Shell was dredged from bays of Chambers County by Horton & Horton, W. D. Haden Co., and Parker Bros. Co. and used principally in manufacturing lime, cement, and industrial chemicals. Salt in brine was obtained from salt domes near Barbers Hill by Diamond Alkali Co. and used in the manufacture of industrial chemicals. Miscellaneous stone, used for concrete aggregate and roadstone, was produced under contract for Division 20 of the Texas Highway Department.

The oil and gas industry produced 17.3 million barrels of crude oil from 42 oilfields, and 91.5 billion cubic feet of natural gas. Natural-gas liquids were recovered at the Anahuac gasoline plant of Humble Oil & Refining Co. Completion of 27 exploratory wells resulted in 1 oil discovery, 1 dual oil-gas discovery, 1 new oil pay, and 3 new gas pays.

Cherokee.—Mineral production valued at $8.3 million included 2.6 million barrels of crude oil from 10 oilfields, 243 million cubic feet of natural gas, fire clay, and iron ore. Exploratory drilling, totaling 254,248 feet from 47 completions, resulted in an important gas-pool discovery near Maydelle townsite.

Brown iron ore was mined from open pits near Jacksonville by L. B. Haberle for use by the cement industry and from open pits near Rusk by Sheffield Steel Corp. for its blast furnace at Houston.

Fire clay was mined from open pits near Troup by General Refractories Co.

Childress.—Paving gravel was produced under contract for concrete aggregate and roadstone for Division 25 of the Texas Highway Department.

Clay.—Production of 6.7 million barrels of crude oil, 316 million cubic feet of natural gas, and natural-gas liquids, with a combined value of $18.8 million, was reported in 1956. There were 92 producing

oilfields, with 1 field yielding over 1 million barrels of crude. Natural-gas liquids were recovered at the No. 3 gasoline plant of Graridge Corp. and the Ringgold plant of Otha H. Grimes. There were 298 well completions, 37 exploratory and 261 development wells. Exploratory drilling totaled 203,143 feet, proving 9 oil discoveries and 1 oil extension.

Cochran.—Mineral output, valued at $22.1 million, included 7.7 million barrels of crude oil from 9 oilfields, 5.8 billion cubic feet of natural gas, and natural-gas liquids. Natural-gas liquids were recovered at the Lehman gasoline plant of Llano Grande Corp. The oil and gas industry completed 8 exploratory wells, resulting in 1 oil-well completion.

Coke.—Production of 13.3 million barrels of crude oil from 37 oilfields, 12.5 billion cubic feet of natural gas, natural-gas liquids, and sand and gravel, with a total value of $43.3 million, was reported in Coke County in 1956. On September 1, 1956, the Railroad Commission of Texas issued a stop-flaring order of casinghead gas, drawn principally from the Jameson (Strawn) field, when the two natural-gasoline plants—the Jameson plant of Sun Oil Co. and the Perkins No. 10 plant of Texas Hydrocarbon Co.—were unable to handle the volume from gathering lines and gasoline plants. The 712 oil wells of the Jameson field produced over 15,300 barrels of crude a day. Exploratory drilling, totaling 212,970 feet from 39 completions, resulted in 3 oil wells and 36 dry holes.

Coleman.—Silica sand, used as molding and glass sand in glass manufacture, was produced at a fixed plant near Santa Anna by the Santa Anna Silica Sand Co., Inc. Miscellaneous clay, used in manufacturing heavy clay products, was mined from open pits near Coleman by the Martin Brick Co.

The oil and gas industry produced 3.3 million barrels of crude oil from 97 oilfields, 5.1 billion cubic feet of natural gas, and natural-gas liquids. Natural-gas liquids were recovered at the Coker gasoline plant of Coker Gasoline Co., the Glen Cove plant of Glen Cove Gasoline Plant, the Robertson LPG plant of French M. Robertson, and the Sappington plant of Sappington Gasoline Plant.

Exploratory drilling by the oil and gas industry totaled 147,654 feet from 59 completions, resulting in 12 oil wells and 1 gas well.

Collin.—Crushed limestone used for concrete aggregate and roadstone was produced under contract for Division 18 of the Texas Highway Department.

Collingsworth.—The oil and gas industry produced 2.1 billion cubic feet of natural gas and 800 barrels of crude.

Colorado.—Building and paving sand and gravel were produced from pits near Columbus and Eagle Lake by Horton & Horton, from pits near Columbus by Parker Bros. & Co., Inc., from pits near Alleyton, Altair, and Eagle Lake by Texas Construction Material Co., and from pits near Glidden and Eagle Lake by Thorstenberg & Tamborello.

Mineral production, valued at $25.9 million, included 565,000 barrels of crude oil from 21 oilfields, 86.9 billion cubic feet of natural gas, natural-gas liquids, and sand and gravel. Natural-gas liquids were recovered at the Sheridan cycling plant of Shell Oil Co. and at the Chesterville gasoline plant of Tennessee Gas Transmission Co.

Exploratory drilling totaling 93,998 feet resulted in 10 completions, with 1 gas discovery and 1 new gas pay.

Comal.—Limestone, quarried and crushed from open pits near New Braunfels, was used in manufacturing lime by the United States Gypsum Co. Limestone, quarried from pits near Ogden and used for railroad ballast, riprap, concrete aggregate, and agricultural lime, was prepared by Servtex Materials Co. Building and paving sand and gravel was prepared by Erhardt Kraft.

Comanche.—Production of 721 million cubic feet of natural gas and 120,000 barrels of crude oil was reported by the oil and gas industry. Crude oil was produced from 8 oil fields. Exploratory drilling proved 3 oil wells and 2 gas wells from 12 completions which totaled 32,643 feet.

Concho.—The oil and gas industry produced 451 million cubic feet of natural gas and 19,000 barrels of crude oil. Crude was produced from 6 oilfields. The oil and gas industry completed 12 exploratory wells totaling 43,153 feet which proved 2 oil wells.

Cooke.—Mineral output valued at $24.6 million included 8.6 million barrels of crude oil from 77 oilfields, with 2 oilfields producing more than 1 million barrels each, 2.5 billion cubic feet of natural gas, and natural-gas liquids. Natural-gas liquids were recovered at the Walnut Bend gasoline plant of Texas Natural Gasoline Corp. and the Sivells Bend gasoline plant of Standard Oil Co. of Texas. Crude oil was processed at the Gainesville refinery of the Tydal Co. Exploratory drilling totaling 181,158 feet proved 3 oil discoveries, 1 new oil pay and 2 extensions.

Coryell.—Crushed limestone for concrete aggregate and roadstone was produced by T. E. Sanderford and Division 9 of the Texas Highway Department. Dimension limestone was prepared by the Mid-Tex Stone Co.

Cottle.—Crushed limestone for concrete aggregate and roadstone was produced under contract for Division 25 of the Texas Highway Department. Paving sand and gravel was prepared by Childress Sand & Gravel Co.

One oilfield produced 4,000 barrels of crude. The oil industry completed 4 exploratory wells totaling 23,727 feet, all of which proved dry.

Crane.—Mineral value totaling $83.4 million was the eighth largest in the State. Production of 28.5 million barrels of crude oil from 74 oilfields, 7 of which produced over 1 million barrels each, and 23.9 billion cubic feet of natural gas was reported.

Sulfur as hydrogen sulfide was recovered from sour gases by the Crane gasoline plant of Phillips Petroleum Co. and the Waddell plant of Gulf Oil Co. These two plants and the Cardona Lake gasoline plant of Houston Hydrocarbon Corp. likewise recovered natural-gas liquids.

Crushed limestone for concrete aggregate and roadstone was prepared under contract for Division 6 of the Texas Highway Department.

Crockett.—Mineral fuels valued at $27.9 million were produced in Crockett County in 1956 and included 9.2 milllon barrels of crude oil from 55 oilfields, 19.6 billion cubic feet of natural gas, and natural-gas liquids recovered at the Todd Ranch gasoline plant of Continental

Oil Co. Exploratory drilling by the oil and gas industry totaled 158,056 feet for 44 completions, with 5 proving to be oil wells.

Crosby.—Two oilfields yielded 43,000 barrels of crude oil for the only mineral production in Crosby County in 1956.

Culberson.—The oil and gas industry produced 300 barrels of crude oil from 1 field and 23 million cubic feet of natural gas in 1956.

Paving gravel was produced for the District Engineer of El Paso.

Dallas.—Limestone was quarried and crushed for use in the manufacture of cement by Lone Star Cement Corp. and General Portland Cement Co.; while crushed limestone for concrete aggregate and roadstone was prepared under contract for Division 18 of the Texas Highway Department. Portland and masonry cements were produced at the Dallas plant of Lone Star Cement Corp. and at the Nos. 1 and 2 Eagle Ford plants of General Portland Cement Co. The Dallas plant of Lone Star Cement Corp. was being enlarged with the addition of a grinding mill, 2 80-foot rotary kilns, 2 30-foot finishing mills, and accessory facilities including 4 slurry tanks and 3 clinker silos. These additions will increase the plant's capacity by 1.4 million barrels to 3.7 million barrels annually.

Sand and gravel, used principally for building and paving purposes, was produced at 19 plants operated by 14 companies.

Crude perlite shipped in from adjoining States was expanded at the Irving plant of Texas Lightweight Products Co. and at the Dallas plant of Texas Vermiculite Co. The principal use of the expanded material was as lightweight aggregate for concrete, for roof decks, and for building plaster. Miscellaneous clay or shale was used principally for the manufacture of heavy clay products and lightweight aggregate at the Mesquite plant of Ferris Brick Co. and the Dallas plant of the Texas Industries, Inc.

A $1.5 million chemical plant was being built at Dallas for the Shea Chemical Corp. to produce sodium phosphate and phosphoric acids used in the manufacture of industrial cleaners and detergents. The plant will have an annual productive capacity of 60,000 tons and will consume 300 million cubic feet of natural gas. The Southwest Industrial Materials Corp. began constructing a new plant at DeSoto to produce industrial absorbents from common clay.

Dawson.—Mineral output valued at $10.6 million consisted of 3.7 million barrels of crude oil from 25 oilfields, with 1 oilfield producing over 1 million barrels, 104 million cubic feet of natural gas, and crushed limestone. Limestone was quarried and crushed from an open pit near O'Donnell for use as concrete aggregate and roadstone by Lone Star Materials, Inc. The oil and gas industry completed 22 exploratory wells for a total of 194,035 feet, resulting in 6 proved oil wells and 16 dry holes.

Denton.—Fire clay was mined from open pits near Denton by Acme Brick Co. Building and paving sand and gravel were prepared by Jefferies & Betts Gravel Co., Opitz Sand & Gravel Co., and Trietsch Gravel Co.

Five oilfields yielded 152,000 barrels of crude during the year.

De Witt.—The Texas and New Orleans Railroad Co. crushed limestone for rubble. Sandstone was crushed under contract for use as concrete aggregate and roadstone for Division 13 of the Texas Highway Department.

Production of 2.9 million barrels of crude oil from 22 oilfields, 24.3 billion cubic feet of natural gas, and natural-gas liquids recovered at the Gohlke gasoline plant of Shell Oil Co. was reported by the oil and gas industry. Exploratory drilling totaled 181,083 feet, proving 1 oil discovery, 3 new oil pays, 1 gas discovery, and 1 new gas pay.

Dickens.—Production of 16,000 barrels of crude oil and 5 million cubic feet of natural gas was reported from Dickens County in 1956. Two exploratory wells totaling 12,905 feet were completed as dry holes in 1956.

Pumicite was mined from open pits near McAdoo by the Caprock Chemical Co., Inc.

Dimmit.—Twenty-two oilfields yielded 326,000 barrels of crude oil during the year. Crude oil was processed at the Carrizo Springs refinery of Texas Calgary Co. The company completed a 2,000 barrel-per-day products unit at its refinery. Exploratory drilling, totaling 171,875 feet with 54 completions, resulted in proving 12 oil wells, 5 gas wells, and 37 wells were dry holes.

Donley.—Paving gravel was produced under contract for Division 25 of the Texas Highway Department.

Duval.—Mineral production valued at $41.2 million, including 12 million barrels of crude oil from 123 oilfields (3 of which produced in excess of 1 million barrels each), 46.9 billion cubic feet of natural gas, natural-gas liquids, and salt was reported in 1956. Exploratory drilling totaling 262,023 feet proved 2 oil discoveries, 3 gas discoveries, 3 new oil pays, and 1 new gas pay. Natural-gas liquids were recovered at the Sejita cycling plant of Trinity Gas Corp. and at the Hagist gasoline plant of Goliad Corp.

Salt in brine was recovered from wells near San Diego by Columbia Southern Chemical Corp.

Eastland.—Natural-gas liquids were recovered at the Desdemona gasoline plant of Magnolia Petroleum Co., the Graridge No. 2 plant of Graridge Corp., the Pueblo plant of Lone Star Gas Co., and Plant No. 108 of Lone Star Producing Co. The oil and gas industry produced 903,000 barrels of crude oil from 35 oilfields and 8.1 billion cubic feet of natural gas during the year. Exploratory drilling, totaling 78,300 feet, resulted in 12 proved oil wells, 1 proved gas well, and 16 dry holes.

Fire clay and miscellaneous clay used in the manufacture of lightweight aggregate, floor and wall tile, and pottery and flowerpots were mined from open pits near Ranger by American Aggregate Co., near Eastland by Texas Lightweight Aggregate Co., near Cisco by Texeramics Co., and by N. D. Gallagher Clay Products Corp.

Paving and other sand was obtained from pits near Gorman by Hart Bros. Sand & Gravel Co.

Ector.—Ector County ranked second among Texas counties in crude-oil output and third in total value of minerals produced in 1956. The oil and gas industry produced 59.6 million barrels of crude oil from 102 oilfields; 15 oilfields producing in excess of 1 million barrels each, 95.7 billion cubic feet of natural gas, natural-gas liquids, carbon black, and sulfur recovered from sour natural gas. Natural-gas liquids were recovered at the Odessa gasoline plant of Odessa Natural Gasoline Co., the Goldsmith and the Judkins plants of Phillips Petroleum Co., the TXL plant of Shell Oil Co., the North Cowden

plant of Stanolind Oil & Gas Co., and the Headlee plant of Texas Gulf Producing Co. Sulfur was recovered from sour gas at the Odessa plant of California-Spray Chemical Corp., the Odessa plant of Odessa Natural Gasoline Co., the Penwell plant of J. L. Parker, and the Goldsmith plants of Pan American Petroleum Corp. and of Phillips Chemical Co. The oil and gas industry completed 623 wells in 1956, 41 exploratory wells and 582 development wells. Exploratory drilling totaled 375,412 feet, resulting in 22 proved oil wells and 19 dry holes.

Limestone was quarried and crushed at the Notrees plant of Permian Sand & Gravel Co., Inc., and the new Odessa crushing plant of F. M. Reeves & Sons, Inc. Soapstone was purchased by Southwest Fertilizer & Chemical Co.

A $12 million copolymer plant to blend styrene and butadiene to form a completely integrated synthetic rubber operation was being built at Odessa by General Tire & Rubber Co. A $20 million plant of Odessa Butadiene Co. and $6 million styrene plant of Odessa Styrene Co. completed the three-plant operation. This integrated operation will produce 50,000 tons of synthetic rubber annually. Stanolind Oil & Gas Co. built a sulfur-recovery unit at its North Cowden gasoline plant to extract native sulfur from hydrogen sulfide removed from sour gas.

Ellis.—Miscellaneous clay used in manufacturing building brick and heavy clay products was mined from open pits near Ferris by Acme Brick Co., and from pits near Palmer by Barron Brick Co. and near Ferris by Ferris Brick Co. Limestone was quarried and crushed for use in concrete and as roadstone by Division 18 of the Texas Highway Department.

Crude oil totaling 2,000 barrels was produced during the year.

El Paso.—Crude oil was processed at the El Paso refineries of the Standard Oil Co. of Texas and of The Texas Co. Standard Oil Co. of Texas began a $20 million expansion program at its El Paso refinery to increase refinery capacity from 36,000 barrels to 61,000 of crude throughput per day. Facilities include a new 25,000-barrel-per-day crude unit, a fluid catalytic cracker, a vacuum flasher, and a polymerization unit.

Crushed limestone used in manufacturing cement and lime was produced by Southwestern Portland Cement Co. and El Paso Building Materials Co. The latter company shut down its quarry because of Mexican competition. Crushed limestone used for concrete aggregate, roadstone, riprap, and railroad ballast was quarried and prepared by A. Courchesne Co., Hugh McMillan, Vowell Material Co., and the Texas Highway Department. Standard Aggregates Co. produced crushed sandstone for riprap, roadstone, and concrete, and dimension sandstone for rubble.

Sand and gravel used for building and paving purposes, as engine sand, and for railroad ballast was produced by three companies: Bowden Sand & Gravel Co., El Paso Sand Products Co., and Standard Aggregates Co.

Portland and masonry cements were produced at the El Paso plant of Southwestern Portland Cement Co. The company completed an expansion program begun in 1955, which included a new grinding mill for the finishing department, a new feed equipment for the mill,

and an air-injection system at the bottom of the dry blending silo. Modern truck-loading facilities installed in 1955 became an important factor in the movement of cement to local markets.

American Smelting and Refining Co. operated its lead and copper smelters at near capacity throughout 1956. The company moved its western research section from Salt Lake City, Utah, to new and larger research, mineral-dressing, and assay-control laboratories adjacent to its El Paso smelter.

Erath.—The oil and gas industry produced 33,000 barrels of crude oil from 1 field and 729 million cubic feet of natural gas during 1956. Five exploratory wells were completed for a total of 17,031 feet; all wells were dry holes.

Falls.—The crude-oil industry produced 7,000 barrels of crude oil from 3 oilfields and completed 1 exploratory well, which proved to be dry.

Division 9 of the Texas Highway Department produced crushed limestone and paving gravel under contract for concrete aggregate and roadstone.

Fayette.—Bentonitic clay, used principally in preparing heavy drilling mud for the oil and gas industry, was mined from open pits near Flatonia by Milwhite Co., Inc., and near Muldoon by the Baroid Division of National Lead Co. Fuller's earth was recovered from open pits near Flatonia by Flatonia Fuller's Earth Co. Crushed sandstone for concrete aggregate and roadstone was prepared under contract for Division 13 of the Texas Highway Department. Building and paving sand and gravel were recovered from pits near LaGrange by Thorstenberg & Tamborello.

The oil industry produced 354,000 barrels of crude oil from 15 oilfields. Five exploratory wells were completed for a total of 24,127 feet; all were dry holes.

Fisher.—Natural-gas liquids were recovered at the Claytonville gasoline plant of Claytonville Gasoline Co. and at the Velta plant of Texas Pacific Coal & Oil Co. Production of 6.2 million barrels of crude oil from 71 oilfields (with 2 fields producing over 1 million barrels each) and 1.7 billion cubic feet of natural gas was reported. The oil and gas industry completed 58 exploratory wells for a total of 319,978 feet; 17 yielded oil, and 41 were dry holes.

Gypsum was mined from open pits near Longworth by the Celotex Corp. and from pits near Rotan by National Gypsum Co.

Floyd.—Building and paving sand was prepared by the Quitaque Sand & Gravel Co.

Production of 8,000 barrels of crude oil from 1 oilfield and 4 million cubic feet of natural gas was reported.

Foard.—Paving gravel was produced under contract for Division 25 of the Texas Highway Department.

The oil and gas industry produced 293,000 barrels of crude oil from 7 oilfields and 125 million cubic feet of natural gas in 1956. Oilfield drilling consisted of 11 exploratory wells totaling 60,575 feet. One well was an oil discovery, and 10 wells were dry holes.

Fort Bend.—Production of 11.7 million barrels of crude oil from 35 oilfields and 33.6 billion cubic feet of natural gas was reported in 1956. The oil and gas industry completed 43 exploratory wells for a

total of 349,383 feet. Six wells were oil wells, 1 was a gas well, and 36 were dry holes.

Native sulfur was recovered from the Orchard dome by Duval Sulphur & Potash Co., from the Nash dome by Freeport Sulphur Co., and from Long Point dome by Jefferson Lake Sulphur Co.

Miscellaneous clay was mined from open pits near Missouri City by Texas Lightweight Aggregate Co. and used in manufacturing lightweight aggregate.

Franklin.—Production of 4.5 million barrels of crude oil from 6 oilfields (with 2 fields producing over 1 million barrels each) and of 262 million cubic feet of natural gas was reported in 1956. During the year Tidewater Oil Co. began building a $2 million cycling plant and connecting pipelines from the New Hope gasfield to recover 80 million barrels of condensate. Six exploratory wells totaling 39,496 feet, drilled by the oil and gas industry, proved dry upon completion.

Freestone.—Crushed miscellaneous stone for concrete aggregate and roadstone was prepared under contract for Division 10 of the Texas Highway Department. Shale was mined from an open pit near Teague for use in manufacturing heavy clay products by the Teague Brick & Tile Co. Paving gravel was prepared under contract for Division 18 of the Texas Highway Department.

Production of 240,000 barrels of crude oil from 3 oilfields and 12.7 billion cubic feet of natural gas was reported in 1956. The oil and gas industry completed 13 exploratory wells totaling 62,981 feet; 1 was a new gas pay, and 12 wells were dry holes.

Frio.—The oil and gas industry produced 3.1 million barrels of crude oil from 11 oilfields and 1.4 billion cubic feet of natural gas during 1956. Of 34 exploratory well completions totaling 140,017 feet, 2 yielded oil, and 32 were dry holes.

Gaines.—Gaines County was the 11th-ranking county, with a total mineral output value of $72.8 million. Seventy oilfields produced 25.4 million barrels of crude oil (6 fields produced over 1 million barrels each) and 14.3 billion cubic feet of natural gas. Natural-gas liquids were recovered from two gasoline plants, and sulfur from the purification of sour natural gas. Natural-gas liquids were recovered at the West Seminole gasoline plant of Cities Service Oil Co. and at the Seminole plant of Phillips Petroleum Co.

Sulfur and carbon black were recovered by the Seminole carbon-black plant of Columbian Carbon Co.

Galveston.—Crude oil was processed at 4 refineries having a combined daily throughput capacity of 242,000 barrels; 20,000 barrels daily capacity was shut down in 1956. These refineries, all at Texas City, were operated by American Oil Co., Republic Oil Refining Co., Sid Richardson Refining Co., and Texas City Refining, Inc. Republic Oil Refining Co. installed a 20,000-barrel crude distillate unit and a control room for 4 processing units at its Texas City refinery. Texas City Refining, Inc., added a $2 million, 7,000-barrel Houdriformer unit at its refinery. The oil and gas industry produced 10.7 million barrels of crude oil from 39 oilfields, 3 oilfields produced over 1 million barrels each and 10.5 billion cubic feet of natural gas. Exploratory drilling on Tidelands sulfur leases offshore from Galveston disclosed some sulfur deposits. Further exploration was planned in 1957.

Paving sand was prepared by the city engineer of Galveston, Tex., and under contract for Division 12 of the Texas Highway Department.

The Texas City tin smelter of Tin Processing Corp. produced 17,631 tons of metal from Bolivia ores. All of the metal was sold to the Government for stockpiling. Sale of the tin smelter was authorized by the Congress, and bids from two prominent mining companies were considered.

Gazza.—Production of 5.7 million barrels of crude oil from 24 oilfields and 31 million cubic feet of natural gas was reported by the Texas oil and gas industry in 1956. Of 25 exploratory well completions totaling 126,509 feet, 2 proved to be discovery oil wells, 3 new oil pays, and 20 dry holes.

Building sand was prepared by C. I. Green Sand & Gravel Co.

Gillespie.—Building and paving sand and gravel were prepared from pits near Fredericksburg by Alvin Usener and by Weirich Bros. Crude feldspar was mined by Dezendorf Marble Co. Soapstone was mined and prepared at the Llano plant of Southwestern Talc Corp.

Glasscock.—Production of 4.1 million barrels of crude oil from 5 oilfields (1 of which yielded over 1 million barrels) and 30.7 billion cubic feet of natural gas was reported by the oil and gas industry in 1956. Five exploratory wells totaling 24,000 feet were drilled during the year; all were dry holes.

Goliad.—The oil and gas industry produced 2.8 million barrels of crude oil from 43 oilfields and 55.7 billion cubic feet of natural gas during the year. Of 24 exploration wells totaling 126,845 feet, 1 was an oil discovery, 2 were oil pays, 3 were gas pays, and 18 were dry holes.

Gonzales.—Paving sand and gravel was prepared from pits near Gonzales by Gonzales Gravel & Sand Co.

Production of 75,000 barrels of crude oil from 3 oilfields was reported during the year. The oil industry drilled 30 exploratory wells totaling 114,649 feet; all proved dry.

Gray.—There were 14.9 million barrels of crude oil from 3 oilfields and 129.8 billion cubic feet of natural gas produced in 1956. Of 373 well completions during 1956, 6 were exploratory and 367 were development wells. Exploration drilling, totaling 64,288 feet, proved 1 gas well; 5 wells were dry holes.

Natural-gas liquids were recovered at the Pampa gasoline plant of Cities Service Oil Co., at 78–1 plant of Coltexo Corp., at No. 6 plant of Kerr-McGee Oil Industries, Inc., and at the Gray, Lefors, North, and Pampa plants of Phillips Petroleum Co. A multi-million-dollar acrylic ester plant was built by Celanese Corp. of America at Pampa, capable of producing 50 million pounds of acrylic esters including methyl-ethyl and butyl acrylates

Carbon black was recovered at 3 contact plants and 1 furnace plant in 1956. Paving gravel was produced under contract for Division 4 of the Texas Highway Department. Molding sand was prepared by W. H. Chitwood.

Grayson.—Production of 11.2 million barrels of crude oil from 139 oilfields and 7.2 billion cubic feet of natural gas was reported in 1956. Natural-gas liquids were recovered at the Sherman gasoline plant of Standard Oil Co. of Texas. The oil and gas industry completed 57

exploratory wells totaling 377,055 feet, resulting in 8 oil discoveries, 16 new oil pays, and 33 dry holes.

Building and paving sand and gravel were prepared by Wray Wible.

Gregg.—Gregg County was the fourth ranking county in total mineral value and third in oil production in 1956. Production of 50.1 million barrels of crude oil from 6 oilfields, 71.5 billion cubic feet of natural gas, and also natural-gas liquids was reported in the county. Crude oil was processed at the Gladewater refinery of Gladewater Refining Co. and at the Longview refineries of Premier Oil & Refining Co. of Texas, and of Skelly Oil Co. Texas Calgary Co. completed a $750,000 expansion program at its Lueders asphalt refinery. Natural-gas liquids were recovered at the East Texas gasoline plant of Arkansas Fuel Oil Corp., the Spear plant of Gulf Oil Corp., the Sabine plant of Magnolia Petroleum Co., Plant 18 of Sinclair Oil & Gas Co., and Plants 31 and 47 of Warren Petroleum Corp. There were two exploratory well completions during the year, both of which proved dry. Premier Oil & Refining Co. began a $1.25 million improvement program at its Longview refinery with installation of a new platformer and a new Unifiner unit.

Grimes.—Production of 15,000 barrels of crude oil from 2 oilfields and 734 million cubic feet of natural gas was reported in the county in 1956.

Guadalupe.—The Fraser Brick Co. mined shale for manufacturing building brick and other heavy clay products. The oil and gas industry produced 4.5 million barrels of crude oil from 14 oilfields and 51 million cubic feet of natural gas during the year. Of 47 well completions totaling 74,013 feet, 1 was an oil well and 46 were dry holes.

Hale.—Production of 2.6 million barrels of crude oil from 4 oilfields and 108 million cubic feet of natural gas was reported by the oil and gas industry in Hale County.

Hall.—Building and paving sand was produced from pits near Memphis by W. F. McElreath.

Hamilton.—Limestone was crushed and quarried for concrete and roadstone by Division 9 of the Texas Highway Department. Building sand was prepared by O. F. Striplin.

Production of 1.9 billion cubic feet of natural gas and 400 barrels of crude oil was reported in the county.

Hansford.—Natural-gas liquids were recovered at the Hansford and Sherman gasoline plants of Phillips Petroleum Co. The oil and gas industry produced 571,000 barrels of crude oil and 20.2 billion cubic feet of natural gas during the year. A dehydration plant, with gathering pipelines and associated facilities, was completed by Northern Natural Gas Co. There were 21 exploratory well completions totaling 140,229 feet, resulting in 3 oil discoveries, 5 new oil pays, 3 new gas pays, and 8 dry holes.

Hardeman.—In all, 6,000 barrels of crude oil was produced from 2 oilfields during the year. All three exploratory well completions reported during the year were dry holes.

Crude gypsum was mined both underground and by open pit and was prepared for the building industry at the Acme plant of Certain-

Teed Products Corp. These properties were acquired by the Bestwall Gypsum Co. during the year.

Hardin.—Natural-gas liquids were recovered at the Nos. 25 and 6 cycling plants of Sinclair Oil & Gas Co. The oil and gas industry produced 9 million barrels of crude oil from 54 oilfields (2 fields produced over 1 million barrels each) and 48.6 billion cubic feet of natural gas during the year. Of 15 exploratory well completions totaling 129,524 feet, 2 proved oil wells, 1 a gas well, and 12 were dry holes.

Miscellaneous stone was quarried and crushed for concrete and roadstone for Division 10 of the Texas Highway Department. Molding sand was prepared by Barry & Barry.

Harris.—Harris County was the sixth ranking county in total mineral value ($128.9 million) and in crude-oil production. The oil and gas industry produced 28.6 million barrels of crude oil from 78 oilfields (6 produced over 1 million barrels each) and 57.5 billion cubic feet of natural gas. Natural-gas liquids were recovered at the North Houston cycling plant of Distillate Production Corp., the Ehrhardt cycling plant of H. M. Harrell, and the Clear Lake and Tomball gasoline plants of Humble Oil & Refining Co. Tennessee Products Pipeline Co. began constructing a fractionation plant at La Porte. Crude oil was processed at 7 refineries having a daily throughput capacity of 662,000 barrels; 13,000 barrels daily capacity was shut down in 1956. Exploratory drilling totaled 72 completions with a total depth of 567,904 feet. Nine completions were oil wells, 7 were gas wells, and 56 were dry holes.

Iron ores from Texas and from foreign countries were used as feed stock for the blast furnaces of Sheffield Division of Armco Steel Corp. Sheffield Steel Co. began operation of a new 100-ton electric furnace at its Houston mill.

Sand and gravel, used principally for building and paving purposes, was recovered at a portable plant near Pasadena by Albers Bank Sand Co. and with dredges near Highlands by Horton & Horton, Johnson & Johnson, and Parker Bros. & Co., Inc.

Portland cement was prepared from oystershell by Ideal Cement Co., Lone Star Cement Corp., and General Portland Cement Co. A $15-million expansion program at the Ideal Cement Co. new Houston plant, which will add 2.75 million barrels capacity to a total of 4 million barrels, was delayed by the midyear steel strike. A feature of the new plant facilities was the degree of electronic control of plant operations; kilns will be "burned" by television, while grinding mills, elevators, pumps, and other facilities will be controlled from a central station.

Salt in brine was recovered from wells near Houston by the Texas Brine Corp. and was mined underground and prepared as rock salt and as pressed block at the Hockley plant of United Salt Corp.

Crude perlite shipped in from adjoining States was expanded at the Houston plants of Perlite of Houston, Inc., and the Trilite Corp. for use by the construction industry in plaster and concrete. Miscellaneous clay or shale was mined from open pits near Houston and used in manufacturing building brick and heavy clay products by Acme Brick Co., Cedar Bayou Brick & Tile Co., J. M. Cordell & Sons, Inc., and Houston Brick & Tile Co. Barite from foreign coun-

tries and other States, was crushed and ground for use in preparing drilling muds at the Houston plants of Baroid Division, National Lead Co., and the Milwhite Co., Inc. Crude vermiculite from adjoining States was expanded for lightweight aggregate in concrete and building plaster at the Houston plants of the Trilite Corp. and Vermiculite Products, Inc.

Lime was prepared from oystershell at the Pasadena plant of Champion Paper & Fibre Co. to be utilized in manufacturing paper and fiberboard at the Houston plant at Nyotex Chemical Co. for use in making industrial chemicals, and at the Houston plant of Sheffield Division of Armco Steel Corp. as a metallurgical flux.

Sulfur was recovered in purifing sour natural gas at the Baytown plant of Consolidated Chemical Industries, Inc., at the Deer Park refinery of Shell Chemical Corp., and at the Houston refinery of Sinclair Refining Co. A $2-million expansion program at the chemical plant of Merichem Co. resulted in doubling the crisylic acid phenol capacity to 150,000 gallons per month and quadrupling the sodium sulfide production to 1,000 tons per month. Shell Chemical Co. was building 2 distillation towers, 4 converters, and additional water-cooling facilities to increase its isopropyl alcohol output by 20 million pounds per year.

The Humble Oil & Refining Co. installed a new Udex unit at its Baytown refinery to produce 7,000 barrels of aromatics daily. An expansion program at the company Baytown butadiene plant increased plant capacity from 49,000 to 65,000 short tons of butadiene per year. Humble also began constructing a $3-million ethylene plant designed to recover 80 million pounds of ethylene from refinery gases annually. A new $4-million asphalt plant to produce 5,000 barrels of paving asphalt per day was built on the Houston ship channel by Texas Asphalt & Refining Co. The plant will mix heavy Boscan crude from Venezuela with Gulf coast distillate to yield a 53-percent asphalt product.

A multi-million-dollar expansion program of the Houston plant of Diamond Alkali Co. will double the perchlorethylene capacity. Phillips Petroleum Co. began operating the first unit of its 110 million-pounds-per-year polyethylene plant on the Houston ship channel early in 1956. Warren Petroleum Corp. was building a $5-million petrochemical plant and warehouse near Houston. The Celanese Corp. of America began a multi-million dollar expansion at its polyolefin resin plant to 40 million pounds per year and the development of a new type of polyethylene plastic which can be produced at low pressure in the presence of a finely dispersed catalyst. A plant to produce new types of polyolefin plastics was completed by the M. W. Kellogg Co.

Harrison.—Miscellaneous clay or shale was mined from open pits near Waskom by Acme Brick Co. and from pits near Marshall by Marshall Brick Co. for use in heavy clay products. The Marshall Pottery Co. mined fire clay and shale for stoneware and hard pottery.

Lignite was mined from open pits near Marshall by McAlester Fuel Co.

The 29 producing oilfields in the county yielded 1.7 million barrels of crude oil. Natural gas totaling 104.5 billion cubic feet was produced. Natural-gas liquids were recovered at the Whelan gasoline plant of

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H. L. Hunt, the Waskom plant of Arkansas Louisiana Gas Co., the Jonesville plant of Le Cuno Oil Corp., the Waskom plant of Waskom Natural Gas Corp., the Whelan plant of D. E. and R. J. Whelan, and the Woodlawn plant of Woodlawn Processing Corp. Exploratory drilling totaled 67,532 feet for 11 completions and resulted in 3 oil discoveries, 2 new oil pays, 1 new gas pay, and 5 dry holes.

Hartley.—The oil and gas industry produced 84,000 barrels of crude oil from 1 oilfield and 34.0 billion cubic feet of natural gas during 1956. Four exploratory wells totaling 28,422 feet proved dry.

Haskell.—Production of crude oil, natural gas, natural-gas liquids, and sand and gravel valued at $9.6 million was reported in Haskell County in 1956. The oil and gas industry produced 3.4 million barrels of crude oil from 66 oilfields and 141 million cubic feet of natural gas. Of 58 exploratory well completions totaling 265,996 feet, 9 proved to be oil discoveries, 1 new oil pay, and 45 dry holes. Miscellaneous gravel was produced by W. W. Kittley.

Hays.—Limestone was quarried and crushed for concrete aggregate and roadstone by Borden Construction Co. Building and paving sand and gravel were recovered from pits near San Marcos by the Hays County Gravel Co.

Hemphill.—The oil industry produced 7,000 barrels of crude oil from 1 oilfield during 1956.

Henderson.—Natural-gas liquids were recovered at the Opelika cycling plant of Lone Star Producing Co. Production of 896,000 barrels of crude oil from 7 oilfields and 4.3 billion cubic feet of natural gas was reported. Exploratory drilling totaling 128,666 feet proved 1 oil discovery well and 25 dry holes.

Miscellaneous clay or shale was mined from open pits near Athens by Athens Brick Co., Inc., Athens Tile & Pottery Co., and Texas Clay Products Co. Fire clay for use in refractories was mined from open pits by Harbison-Walker Refractories Co. The new 50,000 brick-per-day plant of Athens Brick Co., Inc., began producing July 27.

Hidalgo.—The oil and gas industry produced 739,000 barrels of crude oil from 23 oilfields and 40.2 billion cubic feet of natural gas. Crude oil was processed at the La Blanca refinery of Cactus Petroleum, Inc., and at the McAllen refinery of Rado Refining Co. Rado Refining Co. added 1,500 barrels-per-day crude capacity to its McAllen refinery. Natural-gas liquids were recovered at the Delhi-Taylor cycling plant of Delhi-Taylor-Mayfair Oil Corp. Of 25 exploratory well completions totaling 225,216 feet, 1 proved an oil well, 11 proved gas wells, and 13 holes were dry.

Building and paving sand and gravel were produced by Fordyce Gravel Co. and Crow Gravel Co. Miscellaneous clay used in heavy clay products was mined from open pits by Valley Brick & Tile Co.

Hill.—Paving gravel and crushed limestone for concrete aggregate and roadstone were produced under contract for Division 9 of the Texas Highway Department.

Hockley.—The oil and gas industry produced 14.9 million barrels of crude oil from 73 oilfields (1 produced more than 1 million barrels of crude) and 19.9 billion cubic of natural gas. Of 38 well completions in 1956, 14 were exploratory wells, totaling 121,476 feet, and 24 were development wells. Natural-gas liquids were recovered at the

Ropes gasoline plant of Honolulu Oil Corp. and at the Levelland and Slaughter plants of Stanolind Oil & Gas Co.

Sulfur was recovered at the Sundown plant of Pan American Petroleum Corp.

Hopkins.—Production of 2.4 million barrels of crude oil from 5 oilfields and 3.5 billion cubic feet of natural gas was reported in 1956. Natural-gas liquids were recovered at the Pickton gasoline plant of Humble Oil & Refining Co. Exploratory drilling totaled 34,997 feet and resulted in 6 dry holes.

Fire clay used in refractories was produced from open pits by A. P. Green Fire Brick Co.

Houston.—Sandstone was quarried and crushed under contract for Division 11 of the Texas Highway Department and used for concrete and roadstone.

Natural-gas liquids were recovered at the cycling plant of Grier-Jackson, Inc. The oil and gas industry produced 578,000 barrels of crude oil from 2 oilfields and 13.5 billion cubic feet of natural gas. The industry completed 18 wells; 10 were exploratory wells totaling 72,256 feet, and 8 were development wells.

Howard.—The oil and gas industry produced 15 million barrels of crude oil from 23 oilfields (6 of which yielded over 1 million barrels each), and 5.9 billion cubic feet of natural gas. Crude oil was processed at the Big Spring refinery of Cosden Petroleum Corp. Carbon black was recovered from refinery residues. Of 319 well completions, 18 were exploratory (totaling 115,273 feet), and 301 were development wells. Natural-gas liquids were recovered at the East Vealmoor gasoline plant of Reef Fields Gasoline Corp.

The Cosden Petroleum Corp. purchased the 7,000-barrel Abilene refinery of Onyx Refining Co. and the 12,000-barrel Colorado City refinery of Col-Tex Refining Co. in a stock-transfer trade. Cosden likewise expanded and modernized its Big Spring refinery with the installation of a $2.5 million rexformer unit. This would permit the BTX plant full-time production of aeromatic chemicals and to increase the refinery's output of nitration grade of benzene, toluene, and xylene. Other refinery expanded facilities included a 100-mile products pipeline from the refinery to Cosden's Abilene terminal, a 2,100-barrel-per-day unifining unit, and modernization of a $1-million catalytic cracker. Cosden Petroleum Co. also began constructing a $3 million, 20-million-pound styrene plant at which synthetic rubber and plastics will be manufactured.

Building and paving sand and gravel were recovered from pits near Big Spring by Clyde McMahon Sand & Gravel Co. and West Texas Sand & Gravel Co.

Hudspeth.—Limestone was quarried and crushed for concrete aggregate and roadstone under contract for Division 24 of the Texas Highway Department. Miscellaneous stone was quarried and crushed near Van Horn for riprap, concrete aggregate, railroad ballast, and roadstone by Gifford Hill & Co., Inc.

Talc was mined from open pits by Christian & Sons, Lone Star Mining Co., and Southwestern Talc Corp. Soapstone was mined by Glenn-Rey Corp. Gypsum was recovered from open pits for use as a retarder in special cements by Southwestern Portland Cement Co.

Hunt.—Limestone was quarried and crushed near Quinlan for concrete aggregate and roadstone by John F. Buckner & Sons.

The oil industry produced 15,000 barrels of crude oil from 3 oilfields and completed 7 exploratory wells for a total of 36,083 feet; all wells proved dry.

Hutchinson.—Carbon black was recovered at 4 furnace plants and 1 contact plant; 2 plants used sour natural gas for fuel, and 3 used heavy refinery residues. Natural-gas liquids were recovered at the Canadian, Pantex, Rock Creek, and Sanford gasoline plants of Phillips Petroleum Co., the Sanford plant of Frank C. Henderson Trust No. 2, the Huber plant of J. M. Huber Corp., and the Fritch—151 plants of Natural Gas Pipeline Co. of America.

The oil and gas industry produced 14.2 million barrels of crude oil from 2 oilfields (the Hutchinson County field alone produced more than 1 million barrels) and 119.9 billion cubic feet of natural gas. Of 518 well completions in 1956, 3 were exploratory wells totaling 22,857 feet, and resulted in 1 oil discovery, 1 new gas pay, 1 dry hole, and 515 were development wells.

A $15.6-million expansion program at the Borger refinery of Phillips Petroleum Co. included additions and improvements to the distillation, cracking, alkylation, hydrogenation, and fractionation units; also a 139-mile, 12-inch loop of its products line from Borger to St. Louis to increase the products-line capacity several thousand barrels daily.

Paving gravel was produced under contract for Division 4 of the Texas Highway Department.

Irion.—The oil and gas industry produced 200,000 barrels of crude oil from 20 oilfields and 6 million cubic feet of natural gas. The industry completed 88 wells; 47 were exploratory wells totaling 260,703 feet and resulted in 13 oil wells and 34 dry holes and 41 were development wells.

Jack.—Production of 6.8 million barrels of crude oil from 128 oilfields and 20.3 billion cubic feet of natural gas was reported in Jack County in 1956. Natural-gas liquids were recovered at the Black Hawk gasoline plant of Black Hawk Gasoline Corp. and the Brazos cycling plant of Brazos River Gas Co. A new gasoline plant to process 4 million cubic feet of gas daily from the East Risch field was completed by the Centurion Gas & Oil Co. Crude oil was processed at the Bryson Refinery of Bryson Pipe Line & Refining Co. The oil and gas industry completed 269 wells consisting of 162 development wells and 107 exploratory wells. Exploratory drilling totaled 449,023 feet, and resulted in 8 oil discoveries, 10 gas discoveries, and 83 dry holes.

Jackson.—Natural-gas liquids were recovered at the Francitas No. 1 cycling plant of Francitas Gas Co. and at the Vanderbilt gasoline plant of Magnolia Petroleum Co. The oil and gas industry produced 13.6 million barrels of crude oil from 65 oilfields (4 produced over 1 million barrels each) and 37.4 billion cubic feet of natural gas. There were 101 well completions in 1956, consisting of 53 development wells and 48 exploratory wells. Exploratory drilling totaled 369,424 feet, resulting in 2 oil discoveries, 2 gas discoveries, and 43 dry holes.

Jasper.—The oil and gas industry produced 211,000 barrels of crude oil from 14 oilfields and 1.4 billion cubic feet of natural gas in 1956. The industry drilled 16 wells—3 development and 13 exploratory; ex-

ploratory drilling totaled 109,339 feet, resulting in 3 oil discoveries and 2 new oil pays.

Bentonite was recovered from open pits near Brookeland by Bennett-Clark Co., Inc. Miscellaneous clay used in the manufacture of heavy clay products was mined from open pits by Pal-Port Clay Products Corp. Limestone was quarried and crushed for concrete aggregate and roadstone for Division 11 of the Texas Highway Department. Miscellaneous stone was quarried and crushed for concrete aggregate and roadstone purposes for Division 20 of the Texas Highway Department.

Jeff Davis.—Paving gravel was produced under contract for Division 24 of the Texas Highway Department.

Jefferson.—The oil and gas industry produced 8.4 million barrels of crude oil from 36 oilfields (3 of these yielded over 1 million barrels each) and 79.2 billion cubic feet of natural gas. There were 91 well completions, 39 were exploratory wells totaling 381,875 feet proving 2 oil wells and 4 gas wells; 52 were development wells. Daily throughput capacity of the oil-refining industry totaled 931,000 barrels, 38,700-barrel capacity of which was idle during 1956. There were 6 refineries in Jefferson County: Atlantic Refining Co., Gulf Oil Corp., and The Texas Co. at Port Arthur; Magnolia Petroleum Co. at Beaumont; Pure Oil Co. at Nederland; and The Texas Co. at Port Neches. Atlantic Refining Co. added a 15,000 barrel-per-day catformer at its Atrico refinery. Steam and electric generating facilities, 3 new steam units, and a 15,000-kilowatt generator were added to the Port Arthur refinery of The Texas Co. Natural-gas liquids were recovered at the Texas gasoline plant of Texas Gas Corp.

Building sand was dredged from pits near Beaumont by C. A. McKinley Sons, Inc. Miscellaneous stone was quarried and crushed for concrete aggregate and roadstone for Division 20 of the Texas Highway Department. Oystershell was dredged from Sabine Lake by W. T. Burton. Miscellaneous clay, used in the manufacture of heavy clay products, was mined from open pits by Beaumont Brick Co., Inc.

Native sulfur was recovered by the Frasch method from Spindletop dome by Texas Gulf Sulphur Co. Sulfur was recovered from hydrogen sulfide gas at the Port Arthur refinery of Gulf Oil Corp. A Frasch extraction plant was being built by Texas Gulf Sulphur Co. on the Fannett salt dome, where production was expected early in 1957.

Magnolia Petroleum Co. began constructing a 100,000-barrel-per-day crude distillation unit which would eventually replace 7 smaller crude units at its Beaumont refinery. The company also completed a $25 million expansion program to enable higher octane gasoline production. Facilities included the world's largest thermoform catalytic cracking unit and the Southwest's first sovaformer unit. The world's largest fluid catalytic cracking unit, with a rated throughput capacity of 90,000 barrels per day, including 30,000 barrels of recycle stock, was being built by The Texas Co.

Gulf Oil Corp. was nearing completion of a 5-year building program at its Port Arthur refinery, which included expansions in the polymerization, alkylation, and sulfur-recovery units of the refinery. New catalytic reforming facilities produced hydrogen as a byproduct to be

used in a new process to yield higher quality home-heating oils. Pure Oil Co. installed a 15,000 barrel-per-day ultraforming unit at its Smiths Bluff refinery.

A new salt producer, Spindletop Minerals Co., obtained salt in brine from several new wells drilled into a salt dome. Production was rated at 50,000 barrels per day for consumption by the area chemical and processing plants. Full-scale production of an 18-million-pound-per-year polyethylene plant of the Koppers Co. was begun early in the year. Jefferson Chemical Co. expanded production facilities for chlorine, caustic soda, ethylene, ethylene oxide, and other basic chemicals at its Port Neches chemical plant.

Jim Hogg.—The oil and gas industry produced 1.9 million barrels of crude oil from 45 oilfields, as well as 1.2 billion cubic feet of natural gas. The industry completed 99 wells; 36 were exploratory wells totaling 116,732 feet resulting in 2 oil pays and 1 gas discovery, and 63 were development wells.

Jim Wells.—Natural-gas liquids were recovered at the LaGloria cycle plant of LaGloria Oil & Gas Co. and at the Seeligson plant of Magnolia Petroleum Corp. Production of 14.7 million barrels of crude oil from 117 oilfields and of 81.4 billion cubic feet of natural gas was reported in the county in 1956. Of 125 well completions, 47 were exploratory and 78 development wells. Exploratory drilling totaled 268,188 feet, proving 3 oil discoveries, 2 new oil pays, 2 gas discoveries, and 5 new gas pays.

Johnson.—Lime for chemical and industrial purposes was produced by Texas Lime Co. Sandstone was quarried and crushed for concrete aggregate and roadstone by John F. Buckner & Sons. Limestone was quarried and crushed under contract for use as concrete aggregate and roadstone for Division 2 of the Texas Highway Department. Glass sand and building gravel were prepared by Lain Gravel Co., Inc.

Jones.—There were 145 oilfields in Jones County (1 of these produced over 1 million barrels of crude oil alone), which yielded 7.1 million barrels of crude oil during 1956. Natural-gas production totaled 1.8 billion cubic feet. Natural-gas liquids were recovered at the Winberly No. 1 gasoline plant of Texas Natural Gasoline Corp. Crude oil was processed at the Lueders refinery of Petroleum Products Refining & Producing Co. The oil and gas industry completed 263 wells; 93 were exploratory wells and 170 development wells. Exploratory drilling totaled 311,459 feet, and proved 26 oil wells.

Building sand and building and paving gravel were prepared from open pits near Abilene by the R. E. Janes Gravel Co., Inc. Rough and finished dimension limestone was prepared from quarries near Lueders by Lueders Limestone Co. and West Texas Stone Co. West Texas Stone Co. likewise produced riprap.

Karnes.—Natural-gas liquids were recovered at the Cabeza Creek and Karnes City gasoline plants of United Gas Pipe Line Co. The oil and gas industry produced 2.7 million barrels of crude oil from 19 oilfields, as well as 4.7 billion cubic feet of natural gas. Of 48 well completions in the county, 15 were exploratory and 33 development wells. Exploratory drilling totaled 82,163 feet; all of these holes proved dry. The United Gas Pipe Line Co. added a propane-recovery

unit to its Cabeza Creek gasoline plant, as well as auxiliary units to increase butane production.

Kaufman.—Limestone was quarried and crushed under contract for concrete aggregate and roadstone for Division 18 of the Texas Highway Department. Production of 1.2 million barrels of crude oil from 18 oilfields and of 109 million cubic feet of natural gas was reported in 1956. The oil and gas industry completed 20 exploratory wells totaling 89,500 feet; all were dry.

Kenedy.—Seven oilfields in Kenedy County yielded 307,000 barrels of crude in 1956; 3.4 billion cubic feet of natural gas was produced. Natural-gas liquids were recovered at the Julian Pasture cycle plant of Humble Oil & Refining Co. Of 11 well completions in 1956, 7 were exploratory and 4 development wells. Exploratory drilling totaled 68,522 feet, resulting in 2 oil pays, 1 gas discovery, and 1 gas pay.

Kent.—The oil and gas industry produced 6.3 million barrels of crude oil from 14 oilfields, plus 2.1 billion cubic feet of natural gas. The oil and gas industry completed 30 wells—20 exploratory and 10 development. Exploratory drilling totaled 146,257 feet; all holes proved dry.

Kimble.—Paving sand and gravel was produced from pits near Junction by Weirich Bros. Four oilfields in Kimble County yielded 2,000 barrels of crude oil during the year. Of 93 well completions in 1956, 78 were exploratory wells and 15 development wells. Exploratory drilling totaled 73,000 feet, resulting in 6 oil wells and 8 gas wells.

King.—The oil and gas industry produced 1.3 million barrels of crude oil from 10 oilfields and 196 million cubic feet of natural gas during 1956. Of 21 well completions during the year, 9 were exploratory and 12 development. Exploratory drilling totaled 42,197 feet, with 1 oil discovery, 1 new oil pay, and 7 dry holes.

Limestone was quarried and crushed for concrete aggregate and roadstone for Division 25 of the Texas Highway Department.

Kleberg.—Limestone was quarried and crushed from pits near Kingsville for concrete aggregate and roadstone by Heldenfels Bros. Production of 4.4 million barrels of crude oil (from 56 oilfields) and 104 million cubic feet of natural gas was reported in 1956. Thirteen exploratory well completions totaled 126,057 feet, resulting in 4 new oil pays, 2 new gas pays, 1 gas discovery, and 6 dry holes.

Knox.—Production of 1 million barrels of crude oil from 18 oilfields, as well as 241 million cubic feet of natural gas, was reported in Knox County in 1956. The oil and gas industry completed 336 wells, of which 170 were exploratory and 166 development wells. Exploratory drilling totaled 424,427 feet, proving 11 oil discoveries, 3 oil extensions, and 155 dry holes.

Paving gravel was prepared under contract for Division 25 of the Texas Highway Department.

Lamar.—Building and paving sand and gravel were prepared by the Skeen Sand & Gravel Co.

Lamb.—Production of 437,000 barrels of crude oil (from 1 oilfield) and 1 million cubic feet of natural gas was reported in 1956. Five exploratory well completions totaled 23,142 feet; all were dry holes.

Lampasas.—Paving sand and gravel was produced from pits near Lampasas by Lampasas Sand & Gravel Co.

La Salle.—Five oilfields yielded 346,000 barrels of crude oil in 1956. Natural-gas production totaled 1 billion cubic feet. Of 89 well completions in 1956, 20 were exploratory and 69 development. Exploratory drilling totaled 124,684 feet, proving 2 oil wells, 2 gas wells, and 16 dry holes.

Lavaca.—Natural-gas liquids were recovered at the Wilcox gasoline plant of Goliad Corp. and the Provident City plant of Shell Oil Co. Production of 293,000 barrels of crude oil (from 11 oilfields) and of 68.1 billion cubic feet of natural gas was reported. Of 8 exploratory well completions totaling 69,812 feet, 1 was an oil well, 2 were gas wells, and 5 were dry holes.

Sandstone was crushed for concrete aggregate and roadstone for Division 13 of the Texas Highway Department.

Lee.—Production of 2,000 barrels of crude oil from 1 oilfield was reported in Lee County in 1956.

Leon.—The oil and gas industry produced 135,000 barrels of crude oil from 2 oilfields and 23.4 billion cubic feet of natural gas during the year. The industry completed 9 exploratory wells totaling 57,458 feet, resulting in 1 oil discovery; 8 wells were dry holes.

Liberty.—Production of 14.6 million barrels of crude oil from 46 oilfields and 20.9 billion cubic feet of natural gas was reported in 1956. Of 228 well completions in Liberty County, 32 were exploratory wells and 196 were development wells. Exploratory drilling totaled 293,502 feet, proving 3 oil discoveries and 29 dry holes. Natural-gas liquids were recovered at Hull gasoline plant of West Gasoline Co. Underground storage for 1.2 million barrels of LP-gases was completed by Magnolia Petroleum Co.

Texas Gulf Sulphur Co. recovered native sulfur from the Moss Bluff dome by the Frasch method. Miscellaneous stone was quarried and crushed for concrete aggregate and roadstone for Division 20 of the Texas Highway Department. Building and paving sand and gravel were prepared from pits near Cleveland by Costal Sand & Gravel Co., Inc., and Texas Construction Material Co.

Limestone.—Miscellaneous clay, used in heavy clay products, was mined from open pits near Groesbeck by the Barron Brick Co. Limestone was quarried and crushed for concrete aggregate and roadstone for Division 9 of the Texas Highway Department.

The oil and gas industry produced 339,000 barrels of crude oil from 5 oilfields and 9.3 billion cubic feet of natural gas during the year. Of 26 exploratory well completions during the year (totaling 68,132 feet), all proved to be dry.

Lipscomb.—Lipscomb became a new gas-producing county when Humble Oil & Refining Co. developed 11 million cubic feet flow of gas per day from perforations at 9,747–9,764 feet in a wildcat well 6 miles northeast of Lipscomb. Production of 2,000 barrels of crude oil from 1 oilfield was reported during the year. Of 10 exploratory wells completed in 1956, totaling 93,336 feet, 1 was a gas discovery, and 9 were dry holes.

Live Oak.—Natural-gas liquids were recovered at the Kittie gasoline plant of Goliad Corp. and at the Live Oak plant of Western Natural Gas Co. The Goliad Corp. added a $185,000, 1,370 barrel-per-day butane splitter to the Kittie plant. Production of 1.8 million barrels of crude oil from 47 oilfields and 52.5 billion cubic feet of natural

gas was reported during the year. Crude oil was processed at the plant of Three Rivers Refining Co. Paving sand and gravel was prepared by Commercial Materials, Inc. The oil and gas industry completed 140 wells, 40 of which were exploratory wells, totaling 203,675 feet, and 100 were development wells. Exploratory drilling proved 3 oil discoveries, 2 new oil pays, 2 gas discoveries, 2 new gas pays, and 31 dry holes.

Llano.—Crude feldspar was recovered from open pits near Llano by Mrs. Tillie Badu Moss. Marble was quarried and crushed from pits near Llano for use as terrazzo by Dezendorf Marble Co. A graphitic schist was quarried for filter material from pits one mile south of Llano by Graphilter Corp. Talc from Hudspeth County and soapstone from Gillespie County were ground at Llano by Southwestern Talc Corp.

Loving.—The oil and gas industry produced 1.6 million barrels of crude oil from 4 oilfields and 1.3 billion cubic feet of natural gas during 1956. Of 4 exploratory well completions totaling 29,345 feet, 1 proved an oil well, and 3 were dry holes.

Lubbock.—Two oilfields yielded 652,000 barrels of crude oil during the year. Natural-gas production amounted to 2 million cubic feet.

Building sand and gravel was prepared from pits by Chancey Sand & Gravel Co. and Caprock Sand & Gravel Co. Limestone was quarried and crushed for concrete aggregate and roadstone by Division 5 of the Texas Highway Department.

Lynn.—Five oilfields yielded 159,000 barrels of crude oil during 1956. Natural-gas production amounted to 1 million cubic feet. The oil and gas industry completed 12 exploratory wells for a total of 62,858 feet, proving 2 oil wells and 10 dry holes.

Madison.—The oil and gas industry produced 20,000 barrels of crude oil (from 2 oilfields) and 8.9 billion cubic feet of natural gas during the year.

Marion.—Production of 1.1 million barrels of crude oil (from 10 oilfields) and of 12.7 billion cubic feet of natural gas was reported. Natural-gas liquids were recovered at the Jefferson and Smithland gasoline plants of Arkansas Louisiana Gas Co. The oil and gas industry completed 113 wells—15 exploratory and 98 development. Exploratory drilling totaling 98,275 feet resulted in 1 oil discovery, 2 new oil pays, and 12 dry holes.

Martin.—Paving sand was prepared under contract for United States Army Corps of Engineers at Albuquerque, N. Mex.

Five oilfields yielded 641,000 barrels of crude oil during the year. Natural-gas production amounted to 112 million cubic feet. Of 9 exploratory well completions totaling 62,610 feet, 1 was an oil discovery, and 8 were dry holes.

Matagorda.—Natural-gas liquids were recovered at the Blessing cycling plant of American Liberty Oil Co. and at the Markham gasoline plant of Ohio Oil Co. Production of 5.9 million barrels of crude oil from 30 oilfields and 153.6 billion cubic feet of natural gas was reported in the county. The oil and gas industry completed 37 exploratory wells for a total of 342,498 feet, proving 2 oil discoveries, 2 new oil pays, 1 gas discovery, and 5 new gas pays; 26 wells were dry holes.

Shell was dredged from the shallow waters of Matagorda Bay by Matagorda Shell Co.

Maverick.—Production of 12,000 barrels of crude oil from 3 oilfields and 134 million cubic feet of natural gas was reported from the county in 1956. Of 23 exploratory well completions totaling 69,131 feet, 1 proved to be an oil discovery, and 1 a new oil pay; 21 were dry holes. Reynolds Metals Co. completed a fluorspar processing and refining plant at Eagle Pass. The plant will process fluorspar mined by a Mexican subsidiary to produce Acid-grade fluorspar. The company will use it in manufacturing synthetic cryolite.

McCulloch.—In all, 1,000 barrels of crude oil was produced in McCulloch County in 1956. The oil industry completed 11 exploratory wells totaling 10,309 feet; all wells were dry holes.

McLennan.—One oilfield yielded 6,000 barrels of crude oil during the year.

Portland and masonry cements were produced at the Waco plant of Universal Atlas Cement Co. Limestone was quarried and crushed by Universal Atlas Cement Co. for use in cement and by Division 9 of the Texas Highway Department for concrete aggregate and roadstone. Limestone was quarried and cut for rough and finished architectural stone by the Tonk Quarry.

Building and paving sand and gravel and gravel for railroad ballast were prepared from pits near Waco by Central Texas Gravel Co., Kleberg Sand & Gravel Co., and Neelley Sand & Gravel, Inc.

McMullen.—The oil and gas industry produced 920,000 barrels of crude oil from 20 oilfields and 14.8 billion cubic feet of natural gas during the year. The industry completed 35 exploratory wells for a total of 171,445 feet, resulting in 1 oil discovery, 1 new oil pay, 1 gas discovery, 3 new gas pays, and 27 dry holes.

Medina.—Three oilfields yielded 49,000 barrels of crude oil during the year. The oil and gas industry completed 151 wells, 23 were exploratory wells totaling 36,181 feet, and 128 were development wells. All exploratory wells proved dry.

Miscellaneous clay for use in heavy clay products was mined from open pits by D'Hanis Brick & Tile Co.

Midland.—Natural-gas liquids were recovered at the Spraberry gasoline plant of Phillips Petroleum Co., the Sweetie Peck plant of El Paso Natural Gas Co., the Pegasus plant of Magnolia Petroleum Co., and the Midland plant of the Pecos Co. Cities Service Oil Co. was building a gasoline plant between Midland and Odessa; it will process 50 million cubic feet of gas daily to produce 225,000 gallons of natural-gas liquids.

Production of 17.8 million barrels of crude oil from 41 oilfields (3 of these produced more than 1 million barrels each), and 74.2 billion cubic feet of natural gas was reported. The oil and gas industry completed 155 wells; 12 were exploratory wells and 143 development wells. Exploratory drilling totaled 102,998 feet, resulting in 2 oil discoveries, 6 new oil pays, 1 gas discovery, and 3 dry holes.

Limestone was quarried and crushed under contract for use in concrete aggregate and road stone for Division 6 of the Texas Highway Department. Crude perlite from adjoining States was expanded at the Terminal plant of Perlite Industries, Inc.

Milam.—One oilfield yielded 100,000 barrels of crude oil during the

year. Natural-gas production amounted to 111 million cubic feet. Of 28 well completions, 5 were exploratory wells totaling 24,440 feet (all were dry holes) and 23 were development wells.

Operation of two new potlines was begun at the Rockdale reduction works of Aluminum Company of America.

Paving gravel was mined from pits by W. C. Moody and by Mrs. W. A. Robinson.

Mitchell.—The oil and gas industry produced 2.5 million barrels of crude oil from 16 oilfields, 2 of which produced more than 1 million barrels each, and 27 million cubic feet of natural gas. Exploratory drilling totaled 60,788 feet, proving 1 oil discovery, 1 new oil pay, and 16 dry holes. Crude oil was processed at the Colorado City refinery of Cosden Oil Co. which purchased the plant from Col-Tex Refining Co. during the year.

Building and paving sand and gravel were produced by the Colorado Sand & Gravel Co.

Montague.—Production of 7.8 million barrels of crude oil from 162 fields and 9.2 billion cubic feet of natural gas was reported during 1956. Natural-gas liquids were recovered at the Bowie gasoline plant of Bowie Gasoline Co. Exploratory drilling totaling 244,421 feet proved 13 oil discoveries; 32 wells were dry holes.

Building and paving sand and gravel were produced by Watson Sand & Gravel Co. from a plant near Bowie.

Montgomery.—Natural-gas liquids were recovered at the Lake Creek cycling plant of Superior Oil Co. and at the Conroe gasoline plants of Humble Oil & Refining Co. and Midland Gasoline Co. Of 30 exploratory well completions, totaling 222,266 feet, 2 were gas-condensate discoveries and 28 were dry holes.

Carbon black was recovered at the furnace plant of Columbian Carbon Co.

Paving sand and gravel was produced under contract for Division 12 of the Texas Highway Department.

Moore.—Natural-gas liquids were recovered at the Bivins and Four-Way gasoline plants of Colorado Interstate Gas Co., at the Cactus No. 12 plant of Kerr-McGee Oil Industries, Inc., at Station-152 of National Gas Pipeline Co. of America, at the Dumas and Sneed plants of Phillips Petroleum Co., and at the McKee-Sunray plant of Shamrock Oil & Gas Corp.

Crude oil was processed at the Sunray plant of Shamrock Oil & Gas Corp. Helium was recovered at the Exell plant operated by the Government. The oil and gas industry produced 123,000 barrels of crude oil and 386.9 billion cubic feet of natural gas during the year. Four exploratory wells, totaling 16,029 feet, were dry.

Carbon black was recovered at the Sunray furnace plant of Continental Carbon Co.

Sulfur was recovered from hydrogen sulfide of sour natural gas at the Sunray plant of Shamrock Oil & Gas Corp.

Morris.—Brown iron ore was mined from open pits by Lone Star Steel Co. and consumed in the blast furnace of its Daingerfield intergrated steel mill. A $6-million expansion program, which will increase the plant's annual ingot capacity by 100,000 tons, was nearing completion. New facilities included an open-hearth furnace and a stretch reducing mill. Operations at the Daingerfield plant were halted by

a 13-day strike beginning September 7. Over 3,000 plant workers were affected by the action.

Motley.—Building sand and building and paving gravel were prepared from open pits near Matador by Ellison & Thrasher and the Harris Sand Co.

Nacogdoches.—The Trawich (Rodessa) oilfield produced 9,000 barrels of crude oil. Nacogdoches County reported 18.9 billion cubic feet of natural gas produced during 1956. Two exploratory wells, totaling 15,760 feet, proved dry.

Miscellaneous clay used in heavy clay products was mined from open pits near Garrison by the Acme Brick Co.

Navarro.—The oil and gas industry produced 2.9 million barrels of crude oil from 11 oilfields, as well as 244 million cubic feet of natural gas during the year. Of 324 well completions, 34 were exploratory and 290 were development. Exploratory drilling totaled 82,829 feet, and all wells proved dry holes.

Miscellaneous clay used in heavy clay products was obtained from open pits near Corsicana by Whiteselle Brick-Lumber Co. Crushed limestone and paving gravel were produced for concrete aggregate and roadstone by Division 18 of the Texas Highway Department. Furnace slags from Daingerfield and El Paso were processed into rock wool for insulating purposes at a new Corsicana plant of American Rock Wool Corp.

Newton.—The oil and gas industry produced 1 million barrels of crude oil from 17 oilfields and 9.6 billion cubic feet of natural gas during the year. Of 16 exploratory well completions, totaling 132,622 feet, 1 was a new oil pay, 1 a new gas-condensate pay, 1 a gas discovery, and 13 were dry holes.

Miscellaneous stone was quarried and crushed for concrete and road metal for Division 20 of the Texas Highway Department.

Nolan.—Crude gypsum was mined from open pits near Sweetwater by the United States Gypsum Co. A multi-million-dollar gypsum-processing plant was being built near Sweetwater by Flintkote Co. The company planned to mine large gypsum deposits in the Sweetwater area and to manufacture plaster, wallboard, lath, and other gypsum products for the building industry.

Portland and masonry cements were produced by the Mary Neal plant of Lone Star Cement Corp. Limestone was quarried and crushed from pits near the plant for use in cement manufacture.

Building and paving sand and gravel were obtained from pits near Sweetwater by Hillsdale Gravel Co.

The oil and gas industry produced 8.7 million barrels of crude oil from 71 oilfields and 2 billion cubic feet of natural gas. Six gasoline plants recovered natural-gas liquids. The oil and gas industry drilled 70 exploratory and 258 development wells. Exploratory drilling totaled 457,133 feet, resulting in 4 oil discoveries, 5 new oil pays, and 60 dry holes.

Nueces.—Columbian Carbon Co. recovered carbon black at its Corpus Christi No. 56 channel plant. Natural-gas liquids were recovered at 7 gasoline and 6 cycling plants. Crude oil was processed at 6 refineries having a daily throughput capacity of 231,000 barrels; 7,000 barrels was shut down during 1956. Tennessee Gas Transmission Co. completed a fractionation plant near the Houston ship

channel and a 240-mile products pipeline. The new products line will permit movement of butane and other LP-gas products from the Banquete plant to the Butadiene plant of Petro-Tex Chemical Corp., and other petrochemical plants in the Houston area. Construction of a 15,000-barrel-per-day Rexformer unit at the Corpus Christi refinery of Suntide Refining Co. was begun. A Udex unit to separate aromatic and miscellaneous chemicals into upgraded octane gasolines was also being added to this new plant.

The oil and gas industry produced 16.2 million barrels of crude oil from 141 oilfields and 183.5 billion cubic feet of natural gas. The industry drilled 64 exploratory wells and 138 development wells during the year. Exploratory drilling totaled 436,657 feet, proving 4 oil discoveries, 15 new oil pays, 3 gas discoveries, 4 new gas pays, and 36 dry holes.

Portland and masonry cements were prepared from oystershell at the Corpus Christi plant of Halliburton Portland Cement Co. Oystershell was dredged from shallow inlets of Nueces Bay by General Dredging Co., Halliburton Portland Cement Co., Heldenfels Bros., Corpus Christi Shell Co., Inc., and Matagorda Shell Co. The principal uses of oystershell were in cement and lime, for road surfacing, and for railroad ballast. Lime used in industrial chemicals was prepared from oystershell by Columbia Southern Chemical Corp.

Barite from foreign countries and other States was crushed and ground for use in the production of heavy drilling muds by Baroid Division of National Lead Co. Building and paving sand and gravel were obtained from pits near Calallen by Heldenfels Bros.

Ochiltree.—The oil and gas industry produced 356,000 barrels of crude oil from 14 oilfields and 630 million cubic feet of natural gas in 1956. There were 111 well completions during the year, of which 43 were exploratory, and 68 development. Exploratory drilling totaled 362,059 feet, proving 8 oil discoveries, 3 new oil pays, 7 gas discoveries, 7 new gas pays, and 18 dry holes.

Oldham.—Approximately 443 million cubic feet of natural gas was produced in Oldham County in 1956.

Sand and gravel was recovered from pits near Tascosa by Western Aggregates, Inc., and from pits near Channing by Western Sand & Gravel Co. This commodity was used principally for building and paving purposes.

Orange.—Important expansions occurred in the mineral and petrochemical industries of Orange County in 1956. Firestone Tire & Rubber Co. began constructing a 40,000-ton butadiene plant and a 75,000-ton styrene plant at Orange. These commodities are essential ingredients of synthetic rubber and will be prepared from butane gas available in quantity in the area.

The oil and gas industry produced 3.9 million barrels of crude oil from 16 oilfields and 75.5 billion cubic feet of natural gas. Of 13 exploratory well completions totaling 109,577 feet, 1 proved an oil discovery and 12 wells were dry holes.

A 540,000-barrel-annual-capacity cement plant, utilizing oystershell as the basic material, was built at Orange by the Texas Portland Cement Co. Equipment consisted of a 300-foot rotary kiln and accessory grinding, processing, and conveying facilities incorporating many technical advances and innovations in the cement industry.

Miscellaneous stone used for concrete aggregate and roadstone was prepared for Division 20 of the Texas Highway Department.

Palo Pinto.—Miscellaneous clay, used in lightweight aggregate, floor and wall tile, and building brick and tile, was recovered from open pits near Strawn by the Featherlite Corp. and from pits near Mineral Wells by Texeramics Co. and Texas Vitrified Pipe Co.

Building and paving sand and gravel were obtained from pits near Mineral Wells by Mineral Wells Sand & Gravel Co.

Production of 240,000 barrels of crude oil from 10 oilfields and 1.6 billion cubic feet of natural gas was reported in 1956. Natural-gas liquids were recovered at the Gordon gasoline plant of Lone Star Gas Co. Of 45 well completions in 1956, 17 were exploratory wells, and 28 were development wells. Exploratory drilling totaled 43,243 feet; all wells were dry upon completion.

Panola.—Natural-gas liquids were recovered at the Carthage cycling plant of Lone Star Producing Co., the Panola gasoline plant of Arkansas Fuel Oil Corp., and the Carthage plants of the Carthage Co., the Arkansas Louisiana Gas Co., and the Chicago Corp. Production of 1.1 million barrels of crude oil from 19 oilfields and 539.7 billion cubic feet of natural gas was reported in the county. The oil and gas industry completed 163 wells, 6 of which were exploratory wells totaling 37,281 feet, resulting in 2 oil discoveries, 3 new oil pays, and 1 gas discovery.

Parker.—Six oilfields yielded 36,000 barrels of crude oil during the year. Natural-gas production amounted to 206 million cubic feet. Natural-gas liquids were recovered at the Springtown gasoline plant of Lone Star Gas Co. Of 12 exploratory well completions totaling 49,898 feet, 6 proved to be gas discoveries, and 6 wells were dry holes.

Miscellaneous clay used in heavy clay products was obtained from open pits near Bennett by Acme Brick Co. and Mineral Wells Clay Products Co. The Bennett plant was completely rebuilt by the company over a 5-year period, including new grinding facilities, 4 new rectangular suspended arch kilns, and renovation of 12 30-foot beehive kilns, increasing capacity to 125,000 brick equivalents a day.

Pecos.—Production of 17.2 million barrels of crude oil from 72 oilfields (2 of which produced more than 1 million barrels each) and 26.9 billion cubic feet of natural gas was reported. Natural-gas liquids were recovered at the McCandless gasoline plant of Bryce McCandless and at the Santa Rosa plant of The Pecos Co. There were 234 wells drilled in the county in 1956; 42 were exploratory wells and 192 were development wells. Exploratory drilling, totaling 239,808 feet, resulted in 1 oil discovery, 5 new oil pays, 1 gas discovery, 2 new gas pays, and 33 dry holes.

Gem stones, principally of the agate variety, were collected by hobbyists and dealers. Limestone was quarried and crushed for concrete aggregate and road stone for Division 6 of the Texas Highway Department.

Building and paving sand and gravel were recovered from pits near Imperial by F. M. Reeves & Sons, Inc.

Polk.—Production of 2 million barrels of crude oil from 15 oilfields and 5.6 billion cubic feet of natural gas was reported in the county. Natural-gas liquids were recovered at the Sunshine gasoline plant of

Sunshine Gasoline Co. The 3 exploratory well completions, totaling 14,679 feet, proved to be dry holes.

Limestone and miscellaneous stone were quarried and crushed for concrete aggregate and road stone for the Polk County Highway Department. Sand was recovered from pits near Corrigan by Texas Construction Material Co.

Potter.—Natural-gas liquids were recovered at the Fain and Turkey Creek gasoline plants of Amarillo Oil Co. Natural gas totaling 66.2 billion cubic feet was produced in Potter County. Crude-oil production amounted to 180 barrels. The Amarillo refinery of The Texas Co. processed crude oil during the year. No exploratory drilling by the oil and gas industry was reported in the county during the year.

Helium was produced at the Government-owned and operated Amarillo plant near Amarillo.

Building and paving sand and gravel were recovered from pits near Amarillo by Panhandle Gravel, Inc., and Texas Sand & Gravel Co.

Presidio.—Paving gravel was produced under contract for Division 24 of the Texas Highway Department.

Mercury was recovered from ores of the Terlingua mining district by Terlingua Mercury Corp. and Lone Star Mercury Co. Big Bend Mining Co., Inc., conducted a diamond-drilling program under a DMEA contract.

Reagan.—Natural-gas liquids were recovered at the Barnhart gasoline plant of Barnhart Hydrocarbon Corp., the Texon plant of Dorchester Corp., and the Midkiff plant of El Paso Natural Gas Co. The oil and gas industry produced 13.3 million barrels of crude oil from 25 oilfields, 3 of which yielded over 1 million barrels each, and 43.1 billion cubic feet of natural gas. The industry completed 200 wells—16 exploratory and 184 development. Exploratory drilling totaled 81,536 feet and resulted in 2 oil discoveries, 1 new oil pay, and 12 dry holes. Dorchester Corp.—a subsidiary of Oil and Gas Property Management, Inc.—purchased the 6 million-cubic-feet-per-day Big Lake gasoline plant of Texon Gas, Inc. The Northwest Production Corp., production subsidiary of Pacific Northwest Pipeline Corp., acquired the assets of Barnhart Hydrocarbon Corp.

Red River.—Three oilfields produced 10,000 barrels of crude oil in the county during 1956. The oil industry completed 22 exploratory wells totaling 47,848 feet, resulting in 2 oil discoveries and 20 dry holes.

Reeves.—Three oilfields yielded 348,000 barrels of crude oil during 1956. Natural-gas production amounted to 875 million cubic feet. Natural-gas liquids were recovered at the Tunstill gasoline plant of Pecos Petroleum Co. Of 17 exploratory well completions totaling 62,832 feet, 2 were oil discoveries and 15 wells were dry holes.

Building and paving sand and gravel were recovered from pits near Orla by Herman A. Lindley and from pits near Pecos by F. M. Reeves & Sons, Inc.

Refugio.—Natural-gas liquids were recovered at the AGSCO gasoline plant of AGSCO Minerals Corp. and the Tom O'Connor plant of Humble Oil & Refining Co. The oil and gas industry produced 20.6 million barrels of crude oil from 59 oilfields (3 fields produced over 1 million barrels each) and 175.4 billion cubic feet of natural gas. The oil and gas industry completed 104 wells; 18 were exploratory wells, and 92 were development wells. Exploratory

drilling totaled 126,733 feet, resulting in 1 oil discovery, 4 new oil pays, 1 new oil-gas pay, 4 new gas pays, and 8 dry holes.

Roberts.—Three oilfields yielded 1.6 million barrels of crude oil during the year. Natural-gas production amounted to 5.1 billion cubic feet. Of 14 exploratory well completions totaling 92,538 feet, 2 proved oil discoveries and 1 a gas discovery; 11 were dry holes.

Robertson.—Sand and gravel for building and paving purposes was recovered from pits near Hearne by Gifford-Hill & Co., Inc. One oilfield yielded 21,000 barrels of crude oil during the year. Natural-gas production amounted to 188 million cubic feet.

Runnels.—Natural-gas liquids were recovered at the Runnels gasoline plant of Gulf Oil Corp., the Fort Chadbourne plant of Lone Star Producing Co., and the Sykes plant of Runnels Gas Products Corp. Production of 5.4 million barrels of crude oil from 145 oilfields and 5.8 billion cubic feet of natural gas was reported. The oil and gas industry completed 231 wells—84 exploratory and 147 development. Exploratory drilling totaled 331,099 feet, proving 6 oil discoveries, 14 new oil pays, 1 gas discovery, and 63 dry holes.

Rusk.—Rusk County was the seventh ranking mineral producing county in value in 1956, with a total of $85.4 million. Eight oilfields yielded 29 million barrels of crude oil during the year. Natural-gas production amounted to 29.3 billion cubic feet. Natural-gas liquids were recovered at the Cashen gasoline plant of Gulf Oil Corp., the East Texas plant of Humble Oil & Refining Co., the Giles plant of the Parade Co., and Plants 19 and 21 of Sinclair Oil & Gas Co. Of 16 exploratory well completions totaling 77,750 feet, 1 proved an oil discovery, 2 were gas discoveries, and 13 were dry holes.

Miscellaneous clay, used in heavy clay products, was recovered from pits near Henderson by J. M. Cordell & Sons, Inc., and Major Brick Co. Fire clay, also used in heavy clay products, was recovered from pits by the Henderson Clay Products, Inc.

San Jacinto.—Seven oilfields in San Jacinto County yielded 531,000 barrels of crude oil. Production of 10.1 billion cubic feet of natural gas was reported. Natural-gas liquids were recovered at the Plymouth cycling plant of Plymouth Oil Co. Exploratory drilling totaling 25,823 feet resulted in 3 dry holes upon completion.

Sand and gravel for building and paving purposes was dredged from pits near Shepherd by Thorstenberg & Tamborello.

San Patricio.—Natural-gas liquids were recovered at Red Fish Bay gasoline plant of Sunray Mid-Continent Oil Co. and Plant No. 20 of Sinclair Oil & Gas Co. Production of 16.9 million barrels of crude oil from 125 oilfields (3 of which produced over 1 million barrels each) and 45.7 billion cubic feet of natural gas was reported during the year. The oil and gas industry completed 50 exploratory wells and 153 development wells. Exploratory drilling totaled 334,351 feet, resulting in proving 7 oil discoveries, 10 new oil pays, 1 gas discovery, 6 new gas pays, and 26 dry holes.

Limestone was quarried and crushed near Mathis for concrete and roadstone by Heldenfels Bros. Sand and gravel was recovered by Fordyce Gravel Co.

Reynolds Metals Co. operated its San Patricio reduction works and its La Quinta alumina plant near Corpus Christi during the year. A strike, which idled these operations for 26 days, was settled by agree-

ment, resulting in a 3-year contract. The expansion program at the La Quinta alumina plant was to result in a 50-percent capacity increase—from 365,000 tons to 548,000 tons of alumina per year.

Schleicher.—The oil and gas industry produced 3.5 million barrels of crude oil from 17 oilfields and 1.6 billion cubic feet of natural gas. Of 47 well completions, 21 were exploratory and 26 development. Exploratory drilling totaled 121,003 feet, proving 1 oil discovery and 1 oil extension; 19 wells were dry holes.

A new gas-products plant to process 140 million cubic feet of gas a month, from which more than 1.6 million gallons of natural gasoline, butane, and propane will be recovered, was built in the Hilldale field 12 miles northeast of El Dorado by Sinclair Oil & Gas Co. and Skelly Oil Co.

Scurry.—Scurry County ranked fifth in total mineral value in 1956 (with a total value of $129.4 million) and fourth in crude-oil production. The oil and gas industry produced 44.4 million barrels of crude oil from 45 oilfields, 6 of which yielded more than 1 million barrels of crude each, and 49.8 billion cubic feet of natural gas. Natural-gas liquids were recovered at the Diamond "M" gasoline plant of Lion Oil Co., the North Snyder plant of Standard Oil Co. of Texas, the Snyder plant of Sunray Oil Corp., and the Fuller plant of The Texas Co. The oil and gas industry completed 296 wells, 23 were exploratory wells and 273 were development wells. Exploratory drilling, totaling 122,724 feet, proved 7 oil wells, and 16 wells were dry holes.

Building and paving sand and gravel were produced by the Ira Sand & Gravel Co.

Shackelford.—Natural-gas liquids were recovered at the No. 1 gasoline plant of Marshall R. Young and at the Graridge No. 1 plant of Graridge Corp. The oil and gas industry completed 402 wells, 75 were exploratory wells, and 327 were development wells. Exploratory drilling totaled 201,886 feet, resulting in 14 oil discoveries, 2 new oil pays, 1 gas discovery, 1 new gas pay, and 57 dry holes.

Building sand and gravel was produced from pits near Albany by Taylor Bros.

Shelby.—The oil and gas industry produced 9,000 barrels of crude oil from 3 oilfields and 24.2 billion cubic feet of natural gas during 1956. Of 9 exploratory well completions totaling 49,759 feet, 1 proved a new gas pay, and 8 were dry holes.

Sherman.—Four oilfields yielded 15,000 barrels of crude oil during the year. Natural-gas production amounted to 133.2 billion cubic feet. Of 14 wells drilled by the oil and gas industry, 3 were exploratory wells totaling 22,121 feet, resulting in 1 oil discovery and 2 dry holes.

Smith.—Natural-gas liquids were recovered at the Chapel Hill gasoline plant of Etexas Producers Gas Co. and the Chapel Hill cycling plant of Lone Star Producing Co. The oil and gas industry produced 1.6 million barrels of crude oil from 15 oilfields and 8 billion cubic feet of natural gas during the year. Crude oil was processed at the Tyler refinery of McMurray Refining Corp. Of 19 exploratory well completions by the oil and gas industry totaling 115,757, 1 was an oil discovery, and 18 were dry holes.

Sand was produced from open pits near Tyler by H. J. Ellis.

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Starr.—Production of 7.3 million barrels of crude oil from 89 oilfields and 18.3 billion cubic feet of natural gas was reported in Starr County in 1956. Natural-gas liquids were recovered at the Rincon gasoline plant of Continental Oil Co. and at the Sun plant of the Sun Oil Co. The oil and gas industry completed 210 wells; 61 exploratory wells and 149 development wells. Exploratory drilling totaled 238,386 feet, resulting in 7 oil discoveries, 4 new oil pays, 6 gas discoveries, 2 new gas pays, and 42 dry holes.

Pumicite was mined from open pits by Pozzolana, Inc. Building and paving sand and gravel were produced by Fordyce Gravel Co. Miscellaneous clay, to be used in heavy clay products, was mined from open pits by Valley Brick & Tile Co.

Stephens.—The oil and gas industry produced 3.6 million barrels of crude oil from 96 oilfields and 10.2 billion cubic feet of natural gas during 1956. Natural-gas liquids were recovered at the Eliasville gasoline plant of Breckenridge Gasoline Co., the Brooks plant of Lone Star Production Co., the Caddo plant of Texas Pacific Coal & Oil Co., and the No. 30 plant of Warren Petroleum Corp. The oil and gas industry completed 247 wells in 1956, 63 exploratory wells and 184 development wells. Exploratory drilling totaled 244,699 feet resulting in 13 oil discoveries, 12 new oil pays, 2 gas discoveries, 2 new gas pays, and 34 dry holes.

Sterling.—Thirteen oilfields yielded 898,000 barrels of crude oil during 1956. Natural-gas production amounted to 6 million cubic feet. Of 19 exploratory wells completed (totaling 79,338 feet), 1 was an oil discovery, 1 an oil extension, and 17 were dry holes.

Stonewall.—Natural-gas liquids were recovered at the Stonewall gasoline plant of Liquigas Co. The oil and gas industry produced 10.7 million barrels of crude oil from 73 oilfields (3 fields producing more than 1 million barrels each) and 3 billion cubic feet of natural gas during the year. The industry completed 144 wells; 45 were exploratory and 99 development. Exploratory drilling totaled 258,132 feet, proving 5 oil discoveries, 4 new oil pays, 1 oil extension, and 35 dry holes.

Building and paving sand and gravel were recovered from open pits by Hamlin Sand & Gravel Co., Inc.

Sutton.—Two oilfields yielded 14,000 barrels of crude oil in 1956. There were 5.1 billion cubic feet of natural gas produced in the county. Exploratory drilling totaled 32,159 feet, resulting in 1 gas discovery and 6 dry holes.

Swisher.—Division 25 of the Texas Highway Department acquired crushed limestone for concrete aggregate and roadstone purposes.

One exploratory well, drilled to a depth of 9,343 feet, proved dry when completed.

Tarrant.—Crude oil was processed at the Fort Worth refinery of Premier Oil Refining Co. of Texas.

Portland and masonry cements were produced at the Fort Worth plant of General Portland Cement Co. An expansion program, which increased the plant's production capacity 1.25 million barrels to a total of 3.25 million barrels, included installation of a third kiln, and grinding and auxiliary equipment required for the expanded output.

Mica was ground and prepared at the Fort Worth plant of Western Mica Co. Finished architectural limestone was prepared by Carruthers Cutstone Co.

Sand and gravel, used principally for building and paving purposes and for railroad ballast, was recovered from open pits in Tarrant County by 12 producers.

Taylor.—Production of 2.9 million barrels of crude oil from 106 oilfields and 138 million cubic feet of natural gas was reported in 1956. Crude oil was processed at the Abilene refinery of Monarch Refining Co. Natural-gas liquids were recovered at the Eskota gasoline plant of Otha H. Grimes. The oil and gas industry completed 359 wells in 1956; 124 were exploratory wells, and 235 were development wells. Exploratory drilling, totaling 402,680 feet, resulted in proving 15 oil discoveries, 12 new oil pays, and 97 wells were dry.

Limestone was quarried and crushed from pits near View for concrete aggregate and roadstone by H. B. Zachry Co. Miscellaneous clay was mined from open pits for use in the manufacture of heavy clay products by Abilene Brick Co.

Sand and gravel was recovered from pits near Merkel by Atlas Sand & Gravel Co. and from pits near Abilene by Caton Sand & Gravel Co. The principal use was for building purposes with lesser quantities used as glass sand.

Terrell.—Limestone was quarried and crushed for concrete aggregate and roadstone for Division 6 of the Texas Highway Department.

The oil and gas industry completed 2 exploratory wells totaling 4,902 feet; both wells were dry holes.

Terry.—Production of 7.8 million barrels of crude oil from 19 oilfields and 424 million cubic feet of natural gas was reported in Terry County in 1956. Of 8 exploratory well completions totaling 64,204 feet, 2 proved oil discoveries and 6 were dry holes.

Carbon black was recovered at the Seagraves No. 64 furnace plant of Columbian Carbon Co.

Throckmorton.—Production from 114 oilfields in Throckmorton County amounted to 3.6 million barrels of crude oil. Natural-gas production amounted to 365 million cubic feet. The oil and gas industry completed 156 wells during the year; 69 were exploratory wells totaling 241,230 feet, and 87 were development wells. Exploratory drilling proved 10 oil discoveries, 2 new oil pays, and 57 dry holes.

Titus.—Three oilfields (1 of which produced over 1 million barrels) yielded 4.2 million barrels of crude oil in 1956. Crude oil was processed at the 16,500-barrel-per-day Mount Pleasant refinery acquired by American Petrofina from American Liberty Oil Co. of Texas late in the year. Natural-gas production amounted to 18 million cubic feet. Six exploratory wells were completed totaling 37,741 feet; 1 proved to be a dual oil discovery and 5 were dry holes.

Tom Green.—Building gravel was prepared from pits near San Angelo by Vernon Vines.

Production of 2.4 million barrels of crude oil from 38 oilfields and 116 million cubic feet of natural gas was reported during the year. Of 67 exploratory wells completed by the oil and gas industry (totaling 328,930 feet), 3 proved oil discoveries, 1 a new oil pay, 1 a gas dis-

covery, 1 a new gas pay, and 61 wells were dry holes. There were 73 development wells completed during the year.

Travis.—Three oilfields yielded 55,000 barrels of crude oil in 1956. The oil industry drilled 55 wells, 30 exploratory wells totaling 26,178 feet, and 25 development wells. All exploratory wells proved dry upon completion.

Lime was prepared from limestone and sold for building, chemical, and industrial purposes by Austin White Lime Co. Grinding pebbles and marble were obtained from open pits near Austin by Dezendorf Marble Co. Rough and finished architectural dimension limestone was quarried and prepared by Austin Stone Industries and Texas Quarries, Inc. Limestone was quarried and crushed for concrete aggregate, roadstone, and refractory purposes by Border Construction Co. and Texas Crushed Stone Co.

Building and paving sand and gravel were obtained from pits near Austin by Austin Sand & Gravel Co. and R. E. Janes Gravel Co., Inc.

Trinity.—Production of 191 million cubic feet of natural gas was reported from Trinity County in 1956. No drilling was reported by either the oil or the gas industry during the year.

Tyler.—Natural-gas liquids were recovered at gasoline Plant No. 24 of Sinclair Oil & Gas Co. Production of 691,000 barrels of crude oil from 18 oilfields and 7.1 billion cubic feet of natural gas was produced in Tyler County in 1956. Of 5 exploratory wells totaling 47,755 feet, 1 proved an oil discovery, 1 a new oil pay, and 3 were dry holes. Seven development wells were completed during the year.

Miscellaneous stone was quarried and crushed for concrete aggregate and roadstone for Division 20 of the Texas Highway Department. The Coastal Tiles Co., Inc., started operating its wall and ceramic trim tile plant at Woodville during the year. The plant can produce 100,000 square feet of tile a month.

Upshur.—Most of the 3.1 million barrels of crude oil produced in Upshur County came from the prolific East Texas oilfield, which also encompasses Gregg and Cherokee Counties; also 2.5 billion cubic feet of natural gas was produced during the year. Five exploratory wells totaling 17,550 feet proved dry upon completion.

Building, molding, and engine sands were recovered from open pits near Big Sandy by the Big Sandy Sand & Gravel Co.

Upton.—The oil and gas industry completed 350 wells; 37 were exploratory and 313 development. Exploratory drilling totaled 276,017 feet, proving 6 oil discoveries, 13 new oil pays, 1 oil extension, and 17 dry holes. The oil and gas industry produced 16 million barrels of crude oil from 61 oilfields (3 of which produced over 1 million barrels each) and 50.4 billion cubic feet of natural gas.

Natural-gas liquids were recovered at the Benedum gasoline plants of Texas Gas Products Corp., and of Pecos Co., the Pembrook plant of Phillips Petroleum Co., and the McElroy-Wilshire plant of Lone Star Producing Co.

Limestone was quarried and crushed for concrete aggregate and road stone for Division 6 of the Texas Highway Department.

Uvalde.—Native asphalt for road material and surfacing was quarried and prepared from pits near Blewett by Uvalde Rock Asphalt Co. and from pits near Dabney by Whites Uvalde Mines. Miscel-

laneous stone was quarried and crushed from pits for use as concrete aggregate and road stone by Southwest Stone Co.

Van Zandt.—Natural-gas liquids were recovered at the Van gasoline plant of Pure Oil Co. Three oilfields (1 of which produced more than 1 million barrels of crude oil), yielded 9.3 million barrels of crude oil during 1956. Natural-gas production amounted to 4 billion cubic feet. The oil and gas industry completed 65 wells, 13 exploratory wells totaling 57,607 feet and 52 development wells. All exploratory wells proved dry upon completion.

The Morton Salt Co. recovered salt from mines and from wells near Grand Saline. The salt was processed in both open and vacuum pans into pressed blocks and rock salt.

Victoria.—The oil and gas industry produced 7.1 million barrels of crude oil from 49 oilfields and 105 billion cubic feet of natural gas in Victoria County in 1956. There were 74 wells completed by the oil and gas industry during 1956, 18 of which were exploratory wells totaling 122,747 feet, and 56 were development wells. Exploratory drilling proved 1 oil discovery, 4 new oil pays, 1 gas discovery, 1 new gas pay, and 11 dry holes.

Building and paving sand and gravel were produced from pits by the Fordyce Gravel Co. and by Heldenfels Bros.

Walker.—Bentonitic clay was recovered from open pits near Riverside by the Milwhite Co., Inc. The Sam Houston field in Walker County produced 9,000 barrels of crude oil.

Waller.—Natural-gas liquids were recovered at the Katy cycling plant of Humble Oil & Refining Co. The oil and gas industry produced 437,000 barrels of crude oil from 4 oilfields and 361 million cubic feet of natural gas during the year. The 5 exploratory wells, totaling 35,495 feet, all proved dry upon completion.

Paving gravel was produced for Division 12 of the Texas Highway Department and for the Waller County Road and Bridge Department.

Ward.—In all, 11.9 million barrels of crude oil was produced from 37 oilfields (1 of which yielded over 1 million barrels) and 20.4 billion cubic feet of natural gas was reported in Ward County in 1956. The Wickett Refining Co. processed crude oil at its Wickett refinery. Natural-gas liquids were recovered at the Sealy-Smith gasoline plant of El Paso Natural Gas Co., the Monahans plant of Gulf Oil Corp., and the Estes plant of Cabot Carbon Co. The oil and gas industry completed 282 wells in 1956, 19 exploratory wells totaling 11,290 feet and 263 development wells. Exploratory drilling proved 1 oil discovery, 1 new gas pay, and 17 dry holes.

Natural sodium sulfate was recovered and prepared from salt wells and dry lake brines near Monahans by Ozark Mahoning Co.

Building and paving sand and gravel were recovered from pits near Royalty by Permian Sand & Gravel Co., Inc. Limestone was quarried and crushed under contract for concrete aggregate and roadstone for Division 6 of the Texas Highway Department.

Washington.—Five oilfields yielded 304,000 barrels of crude oil in 1956, and 24 million cubic feet of natural gas was produced during the year. The oil and gas industry completed 3 wells, 1 exploratory well drilled to a depth of 7,659 feet proved dry.

Webb.—Gravel used for railroad ballast was produced from pits by Laredo Ready Mix Corp. Miscellaneous clay used in heavy clay

products was recovered from open pits near Laredo by E. C. Delachica Clay Co.

Production of 2 million barrels of crude oil from 46 oilfields and 58 million cubic feet of natural gas was reported in the county in 1956. There were 94 well completions, 27 exploratory and 67 development. Exploratory drilling totaling 97,566 feet resulted in 2 oil discoveries, 1 new oil pay, 1 gas extension, and 23 dry holes.

Wharton.—Natural-gas liquids were recovered at the West Bernard gasoline plant of Tide Water Oil Co. The oil and gas industry produced 7.1 million barrels of crude oil from 37 oilfields (2 of which produced more than 1 million barrels each) and 97.4 billion cubic feet of natural gas in 1956. Of 106 well completions in 1956, 38 wells totaling 241,352 feet were exploratory, and 68 were development wells. Exploratory drilling proved 1 oil discovery, 1 gas discovery, 2 new gas pays, and 34 dry holes.

Native sulfur was recovered by the Frasch process from Boling dome at New Gulf by Texas Gulf Sulphur Co.

Wheeler.—Carbon black was recovered at the Norrick furnace plant of United Carbon Co., Inc.

Natural-gas liquids were recovered at the McLean-28 gasoline plant of Warren Petroleum Corp.

Two oilfields, with the Wheeler County field producing more than 1 million barrels alone, yielded 1.4 million barrels of crude oil during 1956. Natural-gas production amounted to 13.1 billion cubic feet during the year. The oil and gas industry completed 2 exploratory wells totaling 11,500 feet; both were dry holes.

Limestone was quarried and crushed under contract for concrete aggregate and roadstone for Division 25 of the Texas Highway Department.

Wichita.—In all, 11.2 million barrels of crude oil was produced from 41 oilfields (2 of which yielded more than 1 million barrels of crude each) and 7.7 billion cubic feet of natural gas was produced in Wichita County in 1956. Natural-gas liquids were recovered at the Burkburnett gasoline plant of Magnolia Petroleum Co., the Electra plant of The Texas Co., the K. M. A. plant of Continental Oil Co., and the Mankins plant of Redco Corp. Crude oil was refined at the Wichita Falls refineries of American Petrofina, Inc., and Continental Oil Co. The oil and gas industry drilled 768 wells in 1956, of which 28 were exploratory wells totaling 94,959 feet and 740 were development wells. Exploratory drilling proved 2 oil discoveries, 1 new oil pay, 3 oil extensions, and 22 dry holes. A $750,000 Platformer unit to increase the high octane gasoline output to 6.5 million gallons a month was installed at the Wichita refinery of Panhandle Oil Corp. This unit increased the refinery's throughput from 7,000 to 8,000 barrels per day.

Building and paving sand and gravel were recovered from open pits by Foley Sand & Gravel Co., Gravel, Inc., and Northwest Materials Co. Miscellaneous stone and limestone were quarried and crushed under contract for Division 3 of the Texas Highway Department.

Wilbarger.—Natural-gas liquids were recovered at the Rock Crossing gasoline plant of the W. T. Waggoner Estate and the Electra plant of Magnolia Petroleum Co. Production of 5.7 million barrels of crude oil from 56 oilfields and 676 million cubic feet of natural gas

was reported in the county. The oil and gas industry completed 540 wells, 88 were exploratory wells totaling 311,083 feet, and 452 were development wells. Exploratory drilling proved 7 oil discoveries, 1 new oil pay, 3 oil extensions, and 77 dry holes.

Willacy.—The oil and gas industry produced 3.1 million barrels of crude oil from 19 oilfields and 5.3 billion cubic feet of natural gas during 1956. There were 30 wells completed during the year, 6 were exploratory wells totaling 53,408 feet, and 24 were development wells. Exploratory drilling proved 2 new oil pays and 4 dry holes.

Williamson.—Five oilfields yielded 45,000 barrels of crude oil in 1956. Natural-gas production amounted to 3 million cubic feet. There were 19 exploratory wells totaling 24,905 feet drilled in 1956; all proved dry upon completion.

The Round Rock White Lime Co. manufactured lime from limestone for use as building plaster and for chemical and industrial uses. Building and paving sand and gravel were produced by E. G. John. Limestone was quarried and crushed from pits near Round Rock by Round Rock White Lime Co., Superior Stone Products, Inc., from pits near Florence by Texas Carbonate Co., and from pits near Cedar Park by Texas Quarries, Inc. Principal uses of the crushed stone were for concrete aggregate, roadstone, refractory purposes, and in the manufacture of lime. Rough architectural stone was quarried and prepared from a pit near Cedar Park by Texas Quarries, Inc.

Wilson.—The W. S. Dickey Clay Manufacturing Co. recovered fire clay for heavy clay products from pits near Saspamco.

The oil and gas industry produced 826,000 barrels of crude oil from 19 oilfields and 33 million cubic feet of natural gas during 1956. Of 293 well completions during the year, 94 were exploratory wells totaling 262,291 feet, and 199 were development wells. Exploratory drilling proved 3 oil discoveries, 1 new oil pay, 12 oil extensions, and 78 dry holes.

Winkler.—Carbon black was recovered at the Kermit channel plant of Cabot Carbon Co. Natural-gas liquids were recovered at the Kermit gasoline plant of Magnolia Petroleum Co., the Rycade plant of Rycade Oil Corp., the Walton plant of Cabot Carbon Co., and the Keystone plant of Sid Richardson Gasoline Co. (elemental sulfur also was recovered at this plant).

There were 16.3 million barrels of crude oil from 38 oilfields (4 of which produced over 1 million barrels each) and 45.3 billion cubic feet of natural gas produced during the year. The oil and gas industry completed 173 wells, 16 were exploratory wells totaling 132,351 feet, and 157 were development wells. Exploratory drilling proved 1 oil discovery, 3 new oil pays, 1 oil extension, 3 new gas pays, 1 gas extension, and 7 dry holes.

Wise.—Limestone was quarried and crushed and used principally for concrete aggregate, roadstone, riprap, and as agricultural lime, near Bridgeport by Ft. Worth Sand & Gravel Co., Gifford-Hill & Co., Inc., Southwest Stone Co., and Wesco Stone Co. Miscellaneous clay or shale was mined from pits near Bridgeport for use in the manufacture of heavy clay products by Acme Brick Co. Paving gravel was produced under contract for Division 2 of the Texas Highway Department.

Natural-gas liquids were recovered at the Atlanta gasoline plant of Atlanta Gas Co. and the Chico plant of Cities Service Oil Co. The oil and gas industry produced 1.6 million barrels of crude oil from 62 oilfields and 7.3 billion cubic feet of natural gas during 1956. Of 180 well completions during 1956, 36 were exploratory wells totaling 209,991 feet, and 144 were development wells. Exploratory drilling proved 7 oil discoveries, 12 new oil pays, 2 oil extensions, 6 gas discoveries, and 9 dry holes.

Wood.—The oil and gas industry produced 23.3 million barrels of crude oil from 37 oilfields and 16 billion cubic feet of natural gas during 1956. The industry completed 48 wells; 19 were exploratory wells totaling 137,714 feet, and 29 were development wells. Exploratory drilling proved 1 oil discovery, 1 new oil pay, and 17 dry holes. Natural-gas liquids were recovered at the Caska gasoline plant of Caska Corp. and the Hawkins plant of Natural Gasoline Corp.

Yoakum.—Natural-gas liquids were recovered at the Wasson gasoline plant of Shell Oil Co. Production of 19.8 million barrels of crude oil from 25 oilfields (3 of which produced over 1 million barrels each) and 19 billion cubic feet of natural gas was reported in the county. There were 87 well completions in 1956; 13 were exploratory wells totaling 126,214 feet, and 74 were development wells. Exploratory drilling proved 2 oil discoveries, 1 new oil pay, and 10 dry holes.

Salt in brine was recovered from wells near Denver City by Frontier Chemical Co.

Young.—The oil and gas industry produced 7.6 million barrels of crude oil from 193 oilfields and 3.1 billion cubic feet of natural gas during 1956. Natural-gas liquids were recovered at the Le Bus gasoline plant of Le Bus Bros., and the Loving and Peters plants of Turner & West Gasoline Plant. Crude oil was processed at the Graham refinery of Gratex Corp. The oil and gas industry completed 689 wells; 150 were exploratory wells totaling 602,481 feet, and 539 were development wells. Exploratory drilling proved 22 oil discoveries, 13 new oil pays, 3 oil extensions, and 112 dry holes.

Zapata.—Twelve oilfields yielded 1.2 million barrels of crude oil during 1956. Natural-gas production amounted to 785 million cubic feet. Of 87 well completions during 1956, 33 were exploratory wells totaling 83,917 feet, and 54 were development wells. Exploratory drilling proved 2 oil discoveries, 1 gas discovery, 1 gas extension, and 29 dry holes.

Zavala.—Building and paving sand and gravel were recovered from pits near Uvalde by D & D Gravel Co.

Crude oil was produced from the Del Monte oilfield in Zavala County. Natural-gas production amounted to 876 million cubic feet during the year. Exploratory drilling in the oil and gas industry totaled 46,346 feet, proving 1 gas extension and 12 dry holes.

The Mineral Industry of Utah

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Utah Geological and Mineralogical Survey.

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker[1]

THE MINERAL industries continued to play a major role in the overall economy of Utah in 1956; new construction and expansion of plants and facilities related to these industries, begun or completed in 1956, aggregated an investment that exceedes $100 million.

The copper industry, dominating the mineral industries of the State, centered in the Salt Lake City area, embracing Salt Lake and Tooele Counties; this area continued to be one of the most important single mineral producing, milling, processing, smelting, and refining districts in the United States. The Utah Copper mine at Bingham in this area was the Nation's leading copper producer and furnished one-quarter of the entire domestic output. Molybdenum, produced as a byproduct of copper ore from this mine, was another of Utah's major mineral-commodity products. Iron-ore mining in Iron County continued to be an important component of State mineral industries.

Discovery of oil in the Aneth area, southeastern San Juan County, was the most significant development in the fuels industry and very important to the overall mineral industry of Utah in 1956. It started a drilling boom that led to development of substantial oil reserves in the Paradox basin and brought about the announcement of three pipeline projects, to Salt Lake City, to Los Angeles, and to connect with the crude-oil line system in eastern New Mexico and western Texas.

The total value of the mineral production in Utah rose from $331.9 million excluding uranium in 1955 to a new alltime record of $397.1 million including uranium in 1956. This 20-percent increase ($65.2 million) resulted mainly from a 23-percent advance ($39.2 million) in the value of copper output, which composed 54 percent ($213.0 million) of the total value of mineral output in the State in 1956. In terms of value of output by commodities, coal ranked second, supplied 8 percent of the total value of mineral production, and declined 14 percent ($5.6 million). The value of iron-ore shipments, which ranked third and

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TABLE 1.—Mineral production in Utah 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Asphalt and related bitumens: Gilsonite	82,822	$3,117,310	(2)	(2)
Clays	(2)	(2)	[3] 226,728	[3] $491,789
Coal	6,295,524	40,005,140	6,522,164	34,436,090
Copper (recoverable content of ores, etc.)	232,949	173,779,954	250,604	213,013,400
Fluorspar	7,328	151,140	10,581	265,449
Gem stones	[4]	6,000	[4]	10,000
Gold (recoverable content of ores, etc.)—troy ounces	441,206	15,442,210	416,031	14,561,085
Iron ore (usable)—long tons, gross weight	3,847,402	24,687,485	4,001,739	27,508,089
Lead (recoverable content of ores, etc.)	50,452	15,084,696	49,555	15,560,270
Lime	38,710	582,760	55,110	829,772
Natural gas—million cubic feet	17,163	2,386,000	17,268	2,435,000
Perlite	(2)	(2)	2,271	8,518
Petroleum (crude)—thousand 42-gallon barrels	2,227	5,140,000	2,466	5,302,000
Phosphate rock—long tons	(2)	(2)	124,773	771,585
Pumice	2,041	20,011	44,769	329,603
Salt	195,726	1,339,085	183,701	1,471,080
Sand and gravel	5,158,265	3,309,280	5,835,500	4,475,700
Silver (recoverable content of ores, etc.)—troy ounces	6,250,565	5,657,077	6,572,041	5,948,029
Stone	1,925,867	2,650,480	2,321,636	3,298,006
Tungsten concentrate—60-percent WO_3 basis	65	224,742	11	41,200
Uranium ore	[5]	[5]	927,850	22,500,000
Vanadium (recoverable content of ores, etc.)—pounds	995,873	(2)	1,098,802	(2)
Zinc (recoverable content of ores, etc.)	43,556	10,714,776	42,374	11,610,476
Value of items that cannot be disclosed: Carbon-dioxide (natural), cement, halloysite (1956), gypsum, molybdenum, natural gasoline, potash (K_2O), and values indicated by footnote 2		28,733,292		33,250,179
Total Utah [6]		[5] 331,929,000		396,942,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Value of low-grade manganese ore shipped to General Services Administration purchase depots ore is excluded.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[3] Excludes halloysite; value included with items that cannot be disclosed to avoid disclosing individual company confidential data.
[4] Weight not recorded.
[5] Excludes uranium; uranium figure for 1955 not released by Atomic Energy Commission.
[6] Total has been adjusted to eliminate duplicating the value of raw materials used in manufacturing cement and lime.

TABLE 2.—Average unit value of selected mineral commodities in Utah, 1955–56 [1]

Commodity	1955	1956	Commodity	1955	1956
Coal—short ton	$6.355	$5.280	Petroleum (crude) [4] 42-gallon barrel	$2.308	$2.150
Copper [2]—pound	.373	.425	Pumice—short ton	9.805	7.362
Fluorspar—short ton	20.625	25.087	Salt (common)—do	6.842	8.008
Gold [3]—troy ounce	35.000	35.000	Sand and gravel—do	.642	.767
Iron ore (usable)—long ton	6.417	6.874	Silver [5]—troy ounce	.905+	.905+
Lead [2]—pound	.149	.157	Stone—short ton	1.376	1.421
Lime—short ton	15.055	15.057	Tungsten concentrate short-ton unit	58.028	60.614
Natural gas thousand cubic feet	.139	.141	Zinc [2]—pound	.123	.137

[1] Based on average value f. o. b. mines or mills reported by the producers except as otherwise noted.
[2] Yearly average weighted price of all grades of primary metal sold by producers.
[3] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[4] Value at wells.
[5] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505.

was responsible for 7 percent of the total, increased 11 percent ($2.8 million). Other major commodities, accounting for 27 percent of the total, in order of value of output, included uranium, molybdenum, lead, gold, zinc, cement, silver, petroleum, sand and gravel, and asphalt and related bitumens. Sixteen other commodities furnished the remaining 4 percent of the total value of mineral production in the State in 1956.

Arsenic, selenium, tellurium, platinum, palladium, thallium, and other minor metals were recovered at smelters and refineries in Utah in 1956. It is known that some of the output of these minerals came from Utah ores, but the exact quantities are not known because some came from ores of other States and foreign countries. In most instances the content of these minerals is small in the ore, is not accounted for in the early metallurgical processing, and is not credited to the mine of origin. For these reasons, no production of these minerals was recorded for Utah in 1956.

Employment and Wages.—The Industrial Commission of Utah reported [2] that individuals in Utah in 1956 received $1,326 million in personal income—an amount equivalent to $1,633 for every man, woman, and child in the State. Wages and salaries made up 71 percent ($942 million) of this total amount. Two-thirds ($622 million) of the income arising through wages and salaries originated with industries covered by the Utah Employment Security Act. Of this amount, $81 million (6.1 percent of the total personal income for Utah) was paid to employees engaged in mining.

Data in this section are from a report [3] by the United States Department of Labor. The term "mining," as used in the tables, does not cover the entire employment in the mineral industries. Some employment in the mineral industries was included with contract construction because separate records were not kept by the firms for mining, quarrying, and removal of overburden. In addition, employment for smelting and refining ferrous and nonferrous metals from ores—an integral part of the mineral industries—was included with manufacturing. (Manufacturing has been excluded from table 3.)

The annual average employment in the mining industries in Utah was 6.6 percent of the total nonagricultural employment in 1956, compared with 6.3 percent in 1955. The average hourly earnings in Utah mining increased during the year from $2.26 in January to $2.44 in December. The average weekly hours were steady throughout the year in metal mining, but in bituminous-coal mining the average varied from a low of 31.9 hours in July to a high of 39.4 hours in December, following the usual seasonal pattern.

[2] The Industrial Commission of Utah, Department of Employment Security, Annual Report, 1956: 49 pp.
[3] U. S. Department of Labor, Bureau of Labor Statistics, Employment in the Mountain States, 1947–56: 21 pp.

TABLE 3.—Mining employment, 1947–51 (average) and 1952–56 [1] (in thousands)
[U. S. Department of Labor]

Industry	1947–51 (average)	1952	1953	1954	1955	1956
Mining [2]	12.8	13.4	13.6	13.0	14.0	15.4
Metal	7.5	8.2	8.2	8.3	9.4	10.4
Bituminous coal	4.4	3.8	4.0	3.2	3.0	3.1
Nonmetals and other mining and quarrying	.9	1.4	1.4	1.5	1.6	1.9
Contract construction [3]	11.2	11.9	11.4	11.6	14.6	15.4
Manufacturing [4]	28.3	30.8	32.4	31.2	33.4	35.1

[1] Excludes administrative and nonworking supervisory personnel.
[2] Includes milling, quarrying, well operation, exploration and development of mineral properties, and removal of overburden.
[3] Includes some employees engaged in mining, quarrying, and removal of overburden where work was done by contractors conducting other types of construction work other than mining where separate records were not kept for work in connection with the mineral industry.
[4] Includes smelting and refining of ferrous and nonferrous metals from ore which was a part of the mineral industry.

TABLE 4.—Hours and gross weekly earnings for mining and construction employees, 1956
[Utah Department of Employment Security in cooperation with U. S. Department of Labor]

Industry	Average hourly earnings	Average weekly hours	Average weekly earnings
Mining	$2.34	41.1	$96.17
Metal	2.17	42.2	91.67
Bituminous coal	2.85	36.6	104.31
Contract construction	2.61	39.3	102.57
Manufacturing [1]	2.07	40.1	83.01

[1] Gross earnings include overtime pay, shift differential, and special special incentive pay.

Defense Minerals Exploration Administration (DMEA).—The Federal Government continued to participate in financing exploration projects for strategic and critical minerals in Utah in 1956 with the program administered by the DMEA. During 1956, 12 DMEA contracts—10 for uranium, 1 for manganese, and 1 for lead-zinc—were executed for a total of $827,335, compared with $1,142,211 in 1955.

TABLE 5.—DMEA contracts executed during 1956

County and contractor	Property	Commodity	Contract		
			Date 1956	Total amount	Government participation (percent)
Emery					
Adams Uranium Co., Inc.	Red Buttes claims	Uranium	Aug. 7	$16,675	75
Pacific Uranium Mines Co.	Green River claims	do	Mar. 9	73,840	75
Twentieth Century Fuels, Inc.	Dirty Devil mine	do	Aug. 10	55,080	75
Grand					
Hamilton et al. and Simpson Mining Co.[1]	Beaver Mesa group	do	Aug. 1	291,510	75
Norbute Corp.	Sec. 36, T. 22 S., R. 21 W.	do	Mar. 9	45,000	75
Juab					
Black Jack Mining Co.	Black Jack claims	Manganese.	Mar. 12	24,160	75
Privateer Mining Co.	Hornet and Downcast claims.	Lead-zinc	Sept. 14	5,820	50
San Juan					
David Borwick	Gray Horse claims	Uranium	Oct. 25	5,360	75
La Sal Mining & Development Co.	La Sal project	do	Sept. 19	87,132	75
Radium King Mines, Inc.	Big Joe claim	do	Aug. 31	26,280	75
Standard-Col-U-Mex	Ruby Bell et al. claims	do	Oct. 29	38,474	75
Westmont Explorations, Ltd.	Sun Dog et al. claims	do	Aug. 3	158,004	75
Total				827,335	75

[1] Property in Mesa County, Colo., and Grand County, Utah. Value of contract has been split 50–50.

TABLE 6.—Major mineral industry projects started or completed in 1956 [1]

Company	Project	Product	Investment	Location	Date completed or anticipated
Alpha Mining & Milling Corp.	Refinery	Columbium-tantalum	Figures not released	North Salt Lake	February 1957.
American Gilsonite Co	80-mile pipeline	Transporting gilsonite	$16 million (including refinery and development work).	Pipeline: Bonanza, Utah, to refinery near Grand Junction, Colo.	Spring 1957.
	4-compartment shaft and preparation facilities.	Mining and preparation of gilsonite.	do	Bonanza	Spring 1956.
Bonneville, Ltd	Prilling plant	Prilled potash products	$250,000	Near Wendover	Tuneup December 1956; production January 1957.
Calera Mining Co	Electrolytic addition to refinery.	Cobalt metal	$750,000	Garfield	Late in 1957.
	Howe Sound Co. Research Center.	Metallurgical research	$200,000	Salt Lake City	May 1956.
Chemical Salt Production Co.	Solar-evaporation plant	Salt for chlorine and other industries.	$370,000	Near Grantsville	March 1956.
Combined Metals Reduction Co.	Refinery rebuilding and modernization.	Resin from fossil fuels	$300,000	Bauer, Tooele County	June 1956.
Garfield Chemical & Manufacturing Co.	Acid-plant addition and expansion.	Sulfuric acid	$2.75 million	Garfield	December 1956.
General Refractories Co	New plant construction	Fire brick	Figures not released	Lehi	September 1956.
Interstate Brick Co	Automatic tunnel kiln	Building brick	$500,000	Salt Lake City	May 1956.
Kennecott Copper Corp.: Bear Creek Mining Co. Division.	Exploration program	Lead-zinc	$8.5 million	Tintic district, Utah County.	
Utah Copper Division	Haulage tunnel	Copper	$12.9 million	West Mountain (Bingham) district, Salt Lake County.	October 1959.
	Vertical casting facilities at electrolytic refinery.	Copper cakes and billets	$2 million	Garfield	Cake facilities, June 1956; billet, November 1956.
Knight Ideal Coal Co	Installation of 150-ton-per-hour dense-medium coal-cleaning plant.	Coal	Figures not released	Knight mine, Carbon County.	Mid-1956.
Lion Coal Co	Installation Parry drier	do	do	Wattis	August 1956.
Northwest Pipeline Corp	Transmission line	Moving petroleum crudes	$15 million	Four Corners area to Salt Lake City.	December 1957.
Pacific Chemicals Co	Low-temperature carbonization pilot plant.	Coal chemicals and char	Eventually $350,000	Wellington near Price	Rehabilitation and improvement of pilot plant continuing.
Pacific Northwest Pipe Line Corp.	Transmission system	Natural gas	$250 million	San Juan Basin to Canada	Gas at Vancouver, B. C., October 1956.
Phillips Petroleum Co	Processing and blending facilities.	Asphalt, primarily for construction industry.	Figures not released	Woods Cross	September 1956.
Salt Lake Pipeline Co	Transmission-line expansion	Moving refined petroleum products.	$1 million	Salt Lake City to Spokane.	November 1956.

Salt Lake Refining Co	Platinum re-former	High-octane gasoline	Multimillion	North Salt Lake	September 1957.
Salt Lake Tungsten Co	Refinery addition	Ammonium paratungstate (high-purity tungsten for open market).	APT unit $40,000, other facilities $30,000.	Salt Lake City	Initial phase, May 1956; more in 1957.
Sure Seal Corp	Wax refinery	Wax products	$1 million programed between October 1955 and June 1957.	Woods Cross	Production now 750,000 lb. paraffins per month; anticipated at 1.5 million by June 1957.
Texas-Zinc Minerals Corp	Uranium mill and related facilities.	Uranium concentrate	Multimillion	Mexican Hat on Navajo Indian Reservation, San Juan County.	September 1957.
United States Fuel Co	Resin flotation plant	Resin concentrate	Not released	Hiawatha	November 1956.
	Surge-bin facility	Coal	do	do	January 1956.
United States Steel Corp., Columbia-Geneva Division.	Ammonia-nitrogen plant	Anhydrous ammonia, nitric acid, and ammonium nitrate.	$18 million	Columbia-Geneva works near Provo.	Tuneup operations to begin January 1957.
	Increase of open-hearth-furnace facilities from 260 to 300 tons daily capacity.	Steel ingots	$9 million		Mid-1957.
	Addition to existing coal-chemical plant.	Improved-quality ammonium sulfate.	No cost estimate given		Early spring, 1957.
Uranium Reduction Co	Uranium mill	Uranium concentrate	$8.25 million	Moab	Tuneup begun in October 1956; production in November 1956.
Utah Oil Refining Co	Ultraformer	High-octane gasoline	$3.5 million	Salt Lake City	August 1956.
	Laboratory and research building.	Analytical and research activities.	$145,000	do	Do.
Vitro Uranium Co	Uranium-mill expansion and conversion to solvent extraction.	Uranium concentrate	$1.2 million	do	Latter part of 1957.
Western Phosphates, Inc	Expansion and improvement program.	Triple superphosphate, nitrogen phosphate, and eventually potash-containing fertilizer products.	Multimillion	Garfield	Continuous program will continue into 1958.
Western States Refining Co	Houdriformer	High-octane gasoline	$300,000	North Salt Lake	December 1956.

[1] Sources: Intermountain Industry & Mining Review, vol. 59, No. 1, January 1957, pp. 41–42. Chemical Engineering, Mid-September 1956 Inventory Issue, pp. 46–68.

REVIEW BY MINERAL COMMODITIES

METALS

Cobalt.—In 1956 Calera Mining Co. continued to produce cobalt shot and granular cobalt material at its Garfield refinery, using an acid-leach process. Mill concentrate for the plant came from Calera's Blackbird mining and milling operation at Cobalt, Idaho. During 1956 the company—a subsidiary of Howe Sound Co.—started constructing a $750,000 electrolytic cobalt refinery at Garfield that will be capable of producing 8,000 pounds per day of high-specification

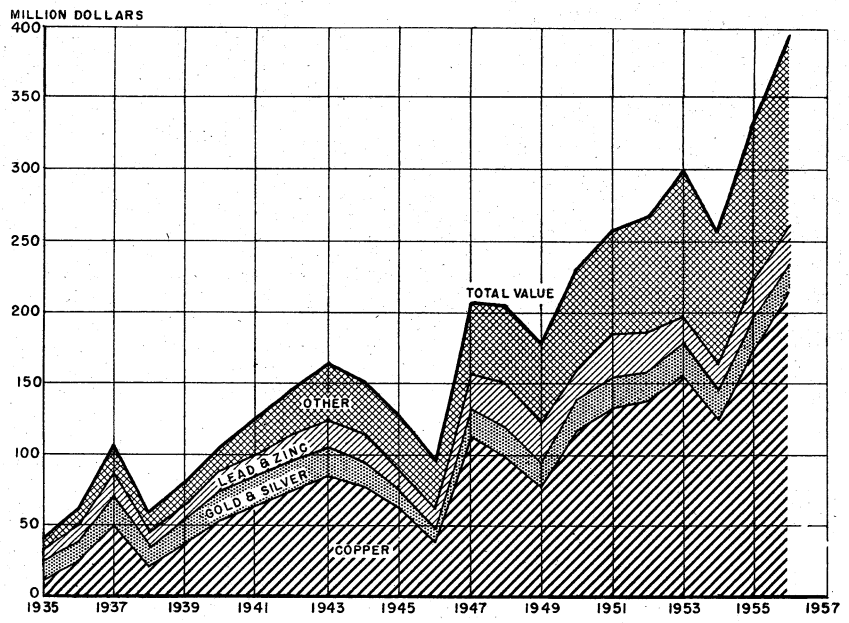

FIGURE 1.—Value of gold, silver, copper, lead, and zinc, and total value of all minerals in Utah, 1935–56.

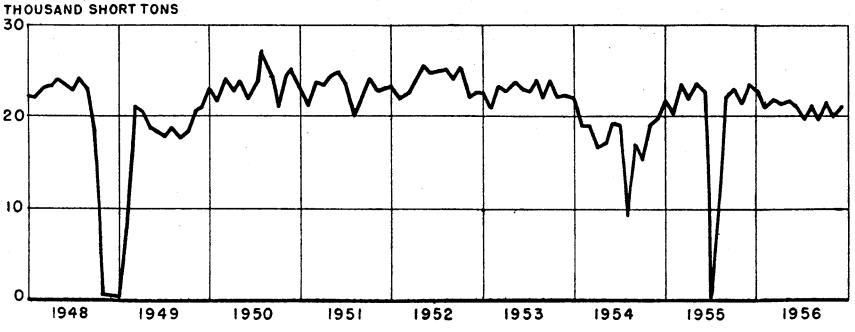

FIGURE 2.—Mine production of copper in Utah, 1948–56, by months, in terms of recoverable metals.

cobalt in the form of broken cathodes. The company expected to have the new plant in operation by late 1957.

Copper.—Utah copper production in 1956 increased 8 percent in quantity and 23 percent in value, compared with 1955. In copper output for 1956 Utah was exceeded only by Arizona; it was two and one-half times that of the third largest copper-producing State—Montana. The value of copper output was 54 percent ($213.0 million) of the total value of all mineral production ($397.1 million) in Utah in 1956.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total, 1864–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947-51 (average)	99	2	28,266,186	398,782	$13,957,363	7,388,943	$6,687,288
1952	63		32,875,034	435,507	15,242,745	7,194,109	6,511,032
1953	55	1	30,682,662	483,430	16,920,050	6,725,807	6,087,195
1954	54		24,846,805	403,401	14,119,035	6,179,243	5,592,527
1955	63		28,598,662	441,206	15,442,210	6,250,565	5,657,077
1956	91		33,232,267	416,031	14,561,085	6,572,041	5,948,029
1864-1956			[3] 861,169,048	14,816,462	418,801,210	789,038,998	587,318,061

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947-51 (average)	248,100	$107,059,026	50,785	$16,130,646	38,366	$10,635,861	$154,470,184
1952	282,894	136,920,696	50,210	16,167,620	32,947	10,938,404	185,780,497
1953	269,496	154,690,704	41,522	10,878,764	29,184	6,712,320	195,289,023
1954	211,835	124,982,650	44,972	12,322,328	34,031	7,350,696	164,367,236
1955	232,949	173,779,954	50,452	15,034,696	43,556	10,714,776	220,628,713
1956	250,604	213,013,400	49,555	15,560,270	42,374	11,610,476	260,693,260
1864-1956	7,388,720	2,711,073,025	4,909,675	639,874,484	1,356,931	238,477,919	4,595,544,699

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailing or slime re-treated; and ore, old tailing, or copper precipitate shipped to smelters during the calendar year indicated.
[2] Does not include gravel washed or tonnage of precipitate shipped.
[3] Figures estimated for certain years before 1901.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	38,607	536,857	22,379	3,589	3,079
February	35,800	518,113	20,628	4,110	3,311
March	36,007	545,045	21,583	3,869	3,388
April	36,547	514,220	21,175	3,533	3,239
May	37,184	584,592	21,494	4,337	3,668
June	33,677	608,767	21,002	4,630	3,718
July	28,582	505,754	19,455	4,353	3,473
August	30,346	560,854	20,979	3,391	2,942
September	34,722	562,627	19,650	4,234	3,754
October	34,665	559,240	21,438	4,373	3,943
November	33,978	537,727	19,917	4,485	3,886
December	35,916	538,245	20,904	4,651	3,973
Total	416,031	6,572,041	250,604	49,555	42,374

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties and districts, in terms of recoverable metals

County and district	Mines producing [1] (lode)	Lode material sold or treated [2] (short tons)	Gold		Silver		Copper		Lead		Zinc		Total value
			Fine ounces	Value	Fine ounces	Value	Pounds	Value	Pounds	Value	Pounds	Value	
Beaver County:													
Beaver Lake	3	1,075	4	$140	261	$236	42,200	$17,935					$18,311
Lincoln	2	72	8	280	235	213	6,500	2,762					3,255
Rocky	1	23			19	17	600	255					272
San Francisco	2	3,559	12	420	986	892	152,000	64,600	700	$110	400	$55	66,077
Star and North Star	2	46	2	70	289	262	1,300	553	8,000	1,256			2,141
Total	10	4,775	26	910	1,790	1,620	202,600	86,105	8,700	1,366	400	55	90,056
Box Elder County:													
Lucin	1	12			70	63	100	43	200	31			137
Promontory	1	4			2	2			400	63	500	68	133
Total	2	16			72	65	100	43	600	94	500	68	270
Davis County	1	13			2	2	1,100	467					469
Grand County: Salt Valley	3	124			121	110	4,100	1,743	100	16			1,869
Juab County:													
Detroit (Drum Mountain)	2	173	15	525	441	399	8,200	3,485					4,409
Fish Springs	1	7			111	100			1,400	220	100	14	334
Mount Nebo (Mona)	2	2,741	1	35	1,330	1,204			179,600	28,197	11,400	1,562	30,998
Tintic [3]	12	77,588	2,414	84,490	369,060	334,018	164,800	70,040	6,121,800	961,122	2,237,000	306,469	1,756,139
West Tintic	1	4			2	2	300	128					130
Total	18	80,513	2,430	85,050	370,944	335,723	173,300	73,653	6,302,800	989,539	2,248,500	308,045	1,792,010
Piute County:													
Mount Baldy	1	44	13	455	1,166	1,055	200	85	400	63	600	82	1,740
Ohio	1	130	12	420	1,051	951	2,200	935	1,600	251			2,557
Total	2	174	25	875	2,217	2,006	2,400	1,020	2,000	314	600	82	4,297
Salt Lake County:													
Big Cottonwood, Little Cottonwood, and Smelter [4]	4	48,541	9	315	6,879	6,226	23,900	10,158	940,100	147,595	7,147,200	979,166	1,143,460
West Mountain (Bingham)	5	32,689,659	393,227	13,762,945	4,540,530	4,109,409	498,834,900	212,004,832	65,781,400	10,327,680	48,620,800	6,661,050	246,865,916
Total	9	32,738,200	393,236	13,763,260	4,547,409	4,115,635	498,858,800	212,014,990	66,721,500	10,475,275	55,768,000	7,640,216	248,009,376
San Juan County: White Canyon	1	360			456	413	66,500	28,262					28,675

Sevier County:													
Henry	2	12	10	350	600	543							893
Redmond	1	4			7	6			100	16	2,700	370	392
Total	3	16	10	350	607	549			100	16	2,700	370	1,285
Summit County: Uintah	6	241,013	3,945	138,075	945,319	855,561	444,200	188,785	12,427,400	1,951,102	15,059,500	2,063,151	5,196,674
Tooele County:													
Blue Bell	2	69	1	35	669	605			25,300	3,972			4,612
Clifton	8	101	6	210	1,036	938	4,500	1,213	16,800	2,638	200	27	5,726
Columbia	1	9			12	11			2,200	345	400	55	411
Dugway	1	35	1	35	139	126	100	42	14,600	2,292	8,600	1,178	3,673
Erickson	1	188	1	35	122	110	100	42	9,700	1,523	15,400	2,110	3,820
Lakeside	1	1			3	3			700	110			113
Ophir	4	15,421	120	4,200	169,281	98,905	212,900	90,483	1,924,300	302,115	1,341,800	183,827	679,530
Rush Valley	3	60,009	2,035	71,225	198,069	179,262	83,100	35,318	5,058,400	794,169	3,070,100	420,604	1,500,578
Smelter		1,787	5	175	840	760	8,000	3,400	39,400	6,186	174,300	23,879	34,400
Total	21	77,620	2,169	75,915	310,171	280,720	308,700	131,198	7,091,400	1,113,350	4,610,800	631,680	2,232,863
Utah County:													
American Fork	1	12			78	71			3,300	518			589
Tintic [3]	8	11,480	477	16,695	128,140	115,973	47,300	20,102	678,400	106,509	150,200	20,577	279,856
Total	9	11,492	477	16,695	128,218	116,044	47,300	20,102	681,700	107,027	150,200	20,577	280,445
Wasatch County: Blue Ledge	2	75,712	13,702	479,570	252,971	228,952	877,300	372,852	5,866,700	921,072	6,906,800	946,232	2,948,678
Washington County:													
Harrisburg (Leeds)	1	706	4	140	11,257	10,188	3,600	1,530					11,858
Tutsagubet	3	1,533	7	245	487	441	218,000	92,650	7,000	1,099			94,435
Total	4	2,239	11	385	11,744	10,629	221,600	94,180	7,000	1,099			106,293
Total: 1956	91	33,232,267	416,031	14,561,085	6,572,041	5,948,029	501,208,000	213,013,400	99,110,000	15,560,270	84,748,000	11,610,476	260,693,260
1955	63	28,598,662	441,206	15,442,210	6,250,565	5,657,077	465,898,000	173,779,954	100,904,000	15,034,696	87,112,000	10,714,776	220,628,713

[1] Operation at slag dumps and old mill or miscellaneous cleanups not counted as a producing mine.
[2] Does not include tonnage of precipitate shipped.
[3] Tintic district lies in both Juab and Utah Counties.
[4] Figures combined to avoid disclosing individual company confidential data.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	1	8	3	5			
Dry gold-silver	22	113,350	2,920	392,284	393,900	1,271,900	600
Dry silver	23	31,646	824	235,343	127,000	1,345,100	1,100
Total	49	145,004	3,747	627,632	520,900	2,617,000	1,700
Copper	15	32,322,279	379,022	2,925,627	486,548,600		
Copper-lead	1	20		224	1,600	2,000	
Copper-lead-zinc	1	50		27	200	700	400
Lead	25	21,928	839	183,487	105,300	3,448,200	344,700
Lead-zinc	18	574,871	29,857	2,561,327	3,661,800	89,230,000	74,897,800
Zinc	2	11		26		500	6,800
Total	55	32,919,159	409,718	5,670,718	490,317,500	92,681,400	75,249,700
Other "lode" material:							
Old tailings [2]	6	117,190	2,551	268,004	224,000	2,957,400	2,222,300
Copper precipitates	2	6,505			10,049,400		
Old slag [3]	4	50,914	15	5,687	96,200	854,200	7,274,300
Total	12	174,609	2,566	273,691	10,369,600	3,811,600	9,496,600
Total "lode" material	91	33,238,772	416,031	6,572,041	501,208,000	99,110,000	84,748,000

[1] Details will not necessarily add to totals, because some mines produce more than 1 class of material.
[2] Silver, 79,688 tons; lead-zinc, 37,502 tons.
[3] Copper, 1,068 tons; lead, 1,042 tons; zinc, 48,804 tons.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Concentration, and smelting of concentrates:					
Ore	408,843	5,487,017	489,966,400	89,260,900	74,780,900
Old tailings	1,153	62,105	45,000	1,749,800	2,202,700
Total	409,996	5,549,122	490,011,400	91,010,700	76,983,600
Direct-smelting:					
Ore	4,622	811,333	872,000	6,037,500	470,500
Copper precipitates			10,049,400		
Old tailings	1,398	205,899	179,000	1,207,600	19,600
Old slag	15	5,687	96,200	854,200	7,274,300
Total	6,035	1,022,919	11,196,600	8,099,300	7,764,400
Grand total	416,031	6,572,041	501,208,000	99,110,000	84,748,000

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and classes of material processed, in terms of recoverable metals

A. For material treated at mills

	Material treated (short tons)	Concentrate shipped to smelters and recoverable metals					
		Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
	BY COUNTIES						
Beaver	50	5	----------	27	200	700	400
Juab	20,093	5,943	396	81,666	21,800	2,488,800	2,046,100
Salt Lake	32,681,185	989,986	392,669	4,450,285	488,679,600	64,638,400	48,575,300
Summit	83,427	20,369	1,087	459,389	143,400	11,088,300	15,039,600
Tooele	75,195	13,204	2,144	303,341	288,600	6,927,800	4,415,400
Wasatch	75,578	17,461	13,700	252,642	877,100	5,866,700	6,906,800
Washington	252	10	----------	1,772	700	----------	----------
Total: 1956	32,935,780	1,046,978	409,996	5,549,122	490,011,400	91,010,700	76,983,600
1955	28,346,943	927,349	436,000	5,488,251	451,988,400	93,906,150	78,686,500
	BY CLASSES OF MATERIAL TREATED						
Dry silver: Crude ore	252	10	----------	1,772	700	----------	----------
Copper: Crude ore	32,321,100	843,399	379,005	2,924,494	486,304,400	----------	----------
Copper-lead-zinc: Crude ore	50	5	----------	27	200	700	400
Lead: Crude ore	2,700	171	1	1,177	----------	175,300	----------
Lead-zinc: Crude ore	574,176	199,269	29,837	2,559,547	3,661,100	89,084,900	74,780,500
Old tailings	37,502	4,124	1,153	62,105	45,000	1,749,800	2,202,700
Total 1956	32,935,780	1,046,978	409,996	5,549,122	490,011,400	91,010,700	76,983,600
	BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS						
Copper		844,405	379,128	2,942,473	486,767,800	48,400	----------
Copper-lead		7,242	9,474	284,858	560,800	7,155,100	115,200
Copper-lead-zinc		1	6	246	100	1,500	300
Iron [1]		49,757	5,476	150,336	287,800	1,203,900	42,900
Lead		73,839	10,428	1,819,810	1,311,600	75,626,200	1,451,200
Lead-zinc		1,640	976	56,448	32,400	1,688,400	214,200
Zinc		70,094	4,508	294,951	1,050,900	5,287,200	75,159,800
Total 1956		1,046,978	409,996	5,549,122	490,011,400	91,010,700	76,983,600

See footnotes at end of table.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Beaver	4,725	26	1,763	202,400	8,000	
Box Elder	16		72	100	600	500
Davis	13		2	1,100		
Grand	124		121	4,100	100	
Juab	60,420	2,034	289,278	151,500	3,814,000	202,400
Piute	174	25	2,217	2,400	2,000	600
Salt Lake	63,520	567	97,124	10,179,200	2,083,100	7,192,700
San Juan	360		456	66,500		
Sevier	16	10	607		100	2,700
Summit	157,586	2,858	485,930	300,800	1,339,100	19,900
Tooele	2,425	26	6,830	20,100	163,600	195,400
Utah	11,492	477	128,218	47,300	681,700	150,200
Wasatch	134	2	329	200		
Washington	1,987	11	9,972	220,900	7,000	
Total: 1956	302,992	6,035	1,022,919	11,196,600	8,099,300	7,764,400
1955	260,049	5,206	762,314	13,909,600	6,997,850	8,425,500
BY CLASSES OF MATERIAL						
Dry gold: Crude ore	8	3	5			
Dry gold-silver: Crude ore	113,350	2,920	392,284	393,900	1,271,900	600
Dry silver:						
Crude ore	31,394	824	233,571	126,300	1,345,100	1,100
Old tailings	79,688	1,398	205,899	179,000	1,207,600	19,600
Copper:						
Crude ore	1,179	17	1,133	244,200		
Precipitates	6,505			10,049,400		
Old slag	1,068	5	377	65,600	7,000	
Copper-lead: Crude ore	20		224	1,600	2,000	
Lead:						
Crude ore	19,228	838	182,310	105,300	3,272,900	344,700
Old slag	1,042	5	840	3,900	33,100	
Lead-zinc: Crude ore	695	20	1,780	700	145,100	117,300
Zinc:						
Crude ore	11		26		500	6,800
Old slag	48,804	5	4,470	26,700	814,100	7,274,300
Total: 1956	302,992	6,035	1,022,919	11,196,600	8,099,300	7,764,400

[1] From lead-zinc ore and lead-zinc tailing.

Utah Copper Division of Kennecott Copper Corp., the Nation's leading copper producer, furnished one-quarter of the entire domestic copper output and 99 percent of the State output in 1956. A record production from this operation was reported in 1956; copper output increased 8 percent, and ore mined and milled increased 17 percent, compared with 1955. Most of the advance in copper output in the State resulted from this gain. The U. S. and Lark mine of the United States Smelting Refining and Mining Co. was the second-ranking copper producer in Utah. Copper was recovered from copper, lead, zinc, and iron (pyrite) concentrates produced from the ore (classed as lead-zinc ore) mined and milled. Copper also was recovered from ore (classed as silver and lead ores) and copper precipitate shipped directly to the smelter from the mine. The next-

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1956, by methods of recovery and classes of material processed, in terms of gross metal content

Class of material	Material shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Copper	844,405	379,128	2,942,473	491,901,357	80,731	78,964
Copper-lead	7,242	9,474	284,858	728,386	7,414,236	1,291,494
Copper-lead-zinc	1	6	246	116	1,554	353
Iron [1]	49,757	5,476	150,336	384,038	1,254,619	1,253,287
Lead	73,839	10,428	1,819,810	1,708,582	78,260,415	8,976,957
Lead-zinc	1,640	976	56,448	38,090	1,717,587	271,098
Zinc	76,094	4,568	294,951	1,236,452	5,566,691	76,929,304
Total: 1956	1,046,978	409,996	5,549,122	495,997,021	94,295,833	88,801,457
1955	927,349	436,000	5,488,251	457,045,016	97,344,446	89,312,115
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold: Crude ore	8	3	5	16		
Dry gold-silver: Crude ore	113,350	2,920	392,284	402,463	2,076,402	797
Dry silver:						
Crude ore	31,394	824	233,571	130,522	2,218,595	39,178
Old tailings	79,688	1,398	205,899	182,879	2,063,720	24,797
Copper:						
Crude ore	1,179	17	1,138	249,629		
Precipitates	6,505			10,202,629		
Old slag	1,068	5	377	66,987	11,648	
Copper-lead: Crude ore	20		224	1,699	3,325	
Lead:						
Crude ore	19,228	838	182,310	135,788	3,374,632	436,317
Old slag	1,042	5	840	5,242	34,512	
Lead-zinc: Crude ore	695	20	1,781	1,397	148,171	148,075
Zinc:						
Crude ore	11		35	37	599	7,946
Old slag	48,804	5	5,758	224,888	865,540	8,601,229
Total: 1956	302,992	6,035	1,024,222	11,604,176	10,737,144	9,258,339
1955	260,049	5,260	766,167	14,371,362	8,870,711	10,637,186

[1] From lead-zinc ore and lead-zinc tailing.

ranking copper producer in the State was the Mayflower-Park Galena operation of New Park Mining Co., where copper was recovered as a byproduct of lead-zinc ore mined and milled.

Gold.—Gold output in Utah declined 6 percent in 1956 compared with 1955, but the State continued to rank second only to South Dakota in terms of quantity of gold produced. This drop in output primarily was the result of decreased production from 2 (Utah Copper and Mayflower-Park Galena) of the 3 leading gold producers. The leading 3 (including U. S. and Lark) supplied 98 percent of the total gold output in Utah in 1956. Most of the gold (98 percent) was recovered from ores of copper, lead, and lead-zinc, but 1 percent came from ores of gold and silver and 1 percent from old tailing and old slag. The decreased production of gold in 1956 can be attributed directly to a drop in the gold content of the copper and lead-zinc ores mined at the major Utah producers.

Iron Ore.—As the result of increased demand for pig iron and steel, shipments of iron ore from deposits in Utah in 1956 advanced 4 percent above 1955. Shipments by the major iron-ore producer (Colum-

bia Iron Mining Co., subsidiary of United States Steel Corp.) was limited to 11 months in 1956 because of a labor strike during July at the Geneva and Ironton works of the corporation Columbia-Geneva Division. Iron ore was mined by 4 companies in 1956 from 10 open-pit operations in Iron County and shipped directly to markets without concentration. The ore averaged 52.4 percent iron and was used for making pig iron and steel, except for a small quantity for paint pigment.

TABLE 14.—Shipments of usable iron ore, 1947–51 (average), 1952–56, and total 1906–56

Year	Long tons	Value	Year	Long tons	Value
1947–51 (average)	3,300,291	$5,415,805	1955	3,847,402	$24,687,485
1952	3,990,505	15,025,899	1956	4,001,739	27,508,089
1953	4,617,288	26,496,950			
1954	3,040,646	19,277,434	1906–56	46,652,517	157,349,058

Columbia Iron Mining Co. ore shipments (hematite mixed with a small quantity of magnetite) from the Desert Mound and Iron Mountain mines went to the company blast and open-hearth furnaces at Geneva and Ironton, Utah. The second-ranking iron-ore producer in Utah—Colorado Fuel & Iron Corp.—shipped magnetite ore from the Blowout, Comstock, and Duncan mines to its plant at Pueblo, Colo., for use in making pig iron and steel. The Utah Construction Co. shipped hematite ore from the Excelsior mine to domestic consumers and to Japan. Helene E. Beatty mined magnetite ore from the Blue Jay, Juniper, Splinter, and Great Western Placer claims for shipment to domestic markets.

The Columbia Iron Mining Co. purchased 18 iron-ore claims, which are a part of the Rex ore body in the Iron Mountain area west of Cedar City, Utah, for a reported $1 million in 1956. An expansion program to increase production capacity of its 10 open-hearth furnaces from 1.9 million to 2.2 million ingot tons per year was continued at the Columbia-Geneva Division works. Consolidated Western Steel Pipe Co., another United States Steel Corp. subsidiary, reported installation of facilities at its plant near Geneva for manufacturing small-diameter, resistant-welded line and water pipe in sizes from 4 to 12¾ inches.

Lead.—In 1956 the quantity of lead produced in Utah decreased 2 percent, but the value of the lead output increased 3 percent because of the higher price throughout the year for lead compared with 1955. The higher price virtually stabilized lead output but apparently was not enough to encourage Utah miners to expand operations, reopen closed mines, or intensify exploration and development.

The U. S. and Lark mine at Bingham, operated by United States Smelting Refining and Mining Co., remained the leading lead producer in Utah by far. It was followed in order of output by four mines operated by United Park City Mines Co., New Park Mining Co., Eagle & Blue Bell Mining Co., and Combined Metals Reduction Co., respectively. The total lead output from these 5 mines was 91 percent of the Utah lead production in 1956.

New Park Mining Co. activity at the Mayflower-Park Galena mine was suspended on August 30 and resumed September 17 on a curtailed basis. Early in March the company, which had been shipping its ore to Combined Metals Reduction Co. Bauer mill, signed a milling agreement with the United States Smelting Refining and Milling Co. to treat the New Park ore at its Midvale concentrator and smelter. As a result of this, operations at the Bauer mill of Combined Metals were materially reduced.

It was reported that United Park City Mines Co. made several encouraging discoveries of ore in its mine during 1956 and that the company spent approximately $1 million on exploration and development and increased monthly ore production from 6,500 to more than 7,000 tons.

Bear Creek Mining Co.—a Kennecott Copper Corp. exploration subsidiary—completed agreements with several firms having properties in the Tintic district, Utah County, for an extensive exploration program involving 10,000 acres of claims and a possible expenditure of $8.5 million. The company already had done considerable drilling on the properties. It contracted with Centennial Development Co. for sinking a 1,020-foot-deep, 2½-compartment shaft on ground held by the Apex Standard Mining Co., an affiliate of Chief Consolidated Mining Co.

In 1956 a DMEA contract for a total amount of $5,820 was written between the United States Government and the Privateer Mining Co. on the basis of equal shares financial participation for lead-zinc exploration on the Hornet & Downcast claims.

Manganese and Manganiferous Ore and Concentrate.—A total of 3,019 long dry tons of ore (or concentrate) averaging 26.5 percent manganese valued at $106,346 and 117 tons of ore (or concentrate) with an average manganese content of 35.5 percent and valued at $7,394 was shipped from Utah mines in 1956 to the Government (GSA) Butte (Mont.) Purchasing Depot. This material was marketed under the low-grade, manganese-ore-purchasing program and will be credited as production in the year a useful product is shipped from the depot. The ore came from 4 mines—2 in Juab County and 1 each in Millard and Weber Counties. In 1956, as in 1955, the Black Boy and Staats Manganese mines in Juab County, operated by L. J. Price and Fred Staats, respectively, were the major manganese-ore producers in Utah. A DMEA contract was executed during the year for manganese exploration on the Black Jack claims by Black Jack Mining Co.; Government participation was 75 percent of the total cost ($24,160).

Molybdenum.—As in past years, the Utah Copper mine—a Utah Copper Division-Kennecott Copper Corp. operation—was the only producer of molybdenum in Utah in 1956. Molybdenum concentrate was recovered as a flotation byproduct of the treatment of copper ore from this mine at the company Arthur and Magna concentration mills. Output in 1956 was virtually the same as 1955, but the value was higher because of the increased price for molybdenum in 1956.

Silver.—In terms of silver output, Utah ranked third in the United States in 1956, with Idaho first and Montana second. Production was 5 percent above 1955. Eighty-six percent of the silver output was recovered as a byproduct of ores of copper, lead, and zinc; 10

percent came from ores of gold and silver; and the remaining 4 percent was derived from old tailing and slag. In 1956 silver output from the two leading producers was increased. The top five (listed in order of silver output) were Utah Copper, U. S. and Lark, United Park City Mines, Mayflower-Park Galena, and Ontario dump. These mines accounted for 84 percent of the total Utah silver production.

Tungsten.—In 1956 tungsten output from Utah mines was one-sixth of that reported in 1955. Part of this drop was attributable to the uncertainty of the Government domestic tungsten purchase program. The purchase quota of the program was filled in May, and the new law extending the program was enacted in July. Under the new program the price was $55 per short-ton unit of WO_3, compared with the previous price of $63. The funds for the new program were exhausted early in December.

Production in 1956 came from 10 mines in 5 counties. Millard County furnished 67 percent of the value of the tungsten production in Utah. Mid-States Development, Inc.—1 of the 3 tungsten-mining operations in Millard County—was the largest tungsten producer in the county and the State in 1956. The Treasure Mountain Mining Co. operation, also in Millard County, was the second largest tungsten producer in the State.

In 1956 an agreement was executed between Rigby Bros. and three operating companies (Sun Uranium Co., Lucky Star Uranium Co., and Baggs Uranium Co.) for mining and milling tungsten ores from claims in the Desert Peak area of the Newfoundland Range near Groome, 80 miles west of Ogden. To treat the ore the Sun Star Milling Co.—an affiliate of the three companies—purchased the H. M. & S. tungsten mill in Salt Lake City.

In addition to treating custom ores from Utah, the Salt Lake Tungsten Co. synthetic scheelite plant in Salt Lake City processed concentrate from the Mineral Engineering Co. property at Glen, Mont. The Salt Lake Tungsten Co. continued to operate its ammonia paratungstate unit of the plant, which bypasses several "end-refining" operations required in processing of artificial scheelite. Part of this product was used for electric light filaments.

Uranium.—Utah mine production of uranium ore for the period July 1955 to June 1956 totaled 772,000 tons, averaging 0.31 percent contained U_3O_8. Production information is based on data supplied to the Federal Bureau of Mines by the AEC. The State tonnage represented 35 percent of domestic total for the period. Major producing counties in Utah were San Juan, Emery, Piute, and Grand.

The State ore reserve, as of November 1, totaled 7.5 million tons at 0.34 percent contained U_3O_8 and formed 12.5 percent of national total.[4] The reserves given included measured, indicated, and inferred ores. One-quarter of the State reserve was of the last class. Approximately 85 percent of the reserve was in San Juan County.

Capacities of operating uranium mills were as follows (tons of ore per day): Monticello, 600; Moab, 1,500; and Salt Lake City, 550.[5] The mill at Moab was placed in operation in November. Ore processed at Moab originated, for the most part, from mines of the Big

[4] Grand Junction (Colo.) Office, AEC, Statistics on Domestic Uranium Production and Ore Reserves: Press Release 178, Dec. 13, 1956, p. 3.
[5] Work cited in footnote 4, p 2.

Indian district. At Mexican Hat construction was begun on a 775-ton-per-day mill to process ores from the Happy Jack mine and other mines in the White Canyon and Monument Valley areas.

TABLE 15.—Mine production of uranium ore in Utah, July 1955–June 1956 [1]

County	July–December 1955			January–June 1956		
	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)
Beaver	2	(2)	(2)	1	(2)	(2)
Box Elder	1	(2)	(2)			
Davis	1	(2)	(2)			
Emery	51	62,338	322,193	58	65,417	360,066
Garfield	54	3,194	20,833	45	3,232	22,511
Grand	52	13,297	82,666	68	12,473	65,616
Kane	1	(2)	(2)	2	(2)	(2)
Piute	4	(2)	(2)	5	(2)	(2)
San Juan	153	256,887	1,714,331	164	315,639	2,031,109
Sevier				1	(2)	(2)
Uintah				1	(2)	(2)
Washington				1	(2)	(2)
Wayne	11	455	2,384	17	887	4,331
Undistributed		16,995	76,467		21,559	105,903
Total	330	353,166	2,218,874	363	419,207	2,589,536

[1] Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Vanadium.—Vanadium was recovered from uranium-vanadium ores mined in Utah. In 1956 the recoverable metal content of such ores was 1.1 million pounds, a 10-percent gain over production for 1955. All Utah ores treated for vanadium recovery were shipped to mills in Colorado.

Zinc.—Recoverable zinc output in Utah in 1956 was 3 percent below that in 1955, whereas the value increased 8 percent as a result of the advanced price for zinc, which apparently only served to roughly stabilize output. Most of the zinc production in Utah in 1956 came from the U. S. and Lark, United Park City, and Mayflower-Park Galena mines. Other major zinc producers were the Bluestone tailing-dump operation and Eagle & Blue Bell and Ophir Unit mines.

MINERAL FUELS

Asphalt and Related Bitumens.—The annual shipment of gilsonite continued to increase, as 1956 output exceeded that in the preceding year. At Bonanza, Uintah County, shaft sinking and other preparation was continued by the American Gilsonite Co. The company also began to construct a gilsonite refinery in Colorado.

To the north near Vernal the asphaltic sand deposits at Asphalt Ridge were examined to determine the economic feasibility of extracting the contained bitumens.

Carbon Dioxide.—Natural carbon dioxide gas was produced from the Farnham Dome field in Carbon County. The gas was transmitted to a dry-ice plant at Wellington.

Coal.—Output of coal from Utah mines continued to rise during 1956 and totaled 6.5 million tons compared with 6.3 million in 1955.

Demand for Utah coal at coke ovens in California and Utah totaled 2.7 million tons—an increase of 200,000 over 1955. In 1956 Utah coal delivered to California ovens totaled 1.4 million tons, the remaining 1.3 million being used at coke ovens within the State. In previous years, Utah ovens consumed the larger share of the State's output of coking coal; for example, in 1955 the comparable figures were: California, 1.1 million tons; Utah, 1.4 million tons. Utah, in turn, has been receiving increasing amounts of coking coal from other States, primarily Oklahoma and Colorado.

TABLE 16.—Production of coal by counties, 1955–56

(Exclusive of mines producing less than 1,000 tons)

County	1955		1956	
	Short tons	Average value per ton [1]	Short tons	Average value per ton [1]
Carbon	4,694,169	$6.87	4,937,335	$5.46
Emery	1,492,002	4.86	1,480,145	4.67
Garfield	1,664	4.81	1,352	4.85
Iron	31,753	4.48	36,996	5.15
Kane	1,742	4.82	2,269	4.85
Sevier	54,638	4.97	46,700	5.65
Summit	18,506	3.84	17,367	4.04
Uintah	1,050	6.00	----------	----------
Total	6,295,524	6.35	6,522,164	5.28

[1] Value received or charged for coal f. o. b. mine, including selling cost. Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.

In 1956 coal lost its dominant position in Utah to natural gas as the chief source of heat energy used at thermal-electric plants. Consumption of coal by such plants was 306,000 tons compared with 376,000 in 1955. During 1956 the proportion of heat energy supplied by the various fuels at thermal-electric plants was: Coal, 32 percent; natural gas, 44 percent; and oil, 24 percent. In 1955 these percentages were, respectively: Coal, 40; natural gas, 35; and oil, 25.

During 1956, 49 mines (all underground) were active within the State. Average employment was 2,883 men—a slight increase over the 2,864 men employed in 1955.

Helium.—Government-owned helium reserves in the Harley Dome and Woodside fields in Grand and Emery Counties, respectively, have been shut in since their discovery in 1924 and 1925.

Natural Gas and Natural-Gas Liquids.—Marketed production of natural gas continued to rise in 1956 and totaled 17.3 million cubic feet. Important sources of natural gas were the Clear Creek field in Carbon and Emery Counties and the Clay Basin field in Daggett County. In 1956 the Joe's Valley field discovery well in Sanpete County was completed, and a confirmation well was drilled. The field was connected by pipeline to the Clear Creek system, but no further drilling was carried out.

In all, 5 gas discoveries were recorded for the year—3 less than in the previous year; successful development wells, however, numbered 13 compared with 2 in 1955.

Natural gasoline was produced from one plant in Daggett County. Natural gas for the plant was produced from the Clay Basin field.

The Pacific Northwest pipeline was completed in 1956, and plans were announced to supply several eastern Utah towns (Vernal, Moab, and Monticello) with natural gas from it.

Petroleum.—With discovery of substantial oil-productive capacity from the Paradox and Hermosa formations of the Paradox basin in San Juan County, 1956 may well be marked as a turning point in the history of Utah as an oil-producing State.

A total of 8 discoveries was recorded in San Juan County—the more notable being the Aneth, North Desert Creek, and East Aneth fields, each of which showed initial flows of more than 1,000 barrels daily at the discovery wells. Average daily production for the whole State in 1955 and 1956 was 6,000 barrels.

TABLE 17.—Production of crude petroleum, 1955–56, by counties, in barrels [1]

County	1955	1956	Producing fields in 1956
Duchesne	29,000	18,000	Duchesne, Flat Mesa.
Grand	6,000	2,000	Seiber.
San Juan	154,000	475,000	Aneth, Desert Creek, Boundary Butte-N.
Uintah	2,038,000	1,774,000	Ashley Valley, Red Wash, Roosevelt, Walker Hollow, Brennan Bottom.
Undistributed	----------	197,000	
Total	2,227,000	2,466,000	

[1] Distribution by counties effected by use of Petroleum Information data adjusted to Bureau of Mines total.

TABLE 18.—Wildcat and development well completions in 1956, by counties

[Oil and Gas Journal]

County	Oil	Gas	Dry	Total	Footage
Wildcat:					
Box Elder	----------	----------	5	5	19,600
Carbon	1	----------	3	4	11,500
Daggett	----------	----------	1	1	3,300
Duchesne	----------	----------	1	1	6,400
Emery	----------	----------	4	4	16,500
Garfield	----------	----------	1	1	4,300
Grand	----------	1	19	20	61,200
Millard	----------	----------	1	1	4,200
San Juan	8	1	23	32	174,100
Sanpete	----------	1	1	2	16,900
Sevier	----------	----------	1	1	6,500
Tooele	----------	----------	1	1	2,900
Uintah	2	2	5	9	57,100
Utah	----------	----------	2	2	11,700
Wayne	----------	----------	2	2	11,500
Total wildcat	11	5	70	86	407,700
Development:					
Emery	----------	3	----------	3	18,700
Grand	----------	7	7	14	42,600
San Juan	21	1	3	25	142,600
Sanpete	----------	1	----------	1	7,300
Uintah	9	1	2	12	71,100
Total development	30	13	12	55	282,300
Total drilling	41	18	82	141	690,000

Petroleum output from Utah for the year totaled 2.47 million barrels, only an 11-percent increase over 1955. Declining production from older areas and lack of outlets for the Paradox basin crude kept production gains to a minimum. At year end 2,000 barrels of oil was being transported daily to Salt Lake City by truck and rail from the Aneth field, which was largely responsible for the increase in production from San Juan County.

Although the change in production was negligible, the increase in petroleum reserves for the State was appreciable. Estimated proved crude-oil reserves for Utah as of the first of the year totaled 35 million barrels; at year end the reserves were estimated at 139 million barrels—a fourfold increase.[6] The added reserves were entirely in the new Paradox Basin fields, and half of the State total was in the Aneth field. The Aneth field, discovered early in the year, also had the longest period of development before the close of 1956.

NONMETALS

Anhydrous Ammonia.—The latest addition to the Columbia-Geneva Steel Division (United States Steel Corp.) plant near Provo was under construction during 1956. The plant will be the first in the Nation constructed by a major steel company to use coke-oven gas as a raw-material source for ammonia. When completed in 1957, this $18 million facility will produce anhydrous ammonia, nitric acid, and ammonium nitrate. The designed capacity of the plant is 200 tons per day of anhydrous ammonia, which can be sold directly, be processed further into nitric acid, or be combined with nitric acid to form ammonium nitrate. The nitric acid unit was designed to produce for the requirements of the ammonium nitrate plant. Part of the output of the acid unit will be processed into high-strength nitric acid for direct sales. The ammonium-nitrate unit consumes ammonia equal to half that of the anhydrous-ammonia production facilities so that when market demands, 100 tons per day of ammonia are converted into 200 tons per day of ammonium nitrate.

The Anaconda Co. signed a contract to purchase substantial quantities of anhydrous ammonia from this plant to be used at Anaconda, Mont., for production of ammonium phosphate fertilizer.

Cement.—Production of cement continued to rise in 1956 as a direct result of the activities of the construction industry, and shipments during the year increased 5 percent compared with 1955. Because of this larger demand, the two 400-foot kilns of Ideal Cement Co. and the two 185-foot kilns used by the Portland Cement Co. of Utah were operated 330 and 326 days, respectively, compared with 301 and 305 days in 1955. These companies continued to mine the bulk of their raw materials (namely, shale and limestone). On the other hand, sand, sandstone, gypsum, iron ore, slag, and miscellaneous other raw materials were purchased locally or from out-of-State sources. Shipments of types I, II, III, V, oil-well, waterproof-portland, and masonry cements were reported in 1956, and the States to which this material was shipped were Arizona, California, Colorado, Idaho, Illinois, Minnesota, Nevada, North Dakota, Utah, Washington, and Wyoming.

[6] Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 157.

Clays.—Mining of halloysite by the Filtrol Corp. at the Dragon mine near Eureka composed a major part of the total value of this mineral commodity in Utah during 1956. The demand for halloysite by the petroleum-refining industry in its catalytic cracking units accounted for a portion of the increase in 1956 sales of clays; however, shipment of fuller's earth, bentonite, and shale for brickmaking also gained. These increases resulted from a stronger demand for clay as a building material.

Four established brick plants continued to be operated in the State during 1956—2 at Salt Lake, 1 at Ogden, and 1 at Provo. The United Brick Co. constructed a $100,000 brick plant at Lehi to produce all types of common building and face brick, using Utah County clays.

With the exception of 57,000 tons of fire clay produced in Utah County by Utah Fire Clay Co., R. D. Wadley Clay Co., and Western Fire Clay Co., and halloysite in Juab County, the bulk of the State output of clays was classified as miscellaneous clay. Producers of the latter type of clay were Interstate Brick Co., Florence Powell, Loyd R. Stubbs, and Utah Fire Clay Co. in Utah County, Interstate Brick Co. in Morgan County, Utah Fire Clay Co. in Summit County, and Harrisville Brick Co. in Weber County. Bentonite and fuller's earth were mined by Western Clay & Metals Co. in Sevier County. During 1956 the Interstate Brick Co. completed constructing a $500,000 automatic tunnel kiln at its Salt Lake City brick plant.

An average of 100 men was employed in clay mining in Utah during 1956, and the number of days of employment averaged 237.

Fluorspar.—Notwithstanding the general downward trend of fluorspar mine production in the United States, the output of this commodity reached 10,600 tons in 1956 compared with 7,300 in 1955 and 4,400 in 1954. Before the Government purchasing program for Metallurgical-grade fluorspar was activated, the only market available to local producers was the steel plant at Geneva and to a lesser degree brokers for West Coast consumers. However, the establishment of a buying program appeared to have aided the fluorspar industry, in that it provided a local outlet for mine production and prevented the closing of mines, as evidenced by increased shipments to the Government stockpile.

The principal mine operators in 1956 were Willden Bros. (Lost Sheep mine) and Chesley & Black (Fluorine Queen). Shipments of Metallurgical-grade fluorspar were also reported by George Spor & Sons (Fluoride mine), Bell Hill Mining Co. (Bell Hill mine), and Fred Staats (Staats Fluorspar mine).

Gem Stones.—The value of gem and ornamental stones collected in Utah rose from $6,000 in 1955 to $10,000 in 1956. As 1955 was the first year in which a measure of value was obtained on a basis of a questionnaire survey, no correlation can be made between value figures for this period (1955–56). A wide variety of gem and ornamental stones was reported from many counties. In terms of value, agate headed the list of important stones, followed by onyx, petrified wood, and obsidian.

Gypsum.—In 1956, as in 1955, all gypsum produced in Utah came from open pits near Sigurd, Sevier County, operated by United

States Gypsum Co. and Western Gypsum Co. As a result of a temporary decline in the demand for wallboard, plaster, Keene's cement, and other building material, output of crude gypsum in 1956 dropped 23 percent from the 1955 output.

A calcining plant was operated at Sigurd by Western Gypsum Co. Coal was used as a fuel in operating 3 kettles and 3 Keene calciners, and the calcined product was used for industrial purposes, including pottery, dental and orthopedic plaster, industrial molding, and building products.

Lime.—Lime output in Utah during 1956 rose to 55,110 tons, a 42-percent increase over 1955. This gain in sales can be attributed to a greater need for lime in processing copper, uranium, and lead ores. Two plants in Utah, owned by Utah Lime & Stone Co. at Grantsville and Lakeside Lime & Stone Co. at Lehi, produced lime for the open market. The third plant was owned by the Utah Copper Division of Kennecott Copper Corp. at Magna; except for a small quantity of quicklime sold, the entire output from this 49,500-ton-per-year facility was hydrated to milk of lime and consumed by the company in treating copper ore. Two rotary kilns and 2 continuous hydrators were operated during 1956, using natural gas as a fuel. The crushed limestone employed as a plant feed was quarried by the Utah Lime & Stone Co. Eleven shaft kilns and 2 batch-type hydrators using coke and fuel oil as fuel were operated by the 2 open-market lime producers.

Perlite.—The sale of the Utco Products Co. mine in Beaver County and expanding plant at Salt Lake City ended the history of the last of the old time operating companies. Both mine and mill were purchased on August 1 by Acme Lite Wate Products, Inc., of Salt Lake City. This new operator discontinued mining at the Beaver County deposit and obtained crude ore for its plant from Nevada mines.

Before August 1, Utco Products Co. mined 2,300 tons of crude perlite, which was consumed at its expanding plant. No other mine production was reported during 1956. Total expanded production during the year reached 3,470 tons valued at $159,000. Shipments of expanded perlite were reported by Acme Lite Wate Products, Inc., from the Utco mill, as well as a Salt Lake City facility leased from Combined Metals Reduction Co. and Utco Products Co. from the Utco mill before it was sold.

Phosphate Rock.—Output of phosphate rock in Utah during 1956 declined somewhat from the 1955 high, but no special significance is attached to the decrease. Demand for phosphate rock, mainly as a fertilizer, remained strong. The San Francisco Chemical Co. was the only mine operator in the State, and development was conducted on 3,000 acres of phosphate reserves 14 miles northeast of Vernal during the year. This deposit is part of a 15,000-acre tract held by the Humphries Phosphate Co. San Francisco Chemical Co. reportedly planned to explore and develop the properties, with a possibility of ultimately constructing an upgrading mill and mining the rock by open-pit methods. All Utah mine output was shipped to Leefe (Wyo.) for processing. During 1956 San Francisco Chemical Co. was constructing a 1,000-ton-per-day beneficiating plant at Leefe, which, when completed, will enable the company to handle greater quantities of both Utah and Wyoming rock. Reportedly, the National Farmers Union planned to begin mining of its Cheney phosphate properties

in Rich County. Also under consideration was construction of a triple superphosphate plant near the mine.

Western Phosphates, Inc., joint subsidiary of Stauffer Chemical Co., American Smelting and Refining Co., and Kennecott Copper Corp., continued its general expansion and improvement program for increased production of triple superphosphate, ammonium phosphate, and (eventually) potash-containing fertilizer products. A boost of 10,000 to 70,000 tons annually in capacity will result. The program will continue well into 1958.

Potash.—Combined sales of potash and alunite in 1956 were 5 percent greater than in 1955, but output was still less than in 1954. The increase in 1956, compared with 1955, can be attributed mainly to a year of uninterrupted work by Bonneville, Ltd., and the production of alunite by the Calunite Corp. The muriate of potash (95–98 percent KCl) was recovered at the Bonneville, Ltd., plant near Wendover from the treatment of potassium-bearing brines of Salduro Marsh on the Bonneville salt flats. The company completed construction during 1956 of a $250,000 "prilling" plant (fusing small salt crystals and producing granulated potash to customers' specifications).

Delhi-Taylor Oil Co., which was engaged in extensive exploration for potash reserves in the Seven Mile Anticline area near Moab, Grand County, extended its holdings to almost 30 square miles of potash leases. Exploratory drilling greatly increased the proved and probable reserve, which, according to company reports, was three times greater than in 1955.

The Alunite Corp. of Utah installed a hammer screen and elevators at its Marysvale mill to provide a capacity of 10 tons of crushed rock per hour compared with the former capacity of only 3 tons. The firm also announced plans in June for further expansion of its mill and construction of a $35,000 plant at Salt Lake City for bagging its fertilizer product made from crushed alunite. Western Gold & Uranium, Inc., operated the Applegarth mine near Marysvale, producing 50 tons of crude alunite for testing purposes.

Pumice.—Increased production of pumice, pumicite, and volcanic scoria in Utah in 1956 indicated more activity than this branch of the mineral industry has experienced in many years. Total sales in 1956 reached 45,000 tons compared with 2,000 tons in 1955. This marked advance was due almost entirely to the mining of scoria at the Red Dome claims in Millard County by Christensen Construction Co. The next major producer was the Utah Lavalite, Inc., also in Millard County, followed by William H. Prince & Sons Block Co., (Utah County) and Harbolite Corp. (Tooele County). The bulk of total sales was used as concrete aggregate, although Utah Lavalite, Inc., reported as uses cleansing and scouring compounds and hand soaps, Harborlite Corp., filter aids and filler; and Christensen Construction Co., roofing aggregate.

Salt.—The most significant development in Utah's salt industry in several decades was highlighted in June 1956, when the gates were opened to permit brine from the Great Salt Lake to flow into a million-dollar salt-pond system constructed near Stansbury Island, Tooele County, by Chemical Salt Production Co. It will be 3 or 4 years before the pond system actually begins to produce, but completion of the ponds marks the beginning of a chemical-salt industry in the

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State. Ultimate production will go to chemical plants in the Tacoma (Wash)–Portland (Oreg.) area for use in producing chlorine, caustic soda, and anhydrous ammonia.

Salt output in 1956 dropped to 184,000 tons, a 6-percent decrease from 1955, but no special significance is attached to the decline. The production of sodium chloride by solar evaporation from lake brines continued to supply the bulk of the State output; rock salt accounted for the remainder. The Morton Salt Co. (Salt Lake County) was the major producer and harvested solar-evaporated salt. The Deseret Salt Co. and Stansbury Salt Co., Inc. (Tooele County), were also solar-evaporation producers. Rock-salt output was reported by Poulson Bros. Salt Co. (Sevier County) and Royal Crystal Salt Co. (Sanpete County); the latter company was the principal rock-salt producer. Some of the more important uses reported by producers were as cattle feed, in canning, for human consumption, and in the processing of uranium ores.

Sand and Gravel.—The total output of sand and gravel in 1956 rose to 5.8 million tons, a 13-percent gain over 1955. The stimulus for this increased production was highway-construction contracts let by the Utah State Road Commission as a result of the Federal highway program, which gained momentum during 1956, and a strong demand created by the building trades. Of the total output in 1956, 3.6 million tons valued at $2.8 million was produced by individuals or firms for commercial use, and 2.2 million tons with a value of $1.7 million was quarried by private contractors and construction crews of county and State highway departments. Demand for commercial sand and gravel was highest in the more populated regions of the State.

Salt Lake County was the leading producing area, with 2.3 million tons or 39 percent of the total output, followed by Davis, Box Elder, Utah, and Weber Counties; in all, sand and gravel was produced in 24 of the 29 counties in Utah. Washed, screened, or otherwise prepared material comprised 81 percent of the total commercial output, and 66 percent of the Government-and-contractor production was processed; only 12 percent of the commercial sand and gravel was transported by railroad—trucks carried the remainder.

Stone.—Crushed limestone used in cement, for flux, concrete aggregate, and sugar refining, and as rock dust for coal mines again constituted the most important type of stone produced in Utah during 1956. Although limestone resources are virtually unlimited in Utah, output was held to 1,694,000 tons during 1956. Production of all types of stone in 1956 reached 2,322,000 tons valued at $3,298,000—21 percent more than 1955. Crushed sandstone was the second-ranking stone, with an output of 319,000 tons. Crushed miscellaneous stone was third, with 306,000 tons, followed by dimension sandstone (2,700 tons).

The leading producers of limestone were Columbia-Geneva Steel Division, United States Steel Corp., Ideal Cement Co., Portland Cement Co. of Utah, American Smelting and Refining Co. (oolitic limesand), Lakeside Lime & Stone Co., and Utah Lime & Stone Co. The major producers of commercial sandstone were Murray Refractories Co. and General Refractories Co. Utah Construction Co. was the principal producer of noncommercial crushed sandstone. Morrison-Knudsen Co., Inc., accounted for all the miscellaneous-stone output.

TABLE 19.—Sand and gravel sold or used by producers, 1955–56, by classes of operation and uses

Class of operation and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Molding	(1)	(1)		(1)	(1)	
Structural	807,303	$609,762	$0.76	878,000	$650,500	$0.74
Paving	267,778	216,471	.80	298,000	304,000	1.02
Grinding and polishing				(1)	(1)	
Blast	(1)	(1)		(1)	(1)	
Fire or furnace	25,000	27,500	1.10	20,000	10,000	.50
Engine	(1)	(1)		(1)	(1)	
Railroad ballast	(1)	(1)				
Undistributed	27,132	32,685	1.20	60,500	82,000	1.36
Total sand	1,127,213	886,418	.79	1,256,500	1,046,500	.83
Gravel:						
Structural	1,011,960	790,601	.78	811,000	613,500	.76
Paving	648,040	458,727	.71	1,221,500	976,000	.80
Railroad ballast	106,018	33,020	.31	69,000	41,000	.59
Undistributed	4,267	4,054	.95	270,500	146,200	.54
Total gravel	1,770,285	1,286,402	.73	2,372,000	1,776,700	.75
Total sand and gravel	2,897,498	2,172,820	.75	3,628,500	2,823,200	.78
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Structural				71,000	116,000	1.63
Paving	74,973	25,469	.34	182,500	125,500	.69
Total sand	74,973	25,469	.34	253,500	241,500	.95
Gravel:						
Structural	186,656	50,407	.27	298,000	256,000	.86
Paving	1,999,138	1,060,584	.53	1,655,500	1,155,000	.70
Total gravel	2,185,794	1,110,991	.51	1,953,500	1,411,000	.72
Total sand and gravel	2,260,767	1,136,460	.50	2,207,000	1,652,500	.75
ALL OPERATIONS						
Sand	1,202,186	911,887	.76	1,510,000	1,288,000	.85
Gravel	3,956,079	2,397,393	.61	4,325,500	3,187,700	.74
Grand total	5,158,265	3,309,280	.64	5,835,500	4,475,700	.77

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.

Sulfuric Acid.—Garfield Chemical & Manufacturing Corp., a jointly owned facility of American Smelting and Refining Co. and Kennecott Copper Corp., expanded production of sulfuric acid to 1,100 tons a day by constructing its fifth contact-process sulfuric-acid unit. The plant is at the Garfield smelter of American Smelting and Refining Co. and is operated by ASARCO personnel. It uses as raw material sulfur-dioxide gas produced by the Garfield smelter copper-converter operation. Output of the new plant was expected to go entirely to the growing Intermountain-area industry. Utah ranked second among the States producing byproduct sulfuric acid (Pennsylvania was first) and furnished approximately one-quarter of the total United States output of this commodity.

Talc.—Montana and California mines continued to supply the crude talc processed at the Ogden mill of Tri-State Minerals Co. during 1956. The finished product was used in paints, ceramics, textiles, rice polishing, and other applications.

Vermiculite.—In 1956, as in 1955, no crude vermiculite was mined in Utah, but a plant producing exfoliated vermiculite was operated by Vermiculite-Intermountain, Inc. The end product, marketed under the trade name Zonolite, was used for insulation.

REVIEW BY COUNTIES

Beaver.—The value of mineral output in Beaver County increased from $23,000 in 1955 to $122,000 in 1956. An advance in copper production in 1956 explained most ($73,000) of this county increase. Sand and gravel output in 1956 was valued at $18,000 compared with none in 1955.

Gold, silver, copper, lead, and zinc came from 10 active mines in Beaver County in 1956. The combined value of these 5 metals ($90,000) composed 74 percent of the total value of mineral production. Most of the output of gold, silver, and copper was from ore mined by Norman Rogers Mining Co. from the Cupric (Newhouse) mines. Peter S. Martin, who operated the Last Chance mine, was the major lead producer in the county.

The North Star Metals, Inc., was the sole producer of tungsten in the county. The ore from the Old Hickory mine was shipped to Salt Lake Tungsten Co. for concentration and subsequent sale to the GSA. The final concentrate—1.18 short tons averaging 66.46 percent WO_3—was valued at $4,700.

Nonmetal production in 1956 totaled $27,500 and consisted of sand and gravel, perlite, and gem or ornamental stones. The 22,000 tons of paving gravel was prepared by L. A. Young Co. and Vernal Sand & Gravel Co. in connection with contracts with the Federal Bureau of Public Roads. Utco Products Co. operated its open-pit perlite mine for a short period during the first half of the year. The company sold the mine to Acme Lite Wate Products, Inc., which did not work the mine after buying it. The collection of gem and ornamental stones consisted of 1,000 pounds of obsidian reported by Dog House Rock Shop.

Shipments of uranium ore were made during the first 6 months of the year from the Monarch No. 1 claim by Fred Staats.

Box Elder.—Sand and gravel and stone were the more important mineral commodities produced in Box Elder County during 1956, and the increased demand for construction materials raised the total value of mineral production for the county to $775,400 compared with $181,000 in 1955. The bulk of the output of sand and gravel was produced by Fife Rock Products Co., Inc., Allen Hunsaker, and Morrison-Knudsen Co., Inc., for the Southern Pacific Railroad Co. This commercial output consisted of structural sand, fill sand, and structural, paving, and railroad (trestle-fill) gravel. Government-and-contractor production was reported by Germer, Abbott & Waldron, Union Construction Co., and L. A. Young Co. as contractors for the Utah State Road Commission and construction crews of the county highway department. Quarried stone consisted of crushed miscel-

laneous stone produced by Morrison-Knudsen Co., Inc., for the Southern Pacific Railroad Co. (used as trestle fill) and crushed sandstone produced by General Refractories Co. (used in refractory products).

Two firms—A. C. D. Uranium & Fertilizer Co. and Consolidated Mines & Milling Co.—mined tungsten ore from deposits in the county. The ore was treated at custom mills and plants and the concentrate sold to the Government. Small quantities of silver, copper, lead, and zinc were recovered from ore mined by Jesse C. Clark and by Doran Hunt.

Cache.—The mineral products of Cache County during 1956 were sand and gravel and stone. Stone output was valued at $293,000 and consisted of 180,000 tons of crushed sandstone quarried by the county highway department and crushed limestone produced by Le Grand Johnson Corp. The sandstone was used in highway surfacing and

TABLE 20.—Value of mineral production in Utah, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Beaver	$23,196	$122,242	Copper, sand and gravel, perlite, tungsten concentrate, silver, lead, gem stones, gold, zinc.
Box Elder	180,725	775,421	Sand and gravel, stone, tungsten concentrate, lead, zinc, silver, copper.
Cache	385,276	450,186	Stone, sand and gravel.
Carbon	32,265,893	27,032,512	Coal, sand and gravel, carbon dioxide.
Daggett	8,699	----------	
Davis	404,804	485,319	Sand and gravel, stone, copper, silver.
Duchesne	69,479	40,075	Petroleum.
Emery	[1] 7,291,266	6,979,512	Coal, sand and gravel, gem stones.
Garfield	57,862	48,656	Sand and gravel, coal, gem stones.
Grand	[1] 30,531	63,379	Sand and gravel, petroleum, copper, gem stones, silver, lead.
Iron	24,884,180	27,784,673	Iron ore, coal, sand and gravel, stone.
Juab	[1] 4,542,011	[1] 3,821,918	Clays, lead, silver, zinc, fluorspar, gold, stone, copper, tungsten concentrate.
Kane	8,496	36,315	Sand and gravel, coal, gem stones.
Millard	[1] 124,594	[1] 385,811	Pumice, sand and gravel, tungsten concentrate, gem stones.
Morgan	6,245,856	6,915,427	Cement, stone, clays, sand and gravel.
Piute	[1] 104,900	20,797	Potash, silver, copper, gold, lead, zinc.
Rich	[2]	774,585	Phosphate rock, sand and gravel.
Salt Lake	226,644,825	269,428,127	Copper, molybdenum, gold, lead, zinc, silver, sand and gravel, cement, salt, lime, stone.
San Juan	368,747	1,175,425	Petroleum, sand and gravel, copper, silver, gem stones.
Sanpete	54,059	41,748	Salt, sand and gravel.
Sevier	[1] 1,289,933	1,106,363	Gypsum, coal, clays, sand and gravel, salt, silver, zinc, gold, lead.
Summit	1,220,192	5,569,691	Zinc, lead, silver, copper, sand and gravel, gold, stone, coal, clays.
Tooele	3,696,655	4,027,627	Lead, potash, zinc, salt, lime, silver, copper, gold, stone, pumice, tungsten concentrate, gem stones.
Uintah	4,775,601	3,983,275	Petroleum, sand and gravel.
Utah	1,848,726	2,575,985	Stone, sand and gravel, clays, lime, silver, lead, zinc, copper, gold, pumice, gem stones.
Wasatch	7,734,544	2,955,678	Zinc, lead, gold, copper, silver, sand and gravel.
Washington	158,746	134,223	Copper, sand and gravel, silver, stone, lead, gem stones, gold.
Wayne	150	5,200	Sand and gravel, gem stones.
Weber	262,370	[1] 304,700	Sand and gravel, stone, clays.
Undistributed	8,299,122	[3] 30,817,650	
Total [4]	[5] 331,929,000	396,942,000	

[1] Excludes value of manganese ore sold and blended at Government low-grade stockplies for future beneficiation.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes uranium, gilsonite, natural gas, vanadium, petroleum, sand and gravel, natural gasoline, and gem stones that cannot be assigned to specific counties, and values indicated by footnote 2.
[4] Total has been adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.
[5] Figure excludes uranium; value of uranium for 1955 was not released by the Atomic Energy Commission.

the limestone in sugar refining. Sand and gravel production, valued at $157,000, was comprised of paving gravel mined and prepared by construction crews of the State and county highway departments and Olof Nelson Construction Co. and Wheelwright Construction Co. as contractors for the Utah State Road Commission. Commercial structural sand and gravel output was reported by Johnson Ready Mix Concrete Co., Kloepfer Sand & Gravel Co., Jack B. Parson Construction Co., and Savage Sand and Gravel Co.

Carbon.—Carbon County coal production rose from 4.7 million tons to 4.9 million in 1956. A total of 27 mines was active during the year, and employment averaged 2,255 men.

In late January 1956 the Hi-Heat Coal Co. ceased operations and abandoned the Rains No. 3 mine. The reason given for terminating operation was reported to be loss of market to natural gas in the Pacific Northwest.

At Hiawatha the United States Fuel Co. installed additional preparation and stockpiling facilities. Equipment for transferring material to and from stockpiles was designed to permit greater flexibility in operating the mine and preparation plant. In addition, a resin flotation unit, designed to recover 4 million pounds of resin annually, was completed and placed in operation in November. The resin recovered was shipped to Bauer in Tooele County.

The Lion Coal Co. (Wattis) placed in operation a new Parry drier in August 1956, designed to remove surface moisture from minus-1½-inch coal at a rate of 150 tons an hour.

During 1956 Knight Ideal Coal Co. contracted for installation of a 150-ton-per-hour dense-medium cleaning plant at the Knight mine.

Natural gas was produced from the Clear Creek field and piped to consuming markets in the Salt Lake City area. No development work was reported in the Carbon County portion of the field during the year. Carbon dioxide gas was produced from the Farnham dome and processed in the dry-ice plant operated by Carbon Dioxide & Chemical Co. at Wellington.

Sand and gravel output consisted of 38,000 tons of paving gravel valued at $39,000. This material was mined by construction and maintenance crews of the Utah State Road Commission in connection with county road projects.

Daggett.—Natural gas from the Clay Basin field was processed at a plant operated by the Mountain Fuel Supply Co. to extract natural gasoline and then shipped through the company pipeline to Salt Lake City.

Davis.—Of the $485,300 worth of mineral commodities produced in Davis County during 1956, $484,000 represented the value of sand and gravel production. Demand by the construction industry, particularly for commercial use, stimulated the sand and gravel industry, and the output of structural and paving sand and structural and paving gravel rose to 735,000 tons in 1956 compared with 530,000 in 1955. The principal commercial operators were Foss Lewis Sand & Gravel Co., White Hill Sand & Gravel Co., and Clarence Waterfall. Government-and-contractor output was reported by Wheelwright Construction Co. as contractor for the Utah State Road Commission. Construction activities also were responsible for the production of 590 tons of crushed limestone by United Concrete Pipe

Corp. which conducted quarrying operations for the Federal Bureau of Reclamation.

Phillips Petroleum Co. and Western States Refining Co. operated refineries at Woods Cross and North Salt Lake, respectively. Construction of additional facilities at both plants was completed in the fall of the year.

Duchesne.—Sources of petroleum production were the Duchesne and Flat Mesa field. Output from the Duchesne field continued to decline falling to half of 1955 output; the downward trend accounted for the drop in county production.

Emery.—The county was the second most important in uranium production in the State; output came primarily from the San Rafael swell and Green River areas. During the first 6 months of the year shipments of uranium ore were made from 58 properties and totaled 65,400 tons at an average grade of 0.28 percent contained U_3O_8. Major properties, in terms of shipments for the period, were as follows:

Property:	*Operator*	*Locality*
AEC No. 3	Consolidated Uranium Mines, Inc.	Temple Mountain.
AEC No. 8	----do	Do.
AEC No. 11	----do	Do.
AEC No. 12	----do	Do.
Delta	Hidden Splendor Mining Co.	San Rafael, South.
Dirty Devil No. 3	Five States Uranium Corp.	Do.
Incline No. 1	Four Corners Uranium Corp.	Green River.
Incline No. 2	----do	Do.
Incline No. 3	----do	Do.
Incline No. 5	----do	Do.
Incline No. 6	----do	Do.
Incline No. 8	----do	Do.
Vanadium King No. 1.	Uranium Industries, Inc.	Temple Mountain.

These 13 properties produced 91 percent of the county total for the 6-month period.

Four Corners Uranium Corp. operated nine properties in the Green River area. In August the corporation signed a contract with Vitro Uranium Co., operator of the Salt Lake City mill, to deliver all of the output of the corporation properties in the Green River area to the Vitro mill. The contract called for delivery of a minimum of 3,000 tons of uranium ore per month, with a maximum of 12,000 tons per month. A similar agreement was made in 1955 between the Hidden Splendor Mining Co. (operator of the Delta mine) and Vitro which called for delivery of 5,000 tons per month, with a maximum of 9,000 tons.

Production of coal remained essentially the same as in 1955. Fifteen mines were reported active, and employment averaged 584 men during the year.

Natural gas was produced from the Clear Creek field in Emery and Carbon Counties. Two successful development wells were completed in the Emery County portion of the field by Three States Natural Gas Co. A successful development well was also drilled by the same company in the Flat Canyon field.

Sand and gravel produced in Emery County during 1956 reached 96,000 tons valued at $62,000. Output consisted of 93,000 tons of

structural and paving gravel produced by Dudley, Jensen & Johnson for the Federal Bureau of Public Roads and construction crews of the Emery County Highway Department, and 3,000 tons of paving gravel prepared by W. W. Clyde Construction Co. for commercial use.

One thousand pounds of agate was collected in the Castledale region.

Garfield.—Shipments of uranium ore were reported from 45 properties during the first half of 1956. Total quantity of ore shipped during the period was 3,232 tons averaging 0.35 percent contained U_3O_8. The Trachyte No. 18 claim (operated by the Vanadium Corp. of America) and the Section 36 property (Lone Star Mining & Development Corp.) were the leading producers during the period. Both properties were on the eastern flank of the Henry Mountains near and to the north of Trachyte Wash.

Although construction materials again dominated the nonmetal portion of the mineral industries of Garfield County in 1956, a shift in the location of highway construction caused a significant decline in the value of these materials. Total value of all minerals in 1956 fell to $48,600, a 16-percent decline from 1955. Sand and gravel (47,000 tons) was mined by the Union Construction Co. for the Federal Bureau of Public Roads and by a contractor for the Utah State Road Commission.

No stone was produced during the year, but $2,100 worth of onyx and petrified wood was collected by the Dog House Rock Shop and Fawcett Hobby Shop.

Coal was produced in Garfield County in 1956 from the Alvey mine operated by Lovell M. Twitchell.

Grand.—Grand County uranium production for the first 6 months of the year totaled 12,473 tons of ore averaging 0.26 percent contained U_3O_8. This output was derived from 68 properties, the more productive of which were as follows:

Property:	*Operator*	*Locality*
Blackstone No. 6	E. E. Lewis Associates	Yellow Cat.
Cane Creek School Section 3.	Climax Uranium Co	Cane Canyon.
Cedar Point No. 2	Frontier Mining Corp. and Great Frontier Mining Co.	Beaver Mesa.
Elva M No. 2	Union Carbide Nuclear Co	Polar Mesa.
FW No. 3	----do	Do.
Parco No. 23	Utah Alloy Ores, Inc	Yellow Cat.
SR Fraction	Union Carbide Nuclear Co	Polar Mesa.
Utah State Lease No. 3971.	Norbute Corp	Yellow Cat.

These 8 properties produced 63 percent of the county total for the half-year period.

In October, Uranium Reduction Co. completed constructing a 1,500-ton-per-day uranium mill at Moab, and in November the first concentrate was shipped to the AEC at Grand Junction, Colo. The plant utilized acid-leach and resin-in-pulp circuit to process ores from the Big Indian district. Reported cost of the new mill was $8 million.

Sand and gravel was produced in Grand County by D. W. Brimhall and H. J. Wimmer, contractors for the Federal Bureau of Public Roads, who mined 75,500 tons of paving gravel; all of it was prepared and used for highway construction.

Agate (1,400 pounds gathered by Dale & Della Hicks and Stoby's Rock & Curio Shop) was the only ornamental stone collected in the county in 1956.

In the San Arroyo field a gas discovery was credited to Sinclair Oil & Gas Co., which found production from the Dakota formation a new productive horizon for the field. The company also completed one successful development well in the field. Six other successful development wells were drilled in the Bar-X area by The American Metal Co., Ltd., and by Burton W. Hancock. The county source of petroleum was the Sieber field.

The recorded production of 121 ounces of silver, 2 tons of copper, and less than 1 ton of lead in the county in 1956 was recovered from 124 tons of silver ore mined from 3 properties, Azurite No. 1, Blue Moon, and Kopper King, and shipped directly to the American Smelting and Refining Co. smelter at Garfield.

Iron.—All of the iron-ore shipments from Utah in 1956 originated in Iron County. The value of these 1956 shipments ($27.5 million) was $2.8 million, (11 percent) above 1955 and represented 99 percent of the total value of mineral output in the county. All of the ore (4 million tons), except 8,700 tons used for paint pigment, was used in making pig iron and steel. Four individuals or companies—Helene E. Beatty, Colorado Fuel & Iron Corp., Columbia Iron Mining Co., and The Utah Construction Co.—mined ore from 10 mines in the county in 1956.

Coal output from 3 Iron County coal mines (Jones-Bullock, Tucker, and Webster) totaled 37,000 tons in 1957, a 16-percent gain over the preceding year; average employment for the year was 17 men.

The value of nonmetal output in 1956 rose to $86,000 compared with $54,000 in 1955 owing to the increased quantity and value of sand and gravel produced. V. C. Mendenhall and Whiting & Haymond supplied the Government-and-contractor output and Cedar Silica Sand Co. the commercial production.

Commercial-stone production consisted of 1,000 tons of crushed sandstone quarried by Willard B. Thompson and used as roofing granules and 400 tons of dimension sandstone produced by the Bear Valley Stone Corp. and used as building stone.

Juab.—The total value of mineral production in Juab County declined from $4.5 million in 1955 to $3.8 million in 1956. A substantial drop in the value of lead, zinc, and silver output was partly balanced by an increased value of clays and fluorspar output.

Clays, fluorspar, and stone comprised the nonmetal group of mineral commodities produced in the county in 1956; despite lack of any sand and gravel and gem-stone production, the total value for this group rose to $2 million compared with $1.5 million in 1955. This advance can be attributed to gains in output of clay and fluorspar. Halloysite from the Dragon mine of Filtrol Corp. accounted for all the clay, whereas fluorspar was mined by five operators. Shipments of Metallurgical-grade fluorspar increased 44 percent over 1955, and Chesley & Black (Fluorine Queen mine) and Willden Bros. (Lost Sheep mine) were the principal mine operators. Crushed sandstone used in refractory materials continued to be mined by General Refractories Co. and Murray Refractories Co. Both firms consumed all their mine production at plants near the mines.

Curtailed operations in 1956 at the Chief No. 1 mine by the Chief Consolidated Mining Co.—one of the 1955 major gold, silver, lead, and zinc producers in Utah—was the main reason for the reduced metal output in the county in 1956. The Eagle & Blue Bell mine (an active producer throughout the last half of 1955), operated by Eagle & Blue Bell Mining Co.—a subsidiary of Chief Consolidated Mining Co.—was the principal metal producer of Juab County in 1956. In terms of output, it ranked fourth in gold and lead and fifth in zinc in the State in 1956. The Plutus Mining Co. (a 93-percent owned subsidiary of Chief Consolidated Mining Co.) operated the Plutus mine, another of the principal metal producers in the county in 1956.

In addition to the Chief No. 1, Eagle & Blue Bell, and Plutus mines, 15 other mines in Juab County produced varying quantities of gold, silver, copper, lead, and zinc. Of these mines the Vagabond-Sinabad (Temple Mountain Uranium Co.), Centennial-Beck-Victoria (United States Smelting Refining and Mining Co.), and Mammoth (Mammoth Mining Co.) were the major producers.

Two companies (Alta Uranium Mills, Inc., and Desert Mountain Mills, Inc.) mined tungsten ore from deposits in Juab County and shipped it to Salt Lake Tungsten Co., Salt Lake City, for treatment. The concentrate produced from the ore was purchased by the Government.

Manganese ore was shipped from the Black Boy mine by L. J. Price and from the Staats Manganese mine by Fred Staats to the Government (GSA) Butte (Mont.) Purchase Depot. This material was marketed under the low-grade-manganese, ore-purchasing program and will be credited as production in the year a useful product is shipped from the depot.

Kane.—Sand and gravel produced in Kane County in 1956 amounted to 30,000 tons of paving gravel valued at $25,000. This material was prepared by a contractor for the Utah State Road Commission.

Agate and petrified wood valued at $310 were collected by the Dog House Rock Shop and the Fawcett Hobby Shop.

Coal was produced from the Smirl-Alton mine operated by William J. Smirl.

During the first 6 months of the year, test shipments of uranium ore were made from the Radiant claim by Lyman & Farnsworth and from the Young No. 1 claim by the Black Mountain Uranium Co.

Millard.—Construction materials (namely, sand and gravel and pumice) made up 93 percent of the total value of all minerals produced in Millard County in 1956. The total value of mineral output in the county rose to $385,800—a threefold increase over 1955. This gain in value was accomplished despite a significant decrease in the value of tungsten production. Operation of the Red Dome claims near Fillmore by Christensen Construction Co. accounted for the major portion of the pumice-pumicite production, although Utah Lavalite, Inc., produced a small quantity of pumice from claims near Milford. Highway-construction activities of the Utah State Road Commission resulted in a contract let to Wilkinson Construction Co. that entailed producing 1,000 tons of paving gravel. In conjunction with roadwork, construction crews of the commission mined 45,000 tons of paving gravel.

Obsidian from the Black Rock region was the only ornamental stone collected in 1956. The Fawcett Hobby Shop and Harold Shugart reported acquiring $240 worth of this material.

Three mines in the county produced two-thirds of the tungsten output in the State in 1956. The most important producer—Mid-States Development, Inc.—sold its ore to the Union Carbide Nuclear Co. (Bishop, Calif.), which treated the ore and sold the concentrate to GSA.

Willden Bros. shipped a substantial quantity of manganiferous ore (averaging 26.9 percent manganese) from the Mizpah mine in Millard County to the Government (GSA) Butte (Mont.) Purchase Depot in 1956.

Morgan.—Nonmetals of the construction-material type were the only commodities reported by the mineral industries of Morgan County in 1956. Cement again ranked as the most important, and operation of the Union Portland Cement Division plant of Ideal Cement Co. for 366 days supplied all the output. The same company operated a limestone quarry as a source of limestone for cement manufacture, which accounted for nearly all the stone produced in Morgan County during 1956. A small quantity of crushed sandstone mined by Morrison-Knudsen Co., Inc., and A. H. Horner Construction Co. for the Federal Bureau of Reclamation was also reported.

Clay mine production amounted to 26,500 tons of miscellaneous clay valued at $66,000. The Henefer open-pit mine was worked by the Interstate Brick Co. as a source of clay for its Salt Lake City brick plant.

The bulk of sand and gravel sold in 1956 was commercial paving gravel mined and prepared by W. W. Clyde Construction Co. and Morrison-Knudsen Co., Inc. However, some structural sand was produced by Wilkinson Construction Co. for the Federal Bureau of Reclamation.

Piute.—The Marysvale district was an important source of uranium ore in the State in 1956. During the first half of the year ore shipments were made from the Farmer John, Freedom, and Prospector properties of Vanadium Corp. of America, from the Buddy mine operated by Sunnyside Uranium Co., and from the Potts Fraction of the Black Bear Consolidated Mining Co. Ore was shipped to the Marysvale buying station, whence it was transferred to the mill at Salt Lake City.

Alunite continued to be the most important nonmetal produced by county mineral industries in 1956. The White Horse mine of Calunite Corp. was idle, but the company processed material mined in 1955 and shipped the crushed ore to various fertilizer-mixing plants. Western Gold & Uranium, Inc., mined 50 tons of alunite from the Applegarth deposit near Marysvale and used it in experiments.

The small output of metals (gold, silver, copper, lead, and zinc) in Piute County in 1956 was recovered from ore produced by Arundel Mining Co. from the Deer Trail mine and by Cedar Hills Mining Co. from the Shamrock mine and shipped directly to smelters without beneficiation.

Rich.—The operation of phosphate-rock properties by San Francisco Chemical Co. constituted the only significant mining activity in

Rich County during 1956. The ore was shipped to a company-owned processing plant at Leefe, Wyo.

Sand and gravel production consisted of 3,000 tons of paving gravel mined by construction crews of the Utah State Road Commission.

Salt Lake.—In 1956, as in numerous past years, Salt Lake County was one of the most important mineral mining, milling, smelting, and refining areas in the United States. The total value of mineral output in Salt Lake County in 1956 was $269.4 million—19 percent above 1955. Most of this increase in 1956 resulted from a $38.9 million advance in the value of output of copper in the county, compared with 1955. Other commodities with substantial gains in value of output included zinc ($1.5 million increase), molybdenum ($1.2 million increase), lead ($814,000 increase), and sand and gravel ($488,000 increase).

Most of the metal output was from the Utah Copper and U. S. and Lark mines. Other activity in metal mining included the Carr Fork Operation (The Anaconda Co.) exploration and development program and leaser production on the Apex-Delaware group, Highland Boy, Utah Apex, and Yampa claims, and production from the El Dorado mine by the El Dorado Mining Co. Other active metal mines in the county in 1956 comprised 2 (Cardiff and Silver King Western) in the Big Cottonwood district and 2 (Dwyer and Sunday claims) in the Little Cottonwood district. In the Smelter district the United States Smelting Refining and Mining Co. re-treated lead slag from the Midvale smelter.

The Utah Copper mine—the largest gold, silver, and copper producer in Utah and top ranking copper-producing mine in the United States—and the U. S. and Lark mine—the State's leading lead and zinc producer—are both in the West Mountain (Bingham) district near Salt Lake City, the leading base- and precious-metal-producing district in Utah in 1956.

Copper ore from the Utah Copper Division, Kennecott Copper Corp., open-pit mine was treated in two 40,000-ton-per-day flotation mills at Arthur and Magna. Both copper and molybdenum concentrates were recovered from the ore. The copper concentrate was shipped to the Garfield copper smelter and copper-anode plant of the American Smelting and Refining Co. Custom ore from Utah and out-of-State producers was also accepted at this smelter. The Kennecott Copper Corp. product from the smelter and plant was transferred to the Kennecott Copper Corp. copper refinery at Garfield, where the finished products were copper, gold, and silver bars.

The lead-zinc ore from U. S. and Lark mine of the United States Smelting Refining and Mining Co. was concentrated at the company 1,700-ton-per-day mill at Midvale. Custom lead-zinc ore from Utah and other States was also treated at this mill. The concentrate went to the company Midvale lead smelter. Granulated zinc-bearing slag from the smelter was shipped to the International Smelting and Refining Co. zinc-fuming plant at Tooele in Tooele County.

Other mineral-processing or refining plants in Salt Lake County included the Howe Sound Co. cobalt refinery, Garfield Chemical & Manufacturing Corp. sulfuric-acid plant, and Western Phosphates, Inc., triple superphosphate plant, all at Garfield.

One of the three uranium mills in Utah was at Salt Lake City; it was operated by Vitro Uranium Co., a division of Vitro Corp. of America. Ore for the 550-ton-per-day plant was supplied primarily from the San Rafael-Green River area and from the Marysvale district. In 1956 Vitro started a $1.2 million program to increase both efficiency and capacity.

In Salt Lake City, Salt Lake Tungsten Co. operated its plant on custom tungsten ore from Utah and other States, and Filtrol Corp. processed halloysite clay from Juab County, Utah.

Two of the State's largest petroleum refineries (operated by Salt Lake Refining Co. and Utah Refining Co.) were also in Salt Lake City.

Cement was produced by Portland Cement Co. of Utah at its plant in this area. Interstate Brick Co. and Utah Fire Clay Co. of Salt Lake City produced common brick.

Salt was produced by solar evaporation of brine at the Morton Salt Co. plant on the shores of the Great Salt Lake near Saltair. An expanded-perlite mill in Salt Lake City was operated for the first half of the year by Utco Products Co. and during the latter half of the year by Acme Lite Wate Products, Inc., on raw material from Beaver County, Utah. Vermiculite-Intermountain, Inc., operated its exfoliated-vermiculite plant in Salt Lake City throughout the year.

The Kennecott Copper Corp. stated in its annual report for 1956 that 32.3 million tons of ore was mined and milled from the Utah Copper mine at Bingham by the Utah Copper Division. This was 17 percent above the quantity of ore mined and milled in 1955. The ore averaged 16.6 pounds of copper per ton. Copper production from all sources (including copper precipitate from water) reported by the Utah Copper Division was 248,158 tons, compared with 230,837 tons in 1955. To get ore out of the pit without hauling it considerable distances upgrade, as the open pit was deepened, two tunnels connecting the lower levels of the pit with the main ore-haulage system had been provided. Work was begun in October on a third tunnel 350 feet below the one completed in 1951. The new tunnel will be 18,000 feet long, will cost approximately $12.9 million, and was planned for completion in 3 years. The vertical casting installation at the refinery, completed late in 1955 to provide the larger shapes now in demand by customers, was placed in operation.

According to the United States Smelting Refining and Mining Co. annual report for 1956, operations at the U. S. and Lark mine at Bingham continued on the alternate 5- and 6-day-week basis, with 2 shifts per operating day. The grade of ore produced was about the same, but tonnage was somewhat higher than in 1955. Sinking of the inclined shaft preparatory to opening 2 new and deeper operating levels in the Lark section was about 80 percent completed at the end of the year, and sinking of a winze to explore deeper levels in the U. S. section was started. Development in the lower Bingham area, extending into the new property acquired under lease last year, was continued, together with other development projects. The Midvale plant operated without interruption on an alternate 5- and 6-day basis. Smelting operations were on a 2-shift basis, with the flotation mill normally on 3 shifts.

The value of nonmetal output in Salf Lake County rose to $4.9 million in 1956, compared with $4.1 in 1955—2 percent of the total

value of all mineral production in the county. Increased demand for sand and gravel by the construction industry—particularly for industrial and residential building—was responsible for the 20-percent increase in nonmetal value over 1955. Coupled with gains in building construction, portland-cement shipments were 4 percent greater than in 1955, and stone output (chiefly for cement) was 15 percent greater. Gains in lime production also were reported by the Kennecott Copper Corp., which produced quicklime for use at its copper-ore-reduction facilities. In comparison, the output of salt declined slightly below the 1955 level. The mining of miscellaneous clay by Interstate Brick Co. was discontinued in 1956.

San Juan.—San Juan County was the prime source of uranium ore, producing three-quarters of the State total. Shipments of ore were reported from 164 properties during the first half of the year and totaled 316,000 tons at an average grade of 0.32 percent contained U_3O_8. The more productive properties were:

Property:	*Operator*	*Locality*
Big Buck No. 9A	Standard Uranium Corp	Lisbon Valley.
Bobcat	Little Beaver Mining Co	Do.
Far West	Hidden Splendor Mining Co	Do.
Fortunate	Hecla Mining Co	Do.
Happy Jack	Bronson & Cooper Mining Co. and Last Chance Mining Co.	White Canyon.
Hideout	White Canyon Mining Co	Deer Flat.
Jean No. 1	Boyles Bros. Drilling Co	Indian Creek.
Maybe No. 3	Hall & Bailey, Inc	Red Canyon.
Mi Vida	Utex Exploration Co	Lisbon Valley.
North Point	White Canyon Mining Co	Fry Canyon.
Richardson	La Sal Mining & Development Co.	Lisbon Valley.
Section 36	Continental Uranium, Inc	Do.

These 12 properties yielded 78 percent of the county total for the half-year period.

The major producing property was the Mi Vida mine of Utex Exploration Co. During 1956 shipments of ore from the mine were limited by the AEC to 15,000 tons per month and production was geared approximately to this schedule. Average labor force at the mine was as follows: 30 miners, 7 mechanics, 6 surface men, and 4 waste-development contract employees for a total of 47. The mine operated on a 2-shift basis. In addition, there were a cook and helper for each shift. All employees at the mine (including salaried personnel) reportedly were averaging 14 tons per man-shift at the end of the year.

During 1956 a sublevel haulage system was completed and placed in operation. The new system consisted of 3,000 feet of tunnel and 7 vertical raises 50 feet in height, through which ore was dropped from the mining horizon.

Mining methods and costs at the Big Buck mine of Standard Uranium Corp. were described in a Bureau of Mines report released in December.[7] As of February 1956, after 1 full year of operation, the Big Buck mine had produced 96,500 tons of ore.

Homestake Mining Co., through its subsidiary companies (the Little Beaver Mining Co. and the La Sal Mining & Development Co.),

[7] Dare, W. L., and Durk, R. R., Mining Methods and Costs, Standard Uranium Corp., Big Buck Mine, San Juan County, Utah: Bureau of Mines Inf. Circ. 7766, 1956, 51 pp.

produced uranium ore at a rate of 300 tons per day from its 2 properties—Little Beaver (Bobcat) and La Sal (Richardson). According to the company annual report, production for the year was: Little Beaver—30,400 tons at 0.41 percent, La Sal—61,700 tons at 0.37 percent. The company began development of a third property, the North Alice group, in January with construction of surface facilities; in March a 3,000-foot inclined adit was begun and was near completion by year end.

At Mexican Hat, Texas-Zinc Minerals Co. (subsidiary of The Texas Co. and The New Jersey Zinc Co.) began constructing a 775-ton-per-day mill. Ore for the mill will originate in part from the company Happy Jack mine in White Canyon and from other mines in the surrounding area.

San Juan County occupied much of the attention of the Rocky Mountain oil industry in 1956 as a result of discovery of major oil-producing areas within the Paradox basin. Early in the year The Texas Co. completed the No. 1 Navajo (sec. 23, T. 40 S., R. 24 E.), the discovery well of the Aneth field. Initial daily flow from the well was 1,700 barrels of oil. The confirmation well was completed by Superior Oil Co. By the end of the year, 20 producing wells had been completed in the field, with daily initial flows ranging from 300 to 1,900 barrels and averaging 800 barrels. Operators responsible for the drilling were The Texas Co., Superior Oil Co., Three States Natural Gas Co., Shell Oil Co., and Gulf Oil Corp.

Discovery of the East Aneth field (sec. 20, T. 40 S., R. 26 E.) by The Texas Co. and of the North Desert Creek field (sec. 12, T. 41 S., R. 23 E., unsurveyed) by the Shell Oil Co. was reported in September. Each discovery well in both fields had a reported initial daily production of 1,400 barrels. In addition, 5 other successful wildcat oil wells were completed, as follows: Recapture Creek (sec. 21, T. 40 S., R. 23 E.) and Bluff (sec. 4, T. 40 S., R. 23 E.) by Shell Oil Co.; 2 unnamed fields (secs. 18 and 26, T. 40 S., R. 24 E.) by The Texas Co., 1 of which was later included in the Aneth field; and a discovery (sec. 16, T. 43 S., R. 22 E., unsurveyed) by the Western Natural Gas Co. A natural-gas discovery was reported by United States Smelting Refining and Mining Co. in sec. 9, T. 43 S., R. 21 E., unsurveyed.

The outstanding success of the 1956 drilling program in San Juan County was primarily responsible for more than a 100-million-barrel increase in State oil reserves. County production, although showing more than a threefold increase over the preceding year, fell far short of the area potential because of lack of outlets. Some crude oil (approximately 2,000 barrels per day) was moving by truck and rail from the Aneth field to Salt Lake City by year end; but, in general, wells were shut in, waiting outlets.

Proposals for pipelines to carry Paradox basin crude oil to Salt Lake City, Texas, and southern California were announced by the end of the year.

Sand and gravel production in 1956 was predominantly paving gravel quarried by D. W. Brimhall & H. J. Wimmer, contractors for the Federal Bureau of Public Roads.

A small quantity of agate was collected by D & E Products Co. from the Thomas Range.

Small quantities of copper and silver were recovered from ore from the Four Aces mine in the White Canyon district.

Some uranium ores of western San Juan County contain appreciable quantities of copper associated with the uranium mineralization; the copper by itself is not economic under present conditions. In the first 6 months of 1956, 37 San Juan properties shipped copper-bearing uranium ore to the AEC mill at Monticello; these shipments totaled 69,161 tons containing 960,580 pounds of copper (13.9 pounds per ton). The copper was paid for by the AEC and became the property of that agency. This copper was not credited to the county or State as production in 1956. Most of the ore came from the White Canyon, Red Canyon, Deer Flat, and Fry Canyon areas; some ore also originated in the Abajo Mountains, Elk Ridge area, and Reed Canyon.

Sanpete.—Rock salt continued to be the dominant mineral commodity in Sanpete County in 1956, and all mine production came from the Royal Crystal Salt Co. mine at Axtell operated by Albert Poulson. Output was used for cattle feed and shipped to feed dealers in Arizona, Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming.

Six thousand tons of structural and paving sand and structural and paving gravel was produced and sold by Cox Bros.

Three States Natural Gas Co. completed the Joe's Valley discovery oil well in early 1956. The well, producing from the Ferron sandstone, was in sec. 20, T. 15 S., R. 6 E. A confirmation was also successfully completed in both the Ferron and the Dakota sandstones. An 8-mile pipeline was installed to connect the field to the Clear Creek gas system.

Sevier.—The nonmetals group, consisting of gypsum, clays, sand and gravel, and salt, accounted for 76 percent of the $1.1 million value of all minerals produced in 1956. This compares with a 79-percent contribution by the nonmetals toward the $1.3 million total value of all minerals in 1955. The decline resulted from a 23-percent lower output of crude gypsum by the United States Gypsum Co. and Western Gypsum Co. The remaining nonmetals all increased in output and followed the general upward trend in the demand for construction materials.

Clays were mined by Western Clay & Metals Co., which produced bentonite and fuller's earth from its Redmond and Aurora pits.

Sand and gravel output reached 48,500 tons and consisted of 30,500 tons of commercial structural sand and gravel produced by Elmo R. Herring and Redmond Sand & Gravel Co. Government-and-contractor output was 18,000 tons of paving gravel mined by construction crews of the Utah State Road Commission.

Salt output reached 2,400 tons and was produced by Poulson Bros. Salt Co., which operated its rock-salt mine near Redmond. Rock salt was shipped to feed dealers in Arizona, Colorado, Idaho, Montana, Nevada, and Utah, and exported to Canada.

Coal production was derived from the Southern Utah Fuel Co. mine, which employed an average of 10 men.

In the first 6 months of the year, 1 test shipment of uranium ore was made from the Last Chance claim operated by the Last Chance Mining Co.

Gold, silver, lead, and zinc with a total value of $1,285 were recovered from ore mined by Scott M. Nebeker, Gloria Mining Co., and Wilford W. Sweeney from deposits in Sevier County.

Summit.—The total value of the mineral production in Summit County increased from $1.2 million in 1955 to $5.6 million in 1956. Most of this gain came from the advanced output of lead and zinc in the county, mainly from the United Park City Mines Co. mines. Production by this company in 1956 came from its Summit County mines, whereas in 1955 most of it came from Wasatch County mines. The value of gold, silver, copper, lead, and zinc output from deposits in Summit County made up 93 percent of the total value of all minerals produced in the county in 1956.

The United Park City Mines Co. group of mines was the second-ranking lead and zinc and third-ranking silver producer in the State in 1956. The company reported that it mined and shipped 83,427 tons of lead-zinc ore (with an average assay of 0.030 ounce of gold and 5.71 ounces of silver per ton, 0.125 percent copper, 7.10 percent lead, and 9.64 percent zinc) to the International Smelting and Refining Co. (IS&R) plant at Tooele and the United States Smelting Refining and Mining Co. (USSR&M) plant at Midvale for concentration, lead smelting, and fuming of the zinc-bearing slag produced. In addition, it shipped 10,376 tons of tailing material to American Smelting and Refining Co. (AS&R) copper smelter at Garfield and 1,260 tons of low-grade siliceous material to IS&R lead smelter and zinc-fuming plant at Tooele and AS&R smelter at Garfield. In 1956 the company also did extensive exploration and development at its mines, comprising 22,988 feet of tunnel, 11,344 feet of diamond drilling, and 42,514 feet of long-hole percussion drilling. An oil warehouse, railroad spur, and loading dock were built near Keetley during 1956.

Five other mines produced varying quantities of gold, silver, copper, lead, and zinc in Summit County in 1956. G. W. Wortley shipped material to the smelter from the Atkinson tailing dump, Wortley Bros. shipped from Clegg Lease tailing dump, Wortley Bros. and McFarland & Hullinger shipped from the Grasselli tailing dump, and McFarland & Hullinger shipped from the Ontario and Park Flag mine dumps.

Nonmetals played only a small role in the overall mining activity of the mineral industries in 1956. Sand and gravel and stone for highway use were the most important. The Federal Bureau of Public Roads, the Utah State Road Commission, and the county highway department were all actively engaged in highway construction. Whiting & Haymond, Vernal Sand & Gravel Co., and Wheelwright Construction Co. were the leading private contractors working for these agencies; crushed sandstone was the principal stone and was quarried by Utah Construction Co. for the Federal Bureau of Reclamation. Clay production consisted of 14,700 tons of miscellaneous clay mined by the Utah Fire Clay Co. from its Henefer pit.

Coal was produced from the Chappell mine operated by the Chappell Coal Co. The company employed 13 men during the year.

Tooele.—The total value of mineral output in Tooele County in 1956 ($4 million) was 9 percent above the comparable figure for 1955. Increased output was reported for 10 of the commodities produced in 1956, including gold, silver, copper, lead, zinc, lime, potash, pumice, and gem stones. Declines were reported for output of salt, stone, and

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tungsten, and no production was reported for clays and sand and gravel.

In 1956 Tooele County continued to be an important lead-zinc milling and smelting area. The International Smelting and Refining Co. 1,500-ton-per-day concentrator and lead smelter and zinc-slag fuming plant at Tooele were operated on ore, concentrate, and slag from Utah and other States throughout the year. In 1956 Combined Metals Reduction Co. continued to accept custom lead-zinc ore for treatment in its 700-ton-per-day mill at Bauer.

Output of gold, silver, copper, lead, and zinc came from 21 active mines in the county in 1956. Of these operations, the United States Smelting Refining and Mining Co. Ophir Unit mine, the Combined Metals Reduction Co. Calumet mine and Bluestone tailings-dump operations, and Zuma Uranium & Oil Corp. Zuma mine were the principal producers. Each of the 17 remaining active mines in the county in 1956 mined and shipped or treated less than 100 tons of ore.

The value of nonmetals produced in Tooele County dropped to $1.8 million, or only 45 percent of the total value of all mineral products, compared with a total value of nonmetals of $1.9 million or 52 percent of the total county value in 1955. This moderate decline was due largely to lack of any clay and sand and gravel production and a decline in salt output. Potash was again the most important commodity, and all output came from the Bonneville, Ltd., plant. Salt ranked second in terms of value, and the Grantsville area of the county was the scene of productive activity by the Deseret Salt Co. and Stansbury Salt Co., Inc. Except for a small quantity of ornamental stones, the construction materials—lime, stone, and pumice and pumicite—accounted for the remaining production.

At Bauer the coal-resin plant of Combined Metals Reduction Co. was rebuilt with modernization after its destruction by fire in September 1955. The new plant has the capacity to produce 10 tons per day of refined resins. The resins are used in chewing gum, paints and lacquers, and printing inks. The resins were received from the Hiawatha coal mine (Carbon County) where a flotation concentrate was produced as a byproduct of the coal-mining operation.

Uintah.—The American Gilsonite Co. completed its 800-foot, 4-compartment shaft on the Cowboy vein at Bonanza in the spring. At the same time, the company laid the foundations for a gasoline and metallurgical-coke refinery near Grand Junction, Colo.

The gilsonite operation has developed considerable interest in several unusual features associated with the mining, transportation, and refining of the solid hydrocarbon. Mining methods take cognizance of the explosive nature of gilsonite dust-laden air, and two methods have been developed for breaking the material from the face. A cutting machine of special design is used where vein material is hard and unfractured, and a water spray is directed through the cutting teeth to reduce dust. Where the vein material is fractured sufficiently, as in most portions of the Cowboy vein, a hydraulic jet directs high-pressure water into the fractures, resulting in disintegration of the face material. No wetting down is necessary for preventing dust in the hydraulic method.

With both cutting methods additional water is supplied to the face to wash the cut material down 2½° slopes to the shaft, where the coarse

material is dewatered and hoisted by clamshell bucket and the fine material (minus-¾-inch) is pumped to surface level.

A surface preparation plant cleans, sizes, and dries material for the conventional market. Additionally, other material will be cleaned and "re-slurried" for transmission to the refinery near Grand Junction (Colo.) through an 8-inch pipeline 71 miles long.

The initial capacity of the refining plant reportedly will be 500 tons per day of gilsonite, with an output of 250 tons of high-purity coke and 60,000 gallons of gasoline.

Sohio Petroleum Co. (a subsidiary of Standard Oil Co. of Ohio) undertook to examine asphaltic sand deposits of Asphalt Ridge near Vernal to determine their extent and the economic feasibility of separating and utilizing the contained bitumen.

Production of crude petroleum declined to 1.8 million barrels in 1956, with smaller output reported from major fields—Ashley Valley, Red Wash, and Roosevelt. The remaining two fields—Walker Hollow and Brennan Bottom—had greater production than in 1955.

An oil discovery was credited to Gulf Oil Corp. for finding production in the Wasatch formation of the Brennan Bottom field. A Havenstrite Oil Co. well (sec. 22, T. 9 S., R. 20 E.) resulted in the second Uintah County oil discovery for the year. The company also had a gas discovery (sec. 9, T. 10 S., R. 22 E.). Both of these latter wells were in the Ute Trail unit; oil production was from the Green River formation and gas from the Wasatch. A second gas discovery was made by El Paso Natural Gas Co. at Southman Canyon (sec. 11, T. 10 S., R. 23 E.), with commercial production from the Green River formation.

At Jensen a 1,200-barrel-per-day refinery was operated by the Uinta Oil Refining Co.

In the first 6 months of the year a shipment of uranium ore was made from the Bobo claim by the Texas Plungers & Associates.

Except for 3,000 tons of commercial sand and gravel mined by W. W. Clyde Construction Co., all sand and gravel produced in 1956 came from pits operated by private contractors working on highway contracts.

Utah.—Of the nonmetals that composed 89 percent of the total value of mineral production in Utah County during 1956, limestone quarried by the United States Steel Corp., Lakeside Lime & Stone Co., and Utah Lime & Stone Co. was the principal commodity. The major uses, in order of importance, were: Flux, lime manufacturing, concrete aggregate, roadstone, refractories, riprap, rock dust for coal mines, and other miscellaneous applications. The bulk of the sand and gravel produced in 1956 was commercial material, and the more important producers were Thorn Rock Products Co., Lee Sand & Gravel Co., and Warburton & Sons. The Lakeside Lime & Stone Co. was the only lime producer and sales of quick and hydrated lime more than doubled in 1956. Shipments were restricted to the Salt Lake City region for use in steel open-hearth furnaces for the concentration of base-metal ores, petroleum refining, and lump lime for flux.

Nine open-pit clay mines were operated by 6 individuals or firms in 1956, and output reached 157,000 tons of fire and miscellaneous clay. Utah Fire Clay Co. operated its Clinton fire-clay mine, and fire clay was also removed from the Wadley mine of R. D. Wadley Clay Co. and the Lake Mountain pit of Western Fire Clay Co. Miscellaneous

clay was mined from pits operated by Florence Powell, Loyd Stubbs, Utah Fire Clay Co., and Interstate Brick Co.

Pumice was recovered from a pit near Cedar Valley worked by William H. Prince & Sons Block Co. and used at its Salt Lake City block plant.

The value of the metal output (gold, silver, copper, lead, and zinc) in the county in 1956 ($280,000) was 11 percent above that in 1955. Of the nine active metal mines, the Tintic Standard and Iron Blossom mines (owned by Tintic Standard Mining Co. and operated by leasers) were the most productive. The Tintic Standard was operated from January 1 to June 30, and a total of 6,420 tons of ore (containing 240 ounces of gold, 105,526 ounces of silver, 42,943 pounds of copper, and 585,475 pounds of lead) was mined and shipped to smelters. The Iron Blossom was operated from August 1 throughout the remainder of the year. A total of 1,717 tons of ore containing 66 ounces of gold, 12,576 ounces of silver, 4,602 pounds of copper, and 66,871 pounds of lead was mined and shipped to the American Smelting and Refining Co. smelter at Garfield. In addition, 6 tons of ore containing 216 ounces of silver and 3,943 pounds of lead was mined and shipped to the International Smelting and Refining Co. smelter at Tooele. The hoist and hoist house were destroyed by fire and replaced in 1956. The Colorado Consolidated, Mountain View, and Yankee Consolidated mines were the remaining major metal producers in the county in 1956.

Wasatch.—The value of mineral production in Wasatch County dropped from $7.7 million in 1955 to $3.0 million in 1956 because of a drop in the value of lead and zinc output. The combined value of these two metals produced in the county in 1956 was $1.9 million, compared with $5.8 million in 1955. Most of this decline resulted from inactivity of the United Park City Mines Co. mines on the Wasatch side of the Wasatch-Summit County boundary line (activity was limited to the Summit County mines), coupled with reduced output from New Park Mining Co. mines in Wasatch County.

The Mayflower-Park Galena mines operation (New Park Mining Co.) was the third-ranking lead, zinc, and gold producer in 1956. The company reported that during 1956 development of the 1,880 and 2,005 levels was begun from the Mayflower shaft, which was sunk an additional 69 feet in 1956. A new pumping station completed on the 1,630 level had a capacity of 3,000 gallons of water per minute. The water flow was 1,100 gallons per minute at the close of the year. A new underground mechanical shop provided immediate service for repairs on mining machinery underground and increased efficiency by eliminating the need for transportation to the surface.

McFarland & Hullinger shipped Park City Consolidated Co. dump material to the American Smelting and Refining Co. smelter at Garfield for use as a flux.

Washington.—The value of gold, silver, copper, and lead output in Washington County made up $106,000 of the $134,000 total value of mineral production in the county in 1956. These metals were recovered from ore from four active mines and copper-slag material from the Apex smelter dump. The Apex-Dixie Mines, Inc., Apex mine in the Tutsagubet district was the major metal-producing mine followed by the Western Gold & Uranium, Inc., Silver Reef mine in the Harrisburg (Leeds) district.

Shipments of uranium ore were made during the first half of the year from the Chloride Chief mine of Western Gold & Uranium, Inc.

All sand and gravel produced in 1956 resulted from the activities of construction and maintenance crews of the State and county highway departments.

Wayne.—Seventeen uranium properties were active in the first 6 months of 1956. Total ore shipments for the period amounted to 887 tons. Major producing properties were the Desert Group operated by N. B. Hunt and the Big Jim No. 11 operated by the Capitol Reef Uranium Corp. and Acme Uranium Mines, Inc.

The Utah State Road Commission had construction crews working in Wayne County during 1956; in the course of highway construction 6,000 tons of paving gravel was produced.

Petrified wood and bone, agate, and obsidian were collected by A. L. Inglesby during the year.

Weber.—Nonmetals were the only mineral products of Weber County in 1956; the value of these commodities rose to $304,700 compared with $263,400 in 1956. Crushed limestone quarried by a number of private contractors working for the Federal Bureau of Reclamation was the only stone produced; 231,500 tons of sand and gravel was classified as commercial material used by local building contractors. Government-and-contractor output consisted of 115,500 tons of paving sand and gravel. The need for clay by the Harrisville Brick Co. for brick and other clay products resulted in the production of 22,800 tons of miscellaneous clay.

The Mineral Industry of Vermont

By Robert W. Metcalf [1]

MINERAL OUTPUT in Vermont in 1956 was valued at $23.1 million—3 percent less than in the peak year 1955 but 13 percent higher than in the preceding peak, 1954. Nonmetals again supplied over 85 percent of the total value, with copper furnishing most of the balance. Eleven minerals were produced in 1956, compared with 12 in 1955. Each of the 14 counties in the State reported output.

Stone (which included marble, granite, limestone, and a small quantity of miscellaneous stone) had the highest value of production in Vermont in 1956. Slate, asbestos, copper, and sand and gravel were next in order of value of output. In 1956 the leading counties, in order of value of mineral production, were Rutland, Washington, Orange, Lamoille, Franklin, and Chittenden.

TABLE 1.—Mineral production in Vermont, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	14,200	$14,200	(2)	(2)
Copper (recoverable content of ores, etc.)	4,305	3,211,530	3,403	$2,892,550
Gem stones	(3)	8		
Gold (recoverable content of ores, etc.)—troy ounces	181	6,335	(2)	(2)
Pyrites—long tons	[4] 21,685	(2)	22,537	107,117
Sand and gravel	1,763,229	1,169,031	1,909,778	905,397
Silver (recoverable content of ores, etc.)—troy ounces	50,447	45,657	(2)	(2)
Slate	(2)	(2)	162,239	3,721,545
Stone	581,749	11,061,196	620,510	11,622,274
Value of items that cannot be disclosed: Asbestos, lime, talc, and values indicated by footnote 2		8,399,641		3,914,647
Total Vermont [5]		23,884,000		23,131,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Weight not recorded.
[4] Revised figure.
[5] Total adjusted to eliminate duplicating value of stone.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Production of copper in 1956 decreased 21 percent in tonnage compared with 1955 but only 10 percent in value, because of the higher price of copper during most of the year. Both underground

[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.

and surface mining was conducted by Appalachian Sulphides, Inc., (South Strafford), at the Elizabeth mine in Orange County.

Gold and Silver.—The smelting of Vermont copper ores yielded small quantities of gold and silver as byproducts. The recovery of both gold and silver in 1956 was smaller than in 1955 because of the decreased copper output.

TABLE 2.—Mine production of recoverable copper, gold, and silver, 1947–51 (average) and 1952–56, in terms of recoverable metals

Year	Copper		Gold		Silver	
	Short tons	Value	Fine ounces	Value	Fine ounces	Value
1947–51 (average)	2,944	$1,272,639	125	$4,382	28,666	$25,944
1952	3,774	1,826,616	162	5,670	45,361	41,054
1953	3,947	2,265,578	171	5,985	43,128	39,033
1954	4,352	2,567,680	185	6,475	48,572	43,960
1955	4,305	3,211,530	181	6,335	50,447	45,657
1956	3,403	2,892,550	(1)	(1)	(1)	(1)

[1] Figure withheld to avoid disclosing individual company confidential data.

NONMETALS

Asbestos.—Production of chrysotile asbestos in 1956 was slightly under 1955. The output was by Vermont Asbestos Mines of the Ruberoid Co. from a quarry at Lowell (Lamoille County), a few miles north of Hyde Park. Twenty or more grades of asbestos, varying in fiber length and quality, were prepared at the nearby mill. Prices were increased 5 percent as of January 2, 1956, and ranged from about $35 to $502 per short ton, according to grade and quality. The average value per ton rose from $88.70 in 1955 to $91.26 in 1956.

Clays.—Miscellaneous clay was mined in 1956 in Bennington, Chittenden, and Rutland Counties for use in making common brick and for mortar.

Lime.—Hydrated lime was produced by the Vermont Associated Lime Industries, Inc., in Addison County. Quicklime also was made in Chittenden County by the same firm.

Pyrites.—Appalachian Sulphides, Inc., produced pyrrhotite concentrate from copper ore mined at the Elizabeth mine in Orange County. Output in 1956 increased 4 percent in quantity compared with 1955.

Sand and Gravel.—Output of sand and gravel in 1956 increased 8 percent in tonnage compared with 1955, although the total value was less. Twenty-five commercial and 3 Government-and-contractor operators were active during the year. Production came from all but 1 of the 14 counties in the State, with commercial producers mining sand and gravel in 9 counties. Counties with the largest production (commercial and Government-and-contractor combined), in order of size of output, were: Windsor, Washington, Chittenden, Caledonia, Orange, and Rutland. Street and highway construction totaled 90 percent of the Government-and-contractor tonnage and 75 percent of the total Vermont tonnage (commercial and Government-and-contractor combined). The quantity of sand and gravel used by

Government agencies was 140,000 tons (13 percent) higher in 1956 than in 1955, mostly because of a large quantity of structural sand and gravel utilized in 1956 contrasted with none reported for structural purposes in 1955.

Slate.—Slate production in 1956 decreased in both quantity and value compared with 1955. The output of slate granules dropped sharply but still represented by far the largest tonnage of any use, followed by flagging and roofing. Both natural and artificially colored granules were prepared. There were 16 producers in 1956 operating 17 quarries, in contrast to 13 operators and 13 quarries in 1955. All output was from Rutland County.

Stone.—Stone production was again the largest mineral industry in Vermont, comprising slightly over half of the total value of all mineral industries in the State. The output in 1956 was 7 percent higher than in 1955 and the value 5 percent greater. Ten commercial producers quarried granite, limestone, marble, and miscellaneous stone. There were 16 quarries in operation: 6 granite quarries in Orange and Washington Counties; 5 limestone quarries in Addison, Chittenden, Franklin, and Rutland Counties (whiting in Rutland County); 4 marble quarries in Grand Isle, Rutland, and Windsor Counties; and 1 miscellaneous stone quarry in Bennington County. No municipal, county, or other Government-and-contractor operations were reported in 1956.

Talc.—Talc was mined in Vermont in 1956 by Eastern Magnesia Talc Co., Inc. (Burlington), operating in Lamoille and Washington Counties; and Vermont Talc Co. (Chester), with a mine in Windham County. Both firms operated crushing and grinding plants near the mines. The raw-material stocks at the Reading plant of the Vermont Mineral Products, Inc., which was destroyed by fire in 1955, were purchased in May 1956 by Eastern Magnesia Talc Co., Inc. Although the mine was not in operation in 1956, some sales of crude talc from stocks were made for use in roofing products. The total output of talc in Vermont in 1956 declined 14 percent and the value of production 4 percent, compared with 1955. No soapstone or pyrophyllite was mined in Vermont.

REVIEW BY COUNTIES

Addison.—Vermont Associated Lime Industries, Inc., produced hydrated lime, mostly for building and for insecticides and fungicides. Sand and gravel was mined under contract for the State highway department for use in road construction. The United States Forest Service also produced some paving gravel for building roads in the Green Mountain National Forest. The Vermont Associated Lime Industries, Inc., also sold limestone for agricultural and other uses.

Bennington.—The Bennington Brick Co. resumed operations in 1956 after suffering severe flood damage the preceding year and produced a small tonnage of miscellaneous clay for brick. The Vermont Highway Department dug paving gravel, both with its own crews and under contract for road construction. The United States Forest Service also produced gravel in Bennington County for building forest roads. William E. Dailey, Jr., produced building and paving sand and paving gravel at a fixed plant at South Shaftsbury near North

Bennington. E. H. Fisher & Son (Manchester), mined a small tonnage of paving gravel. Miscellaneous stone also was produced by William E. Dailey, Jr. The stone was crushed and sold as roadstone, railroad ballast, and roofing granules.

TABLE 3.—Value of mineral production in Vermont, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Addison	$131,218	$138,048	Lime, stone, sand and gravel.
Bennington	69,349	73,195	Sand and gravel, stone, clays.
Caledonia	(1)	138,871	Sand and gravel.
Chittenden	329,644	353,316	Sand and gravel, lime, stone, clays.
Essex	(1)	12,850	Sand and gravel.
Franklin	(1)	(1)	Stone, sand and gravel.
Grand Isle	(1)	(1)	Stone.
Lamoille	(1)	(1)	Asbestos, talc, sand and gravel.
Orange	(1)	(1)	Copper, stone, pyrites, sand and gravel, silver, gold.
Orleans	(1)	12,550	Sand and gravel.
Rutland	9,520,069	9,693,744	Stone, slate, sand and gravel, clays.
Washington	(1)	(1)	Stone, sand and gravel, talc.
Windham	(1)	(1)	Sand and gravel, talc.
Windsor	142,413	139,902	Sand and gravel, stone.
Undistributed [2]	13,691,105	12,568,054	
Total	23,884,000	23,131,000	

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes value for counties indicated by footnote 1 and in 1955 value of gem stones for which no county of origin was reported.

Caledonia.—Caledonia Sand and Gravel Co., Inc., produced washed sand and gravel from a portable plant near Waterford for building and road construction. Paving gravel was produced under contract for the Vermont Highway Department.

Chittenden.—Miscellaneous clay was mined by Drury Brick Co., Inc., at an open pit near Essex Junction; it was used in brickmaking. The W. C. Kirby Estate mined structural sand and gravel—part of which was sold as bank-run—from a pit near Burlington. George C. Stanley & Sons, Inc. (Burlington), produced run-of-bank sand for building and road use, and Vermont Paving Co. dug paving and road sands at Richmond. Engine sand was mined by the Rutland Railway Corp. from a pit at Colchester. The State highway department produced paving gravel under contract in Chittenden County. Vermont Associated Lime Industries, Inc., produced limestone for agricultural and other purposes, including the manufacture of lime.

Essex.—Road gravel was mined under contract for the State highway department.

Franklin.—Paving gravel for local use was produced under contract for the State highway department. The Swanton Lime Works, Inc., produced crushed limestone in Swanton for agricultural purposes, concrete aggregate and roadstone, flux, and other uses.

Grand Isle.—The Vermont Marble Co. quarried rough dimension marble at its Isle La Motte quarry.

Lamoille.—The Ruberoid Co. operated its Vermont Asbestos Mines quarry and mill at Lowell about 14 miles north of Hyde Park. Its product—chrysotile asbestos—was marketed in a number of grades for a variety of uses. The Eastern Magnesia Talc Co., Inc., mined talc from the No. 4 mine. Some of this material was sold crude, but

most of the product was ground in the company mill at Johnson. The ground talc was used for insecticides, asphalt, paint, paper, foundry facing, rubber, roofing, and other purposes. Sales also were made to dealers. Building and paving gravels were produced at a fixed plant by V. C. Farr of Morrisville. Paving sand and gravel was sold by Albert Nadeau of Johnson. Paving gravel for its own use was produced for the State highway department in Lamoille County.

Orange.—Copper was the mineral product of highest value in Orange County in 1956, followed in order by stone (granite), pyrites, sand and gravel, silver and gold. Appalachian Sulphides, Inc., produced copper from the Elizabeth mine south of South Strafford. Byproducts of milling were gold, silver, and a pyrite (pyrrhotite) concentrate. Both open-pit and underground mining was used. Benching in the opencut yielded about 17 percent of the total output. Both shrinkage and open-stoping methods were employed underground. Work underground included 3,593 feet of drifts, 11,449 feet of diamond drilling, and 1,290 feet of raising. A New Hampshire paper company purchased the pyrrhotite concentrate. The copper concentrate was shipped to the Laurel Hill (Long Island, N. Y.) refinery of the Phelps Dodge Refining Corp.; Brandeis Goldschmidt & Co., New York, N. Y.; and the General Services Administration for stockpiling.

The Rock of Ages Corp. produced light- and dark-gray granite block for monuments from the Pirie quarry at Williamstown. Paving sand was recovered from a pit at Williamstown by Levi Lemieux, and building and paving gravels were mined by the State highway department for local use in building roads.

Orleans.—Road gravel was mined in Orleans County under contract for the State highway department.

Rutland.—Rutland County in 1956 again ranked first in value of mineral output of Vermont counties. Mineral commodities produced, in order of value, were stone (crushed and dimension marble and crushed limestone), slate, sand and gravel, and clay.

Refractory mortar prepared from clay mined near Rutland was sold by Rutland Fire Clay, Inc.

Slate was quarried only in Rutland County in 1956. Seventeen quarries were operated by 16 producers. The principal producing firms or individuals were: Central Commercial Co., Castleton (roofing granules); Vermont Structural Slate Co., Fairhaven and Poultney (structural and sanitary, flagging, roofing, electrical, and miscellaneous); Covino Bros. Slate Co., Wells (roofing); Rising & Nelson Co., Inc., West Pawlet (roofing and flagging); Pedro Bros. Slate Co., Poultney (roofing and flagging); and Green Mountain Slate Co., South Poultney (roofing and flagging). The above 6 companies produced 96 percent of the tonnage of slate in Vermont in 1956 and 94 percent of the total value. Other leading producers were: Taran Bros., North Poultney; Calvert Slate Co., Inc., Poultney; Prehoda Slate Co., Inc., Wells; and Somich Bros., Pawlet—all of these firms produced slate for flagging and roofing.

Structural and paving sand and gravel were produced by R. D. Barker from his West Street pit in Rutland. This plant was sold to J. P. Carrara in December. The Vermont Marble Co. operated its Brandon pit during the year. Clark & Haynes produced structural

and paving sand and gravel near Poultney. Robert R. Greer (Poultney) mined sand and gravel for building and highway use and for sanding icy roads. Sand and gravel was mined under contract for the Vermont Highway Department for building local roads. The United States Forest Service mined gravel also for use in building roads.

Vermarco Lime Co. (West Rutland) and White Pigments Corp. (Florence) produced crushed and ground limestone. The Vermarco Lime Co. prepared limestone for blast-furnace flux, railroad ballast, agricultural purposes, use in paper and sugar mills, as a filler in various products, and for many other uses. White Pigment Corp. produced limestone for fillers for paints, pigments, and other materials; and products for abrasive use, leather finishing, and chemical purposes. Green Mountain Marble Corp. produced rough marble block at two quarries in Rutland County—the Clarendon and the Mine. The product of these quarries was transferred to the West Rutland mill for finishing. This mill produced rough block and sawed stone for exterior use, and cut or dressed marble for both exterior and interior use and for monuments. The Vermont Marble Co. produced rough marble block at its quarry at West Rutland. The finishing mill near the mine marketed sawed monumental and building stone, finished monumental stone, exterior and interior building stone and marble tile, and other specialties.

Washington.—Talc was mined from the No. 2 mine near Waterbury by Eastern Magnesia Talc Co., Inc. This product was ground in a nearby mill operated by the same company and sold for many different uses, including fillers for various industrial purposes. A special application for which the talc was sawed, not ground, was in making marking crayons.

Paul Dutton (Northfield) produced building gravel. Clarence J. Lepage (Barre) mined structural and paving gravel and small quantities of molding and building sand. Wilfred D. Lovie (Barre) produced structural and paving sand at a portable plant in Barre. Paving gravel for making town and county roads was produced by Alfred W. Adams from a plant near Montpelier. Richard C. Fiddock sold paving and road gravel from a pit at Berlin. Building and paving gravel was sold by J. F. Lamson and Kings Gravel Pit (both of South Barre). The City of Montpelier produced paving sand and gravel with its own crews for local street construction. The State highway department mined building sand and gravel. Gravel for road construction also was produced under contract for that agency.

The Rock of Ages Corp. produced rough and dressed monumental granite from three quarries in Washington County—the Rock of Ages and the E. L. Smith quarries, both near Graniteville; and the Wetmore-and-Morse quarry, near Websterville. A quantity of curbing stone for use on State highways also was sold. Both light and dark granites were marketed. Among the projects for which Rock of Ages granite was utilized were the following: War memorials in Tacoma, Wash., and Greenwich, Conn.; the Jesse Jones Memorial, Houston, Tex.; and a monument to Warren R. Austin, Sr., at Burlington, Vt. Rough monumental granite was quarried by Wells-Lamson Quarry Co., Inc., Websterville; and by Charles A. Pillette from the Adamant

quarry. Crushed granite for concrete and roadstone also was sold by Wells-Lamson Quarry Co., Inc.

Windham.—Vermont Talc Co. produced talc near Windham. The talc was ground in the company mill near Chester, Windsor County. Ground talc was sold for use in insecticides, paint, paper, rubber, and other products. Brattleboro Sand & Gravel Co. (Brattleboro) mined sand and gravel in 1956. Woodsboro Sand & Gravel Co. produced paving gravel near Jamaica, and Grafton L. Wilson, Jr., sold paving sand and gravel from a portable plant near Grafton. Sand and gravel for road construction was produced under contract for the Vermont Highway Department.

Windsor.—Vermont Mineral Products, Inc., sold the stocks of talc at its Reading mine to Eastern Magnesia Talc Co., Inc., in May 1956. The mine was idle during the year, but Eastern Magnesia Talc Co., Inc., sold appreciable quantities of talc from the Reading mine stockpile. The Vermont Talc Co. operated its grinding mill near Chester. Colonial Sand & Gravel, Inc., sold both bank-run and prepared sand and gravel for use in road construction. The preparation plant was at Sharon near White River Junction. The State highway department produced building sand and gravel. Sizable tonnages of paving gravel were mined under contract for that agency. The Vermont Marble Co. quarried rough block from which sawed and dressed stone were prepared. Some rough block was sold for exterior building purposes.

The Mineral Industry of Virginia

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the Virginia Division of Mineral Resources.

By Robert W. Metcalf[1]

VIRGINIA mineral production in 1956 broke all records in value and totaled nearly $209 million, more than one-fifth greater than the previous peak in 1955. Federal, State, and local road-building programs increased business and industrial construction, and the rising foreign demand for coal stimulated mineral output. This combination resulted in record production for stone and sand and gravel (the chief road building and construction materials produced in the State), and for the principal fuel mined—coal.

The value of production of clays, portland cement, coal, feldspar, kyanite, lead, lime, natural gas, sand and gravel, slate, stone, ilmenite, and zinc rose substantially compared with 1955. Of the 26 minerals produced in the State, only aplite, manganese ore, calcareous marl, mica, and soapstone declined appreciably. In order of value of products, the 10 chief mineral commodities produced in the Commonwealth were coal, stone, portland cement, sand and gravel, lime, zinc, salt, manganese ore, masonry cement, and gypsum. Coal supplied almost two-thirds of the total value of mineral output. The quantity of coal produced was double that of stone, which ranked second.

The value of fuels produced in Virginia increased to 67 percent of the total value of mineral output, compared with 63 percent in 1955. The value of all nonmetallics represented 29 percent compared with 32 percent in 1955, and the value of metals declined to about 4 percent of the total.

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[1] Commodity-industry analyst, Region V, Bureau of Mines, Pittsburgh, Pa.

TABLE 1.—Mineral production in Virginia, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate---pounds	1,259	$389	1,349	$454
Clays	935,941	873,348	1,000,019	1,032,665
Coal	23,507,509	108,173,907	28,062,775	138,126,577
Gem stones	255	344		
Lead (recoverable content of ores, etc.)	2,997	893,106	3,035	952,990
Lime	494,293	5,048,697	512,346	5,925,915
Manganese ore (35 percent or more Mn)---gross weight	32,654	2,779,337	20,231	1,901,983
Marl, calcareous	(2)	(2)	10,522	12,220
Mica, sheet---pounds	(2)	(2)	396	5,814
Natural gas---million cubic feet	968	259,000	2,926	810,502
Petroleum (crude) ---thousand 42-gallon barrels	4	(2)	(2)	(2)
Sand and gravel	6,460,886	8,076,104	7,783,103	9,240,407
Silver (recoverable content of ores, etc.)---troy ounces	1,850	1,674	1,874	1,696
Slate	31,536	820,124	31,894	1,034,858
Stone	11,965,890	19,869,675	14,081,904	23,075,595
Zinc (recoverable content of ores, etc.)	18,329	4,508,934	19,196	5,180,616
Value of items that cannot be disclosed: Aplite, cement (portland, masonry, and hydraulic lime), feldspar, gypsum, iron oxide pigments, kyanite, manganiferous ore (10 to 35 percent Mn), scrap mica (1955), pyrites, salt, soapstone, titanium concentrate, and values indicated by footnote 2		24,045,936		24,931,107
Total Virginia [3]		172,541,000		208,806,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] The total has been adjusted to eliminate duplicating the value of clays and stone.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Stimulated by the strong export demand and an active domestic market, coal production in Virginia again broke all records, rising to 28 million short tons valued at $138 million—a 19-percent increase in tonnage and a 28-percent rise in value. Higher costs and increased average values per ton contributed to the greater proportional rise in total value. Virginia ranked sixth as a coal-producer, its output represented nearly two-thirds of the value of all mineral production in the State.

Good-quality low- and high-volatile coals were mined and used for domestic and industrial purposes, including metallurgical, steam, and coking use. Semianthracite also was mined, principally for domestic consumption, in Montgomery County.

Bituminous coal was produced in 8 counties; by far the greater part came from counties in the extreme southwestern section of the State. Combined output in the 4 leading counties—Buchanan, Wise, Dickenson, and Tazewell—aggregated 92 percent of both total tonnage and value in the State. Most of the coal was mined underground, although a sizable tonnage was stripped, especially in Wise and Dickenson Counties. Over 600,000 tons (chiefly in Wise and Buchanan Counties) was mined with augers.

TABLE 2.—Production and value of bituminous coal, 1955–56, in short tons, by counties

County	1955			1956		
	Short tons	Value	Average value per ton [1]	Short tons	Value	Average value per ton [1]
Buchanan	8,913,067	$40,356,855	$4.53	9,430,237	$45,599,393	$4.84
Dickenson	3,890,719	17,927,551	4.61	4,792,884	25,460,407	5.31
Lee	660,395	3,789,514	5.74	761,584	4,636,273	6.09
Montgomery	(2)	(2)	(2)	7,340	44,627	6.08
Russell	1,013,633	4,708,989	4.65	1,471,111	6,661,502	4.53
Scott	(2)	(2)	(2)	7,300	34,310	4.70
Tazewell	2,970,212	15,695,409	5.28	3,542,464	21,464,700	6.06
Wise	6,026,003	25,515,144	4.23	8,049,855	34,225,365	4.94
Other counties	33,480	180,445	5.39			
Total Virginia	23,507,509	108,173,907	4.60	28,062,775	138,126,577	4.92

[1] Value received or charged for coal f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel, and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Other counties."

Petroleum and Natural Gas.—Petroleum and natural gas were important local sources of fuel.

Output of petroleum was entirely from the Rose Hill field in Lee County. No new wells were drilled in this field during 1956, but a new company purchased 11 wells—8 will be plugged and 3 saved as producers.

The output of natural gas in Virginia in 1956 tripled in both quantity and value and was recovered largely from Dickenson and Buchanan Counties; much smaller quantities came from the Early Grove field in Scott County and from Russell and Wise Counties. The increased production was due to completion of a 12-inch pipeline and four smaller lines connecting the Clinchfield Coal Co. wells in Dickenson County with the distribution lines of the Kentucky-West Virginia Gas Co. In Buchanan County, the United Producing Co. delivered sizable quantities of natural gas to the Hope Natural Gas Co.[2] The producing gas wells range from 2,500 to 5,900 feet in depth. As a result of test drilling in Buchanan, Dickenson, Russell, and Wise Counties in the Appalachian Plateau region, two new fields were discovered in south central Dickenson County, and wells were being connected into the pipeline distribution system.[3]

NONMETALS

Aplite.—The competition of imported glass, especially window-glass, reduced the demand for aplite from American glassmakers. As a result, the production of aplite decreased, compared with 1955. Two producers in Amherst and Nelson Counties near Piney River shipped aplite to glass manufacturers as a source of alumina. Virginia was the only source of aplite in the United States.

[1] Young, David M., Oil and Gas Development in Virginia During 1956: Virginia State Dept. of Labor and Industry, Ann. Rept., 1956, Richmond, Va., 1957, pp. 87–88.
[2] Richards, Horace G., Developments in Atlantic Coastal States Between New Jersey and South Carolina in 1956: Bull. Am. Assoc. Petrol. Geolog., vol. 41, No. 6, June 1957, p. 1221.

Cement.—Portland-cement shipments in Virginia almost matched shipments in the active year 1955 but surpassed the 1955 value by 6 percent. Shipments of masonry cement and hydraulic lime decreased 7 and 8 percent, respectively, compared with 1955. Hydraulic lime was produced from local shale in Warren County at Riverton. Portland and masonry cements were manufactured by 2 companies, 1 operating a dry-process plant at Fordwick, Augusta County and the other both a dry-process plant at Cloverdale (Botetourt County, and a wet-process plant at South Norfolk (included for statistical purposes under Norfolk County). Production of the South Norfolk plant was slowed by a towboat-crew strike, resulting in a loss of 71 kiln days. This was partly offset by adding a new kiln, which began burning cement in mid-September at the Cloverdale works. Chief raw materials used at the South Norfolk plant were marl and clay from nearby company mines. The cement company mined limestone near the Cloverdale plant and also produced shale and limestone, which were used at the Fordwick plant.

Clays.—Production of clays in Virginia in 1956 topped 1 million short tons valued at over $1 million and was 7 percent higher in tonnage and 18 percent higher in value than in 1955. The entire output, consisting of miscellaneous or common clay or shale, was consumed in heavy clay products, lightweight aggregate, and cement. Clays were produced by 13 companies at 15 plants in 13 counties. The leading clay-mining companies in 1956 were: Roanoke-Webster Brick Co., Inc., Roanoke (Botetourt County) and Suffolk (Nansemond County); Virginia Lightweight Aggregate Corp., Webster (Botetourt County); Southside Brick Works, Inc., Richmond (Chesterfield County); and Shenandoah Brick & Tile Corp., Winchester (Frederick County). The more important clay-producing counties, in order of output, were: Botetourt, Henrico, Chesterfield, and Frederick.

TABLE 3.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	591, 801	$554, 496	1954	704, 843	$723, 292
1952	940, 496	996, 351	1955	935, 941	873, 348
1953	952, 266	927, 571	1956	1, 000, 019	1, 032, 665

Feldspar.—Output of feldspar in 1956 in Virginia increased 7 percent over 1955. All production in Bedford County came from 1 producer at 4 mines near Bedford. Both potash and soda feldspar were produced. The feldspar was ground in the company mill for use in pottery and enamel. Some North Carolina feldspar also was processed.

Gypsum.—The United States Gypsum Co. mined crude gypsum at Plasterco (Washington County). Production in 1956 was slightly under 1955. At Plasterco this firm also operated a mill and plasterboard plant and at Norfolk a calcining plant, which was supplied both with domestic and imported gypsum. Several fertilizer plants in the Norfolk area marketed imported gypsum for agricultural use as land plaster.

Iron Oxide Pigments.—Crude iron oxide pigments were mined in Virginia in 1956 by American Pigments Corp., at Hiwassee (Pulaski County). Production which was less than in 1955 and consisted of both brown and yellow iron oxide, including sienna, umber, ocher, and natural yellows. Finished iron oxide pigments were produced by two companies in 1956—the American Pigment Corp., plants at Pulaski and Hiwassee, Pulaski County; and Blue Ridge Talc Co., Inc., at Henry, Franklin County. Both natural and manufactured finished pigments were prepared; sales included mineral blacks and browns, red and yellow oxide, ochers, siennas, and umbers.

Kyanite.—Kyanite production gained moderately over 1955. The only producer, Kyanite Mining Corp., mined biotite-feldspar schist on Baker Mountain near Farmville (Prince Edward County). This ore was processed at Cullen and Pamplin for use chiefly in firebrick and other special refractories and also in ceramic bodies, including porcelain, kiln furniture, and insulators.

Lime.—The output of lime in Virginia continued to grow and in 1956 topped 500,000 short tons valued at nearly $6 million, an increase over 1955 of 4 percent in quantity and 17 percent in value. Ninety-four percent of both the quantity and value of the lime produced was consumed in chemical or other industrial uses. Ninety percent of the total lime sold or used was quicklime. The demand for chemical and industrial lime in Virginia was strong throughout the year, but that for agricultural and building lime was poor. The price increased about 8 percent, effective in October.

Lime manufactured in Virginia was derived from abundant, high-quality limestone deposits in the Shenandoah and other valleys west of the Blue Ridge and from the soft limestone in the eastern part of the State on the Coastal Plain. One plant each in Isle of Wight and Norfolk Counties used oystershell as a raw material. Leading lime producers were: National Gypsum Co. and Standard Lime & Cement Co., Kimballton, Giles County; M. J. Grove Lime Co., Stephens City, Frederick County; and Dominion Limestone Division and Strasburg Lime Co., Division of Chemstone Corp., Strasburg, Shenandoah County. Other counties in which lime was burned were Montgomery and Tazewell.

TABLE 4.—Lime (quick and hydrated) sold and used by producers, 1947–51 (average) and 1952–56 by types

Year	Agricultural		Building		Chemical and other industries		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	21,601	$250,262	12,063	$133,841	341,046	$3,023,346	374,710	$3,407,449
1952	20,151	241,139	11,566	126,428	411,128	4,081,357	442,845	4,448,924
1953	19,215	243,030	10,819	117,477	447,350	4,586,911	477,384	4,947,418
1954	11,146	91,616	14,781	180,802	419,231	4,338,227	445,158	4,610,645
1955	26,945	333,464	4,355	52,034	462,993	4,663,199	494,293	5,048,697
1956	25,125	322,644	3,572	41,914	483,649	5,561,357	512,346	5,925,915

Marl, Calcareous.—Output of calcareous marl in 1956 was less than in 1955 due to slackened demand for agricultural use. Two producers in Clarke County and one in Surry County again contributed the entire output. The Surry County material was derived from Coastal Plain deposits; the Clarke County product was a travertine marl. Preparation for sale consisted of drying and pulverizing.

Mica.—Sheet-mica output was small, substantially less than in 1955. No production of scrap mica was reported. Hand-cobbed and full-trim mica were sold to the Government through General Services Administration by Piedmont Mining Co., Inc., from mines in Goochland and Powhatan Counties and full-trim by Ed Martin from Henry County and W. O. Baltzley from unspecified counties.

Nitrogen Compounds.—Production of synthetic nitrogen in Virginia in 1956 was reported by the Allied Chemical & Dye Corp. Nitrogen Division plant at Hopewell (Prince George County). Synthetic sodium nitrate (made by only one other company in the United States), ammonia, ammonium nitrate, and urea solutions, ammonium sulfate and ammonium nitrate-limestone were manufactured. During 1956 the firm also was installing facilities for manufacturing solid ammonium nitrate.[4] The leading market for these nitrogen compounds was in agriculture as fertilizers and fertilizer materials.

Perlite.—Perlite was expanded at Hopewell (Prince George County) from raw material shipped from Colorado and New Mexico. Virginia Perlite Corp., the only producer in Virginia, sold this material largely for plaster aggregate; smaller quantities were used for concrete aggregate. Output in 1956 was virtually the same as in 1955; prices for the finished product increased 20 percent.

Pyrites.—The Gossan mine in Carroll County, operated by General Chemical Division, Allied Chemical & Dye Corp., produced both lump and fines as concentrate. Output was 5 percent greater in 1956 than in 1955 and was utilized at the company sulfuric acid plant at Pulaski.

Salt.—The Olin Mathieson Chemical Co. (Saltville) produced chlorine, soda ash, and other chemicals from brines obtained from underground rock-salt deposits. This company was the only salt producer in Virginia. Production in 1956 was virtually the same as in 1955.

Sand and Gravel.—Output of sand and gravel in Virginia in 1956 increased 20 percent in tonnage and 14 percent in value. Street and highway construction and increased commercial and industrial building were the leading factors in the higher production. There were 39 commercial companies and 2 Government-and-contractor agencies producing sand and gravel in Virginia in 1956. The output reported from 30 counties included paving and building sand and gravel, and sizable quantities both of engine sand (mostly from Princess Anne County) and of glass sand (from Frederick and Rockbridge Counties). Paving sand and gravel furnished 52 percent of the total (including Government-and-contractor tonnage) and structural and paving sand and gravel greater than 90 percent of the total quantity sold or used.

[4] Oil, Paint and Drug Reporter, vol. 169, No. 8, Feb. 20, 1956, p 4.

The chief sand-and-gravel producing counties include the more important metropolitan areas in the State and in 1956 were as follows (the metropolitan areas are in parentheses): Chesterfield (Richmond), Fairfax (Washington, D. C.), Henrico (Richmond), Prince George (Petersburg-Hopewell), Spotsylvania (Fredericksburg), and Princess Anne (Norfolk-Portsmouth). The leading producers in the State in 1956 were: Southern Materials Co., Inc., Chesterfield County; Modern Sand & Gravel Corp., Northern Virginia Construction Co., Inc., C. R. Vaughan, Inc., and Virginia Sand & Gravel Co., Inc., Fairfax County; Commonwealth Sand & Gravel Corp. and West Sand & Gravel Co., Inc., Henrico County; Bryan Rock & Sand Co., Prince George County; and Massaponax Sand & Gravel Corp., Spotsylvania County.

TABLE 5.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Tota	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building	1,448,193	$1,589,376	$1.10	(1)	(1)	(1)
Paving	1,038,633	697,280	.67	1,456,852	$1,094,523	$0.75
Engine	(1)	(1)	(1)	81,089	81,510	1.01
Other	37,708	38,105	1.01	26,294	29,592	1.13
Gravel:						
Building	1,590,708	2,617,937	1.65	1,788,653	2,840,894	1.59
Paving	1,834,978	2,199,932	1.20	2,475,759	2,689,551	1.09
Other				8,500	15,300	1.80
Undistributed [2]	344,225	825,761	2.40	1,795,302	2,379,964	1.33
Total sand and gravel	6,294,445	7,968,391	1.27	7,632,449	9,131,334	1.20
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building				30,056	15,281	.51
Paving	52,321	21,503	.41	22,393	8,553	.38
Gravel:						
Paving	114,120	86,210	.76	98,205	85,239	.87
Total sand and gravel	166,441	107,713	.65	150,654	109,073	.72
Grand total	6,460,886	8,076,104	1.25	7,783,103	9,240,407	1.19

[1] Figure withheld to avoid disclosing individual company confidential data; included in "Undistributed."
[2] Includes glass, molding (1955), filter (1955), railroad ballast sand (1955), and those uses indicated by footnote 1.

Slate.—Output of slate in Virginia was only slightly higher than in 1955, but value rose over 25 percent to more than $1 million. Higher wages in the industry led to higher prices and also to somewhat reduced demand for slate products. Roofing slate and flagging increased in quantity in 1956 over 1955 by 3 and 25 percent, respectively; granules were less than in 1955. Virginia slate, usually dark gray with greenish or brownish tints, was mined from quarries in Albemarle and Buckingham Counties. One company prepared roofing granules from slate in both counties, and three other firms in Buckingham County marketed roofing and flagging slate.

Soapstone.—Considerably less ground soapstone was produced in 1956 than in 1955. Statistics of dimension soapstone are included under the Stone section in this chapter. Two firms ground soapstone for use chiefly in insecticides, foundry facings, rubber, and roofing; they were Blue Ridge Talc Co., Inc., Henry, Franklin County; and Alberene Stone Corp., Schuyler, Nelson County.

TABLE 6.—Stone sold or used by producers, 1955–56, by kinds and uses

Kind and use	1955		1956	
	Short tons	Value	Short tons	Value
Dimension stone: Sandstone, all uses	433	$4,465	507	$4,895
Crushed and broken stone:				
Granite:				
Riprap			135,798	225,947
Concrete and roadstone	(1)	(1)	1,425,662	2,268,458
Other uses [2]	1,352,539	1,878,536	399,790	453,880
Basalt and related rocks: Concrete and roadstone	707,302	1,184,604	743,884	1,249,759
Limestone:				
Fluxing stone	547,182	845,515	578,099	962,951
Concrete and roadstone	4,519,086	6,034,403	5,432,119	7,298,612
Railroad ballast	348,871	408,460	472,758	551,394
Agriculture	585,165	1,134,031	593,481	1,132,630
Miscellaneous [3]	3,712,066	5,728,984	4,035,141	5,889,277
Undistributed [4]	193,246	2,650,677	264,665	3,037,792
Total	11,965,890	19,869,675	14,081,904	23,075,595

[1] Included with "Other uses" to avoid disclosing individual company confidential data.
[2] Includes railroad ballast.
[3] Includes riprap.
[4] Includes miscellaneous dimension stone, miscellaneous crushed and broken stone including concrete and roadstone, crushed and broken marble, and crushed sandstone and shell.

Stone.—In production and value, stone continued to rank second among the minerals produced in Virginia. In comparison with 1955, output and value increased 18 and 16 percent, respectively, owing mostly to increased demand for stone used as concrete aggregate and roadstone—the principal use of Virginia's stone. Varieties of stone produced in Virginia in 1956 were basalt, granite, limestone, marble, sandstone, and miscellaneous stone. Of these, limestone supplied by far the greater part (79 percent) of the State's total stone production. Leading stone-producing counties were: Botetourt, Nelson, Smyth, and Greensville, in decreasing order of value.

Virginia stone output was produced in 35 counties by 59 commercial operators and 6 State and municipal agencies from 65 quarries and mines. Of the commercial producers 44 produced limestone at 50 quarries, 4 quarried basalt (diabase), 5 granite, 1 marble, 2 sandstone, and 3 miscellaneous stone (dimension greenstone and soapstone 1 each and crushed stone 1). Limestone was mined in 23 of the 98 counties in the State.

METALS

Beryllium Concentrate.—One firm in Powhatan County produced beryllium concentrate. Production increased 7 percent in quantity and 17 percent in value over 1955. It was sold to the Government Spruce Pine (N. C.) Purchase Depot, administered by General Services Administration (GSA).

Lead and Zinc.—Output of recoverable lead in Virginia in 1956 rose slightly in tonnage and 7 percent in value over 1955. Production of

recoverable zinc was 5 percent higher in quantity and 15 percent higher in value than in 1955 and represented the highest output since 1941. In 1956 these two metals were recovered from Wythe County zinc-lead ore, which was treated in a 2,000-ton-per-day mill at Austinville, producing zinc and lead concentrates. The zinc concentrate was shipped to plants at Palmerton, Pa.; and East Chicago, Ind. Lead concentrate was shipped to Palmerton, Pa.; and Federal, Ill. Progress in dewatering the Arminius mine at Mineral (Louisa County) allowed deepening of the main shaft as a further aid in planning redevelopment of the property.

A descriptive report on the nine chief sulfide-ore areas in Virginia included discussions of the types of ore and occurrence for each, a brief historical summary of sulfide mineralization, and the production record of metals in these regions. The largest single zone of sulfide mineralization is the Great Gossan Lead in Western Carroll County.[5] The nature and extent of sulfide mineralization in Rockingham and Shenandoah Counties in the Shenandoah Valley were presented in a detailed study of the geology, mineralogy, and location of deposits, using the results of core-drilling and other exploratory work by Tri-State Zinc, Inc.[6]

Exhaustive mineral-dressing tests on the Great Gossan ore from the Betty Baker mining area in Carroll County revealed that a combination of flotation and roasting and leaching extractive techniques would effect the most complete use of the minerals. The Betty Baker ore is complex. It was suggested that these methods of treatment might be adapted to successful mineral recoveries on the other less complicated ores of this mineralized belt. Copper, zinc, lead, and iron and possibly some byproduct manganese were present in the ore.[7] The projected erection of a $400,000 plant to mine and concentrate zinc ore near Timberville in northwestern Rockingham County by Tri-State Zinc, Inc., was announced. This firm also operated mines and a zinc concentrate plant at Galena, Ill.

TABLE 7.—Mine production of recoverable lead and zinc, 1947–51 (average) and 1952–56

Year	Lead		Zinc	
	Short tons	Value	Short tons	Value
1947–51 (average)	3,316	$1,045,239	13,113	$3,548,358
1952	3,792	1,221,024	13,409	4,451,788
1953	2,788	730,456	16,676	3,835,480
1954	4,320	1,183,680	16,738	3,615,408
1955	2,997	893,106	18,329	4,508,934
1956	3,035	952,990	19,196	5,180,616

Manganese Ore.—Production of manganese ore in Virginia in 1956 dropped 38 percent in quantity compared with 1955. Virtually all of the 35 percent or more manganese was metallurgical ore, which was shipped mostly to GSA under the Government carlot program. Difficulties in meeting Government specifications, higher prices of

[5] Young, Robert S., Sulfides in Virginia: Virginia Minerals, vol. 2, No. 1, January 1956, pp. 1–7.
[6] Herbert, Paul, Jr., and Young, Robert S., Sulfide Mineralization in the Shenandoah Valley of Virginia: Virginia Div. of Geol., Bull. 70, Charlottesville, Va., 1956, 58 pp.
[7] Corriveau, M. P., Mineral-Dressing Studies on the Great Gossan Lead Ore from Carroll County, Virginia: Virginia Polytech. Inst. Eng. Exp. Sta. Ser. 113, Blacksburg, Va., 1956, 79 pp.

equipment and supplies, and lack of a buying program for lower grade manganese were listed by producers as hindering mining and disposal of the product. Washing to improve grade was general, and some producers used dense-medium separation to further process their material. The larger active producers in 1956 were: South River Mining Co., Inc., Augusta County; J. Gordon Gusler, Giles County; Manganese Mining & Contracting Co., National Manganese Co., Inc., Sidney Manganese Corp., and Umbarger Manganese Co., Smyth County; and Colitz Mining Co., Inc., Washington County. The leading producing counties were Smyth, Washington, and Augusta. Other counties where manganese ore was mined in 1956 were: Appomattox, Bland, Campbell, Frederick, Giles, Page, and Rockbridge.

TABLE 8.—Manganese and manganiferous ores shipped from mines, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	[1] 11	$320	1954	22,678	$1,780,934
1952	1,011	[2]	1955	32,654	2,779,337
1953	8,454	635,926	1956 [3]	20,231	1,901,983

[1] In addition, there was an average output of 1,990 tons of ferruginous manganese ore valued at $15,886 in 1947–51.
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Incomplete total; excludes a small quantity of ferruginous manganese ore.

Silver.—The zinc-lead ore mined at Austinville (Wythe County) yielded silver as a byproduct of beneficiation. Production of silver was slightly higher in 1956 than in 1955.

Titanium Concentrate (Ilmenite).—Production of ilmenite in Virginia in 1956 rose 7 percent in both quantity and value compared with 1955. American Cyanamid Co. near Piney River (Amherst County) produced the entire output for consumption in its adjacent titanium-pigments-preparation plant. Characteristics, uses, geology, modes of occurrence (with special reference to Virginia occurrence) periods of development of titanium in foreign countries and the United States production, and future production possibilities were discussed in a published report.[8] A plant to produce rutile and ilmenite near Montpelier, Hanover County, will be built by Metal & Thermit Corp., New York. It was estimated that the mine and processing plant would cost $750,000.[9]

REVIEW BY COUNTIES

Albemarle.—Charlottesville Stone Corp. quarry and crusher near Charlottesville produced crushed and broken basalt for concrete aggregate and roadstone. Crushed and broken granite used for concrete aggregate, roadstone, railroad ballast, and stone sand was produced by Superior Stone Co. (Red Hill). The United Brick Corp. open-pit mine near Woodbridge Station produced clay for heavy clay products. S. L. Williamson Co., Inc. (Charlottesville) produced paving sand and gravel for road construction from dredging, and Superior Stone

[8] Pegau, Arthur A., Titanium: Virginia Div. of Min. Resources, Min. Res. Circ. 5, Charlottesville, Va., 1956, 17 pp.
[9] Steel, vol. 138, No. 9, Feb. 27, 1956, p. 100.

(North Garden) produced paving gravel for road construction. Blue Ridge Slate Corp. quarried and crushed slate for granules at Esmont.

Alleghany.—Virginia Department of Highways produced paving gravel in 1956.

TABLE 9.—Value of mineral production in Virginia, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value [2]
Accomack	$20,518		Sand and gravel.
Albemarle	(3)	(3)	Stone, clays, slate, sand and gravel.
Alleghany	290	$1,559	Sand and gravel.
Amelia	119		Gem stones.
Amherst	(3)	(3)	Titanium, aplite, sand and gravel.
Appomattox	(3)	(3)	Stone, manganese, sand and gravel.
Augusta	(3)	(3)	Cement, stone, manganese, sand and gravel, clays.
Bedford	(3)	(3)	Feldspar.
Bland	314,921	63,007	Manganese.
Botetourt	(3)	(3)	Cement, stone, clays.
Brunswick		(3)	Stone.
Buchanan	40,356,855	45,599,393	Coal.
Buckingham	758,721	(3)	Slate, sand and gravel.
Campbell	(3)	(3)	Stone, manganese, sand and gravel.
Carroll	(3)	(3)	Pyrites.
Charlotte	713	55	Sand and gravel.
Chesterfield	(3)	(3)	Sand and gravel, clays.
Clarke	(3)	12,000	Calcareous marl.
Culpeper	(3)	184,000	Stone, sand and gravel.
Cumberland		5,260	Sand and gravel.
Dickenson	17,927,551	25,460,407	Coal.
Fairfax	2,408,204	2,195,050	Sand and gravel, oystershell.
Fauquier	586,965	500,168	Stone.
Franklin	12,163	(3)	Soapstone.
Frederick	1,629,027	1,611,669	Stone, lime, sand and gravel, clays, manganese.
Giles	5,068,991	(3)	Lime, stone, manganese.
Goochland	360,000	650,641	Stone, mica.
Greensville	(3)	1,031,002	Stone.
Halifax		989	Sand and gravel.
Henrico	(3)	(3)	Sand and gravel, clays.
Henry	16,952	(3)	Stone, mica.
Isle of Wight	75,637	78,017	Lime, oystershell.
King William	(3)	(3)	Sand and gravel.
Lee	4,225,610	(3)	Coal, stone.
Loudoun	364,604	444,822	Stone.
Madison	195		Gem stones.
Montgomery	623,138	680,589	Stone, coal, clays, lime.
Nansemond	(3)	(3)	Clays.
Nelson	(3)	(3)	Stone, aplite, sand and gravel, soapstone.
Norfolk	(3)	(3)	Cement, lime, oystershell, sand and gravel.
Nottoway	130,000	175,000	Stone.
Orange	(3)	(3)	Stone.
Page		3,235	Manganese.
Pittsylvania	(3)	115,151	Stone, sand and gravel.
Powhatan	(3)	3,301	Mica, beryl.
Prince Edward	(3)	(3)	Kyanite, sand and gravel.
Prince George	(3)	706,403	Sand and gravel.
Prince William	(3)	(3)	Stone, clays.
Princess Anne	301,651	255,885	Sand and gravel.
Pulaski	(3)	(3)	Iron oxide pigments.
Roanoke	(3)	(3)	Stone, clays, sand and gravel.
Rockbridge	1,220,972	1,324,551	Stone, sand and gravel, clays, manganese.
Rockingham	574,581	(3)	Stone, sand and gravel.
Russell	4,889,330	(3)	Coal, stone.
Scott	(3)	(3)	Stone, coal.
Shenandoah	799,066	1,549,408	Lime, stone.
Smyth	5,172,232	4,944,989	Salt, stone, manganese, sand and gravel, clays.
Spotsylvania	(3)	273,406	Sand and gravel.
Surry	320	220	Calcareous marl.
Tazewell	16,440,792	22,324,738	Coal, stone, lime, clays.
Warren	(3)	(3)	Cement, stone.
Washington	2,275,673	2,063,915	Gypsum, stone, manganese, sand and gravel.
Westmoreland	(3)	(3)	Sand and gravel.

See footnotes at end of table.

TABLE 9.—Value of mineral production in Virginia, 1955–56, by counties [1]—Con.

County	1955	1956	Minerals produced in 1956 in order of value [2]
Wise	$25,552,644	(3)	Coal, stone.
Wythe	(3)	(3)	Zinc, lead, stone, silver.
York		(3)	Sand and gravel.
Undistributed [4]	40,432,937	$95,547,092	
Total [5]	172,541,000	208,806,000	

[1] The following counties are not listed, because no production was reported: Arlington, Bath, Caroline, Charles City, Craig, Dinwiddie, Elizabeth City, Essex, Floyd, Fluvanna, Gloucester, Grayson, Greene, Hanover, Highland, James City, King and Queen, King George, Lancaster, Louisa, Lunenburg, Mathews, Mecklenburg, Middlesex, New Kent, Northampton, Northumberland, Patrick, Rappahannock, Richmond, Southampton, Stafford, and Sussex, Warrick.

[2] Value of fuels, including coal for certain counties in 1955, petroleum, and natural, gas, included with "Undistributed."

[3] Figure withheld to avoid disclosing individual company confidential data.

[4] Includes value of gem stones in 1955, part of the value of manganese ore and mica, petroleum and natural gas and values indicated by footnote 3; for these commodities complete distribution by counties was not available.

[5] Total adjusted to eliminate duplicating the value of clays and stone.

Amherst.—American Cyanamid Co. produced ilmenite for consumption in its titanium-pigment plant at Piney River. Output of the raw material in 1956 was higher than in 1955. This was the only production of titanium concentrate in Virginia. The Riverton Lime & Stone Co. Division, Chadbourn Gotham, Inc. (formerly Dominion Minerals Division, Riverton Lime & Stone Co., Inc.), mined aplite in Amherst County near Piney River and processed it in a nearby mill in Nelson County for use in glass. J. M. Smiley, Lynchburg, again produced building sand by dredging. The Virginia Highway Department produced paving gravel.

Appomattox.—Appomattox Stone Corp., Appomattox, and the Virginia Department of Highways produced limestone for concrete aggregate, roadstone, and agricultural purposes. The Southeastern Manganese Co. mined metallurgical manganese ore from its Nuttall mine near Lynchburg. Paving sand was produced by Virginia Department of Highways.

Augusta.—Lehigh Portland Cement Co. operated a portland-cement plant near Fordwick. Masonry mortar also was produced. General-use and moderate-heat and a lesser quantity of high-early-strength cement were burned in the six-kiln plant. Finished material was distributed largely to Virginia destinations. Crushed limestone used for cement production, concrete aggregate, roadstone, and asphalt filler was quarried during the year. Producers were Lehigh Portland Cement Co. (quarry and cement plant near Fordwick), Belmont Trap Rock Co., Inc., Augusta Stone Corp., Valley Stone, and Virginia Department of Highways, all operating near Staunton. Valley Stone began producing during 1956 at the Old James quarry and crusher. Active producers of 35-percent or more manganese ore in Augusta County were the Mountain Top Mining Co., at its Mountain Top mine near Waynesboro, Parker Manganese Co. at its Crimora mine, Crimora, and South River Mining Co., Inc., near Vesuvius. The ore was all Metallurgical grade, and by far the largest part was purchased through the General Services Administration under the Defense Production Act carlot program. North American Brick Co., near Staunton mined miscellaneous clay and shale for heavy clay

products. F. R. Weeks, Raphine, produced building sand for road construction, and the Virginia Department of Highways produced paving gravel.

Bedford.—In Virginia, feldspar was produced only in Bedford County by The Clinchfield Sand & Feldspar Corp. at four open-pit mines—Clayton, Coles, Mitchell, and Peaksville. The Coles and Clayton mines yielded potash feldspar; the Peaksville, soda feldspar; and the Mitchell, mixed soda and potash feldspar. The raw feldspar, produced from these mines and one North Carolina mine, was ground in the company mill at Bedford and sold for ceramic products, including pottery and enamel.

Bland.—Manganese ore was mined in 1956 in Bland County by Bluefield Mining Corp. and the Southern Manganese Corp.

Botetourt.—Botetourt County led Virginia stone-producing counties. Limestone, used mainly for cement, concrete aggregate, and roadstone, was quarried at five operations in the county. Producers were Lone Star Cement Corp. at a quarry and cement plant, Cloverdale; Blue Ridge Stone Corp., Blue Ridge; James River Hydrate & Supply Corp., Buchanan; and Liberty Limestone Corp. at Rocky Point and Sherwood quarries near Rocky Point and Buchanan, respectively. Other uses of limestone quarried in the county included: Agricultural, railroad ballast, blast-furnace flux, alkali, rock dust for coal mines, stone sand, and filler for asphalt and fertilizer. Liberty Limestone Corp. was inactive from July 26 to September 10 due to a labor dispute. Lone Star Cement Corp. produced general-use and moderate-heat and high-early-strength cement at its four-kiln plant at Cloverdale. (The fourth kiln was placed in operation in September.) Masonry cement also was produced there. Roanoke-Webster Brick Co., Inc. (Roanoke), and Virginia Lightweight Aggregates Corp. (Webster), produced miscellaneous clay at their open-pit mines. This material was used in heavy clay products and for concrete and lightweight aggregate.

Brunswick.—Bryan Rock & Sand Co. of Raleigh, N. C., at the Rawlings quarry near Rawlings produced crushed granite for concrete aggregate, roadstone, and screenings.

Buchanan.—Buchanan County again led in producing bituminous coal in Virginia in 1956; the output was over 9 million tons. Production from 550 mines increased 6 percent in tonnage and 13 percent in value over 1955. The following companies are listed according to production value: Jewell Ridge Coal Corp. (two mines), Island Creek Coal Co., Harman Mining Corp., Sycamore Coal Co. (Buccaneer), Preston Mining Co., Paragon Jewell Coal Co., Inc., Panther Coal Co., Inc., Hi-Grade Coal Co., Knox Creek Coal Co., and Wellmore Coal Co.

Buckingham.—Blue Ridge Slate Corp. produced slate granules at its Dutch Gap quarry at Bremo Bluff. Slate for roofing, flagging, and other uses was quarried by Arvonia-Buckingham Slate Co., Inc., LeSueur-Richmond Slate Corp., and Williams Slate Co. (all of Arvonia). Structural sand was produced by Virginia Department of Highways in 1956.

Campbell.—Virginia Greenstone Co., Inc., produced Virginia Greenstone at its quarry and fabricating mill in Lynchburg. Output was used as rough and dressed building stone and as dimension laboratory-

table tops, sinks, tubs, and bakery hearths. Crushed and broken greenstone was used for flagging and miscellaneous purposes. Two new limestone quarries and crushers began operating in Campbell County—Blue Ridge Stone Corp. and Rockydale Stone Service Corp. near Lynchburg and Concord, respectively. Output from both companies was used for concrete aggregate and roadstone. Manganese was produced by William H. Irvine near Evington. Paving sand was produced by the Virginia Department of Highways.

Carroll.—Pyrites was produced at the Gossan mine at Cliffview near Galax by General Chemical Division, Allied Chemical & Dye Corp. This material was used in making sulfuric acid at Pulaski.

Charlotte.—The Norfolk and Western Railway Co. produced a small quantity of sand for unspecified use in Charlotte County.

Chesterfield.—Southern Materials Co., Inc., again reported a substantial tonnage of building and paving sand and gravel from dredging on the James River near Dutch Gap. An output of miscellaneous clay mined from an open pit near Richmond was reported by Southside Brick Works, Inc.

Clarke.—A. C. Strother, Berryville, and J. C. Digges & Sons (White Post, near Berryville) dried and pulverized calcareous marl for agricultural use.

Culpeper.—Culpeper Stone Co. quarried stone, which was crushed or broken for riprap, concrete aggregate, and road material near Culpeper. Building and paving sand and gravel was produced by the Culpeper Sand Co. (Culpeper).

Cumberland.—Structural sand was produced by Virginia Department of Highways.

Dickenson.—Dickenson County again ranked third among Virginia's 8 coal-producing counties; it produced over 4 million tons. The output was chiefly from underground mines. The leading producer in the county was again Clinchfield Coal Co. at underground, strip, and auger mines. Other leading producers were: Baker Coal Co., Cassell Coal Co., Lambert Coal Co., R. & M. Coal Co., Luther Sauls Coal Co., Dickenson Fuel Co., Dotson Bros. Coal Co., Helen Coal Co., Crabtree Coal Co., and Neece Creek Coal Co.

Fairfax.—Building sand and gravel was produced by Modern Sand & Gravel Corp., Northern Virginia Construction Co., Inc., Virginia Sand & Gravel Co., Inc., and Belvoir Sand & Gravel Co. (all with offices in Alexandria). Hilltop Sand & Gravel Co., Inc., produced building and paving sand and gravel. Clem Road Gravel Co. and C. R. Vaughan, Inc., produced paving gravel. Herbert Bryant, Inc. (Alexandria), produced crushed oystershell for poultry grit and lime. Statistics for this material were included under stone.

Fauquier.—Crushed limestone for concrete aggregate and roadstone was produced by Millbrook Quarries, Inc. (Broad Run). W. W. Sanders produced crushed basalt for concrete aggregate and road material. Sandstone used for rough construction and flagging was quarried by John Costello (The Plains).

Franklin.—Blue Ridge Talc Co., Inc. (Henry), produced soapstone for grinding stock at its King-Ramsey quarry. The product after grinding was sold for insecticides and foundry facings. Finished iron oxide pigments, including mineral blacks and browns, red and yellow

oxides, ochers, umbers, and siennas, also were marketed by this company.

Frederick.—Stuart M. Perry, Inc. (Winchester), and M. J. Grove Lime Co. (Stephens City and Middletown), produced limestone. Output was used for concrete aggregate, road material, blast-furnace and open-hearth flux, agricultural purposes, glass, and other miscellaneous uses. Lime for building, agricultural, and chemical uses was produced by M. J. Grove Line Co. at its Stephens City plant. Hott & Miller mined metallurgical manganese ore at the Mineral Ridge mine near Star Tannery. Virginia Glass Sand Corp. recovered glass and building sand at a pit near Gore. The Shenandoah Brick & Tile Corp. open-pit mine near Winchester produced miscellaneous clay for use in heavy clay products.

Giles.—During 1956 the Kimballton plants of National Gypsum Co. and Standard Lime & Cement Co. and the Ripplemead plant of Ripplemead Lime Co., Inc., produced lime for building, agricultural, and chemical purposes. In addition to lime production these companies and Virginia Limestone Corp. (Ripplemead) quarried limestone for lime manufacture, concrete aggregate, road material, blast-furnace flux, railroad ballast, agricultural purposes, and various other uses. J. Gordon Gusler mined manganese ore of 35-percent or more manganese content near Newport.

Goochland.—Boscobel Granite Co. produced crushed stone for concrete aggregate, road material, and screenings at its granite quarry at Manakin. Small quantities of full-trim mica produced from the Amber Queen and Donna mines near Goochland were sold to the Government (GSA) Spruce Pine (N. C.) Purchase Depot by Piedmont Mining Co., Inc. (Powhatan).

Greensville.—Crushed and broken granite used for concrete aggregate, road material, railroad ballast, riprap, and stone sand was produced near Emporia by Trego Stone Corp.

Halifax.—Virginia Department of Highways produced a small quantity of paving sand in 1956.

Henrico.—Building and paving sand and gravel was produced in Henrico County by Commonwealth Sand & Gravel Corp. and West Sand & Gravel Co., Inc., of Richmond. The Henrico County Highway Department produced paving sand and gravel. Miscellaneous clay for heavy clay products was produced at the open-pit mines of Redford Brick Co. and Daniels Brick & Tile Co. (both of Richmond).

Henry.—Crushed and broken granite used for concrete aggregate and road material was produced by the City of Martinsville for its own use. A small quantity of full-trim mica produced at the Nance mine near Axton by Ed. Martin was sold to the Government (GSA) Spruce Pine (N. C.) Purchase Depot.

Isle of Wight.—Battery Park Fish & Oyster Co. (Battery Park) produced agricultural lime from oystershell at Smithfield.

King William.—Building and paving sand and gravel was produced in 1956 by Fox Co., Aylett. Reporting production of paving sand and gravel and miscellaneous sands for the first time was Mattaponi Sand & Gravel at Beulahville.

Lee.—Lee County again ranked sixth among Virginia's eight coal-producing counties. Leading producers were Blue Diamond Coal

Co., Benvir Coal Co., Virginia Lee Colliery, Penn Darby Coal Co., Peabody Coal Co., Kemmerer Gem Coal Co., Laurel Branch Coal Co., Walter Bledsoe, Lewis Coal Co., and Moran Lewis Coal Co. Crushed and broken limestone was produced by Kentucky Virginia Stone Co. (Gibson Station) and Woodway Quarries (Woodway) for use as riprap, concrete aggregate, road material, railroad ballast, and as dust for coal mines.

Loudoun.—Arlington Stone Co. (Leesburg) quarried basalt used as concrete aggregate and roadstone. The Virginia Department of Highways quarried basalt and miscellaneous stone for use as concrete aggregate and road material.

Louisa.—Progress in unwatering the Arminius mine of the New Jersey Zinc Co. at Mineral allowed the deepening of the main shaft, which action further aided planned redevelopment of this lead-zinc property.

Montgomery.—Producers of crushed limestone were Radford Limestone Co., Inc., (Radford); and Montgomery Lime Co., Inc., (Ellett). Output was used for concrete aggregate, roadstone, railroad ballast, agricultural purposes, and other miscellaneous uses. The City of Radford produced limestone for its own use as concrete aggregate and roadstone. The Ellett plant of Montgomery Lime Co., Inc., also produced a small quantity of lime for agricultural purposes using limestone from its own quarry as raw material. The Old Virginia Brick Co., Inc., open pit near Salem produced miscellaneous clay for heavy clay products in 1956. Montgomery County was again the only county in Virginia to produce semianthracite.

Nansemond.—The Roanoke-Webster Brick Co., Inc., open-pit mine near Suffolk produced miscellaneous clay for heavy clay products.

Nelson.—Soapstone was quarried near Schuyler by Alberene Stone Corp. of Virginia. Output was marketed mainly as dressed dimension stone for laboratory and architectural use and for flagging; a sizeable quantity was crushed or ground for use in rubber and roofing compositions, or as miscellaneous filler. The Virginia Department of Highways produced paving gravel in Nelson County. Consolidated Feldspar Department, International Minerals & Chemical Corp. mined and ground aplite in an adjacent mill in Nelson County. Similar material mined in Amherst County by Riverton Lime & Stone Co. Division, Chadbourn Gotham, Inc. (formerly Dominion Minerals Division, Riverton Lime & Stone Co.), was ground in a mill in Nelson County, also near Piney River. The ground aplite was sold to glassmakers, principally because of its high alumina content.

Norfolk.—The United States Gypsum Co. operated a calcining plant at Norfolk and some fertilizer dealers in that area imported raw gypsum for use chiefly as land plaster. These firms included: Baugh & Sons, Portsmouth; and Charles W. Priddy & Co. Inc., F. S. Royster Guano Co., and Smith Douglass Co. Inc., all of Norfolk. Lone Star Cement Corp. produced general-use and moderate-heat and masonry cement at its three-kiln plant at South Norfolk.[10] Marl was used as raw material in its manufacture. Reliance Fertilizer & Lime Corp. (South Norfolk) produced agricultural lime. Randolph B. Cooke produced a small tonnage of engine sand in Norfolk County.

[10] Although South Norfolk is an independent city, it is included in Norfolk County.

Oystershell was marketed for filter beds by Ballard Fish & Oyster Co. (Norfolk). J. H. Miles & Co. (Norfolk) also sold oystershell for road building and for lime.

Nottoway.—Burkeville Stone Co., Inc., near Burkeville, quarried and crushed granite for concrete aggregate and road material.

Orange.—Royal Stone Corp. quarried stone (epidote) near Orange for use as concrete aggregate and roadstone.

Page.—Compton Manganese Corp. produced some 35-percent-or-more-grade manganese ore in Page County; the specific mine location was not reported.

Pittsylvania.—Granite used as riprap was produced by the City of Danville for local use. Kendall Sand Works produced paving sand at its portable plant in Danville and the Marshall Sand Co. fixed plant at Danville produced structural and miscellaneous sands.

Powhatan.—Beryl was recovered by Piedmont Mining Co., Inc., from its Baltzley No. 3 mine near Powhatan. Piedmont Mining Co., Inc., also produced some hand-cobbed and full-trim sheet mica from the same mine and sold it to the Government through the GSA Spruce Pine (N. C.) Mica Depot.

Prince Edward.—Kyanite Mining Corp., the only producer in Virginia, mined kyanite from an open pit on Baker Mountain near Farmville. Two grinding mills owned by the company (one at Cullen and the other at Pamplin) prepared the raw material for shipment to refractories manufacturers and makers of ceramic bodies such as firebrick, insulators, and porcelain. The mining and milling of this firm including the flowsheets of the concentration processes and of mullite preparation, was described in detail in a publication[11]. The Virginia Department of Highways produced building sand in 1956.

Prince George.—Arthur Hitch (Hopewell) produced paving and road gravel in Prince George County in 1956. Friend Sand & Gravel Co., Inc., and Bryan Rock & Sand Co. (Petersburg) produced paving and building sand and gravel. The Nitrogen Division of the Allied Chemical & Dye Corp. (Hopewell) produced various nitrogen compounds, such as ammonia, ammonium sulfate, and ammonium nitrate-limestone. This plant was 1 of 2 producers of sodium nitrate; during the latter part of the year facilities were being installed to produce solid ammonium nitrate, in addition to its current output of ammonium nitrate and urea solutions. Virginia Perlite Corp. (also at Hopewell) expanded perlite from Colorado and New Mexico for sale as plaster and concrete aggregate.

Prince William.—Miscellaneous clay used for heavy clay products was recovered at an open pit of the Woodbridge Clay Products Co. Inc. (Woodbridge). Fairfax Quarries, Inc., produced basalt near Manassas for use as concrete aggregate and roadstone.

Princess Anne.—Building and engine sands and sands for fertilizer and fill were produced in Princess Anne County by J. C. Jones Sand Co., Inc., Oceana; Tidewater Sand Co., Inc., Little Creek; and Little Creek Sand & Gravel Co. and E. V. Williams Co., Inc., Norfolk.

Pulaski.—Hiwassee Pigments Corp. (Hiwassee) produced crude iron oxide pigments, including sienna, umber, ocher, and natural yellow oxides.

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[11] Corriveau, Martial P., Kyanite Recovery at Baker Mountain, Va.: Mineral Industries Jour. (Virginia Polytech. Inst., Blacksburg, Va.), vol. 2, No. 4, December 1955, pp. 1–4.

Roanoke.—Rockydale Stone Service Corp. produced limestone for concrete aggregate, roadstone, and agricultural purposes. Old Virginia Brick Co., Inc., recovered miscellaneous clay used in heavy clay products at an open-pit mine near Salem. Building sand was produced by Marl & Stone Corp. (Salem), and Rockydale Stone Service Corp. produced some engine sand.

Rockbridge.—W. G. Mathews, Jr., Inc., quarried quartzite near Greenlee for use in preparing ferrosilicon and as railroad ballast. Byproduct sand was also recovered for use in mixing mortar and concrete. Limestone used as railroad ballast, concrete aggregate, and roadstone, was quarried by Charles W. Barger & Son, Lexington; and Lone Jack Limestone Co. Inc., Glasgow. The Locher Silica Corp. plant near Goshen produced glass and building sand. Virginia Department of Highways produced paving gravel in Rockbridge County. An open-pit mine for producing miscellaneous clay was operated by Locher Brick Co., Glasgow. Ivanhoe Mining & Smelting Corp. produced both 10 to 35 percent and 35 percent or more manganese ore from its Midvale mine near Buena Vista. This material was shipped partly for Government and partly for private account.

Rockingham.—Jamison Black Marble Co. of Roanoke—the only marble producer in Virginia—quarried marble for use chiefly as terrazzo. Crushed and broken limestone used for concrete aggregate, roadstone, and agricultural purposes was produced by Frank K. Betts, III, A. Y. Frazier, both of Harrisonburg; and C. S. Mundy Quarries, Inc., Broadway. Virginia Department of Highways produced paving sand and gravel in Rockingham County in 1956.

Russell.—Bituminous-coal production in Russell County in 1956 increased 45 percent in tonnage and 41 percent in value compared with 1955; output came chiefly from underground mines. The leading producers were Clinchfield Coal Corp., Turner Coal Co., Smith Coal Co., Castle Coal Co., Ben Sword & Willard Ball, J. C. Vance Coal Co., G. & H. Coal Co., Nash Coal Co., and Russell Coal Co. Clinch River Quarries (St. Paul) quarried limestone for use as concrete aggregate and roadstone.

Scott.—Limestone used for railroad ballast, concrete aggregate, and roadstone was quarried near Clinchport by Natural Tunnel Stone Co. Penn-Dixie Cement Corp. quarried limestone in Scott County for use in its cement plant at Kingsport, Tenn. A small quantity of coal was produced from five operations in 1956.

Shenandoah.—The two lime producers in Shenandoah County—Dominion Limestone, Inc., and Strasburg Lime Co., Inc., both of Strasburg—were absorbed by Chemstone Corp. They will be known as Dominion Limestone Division, Chemstone Corp., and Strasburg Lime Division, Chemstone Corp., respectively. They produced chemical and industrial lime for paper, water purification, and metallurgical purposes and an asphalt mix that was employed in road construction. Limestone used mainly for blast-furnace and open-hearth flux, concrete aggregate, and roadstone was quarried in the county during the year. Producers were: Dominion Limestone Division, Chemstone Corp., Shenandoah Valley Lime & Stone Corp., Strasburg Lime Division, Chemstone Corp., all of Strasburg; C. S. Mundy Quarries, Inc., Timberville; and Toms Brook Lime & Stone Co., Inc., Toms Brook.

Smyth.—Metallurgical manganese ore containing 35 percent or more manganese was mined in Smyth County by Manganese Mining & Contracting Co., Rural Retreat (Glade Mountain mine); and Marion Manganese Ore Co., Inc., National Manganese Co., Inc., Rural Retreat Manganese Ore Co., O. E. Sayers (Slabtown mine), Sidney Manganese Corp., and Umbarger Corp., all near Marion. Nearly 60 percent of the State production of manganese ore was mined in Smyth County. Olin Mathieson Chemical Co. recovered salt from artificial brines; the salt was processed into chlorine, soda ash, and other chemicals. The brines were obtained from underground salt beds at Saltville. Olin Mathieson Chemical Corp. also produced limestone from the Worthy mine near Saltville. Output was employed mainly for chemical use by alkali plants. Other limestone producers were E. P. Ellis Quarry and Holston River Quarry, Inc., both near Marion. Their output was used principally for concrete aggregate and roadstone. The pits of Clay S. Sayers and C. R. Snider & Sons, both of Marion, produced building sand. Appalachian Shale Products Co., Marion, produced miscellaneous clay for use in heavy clay products near its open-pit mine.

Spotsylvania.—The only mineral producer in Spotsylvania County was Massaponax Sand & Gravel Corp. near Fredericksburg; it produced building and paving sand and gravel.

Surry.—Paul Miller (Spring Grove) mined calcareous marl from an open pit near Claremont and dried, ground, and bagged it for agricultural purposes.

Tazewell.—Again Tazewell County ranked fourth in coal produced in Virginia and increased 37 percent in value compared with 1955. Pocahontas Fuel Co. produced the greatest quantity of coal in the county from the combined output of the Amontate, Bishop, Boissevain, and Jenkinjones mines. Other leading producers were Jewell Ridge Coal Corp., Cox & Cooper Coal Co., Alfredtown Coal Co., Fleetwood Coal Co., Nance Fork Coal Co., Shelton & Simmons Coal Co., James T. Absher, Dixon Red Ash Coal Co., Inc., Bandy Bros. Coal Co., and Albert T. Keen.

Lime for building, agricultural, and chemical uses was produced by Blue Grass Lime Co., Tazewell; and Peery Lime Co., North Tazewell. General Shale Products Corp. at its Richlands pit produced miscellaneous clay for heavy clay products. Crushed limestone used for concrete aggregate, roadstone, railroad ballast, blast-furnace flux, agricultural purposes, and as dust for coal mines was produced by Pounding Mill Quarry Corp., Pounding Mill; and Peery Lime Co., North Tazewell.

Warren.—Riverton Lime & Stone Co., Division of Chadbourn Gotham, Inc. (formerly Dominion Minerals Division, Riverton Lime & Stone Co.), quarried and crushed limestone for concrete aggregate, roadstone, railroad ballast, and agricultural uses. This firm also produced hydraulic lime at its 6-pot kiln plant at Riverton.

Washington.—Only United States Gypsum Co. mined gypsum in Virginia at Plasterco. Lambert Bros., Inc. (Bristol) quarried limestone for use as concrete aggregate and roadstone and produced a small tonnage of paving and road sand. The Colitz Mining Co., Inc., continued to produce sizable quantities of manganese ore of 35-percent or more manganese content from operations near Damascus.

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Beneficiation of the raw material consisted of washing and dense-medium separation.

Westmoreland.—Paving and road sand and gravel was produced by Brown Construction Co. (Montross).

Wise.—Of the 8 coal-producing counties in Virginia, Wise County ranked second and increased 34 percent in value of production over 1955. Leading coal producers were Stonega Coal & Coke Co., Clinchfield Coal Co., Coal Processing Corp., Wise Coal & Coke Co., Sunrise Coal Co., Stallard & Nicewonder Coal Co., Dale Branch Coal Co., Fleming Coal Co., Bolling Coal Co., and Lease Hollow Coal Co. Limestone for concrete aggregate and roadstone was produced near Big Stone Gap by Southwest Quarries, Inc.

Wythe.—Silver was recovered as a byproduct of the beneficiation of Austinville zinc-lead ores by New Jersey Zinc Co. The production of both lead and zinc increased compared with 1955, continuing at capacity. Mine development at both Austinville and Ivanhoe mines was progressing satisfactorily. The connecting tunnel between the two mines was nearly completed at the end of the year. A history of mining at Austinville, including the mining of land during the early Colonial, Revolutionary, and Civil War days, was published.[12] The discovery of zinc values and the successful application of flotation in treating zinc sulfide ores led to continued growth of mining and concentrating at this place. Limestone used for agricultural purposes, fertilizer filler, and road building, was recovered as a byproduct of zinc mining by the New Jersey Zinc Co., Austinville. Near Poplar Camp, H. D. Crowder quarried and crushed limestone for concrete aggregate and roadstone. The Town of Wytheville also quarried limestone for concrete aggregate and roadstone.

York.—Diamond Construction Co. produced building sand and paving gravel in the City of Hampton [13] in 1956.

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[12] Albers, W. L., 200th Anniversary of Austinville Mine: Mineral Resources Jour., vol. 3, No. 3 September 1956, pp. 5–7.

[13] Although Hampton is an independent city, it is included in York County.

The Mineral Industry of Washington

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the State of Washington Division of Mines and Geology.

By Kenneth D. Baber,[1] Frank B. Fulkerson,[1] Norman S. Petersen,[1] and Albert J. Kauffman, Jr.[2]

WASHINGTON'S mineral production dropped nearly $5.7 million in 1956. Metals supplied 26 percent of the total value and nonmetals and fuels 74 percent. Most of the decline was due to a decrease of $5.5 million in production of nonmetals and fuels, principally sand and gravel, cement, and coal. Production of lime and of talc and soapstone also declined. Stone output was up in 1956, as were several other commodities of smaller total value, including clays, diatomite, gypsum, olivine, and peat. In metal mining a decrease in the value of copper, gold, and zinc output was largely offset by a gain in lead production. Total value of metals declined only $200,000. Minor contributions to the State value were made by chromite, iron ore, silver, and tungsten.

Trends and Markets.—In the metal mining-industry construction was begun late in 1956 on a $3 million uranium-ore-processing plant in Stevens County. Completion of the plant was expected to stimulate uranium mining by providing a market for custom ore. Output of lead was second highest on record, in consequence of a development program by the leading lead producer; however, 1 of the 4 major mines producing lead and zinc was shut down indefinitely on November 21 because of difficulty in marketing zinc concentrate. It was announced also that the only large copper mine in the State was to be abandoned in 1957. Lead and zinc prices rose 6 and 10 percent, respectively. The price of lead was stabilized at 16 cents throughout 1956. The price of zinc increased ½ cent per pound to 13½ cents in January and remained at this level for the remainder of the year. Demand for lead continued strong, but the zinc market weakened in midyear, although continued purchases for the Government stockpile prevented a price decline. The market for copper was featured by a near-record high price early in the year, followed by sharp declines. The price of electrolytic refined copper, which had risen from 30 cents in January 1955 to 46 cents in early 1956, was reduced to 40 cents in July and cut further to 36 cents in October. Strikes at United States and foreign operations had brought about a price increase in 1955, and the decrease in price in 1956 was caused by greater supplies of copper from United States and foreign mines. Average weighted prices per pound of all grades of refined metal sold in 1956, as com-

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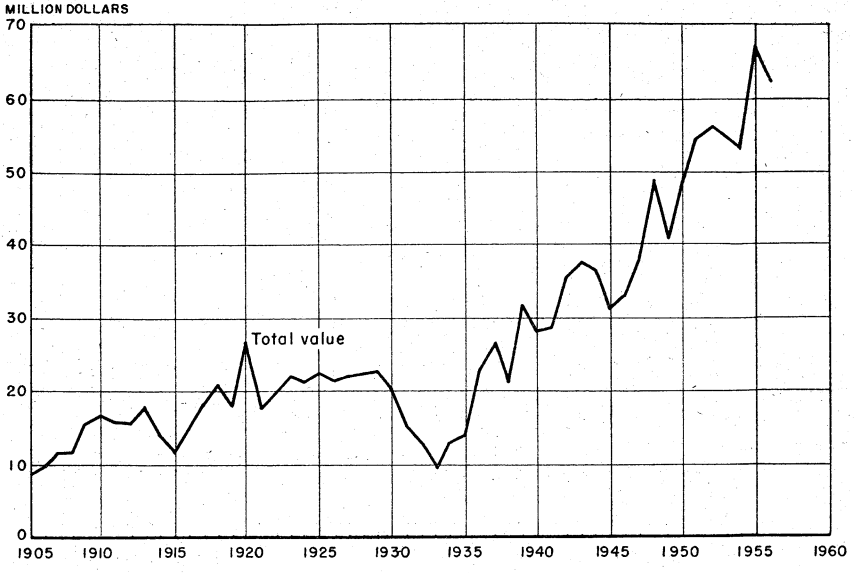

FIGURE 1.—Value of mineral production in Washington, 1905–56.

TABLE 1.—Mineral production in Washington, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite	25	$250		
Clays	365,331	411,807	319,988	$439,461
Coal	609,790	4,263,030	472,620	3,432,127
Copper (recoverable content of ores, etc.)	3,958	2,952,668	2,926	2,487,100
Chromite—gross weight	22	1,706	30	3,330
Epsomite	100	5,000	(2)	(2)
Gold (recoverable content of ores, etc.)—troy ounces	74,360	2,602,600	70,669	2,473,415
Gypsum	3,500	14,000	(2)	(2)
Lead (recoverable content of ores, etc.)	10,340	3,081,320	11,657	3,660,298
Peat	37,640	113,254	37,043	128,964
Pumice	(2)	(2)	5,291	14,757
Sand and gravel	21,645,161	19,350,682	16,841,792	15,037,128
Silver (recoverable content of ores, etc.)—troy ounces	436,348	394,917	448,442	405,863
Stone	6,593,212	10,579,631	8,057,338	11,659,598
Tungsten ore and concentrate 60-percent WO_3 basis	12	45,949	2	(2)
Zinc (recoverable content of ores, etc.)	29,536	7,265,856	25,609	7,016,866
Value of items that cannot be disclosed: Abrasive stone, carbon dioxide, cement, diatomite, gem stones, iron ore, lime, magnesite, olivine, strontium (1956), talc and soapstone, and values indicated by footnote 2		19,765,194		17,753,142
Total Washington [3]		67,334,000		61,665,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originate in Washington cannot be credited owing to lack of information (see last paragraph of introduction).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total adjusted to eliminate duplicating value of clays and stone.

pared with 1955, were as follows (1955 prices in parentheses): Copper, $0.425 ($0.373); lead, $0.157 ($0.149); and zinc, $0.137 ($0.123).

Washington was the principal Pacific Coast State in the importation and exportation of metals, due to the large imports of copper ore and concentrate and exports of refined copper handled at the Port of Tacoma. Smelting and refining of nonferrous metals was the second fastest growing manufacturing industry in Washington, ranking behind aircraft. Refined copper and aluminum were produced. In 1956 aluminum plants in the State operated with no interruptions to power supplies. Production of primary aluminum reached a new record high and owing to the growing demand the price in the United States for aluminum ingot advanced from 24.4 to 27.1 cents a pound during the year. In ferrous-metals processing a $25 million program was announced to expand the largest steelworks in the State to meet increased steel requirements in the Northwest.

In nonmetals the year was marked by expansion of cement production capacity and distribution facilities and completion of a structural glazed-tile plant. In prospect for 1957 was construction of a large plant to manufacture refractories. Production of cement, sand and gravel, and clays was down in 1956 due to a decline in construction. Employment by construction contractors averaged only 43,900, lowest since 1950. About 1,000 workers were idled in the spring by a 76-day labor-management dispute. The tieup hampered expansion in this seasonal industry. Residential building decreased. Completion of major construction at The Dalles and Chief Joseph Dam was a major factor in the employment decline. Valuation of building permits issued was $390.6 million compared with $381.0 million in 1955. This was an increase of 2 percent, but actual construction covered by the permits declined, because building costs increased by more than 2 percent. The building-permit totals covered residential, commercial, and industrial building authorized by municipalities.

It was estimated that Federal grants to the State of Washington for highway construction in 1957–70 would total $582 million. This represented 90 percent of the estimated cost of the interstate system and 50 percent of the estimated cost of other Federal-aid roads. The National Crushed Stone Association estimated that construction on the new program in Washington in 1957–59 would require mineral aggregate above normal requirements as follows: 1957, 5 million tons; 1958, 6 million tons; 1959, 7 million tons.[3]

Oil refining in the State continued to grow rapidly. Expansion was underway at 1 plant, and plans were reported for constructing 2 additional refineries. Production of coal continued to decrease sharply. Coal output has decreased continuously since 1949 owing to competition from out-of-State producers and conversion of locomotives to diesel power. Initial deliveries of natural gas from the San Juan fields of New Mexico were begun during the year.

Most important development in the chemical industry in 1956 was initiation of construction by Phillips Pacific Chemical Co. on a $20 million anhydrous ammonia plant on the Columbia River near Kennewick and Pasco. The plant was to produce 200 tons per day of ammonia for agricultural and industrial uses. The industry was

[3] Rock Products Rock Products Forecast: Vol. 60, No. 1, January 1957, pp. 78-79.

made possible by the availability of natural gas in the State. A report [4] indicated that the chemical industry in Washington was the fifth largest manufacturing industry based on employment and the sixth fastest growing. The bulk of employment was in inorganic chemicals, principally in the manufacture of fissionable materials at the Hanford atomic works. A wide variety of chemicals was produced, including alkalies and chlorine, fertilizers, explosives, and compressed and liquefied gases. The average employment in 1956 represented 5.8 percent of the total manufacturing employment compared with 4.7 percent in 1947. The average number of employer units was 156 in 1956 as compared with 130 in 1947. In contrast with lumber and wood products—the principal manufacturing industry in the State—there usually are no serious seasonal fluctuations in chemicals. The industry was concentrated in the Seattle and Tacoma metropolitan areas and in Benton County in eastern Washington. According to the report, the long-run outlook for chemicals in the State was extraordinarily good. Factors which would promote growth in chemicals included the advent of natural gas in the area; growing local markets; promise of increased hydroelectric power; and expanding industries, such as oil refining, which will make byproducts available for the manufacture of chemicals. A survey [5] disclosed that 806,600 tons of chemical raw materials was used in 1956 by Pacific Northwest pulp and paper plants. The survey listed 45 chemical raw materials, the tonnage required in 1956, and the percentage of total tonnage obtained from northwestern, western, central, eastern, and foreign sources. The entire tonnages of caustic soda (71,798 tons) and chlorine (113,959 tons) were purchased from Pacific Northwest producers, while sulfur (146,652 tons) was obtained from Wyoming (49 percent), Texas and Louisiana (46 percent), and the Pacific Northwest (5 percent).

Inventory of Metallic Minerals.—An inventory of all the metallic mineral occurrences known in the State was published.[6] The report contained a large amount of previously unpublished information.

Employment and Wages.—Mining-industry employment advanced slightly (2 percent), while payrolls increased sharply (9 percent). Expansion of employment in one segment of the industry (nonmetallic mining) explained the gain. A drop in copper-ore mining offset an advance in metal-mining contract services and miscellaneous metal mining (includes uranium). Nearly all parts of the mining industry had larger payrolls than in the preceding year; however, copper-ore mining and coal mining dropped in both employment and payrolls. Mineral-manufacturing employment and payrolls were up 6 and 10 percent, respectively. Three product groups—smelting, refining, and casting of ferrous and nonferrous metals, industrial inorganic chemicals, and petroleum and coal products—recorded increases. The remaining product group—stone, clay, and glass products—dropped in employment but reported a slightly higher wage total. Employment in mineral manufacturing was more than eight times greater than in mining.

[4] Washington Employment Security Department, The Washington Labor Market: Issue 141, July 1957, pp. 5-6.
[5] Guthrie, Frank K., Nelson, Robert J., and Wicks, Charles E., The 1956 Chemical Requirements for the Pacific Northwest Pulp and Paper Industry: Raw Materials Survey, Market Survey 4, 1957, 10 pp.
[6] Huntting, Marshal T., Inventory of Washington Minerals, Part II Metallic Minerals: Washington Division of Mines and Geology Bull. 37, vol. I—text, vol. II—Maps, 1956, 495 pp.

TABLE 2.—Average monthly employment and total wages in mining and mineral manufacturing, 1954–56, by industry [1]

Industry	1954		1955		1956	
	Average monthly employment	Total wages	Average monthly employment	Total wages	Average monthly employment	Total wages
Mining:						
Metal mining:						
Copper ore	318	$1,607,998	293	$1,601,076	246	$1,433,839
Lead and zinc ore	355	1,704,637	404	1,991,424	415	2,349,704
Gold and silver ore	192	865,467	188	961,958	175	962,934
Metal mining not elsewhere classified and metal-mining contract services	41	139,951	70	275,788	135	596,779
Bituminous coal	677	2,925,159	608	2,834,807	513	2,473,431
Crude petroleum and natural gas	48	244,606	72	375,196	76	437,474
Nonmetallic mining and quarrying:						
Dimension-stone quarries	94	452,286	74	355,128	82	407,869
Crushed-stone quarries other than limestone	107	497,725	109	517,856	130	684,295
Crushed-limestone quarries	79	318,242	100	432,828	102	485,822
Sand and gravel quarries, pits, and dredges	298	1,456,220	317	1,649,867	397	2,130,183
Clays, ceramic and other refractory materials	105	431,748	151	665,954	164	761,398
Nonmetallic minerals not elsewhere classified	11	27,892	14	41,447	14	53,693
Total mining	2,325	10,671,931	2,400	11,703,329	2,449	12,777,421
Mineral manufacturing:						
Stone, clay, and glass products:						
Glass products	(2)	(2)	283	1,396,395	265	1,439,119
Cement, hydraulic	809	3,569,281	792	3,562,804	732	3,611,356
Structural clay products	618	2,594,020	624	2,764,518	575	2,616,461
Pottery and related products	22	64,632	21	62,243	24	69,582
Concrete, gypsum, and plaster products	1,300	5,799,752	1,520	6,864,614	1,451	6,824,202
Cut stone and stone products	36	120,482	44	140,084	33	102,787
Miscellaneous nonmetallic mineral products	684	3,097,827	351	1,559,733	365	1,718,383
Total stone, clay, and glass products	3,469	15,245,994	3,635	16,350,391	3,445	16,381,890
Smelting, refining, and casting:						
Blast furnaces, steelworks, and rolling mills	1,790	8,279,604	2,224	11,319,252	2,358	12,533,525
Iron and steel foundries	963	4,348,157	1,145	5,346,374	1,189	5,785,859
Smelting and refining of nonferrous metals, except aluminum	9,070	45,312,091	1,085	5,194,126	1,269	6,168,135
Smelting, rolling, drawing, and alloying of aluminum			8,855	48,142,042	9,792	56,026,585
Nonferrous foundries	212	1,045,555	266	1,403,570	259	1,341,178
Miscellaneous primary metal industries	148	704,123	101	529,818	122	671,067
Total smelting, refining, and casting	12,183	59,689,530	13,676	71,935,182	14,989	82,526,349
Industrial inorganic chemicals	9,131	53,034,755	9,721	58,049,310	9,910	60,575,884
Products of petroleum and coal	197	1,189,215	719	3,954,200	1,042	6,390,697
Total mineral manufacturing	24,980	129,159,494	27,751	150,289,083	29,386	165,874,820
Total mining and mineral manufacturing	27,305	139,831,425	30,151	161,992,412	31,835	178,652,241

[1] Washington State Employment Security Department. Data in this series are published quarterly in Employment and Payrolls in Washington State by County and by Industry—Industries Covered by the Employment Security Act. "Covered" employment in Washington applies to all services performed except agricultural labor, domestic service, Government service, railroads, and minor exceptions. There are no limitations with regard to size of firm or size of payroll.

[2] Included with miscellaneous nonmetallic mineral products.

Power.—Federal power projects under construction included The Dalles Dam on the Columbia River between Oregon and Washington and an addition to the powerhouse at McNary Dam on the same reach of the river. Upstream, additional generating capacity was being installed at Chief Joseph Dam. These 3 projects were to add 2.0 million kw. of installed capacity. Another Federal project—Ice Harbor Dam—was underway on the Snake River and was to create 270,000 kw. of capacity. Nonfederal agencies had 6 hydroelectric projects under construction, which will add 1.2 million kw. to State power capacity; also, these agencies held licenses from the Federal Power Commission for construction of 2 additional hydroelectric installations with capability of 1.3 million kw.[7]

The Grant County Public Utility District began constructing the Priest Rapids Dam and a 640,000-kw. generating plant on the Columbia River. This public utility district also held a Federal license for the Wanupum Dam, above Priest Rapids, which would generate 570,000 kw. Construction had not begun at the end of 1956. Farther north on the Columbia River, the Chelan County Public Utility District planned to begin construction early in 1957 on the 711,000-kw. Rocky Reach Dam and powerplant.

In western Washington the Pacific Power & Light Co. was constructing a $44-million hydroelectric development on the Lewis River known as the Swift project, which would produce 256,000 kw. Excavation in the bed of the river was underway, and the diversion tunnel was driven. Owing to the new storage at the Swift project, a third generator to produce 50,000 kw. was to be installed at the company Merwin Dam downstream on the Lewis River.

The city of Tacoma initiated construction on a 160,000-kw. development at the Mayfield Dam on the Cowlitz River. The Seattle Light Department was adding 137,000 kw. by increasing storage at the Gorge and Ross sites on the Skagit River. The Puget Sound Power & Light Co. was to install additional generating capacity at two points on the Baker River. The company also was adding another generator at its Snoqualmie No. 2 location on the Snoqualmie River.

Defense Minerals Exploration Administration.—During 1956 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial participation by the Government was repayable from royalties on ore discovered and subsequently mined.

Mineral Values Not Included.—In addition to the mineral values credited to Washington in table 1, some are omitted owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, selenium, tellurium, gallium, and germanium. The quantities sometimes are not known and sometimes (though known by analyses) are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues obtained from refining such metals as copper and lead and those obtained in other ways. It is not possible in many such instances to allocate the mineral pro-

[7] Seattle-First National Bank, Quarterly Review: February 1957, 8 pp.

TABLE 3.—Defense Minerals Exploration Administration contracts active during 1956

County and contractor	Property	Commodity	Contract		
			Date	Total amount	Government participation, percent
CHELAN					
Howe Sound Co	Holden	Copper	Dec. 7, 1953	$363,840	50
CLALLAM					
Peacock and Peacock	Crescent	Manganese	Mar. 23, 1955	31,000	75
PEND OREILLE					
LaSota-Jones Lead & Zinc Corp.	LaSota-Jones	Lead-zinc	Aug. 13, 1956	11,310	50
SKAGIT					
Twin Sisters Magnesium & Chrome Corp.	Alamether, Begonia and Shaft.	Chromium	May 26, 1955	24,175	50
SNOHOMISH					
Robert T. Curtiss	Mint claims	Copper	Oct. 7, 1952	17,600	50
SPOKANE					
Affiliated Mines, Inc	Sprague lease	Uranium	May 18, 1956	9,460	75
STEVENS					
Grandview Mines (assignee of Scandia Mining Group).	Scandia	Zinc	Aug. 15, 1952	29,260	50
Northwest Uranium Mines, Inc.	Peters and Boyd permits.	Uranium	June 15, 1956	29,160	75
Pacific Northwest Mining Co.	Lucile	Lead-zinc	Dec. 14, 1951	29,210	50

ducts to States of origin, and sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral commodity of value, the production of which usually cannot be separated as to source, is byproduct sulfuric acid.

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—Production of primary aluminum continued to increase to record totals. Output in 1956 was 486,204 short tons, with a value of $233,632,126, compared with 452,874 short tons and $197,836,809 in 1955. Contributing to the total were reduction plants at Vancouver and Wenatchee (Aluminum Company of America), Spokane and Tacoma (Kaiser Aluminum & Chemical Corp.), and Longview (Reynolds Metals Co.). New capacity was added, and there were no production losses because of interruptions to power supplies. Kaiser Aluminum & Chemical Corp. planned to build an aluminum-reduction plant in Douglas County by 1961.[8] The project was contingent on construction of the proposed Wells Dam by the Douglas County Public Utility District. The Kaiser plant would require 150,000 kw. for its three potlines. The Wells Dam ultimately would supply 483,000 kw. Estimated cost of the dam was $110 million.

[8] E&MJ Metal and Mineral Markets, vol. 27, No. 46, Nov. 15, 1956, p. 8.

A report [9] on development of the Pacific Northwest aluminum industry (Washington, Oregon, and Montana) provided data on production, plant capacities, and employment. In a subsequent newsletter,[10] employment in the primary-aluminum industry in 1956 in this area was shown as 11,400, with wages totaling $63.9 million. About 46 percent of the aluminum output was processed by the producing companies into finished and semifinished forms, such as sheet rod, wire, cable, and extrusions. The value of electric power purchased was $22.8 million, and purchases of materials, supplies, and services totaled $32.9 million.

In 1956 reduction capacity at the Alcoa Vancouver plant was increased 2,000 tons per year, bringing the installed capacity to 97,500 tons. Construction contracts with a value of $500,000 were let for three office and shop buildings. The largest project in the contract was for a two-story extension to the main office building. On August 14 a new 3-year wage agreement was signed between Alcoa and the Aluminum Trades Council of Vancouver, providing wage increases for 1,350 employees and extending other benefits.

A 3-year contract including virtually the same terms also was signed at Wenatchee during August. At the Wenatchee works new potline equipment in a $2 million expansion program went into operation in March. This project had begun in September 1955 and involved installation of additional pots in each of the plant's 4 potlines to increase installed capacity to 108,500 tons annually.

Alcoa indicated that the annual payroll at its Wenatchee and Vancouver works reached an alltime high of $14.7 million. Another $7 million was spent for purchases of materials and supplies in the Vancouver and Wenatchee areas, and expenditures for transportation amounted to more than $11 million. Electricity expenses exceeded $7 million, and State and local taxes totaled nearly $2 million. During 1956 contracts were signed for delivery of natural gas on an interruptible basis to the Vancouver and Wenatchee plants for use in producing steam heat, in baking carbon electrodes, and in heating remelt furnaces. The Wenatchee plant contracted for 1.2 million cubic feet of gas daily on a 5-year basis directly from the Pacific Northwest Pipeline Corp. At Vancouver, 35,000 therms per day were contracted for on a 5-year basis from the Portland Gas & Coke Co. Both the Vancouver and Wenatchee plants were to maintain standby heating equipment employing other fuels, for use when gas supplies were interruptible, particularly during cold weather.

The program of Kaiser Aluminum & Chemical Corp. in 1956 involved modernizing and improving the efficiency of its operations. Facilities included reduction plants at Tacoma and Mead (near Spokane), an aluminum-rolling mill at Trentwood in the Spokane area, and the company department of metallurgical research at Spokane. The total payroll during 1956 was $37.7 million. Purchases of materials, supplies, and services in the Pacific Northwest totaled $29.5 million, which included $8.5 million for electric power. Above-average stream flows, augmented by release of water from Hungry Horse Dam at crucial periods according to terms of a provisional power contract

[9] Sterrett, Chester K., Aluminum Fabrication in the Pacific Northwest: Raw Materials Survey Inf. Circ. 10, August 1956, 5 pp.
[10] Raw Materials Survey Newsletter, Issue 1, Series 57, Mar. 29, 1957.

with Bonneville Power Administration (BPA), permitted full production during 1956. Some high-cost, steam-generated power was purchased in October and December to supplement hydropower sources. Nearly half of the company aluminum-smelting operations at Mead and Tacoma depended on interruptible electric power.

Production capacity at the Tacoma reduction works was increased 5,300 tons in 1956 by the addition of 18 new reduction cells to bring the rated capacity to 38,500 tons of primary aluminum a year. The new cells, designed to operate on 100,000 amperes, were twice the size of the conventional cells at the plant. Plans for improving working conditions and operating efficiency at Tacoma were underway and included modification of the paste plant, which produced the carbon paste used in the reduction-cell anodes. Other planned work included a complete new lighting system in the potrooms.

Production capacity of the Mead plant was increased to 176,000 tons of primary aluminum annually by the addition of 16 new reduction cells. The project, costing $300,000, added 1,000 tons to annual capacity.

A new rolling-ingot casting station also was completed to supplement the ingot produced by the remelt facilities at the Trentwood rolling mill. Production of aluminum sheet and plate at the Trentwood plant increased to a new high. Rated capacity was 396 million pounds annually. Two new products—cross-corrugated roofing sheet and shade screen up to 48 inches wide—were added to the commodities made at Trentwood. Major improvements included increasing the capacity of the heavy-plate stretcher to 10 million pounds per square inch pull to produce bigger stress-relieved stretched airframe stock and addition of heavy-plate sonic-test equipment. A new gold-colored aluminum alloy was developed in the department of metallurgical research, and a new connector for joining aluminum and copper in electrical connections was perfected.

The Mead and Trentwood plants converted from oil to natural gas. These plants, the largest Spokane-area industrial consumers of gas, contracted for daily maximums of 10 million cubic feet at the Trentwood rolling mill and 2.8 million cubic feet at the Mead smelter. The gas replaced oil formerly used for heat energy. The amount of electricity required in reducing primary aluminum was not affected by the use of natural gas. At the Trentwood plant natural gas replaced fuel oil in 7 production and maintenance areas in the 525-acre plant site. Other planned uses included generation of inert gas for use in aluminum-annealing furnaces. Over 10,000 feet of main feeder pipe ranging in size from 1¼ inches to 10 in diameter, were installed at Trentwood to serve the boilerhouse heating plant, remelt furnaces, reclamation furnaces, machine shop, and other facilities. The total cost of the conversion at Trentwood was one-third million dollars. At the Mead plant gas was utilized in three areas. Major uses were in the rolling-ingot casting furnaces and in production of the carbon-anode blocks used in the reduction process.

Chromium.—A small tonnage of chromite ore was shipped from the Cypress Island mine, Skagit County, to the Government (GSA) Grants Pass (Oreg.) Purchase Depot.

Copper.—Plans for closing the Holden mine, Chelan County, Washington's only large copper producer, were disclosed in the Howe

Sound Co. 1956 annual report to shareholders. The operation was to be shut down in June 1957, but it was estimated that complete closing would take 1½ to 2 years. Owing to increased costs, the operation was marginal in recent years, except in periods of high copper prices. The Holden mine was acquired by Howe Sound Co. in 1929, and development during the next 25 years at a cost of more than $3 million included construction of the town of Holden and of a 2,000-ton concentrator. Average employment in 1956 was between 200 and 225 men; and the town, which included 20 company-owned residences

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in 1956, by months, in terms of recoverable metals

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	5,770	35,670	273	1,034	1,975
February	6,320	51,860	296	1,023	2,089
March	5,040	35,440	251	877	2,001
April	6,020	46,050	224	840	1,900
May	6,060	40,430	239	778	2,074
June	5,590	32,470	218	862	1,976
July	5,720	30,750	275	1,098	2,238
August	7,195	42,800	300	1,265	2,344
September	5,805	42,570	241	1,106	2,166
October	6,490	26,781	246	911	2,166
November	5,473	37,005	195	854	2,179
December	5,186	26,616	168	1,009	2,501
Total	70,669	448,442	2,926	11,657	25,609

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1947–51 (average), 1952–56, and total 1860–1956, in terms of recoverable metals [1]

Year	Mines producing [2]		Material sold or treated [3] (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1947–51 (average)	28	3	1,049,344	67,311	$2,355,892	345,205	$312,425
1952	28	1	1,402,472	54,776	1,917,160	315,645	285,675
1953	33	2	1,706,410	62,560	2,189,600	321,202	290,704
1954	24	6	1,552,141	66,740	2,335,900	313,735	283,946
1955	16	1	1,712,113	74,360	2,602,600	436,348	394,917
1956	34	1	1,697,099	70,669	2,473,415	448,442	405,863
1860–1956			(4)	2,844,331	78,306,908	16,391,269	12,332,742

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	4,465	$1,912,110	7,452	$2,337,732	14,035	$4,038,162	$10,956,321
1952	4,357	2,108,788	11,744	3,781,568	20,102	6,673,864	14,767,055
1953	3,740	2,146,760	11,064	2,898,768	32,786	7,540,780	15,066,612
1954	3,636	2,145,240	9,938	2,723,012	22,304	4,817,664	12,305,762
1955	3,958	2,952,668	10,340	3,081,320	29,536	7,265,856	16,297,361
1956	2,926	2,487,100	11,657	3,660,298	25,609	7,016,866	16,043,542
1860–1956	119,869	42,101,613	167,765	37,980,652	338,326	75,884,490	246,606,405

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped to smelters during calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Does not include gravel washed.
[4] 1860–1903: Figure not available; 1904–56, 25,842,327 tons produced.

and approximately 100 private homes, had a population of 450. In addition to copper, the mine produced substantial quantities of gold, silver, and zinc. In 1955 and part of 1956 extensive work in areas of the mine not previously explored was carried out under the DMEA program.

TABLE 6.—Gold produced at placer mines, 1947–51 (average) and 1952–56, by methods of recovery

Method	Mines producing	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	
				Total	Average per cubic yard
Nonfloating washing plants: [1]					
1947–51 (average)	1	4,140	22	$770	$0.186
1952					
1953	2	550	28	980	1.782
1954	4	3,400	106	3,710	1.091
1955	1	100	3	105	1.050
1956					
Small-scale hand methods:					
1947–51 (average)	2	367	5	175	.477
1952	1	60	3	105	1.750
1953	(2)	(3)	1	35	
1954	2	1,150	12	420	.365
1955					
1956	1	360	6	210	.583
Grand total placers:					
1947–51 (average) [4]	3	5,907	33	1,141	.228
1952	1	60	3	105	1.750
1953	2	[5] 550	29	1,015	[5] 1.782
1954	6	4,550	118	4,130	.908
1955	1	100	3	105	1.050
1956	1	360	6	210	.583

[1] Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."
[2] From property not classed as a mine.
[3] Figure not available.
[4] Includes 14 ounces of gold from dragline dredges.
[5] Excludes small-scale hand methods.

Production from other copper mines in Washington continued at about the same rate as in 1956. In King County Western States Copper & Uranium Corp. leased the Rainey property 16 miles northeast of North Bend to H & R Corp. of Everett. The mine was equipped with a 50-ton-per-day ore-concentrating plant and was a small producer of copper in 1952–56. In Snohomish County small quantities of copper ore were shipped from three mines by April Mines, Inc., Broken Ridge Mining Co., and Rosaia Mining Co.; and Kromona Mines Corp. continued development and production at the Kromona copper-tungsten property. The Bonanza Lead Co. was the only producer of copper ore in Stevens County; production was from the Copper Mountain property in the Chewelah district. Lead-zinc ores mined in the State yielded small quantities of copper.

A Ferry County exploration project at the Lone Star mine was carried out by Granore Co., United States subsidiary of Granby Consolidated Mining, Smelting & Power Co., Ltd., of Copper Mountain, British Columbia. The Lone Star mine (in the extreme northern part of the county near the Canadian boundary) was first developed in 1897 by the Reservation Mining & Milling Co. In 1907 the prop-

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1956, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer) [1]		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Chelan	3		38,522	$1,348,270	78,355	$70,915
King	1		58	2,030	2,048	1,854
Kittitas	3		101	3,535	309	280
Okanogan	2	1	8	280	11,501	10,409
Pend Oreille	6		2	70	29,373	26,584
Snohomish	4		110	3,850	263	238
Stevens	12		133	4,655	22,303	20,185
Undistributed [2]	3		31,735	1,110,725	304,290	275,398
Total	34	1	70,669	2,473,415	448,442	405,863

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Chelan	2,630	$2,235,500	3	$942	297	$81,378	$3,737,005
King	37	31,450					35,334
Kittitas							3,815
Okanogan	4	3,400	129	40,506	63	17,262	71,857
Pend Oreille	26	22,100	9,440	2,964,160	12,524	3,431,576	6,444,490
Snohomish	12	10,200					14,288
Stevens	215	182,750	2,085	654,690	12,725	3,486,650	4,348,930
Undistributed [2]	2	1,700					1,387,823
Total	2,926	2,487,100	11,657	3,660,298	25,609	7,016,866	16,043,542

[1] Source of gold: 70,663 ounces from lode mines and 6 ounces from placers.
[2] Includes values and quantities that cannot be shown separately for Ferry, Lincoln, and Pierce Counties.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1956, by classes of ore or other source material, in terms of recoverable metals

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	6	124,748	56,894	332,037	4,000		
Dry gold-silver	1	27	2	257			
Dry silver	2	8		24			
Copper	8	318,306	13,752	53,100	5,768,000	6,000	594,000
Lead	6	447		259		552,300	4,400
Lead-zinc	11	1,253,563	15	62,764	80,000	22,755,700	50,619,600
Total "lode material"	34	1,697,099	70,663	448,441	5,852,000	23,314,000	51,218,000
Gravel (placer operations)	1	[1]	6	1			
Total, all sources	35	1,697,099	70,669	448,442	5,852,000	23,314,000	51,218,000

[1] 360 cubic yards.

erty was acquired by the British Columbia Copper Co., Ltd. From 1912 to 1918 this firm explored the property further by 2,220 feet of drifts, shafts, winzes, and raises and by 3,590 feet of diamond drilling. The mine was shut down at the close of World War I and remained idle, except for some minor rehabilitation and underground diamond drilling. Mineralization consisted of pyrite, chalcopyrite, and minor amounts of gold in veinlets and disseminations in a silicified zone 10 to 50 feet wide, adjacent to a sheared dacite-basalt contact. Accord-

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1956, by types of material processed and methods of recovery, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation	93	46			
Cyanidation	5,819	84,956			
Concentration and smelting of concentrates	39,607	334,116	5,839,600	22,764,600	51,213,000
Direct smelting	25,144	29,323	12,400	549,400	5,000
Total lode	70,663	448,441	5,852,000	23,314,000	51,218,000
Placer	6	1			
Grand total	70,669	448,442	5,852,000	23,314,000	51,218,000

ing to a news report,[11] diamond drilling by Granore Co. delineated approximately 400,000 tons of 1-percent copper ore feasible for open-pit operations and about 200,000 tons of higher grade ore suitable for underground mining.

Exploration by Bear Creek Mining Co., a subsidiary of Kennecott Copper Corp., was resumed in the summer at the Glacier Peak property high in the rugged Cascade Mountains of Snohomish County. Preliminary examinations were initiated in 1953. The firm had a purchase option on the property from Glacier Peak Mining & Smelting Co. The magnitude of the deposits was uncertain, but results were encouraging enough to warrant continuation of the work. A bulletin[12] stated:

> The main ore body is at least 600 feet by 350 feet in cross section and 400 feet deep and the second ore body is thought to be similar but smaller. It is egg shaped in cross section and is known to extend to a 500-foot depth, but the lower boundary is not known.

The helicopter airlift originating in the spring of 1955 proved successful. Loads weighing a maximum of 412 pounds were flown 19 miles to unloading areas 5,400 to 6,500 feet in elevation; a maximum of 5,280 pounds was transported in 1 day.

Ferroalloys.—Production of ferroalloys continued at three plants operated by Keokuk Electro-Metals Co., Ohio Ferro-Alloys Corp., and Pacific Northwest Alloys, Inc., in Douglas County, Pierce County, and Spokane County, respectively.

Gold.—Knob Hill Mines, Inc., near Republic in Ferry County was the leading producer of gold in the State. Production from the Knob Hill mine was increased substantially over 1955. Ore was processed in a 400-ton flotation-cyanidation plant. Conversion was made from overhand cut-and-fill stoping (using conventional stope-hammers), to horizontal cut-and-fill stoping (using airleg drills). A 1,500 cubic-foot mine compressor was installed.

The Gold King property of Lovitt Mining Co., Inc., near Wenatchee, Chelan County, was also a major producer of gold. Ore was shipped crude to a smelter. Most of the remainder of the State gold was produced as a byproduct from the Holden copper mine (Chelan

[11] Mining World, vol. 18, No. 7, June 1956, p. 110.
[12] Work cited in footnote 6, p. 84.

County). It was announced that the Holden mine would be closed in the summer of 1957 (see Copper). Production was reported from the Anna May and Ace-of-Diamonds mines, both in Swauk district of Kittitas County, and base-metal ores produced from several mines yielded small quantities of gold.

Lead.—Lead production increased 13 percent and totaled 11,657 tons—a quantity second only to that in 1952. Greater production from the Pend Oreille mine accounted for the increase. A total of 17 mines yielded lead and lead-zinc ores compared with only 7 in 1955; however, 1 of the largest lead mines in the State, the Goldfield Consolidated Mines Co. Deep Creek mine (Stevens County), was closed indefinitely on November 21. The company stated in its annual report to stockholders that ore from working levels was exhausted. In view of the current lead-zinc prices, high operating costs, and the difficulties experienced in marketing zinc concentrate, it was decided that sinking the shaft to develop ore at depth was not warranted. The Deep Creek venture was begun in 1947 under a $300,000 purchase contract. After that time production brought sales of $6.1 million with a total profit of about $1.8 million before depreciation, depletion, and income taxes.

A substantial increase in lead production was made at the Pend Oreille mine of Pend Oreille Mines & Metals Co., the leading Washington lead producer. During 1956 the mine and mill were operated 6 and 7 days a week, respectively, compared with 5 and 6 days in 1955. Substantial wage increases were granted to all employees, retroactive to July 1, 1956, in a new collective-bargaining agreement reached December 21. Marked improvement in the underground manpower situation permitted a greatly increased development program to be undertaken. This program had been hampered by a shortage of underground workers. A total of $530,000 was expended for development in the year, including 7,280 feet of drifts and raises, 2,170 feet of inclined shaft, 411,700 cubic feet of station work, and 30,800 feet of diamond and rotary drilling. Pend Oreille Mines & Metals Co. acquired land along both sides of the Pend Oreille River upstream from the Z-Canyon power site. This area, withdrawn in earlier years for waterpower purposes, had been reopened to mineral entry by the Congress.

Production from the Grandview mine, operated by the American Zinc, Lead & Smelting Co., continued at the same rate as in 1955. An exploration program in progress was expected to increase mine output. The leased Lead Hill mine was operated by the same firm for 2 months.

In Stevens County the American Smelting and Refining Co. Van Stone mine, predominantly a zinc producer, also supplied a substantial tonnage of lead. The Pend Oreille, Grandview, and Van Stone mines produced 92 percent of the State lead.

Low lead and zinc prices discouraged exploration activity; however, A. G. Lotze, lessee of the Gladstone group, reported discovery of a new chimney of high-grade sulfide ore. One 12-ton shipment averaged 81.1 percent lead, gross content. Ore shipments during the year totaled 393 tons, with gross content averaging 79 percent lead. A new shaft 80 feet deep, was sunk. Other lead-producing mines in Stevens County were the Goldfield Consolidated Mines Co. Lead

Trust and Sierra Zinc mines, Pacific Northwest Mining Co. Lucille mine, and A. C. Neiman Red Top mine. In Okanogan County the Peacock mine (near Conconully) was the only lead-zinc producer. The property was worked from April to November. Ore was processed in a leased mill at Omak.

Silver.—Silver production totaled 448,400 ounces compared with 436,300 in 1955; it was recovered entirely as a byproduct. The Knob Hill gold mine in Ferry County continued to be the leading producer. Other comparatively large producers were the Holden mine (copper ore) and the Gold King mine (gold ore), Chelan County; and the Pend Oreille property (lead-zinc ore), Pend Oreille County. Also contributing to the State total were the Peacock mine (lead-zinc ore), Okanogan County; Grandview mine (lead-zinc ore), Pend Oreille County; and the Deep Creek mine (lead-zinc ore) and the Van Stone mine (zinc ore), Stevens County.

Steel.—An expansion and modernization program to increase the steelmaking capacity of its Seattle plant 70 percent was announced by Bethlehem Pacific Coast Steel Corp. in December. The project was to be completed in 2½ to 3 years at a cost of approximately $25 million. Construction was to begin early in 1957. The new facilities were to include two 100-ton electric furnaces, which would be the largest electric steelmaking furnaces in the 11 Western States. The capacity of the electric furnaces was to be 420,000 net tons of ingot annually compared with the present capacity of 246,000 net tons from 5 open-hearth furnaces. Electric power needed to operate the furnaces would be approximately equal to the consumption of a city of 50,000.

Other planned facilities included soaking pits to heat the ingots before rolling and a 32-inch blooming mill to produce blooms, billets, and slabs from ingots. These facilities would permit adoption of standard-size ingots and standard practice in pouring, rolling, and preparation of the steel. A new barmill was to be constructed to replace the 12-inch barmill and produce a wider variety and greater tonnage of bars and light structural shapes. A new universal plate mill stand was to be added to the 22-inch rolling mill to produce wider, longer, thicker plates. The first step in the construction program was to be installation of the electric furnaces. The open-hearth furnaces were to be dismantled, and the area used for construction of the new blooming mill and soaking pits. It was expected that the plant would be kept in nearly full production while the expansion program was underway.

At the Isaacson Iron Works, a steel processing and fabricating plant also in Seattle, 2 bays for steel receiving and storage in the structural steel division were added; and another bay measuring 280 by 133 feet was under construction. Scrap steel was melted in two electric furnaces having an annual capacity of 100,000 tons. Carbon alloy and stainless steels were produced and used for ingots, billets, structural steel, and a variety of other industrial steels.

Tungsten.—Addy Development Co. (Stevens County) and Kelly Camp Tungsten Co. (Ferry County) made small shipments of tungsten concentrate.

Uranium.—Construction of a $3 million uranium-processing plant at Ford (Stevens County), about 40 miles northwest of Spokane, was begun by Dawn Mining Co. in October. The location was on the

eastern border of the Spokane Indian Reservation, which contained the Midnite mine—site of the original discovery of uranium ore in the State—as well as several other properties. Mill capacity of 400 tons per day would enable mining out the known Midnite ore reserve during the term of the Atomic Energy Commission (AEC) concentrate purchase contract, which was to expire March 31, 1962. Provision was made for treating up to 100 tons per day of custom ore meeting grade requirements of 0.20 percent U_3O_8 or better. The plant was to use a column ion-exchange process, utilizing acid leaching and countercurrent decantation thickening, followed by uranium recovery in ion-exchange columns. This process was investigated by the National Lead Co. and the Bureau of Mines under sponsorship of the AEC.

Dawn Mining Co. began developing deposits adjacent to the producing Midnite mine. A stripping contract was awarded to Isbell Construction Co. to remove 231,000 tons of waste from the deposits (known as Boyd's leases), which were obtained in 1956. Diamond drilling in 1955 indicated that the property contained a continuation of the Midnite ore body. Daybreak Uranium, Inc., operated the Daybreak mine (Dahl lease) and new operations on the adjoining Huffman and Kit Carson tracts in the Mount Spokane area (Spokane County). The Lowley and Blair leases on the Spokane Indian Reservation also were acquired. Dahl Uranium Mines, Inc., and Big Smoke Uranium, Inc., also were reported to have shipped ore in 1956. Northwest Uranium Mines, Inc., began a DMEA project at holdings a few miles south of the Midnite property.

Exploration of uranium prospects declined in the latter half of 1956, owing to lack of a nearby custom mill. Activity was expected to increase after completion of the new processing plant at Ford. The AEC discontinued in 1955 the practice of entering into "off-the-plateau" purchase contracts, under which uranium producers were reimbursed for freight charges if their shipments averaged 0.20 percent uranium oxide or more. Such producers were to receive only the haulage allowance of 6 cents per ton-mile, up to 100 miles, that producers on the Colorado Plateau received.

Zinc.—Production of zinc was down 13 percent compared with 1955. Four mines continued to supply most of the output. One was mainly a zinc producer, and the other three were lead-zinc properties. The drop in production was due to a decline in output from the Van Stone zinc mine and closing of the Deep Creek mine. Output from the Grandview mine was greater than in the previous year, while production from the Pend Oreille property was slightly under 1955. The 4 mines produced 98 percent of all Washington zinc in 1956 (see also Lead).

NONMETALS

Abrasive Materials.—Grinding pebbles produced near Chewelah (Stevens County) by Mineral Products Co. were used for tube-mill grinding by Manufacturers Mineral Co. (Seattle). The former company also crushed sandstone for abrasive purposes. Silicon carbide, used both as an abrasive and refractory, was made by the Carborundum Co. (Vancouver, Clark County), from silica mined in Oregon.

Barite.—No barite was reported produced in Washington during 1956.

Cement.—Production and shipments of cement decreased about 11 and 17 percent, respectively, compared with 1955. Year-end stocks were slightly higher than at the close of the last year. A slowdown in construction of dwellings and commercial structures figured prominently in the slackened demand for cement. Companies producing portland cement reported a price increase in line with the upward national trend. Average price for cement shipped by Washington and Oregon producers was about 25 cents a barrel above the 1955 average. This price advance was offset by higher wages, fuel-oil costs, and freight rates.

Superior Portland Cement, Inc., plants at Concrete (Skagit County) and Seattle (King County) continued to lead in cement output. Also active were Olympic Portland Cement Co., Ltd., Bellingham, Whatcom County; Ideal Cement Co., Irvin, Spokane County; Lehigh Portland Cement Co., Metaline Falls, Pend Oreille County; and Northwestern Portland Cement Co., Grotto, King County. A distributing plant on Harbor Island (Seattle) was completed by Olympic Portland Cement Co., Ltd. Cement shipped by barge from the company Bellingham plant was packed for transshipment to major areas outside of Seattle. At the Bellingham plant construction to double the output capacity was under way. Construction also was begun by the Lehigh Portland Cement Co. at its Metaline Falls plant. Improvements and additions to the packaging and loading facilities were planned.

Permanente Cement Co. established a distributing plant at Pasco to serve eastern Washington and adjacent areas in Oregon with cement. The product was moved by truck, ship, and barge from the Permanente plant at San Jose (Calif.) to Pasco.

Cement shipments continued from plants in western Washington to Alaska and several foreign countries and from eastern Washington sources to as far as Illinois.

Several Washington cement plants were described.[13]

Clays.—Compared with 1955 total clays output declined 12 percent in quantity and increased 7 percent in value. This advance in value was brought about by the higher prices per ton reported for fire clay and miscellaneous clay.

Of the 8 producing counties, King and Spokane ranked first and second, respectively, and supplied 46 percent of the total clays output. Other producing counties (in order of output) were Pierce, Stevens, Snohomish, Lewis, Yakima, and Clark.

Fire clay used in firebrick and other refractory products was produced in King, Spokane, and Stevens Counties. Heavy clay products were made with clay mined at 13 pits: 5 in King County, 2 in Clark County, and 1 each in Spokane, Pierce, Stevens, Snohomish, Lewis, and Yakima Counties. Bentonite for lining irrigation canals was produced near Naches (Yakima County) by Calco Industrial Minerals.

Face and common brick, partition tile, and drain tile were manufactured at 4 plants in King County, 2 in Spokane and Clark Counties, and 1 each in Lewis, Pierce, Stevens, and Yakima Counties. Firebrick and other refractory products were made at 2 plants in Spokane

[13] Lenhart, W. B., Industry Booming on Pacific Coast: Rock Products, vol. 59, No. 8, August 1956, pp. 144–152 and 220–224.

County and at 1 in King County. A flowerpot plant also was active in King County.

Gladding, McBean & Co. announced plans for constructing a new refractory-products plant at Mica (Spokane County) to make firebrick in super-, high-, intermediate-, and low-duty grades. Consumption of one-half million cubic feet of natural gas daily to fire the kilns was expected. In July the Washington Brick & Lime Co. completed its new structural glazed-tile plant at Dishman (Spokane County). This facility was the only one in the Pacific Northwest making glazed-tile products.

The ceramic-industry development and raw-material resources of Washington were discussed in a report.[14]

Diatomite.—Production of diatomite at the two active operations in the State was 25 percent greater in quantity and 22 percent higher in value than in 1955. Kenite Corp. continued to mine and process diatomite at its facility near Quincy (Grant County). Plant improvements during the year included installation of dry dust collectors and additional packaging equipment. The other producing company—Western Ventures, Inc.—operated the Squaw Creek deposit near Ellensburg (Kittitas County).

Diatomite was marketed for filtration, insulation, filler, and other purposes.

Gem Stones.—Agate and petrified wood suitable for cutting and polishing were the gem materials collected during 1956. As in other years, there was no organized mining of gem stones in the State; production resulted from the efforts of hobbyists, vacationers, and individual collectors. In the more favorable areas ranchers opened their properties to collectors for a nominal fee. Most of the activity was in Yakima, Kittitas, and Klickitat Counties.

Tumbling methods developed during recent years for polishing gem materials continued to expand in scope. Much activity was directed toward developing new tumbling machines and techniques, especially to yield a finished product with a much higher polish.

Gypsum.—A substantial increase in the quantity of gypsite mined was reported by Agro Minerals, Inc., the only producer in the State, from its Poison Lake deposit near Tonasket (Okanogan County). The marketed product was used as land plaster.

Crude gypsum shipped into the State provided for a multi-million-dollar processing industry. The Seattle plant of Kaiser Gypsum Co., Inc., manufactured gypsum lath, wallboard, and sheathing and basecoat and molding plasters from raw material shipped by water from company-owned deposits on San Marcos Island (Baja California, Mexico). Columbia Gypsum Co., Ltd. (Spokane), processed crude gypsum from a quarry near Athalmer (British Columbia) for use as a cement retarder and for agricultural purposes.

Lime.—Output of lime by Roche Harbor Lime & Cement Co. up to September 30, 1956—when the plant closed permanently—was about 31 percent below 1955. Quick and hydrated lime was produced from limestone mined near the plant in San Juan County. The quicklime was used chiefly for building, chemical, and other industrial

[14] Kelly, H. J., Strandberg, K. G., and Mueller, J. I., Ceramic Industry Development and Raw-Material Resources of Oregon, Washington, Idaho, and Montana: Bureau of Mines Inf. Circ. 7752, 1956, 77 pp.

applications. A small quantity of hydrated lime was marketed for building purposes.

The Edna Bay Pure Stone Co.—a Texas corporation—in July announced plans for constructing a $5 million lime plant at Vancouver, Wash. The company reportedly completed negotiations with the Aluminum Company of America for long-term leasing of the latter company's Edna Bay (Alaska) limestone claims. Plans called for transporting the high-calcium limestone from Alaska to the Vancouver processing plant in self-unloading ships. The plant, which would produce lime for use by the cement, paper, sugar-beet, and carbide industries of the west coast, was scheduled to begin operations in 1957.

Magnesium Compounds.—Crude magnesite output by the Northwest Magnesite Co. (the leading producer of this commodity in the Nation) was 6 percent higher than in 1955. The company marketed refractory magnesia from beneficiated crude material mined at several of its quarries in Stevens County. The steel industry continued to be the principal consumer of this product.

Hydrous magnesium sulfate (epsomite) was recovered by Agro Minerals, Inc., from its deposit at Poison Lake (Okanogan County). This magnesium salt was used in fertilizers.

Production of olivine (magnesium silicate) by Northwest Olivine Co. from its Twin Sisters quarry (Skagit County) was substantially greater than in 1955. The quantity sold for use as foundry sand also increased significantly. Development by Twin Sisters Magnesium & Chrome Corp. was started at its Alamether-Begonia olivine deposit near Hamilton (Skagit County).

Pumice.—Pumice and pumicite, which totaled 5,291 tons in 1956, was substantially lower than in the preceding year. Arne Sorlie (Lakeside, Chelan County) and Entiat Pumice Co. (Ephrata, Grant County) were the leading producers. Superior Portland Cement, Inc. (Sentinel Mountain pit, Grant County), and Rainier Pumice Co. (Damnation Creek, King County) reported mining small quantities of pumicite. The chief use for both materials was as aggregate in manufacturing lightweight building block.

Sand and Gravel.—A 22-percent decrease was reported in sand and gravel output compared with 1955. The total production (16.8 million tons valued at $15.0 million) was distributed between commercial, 8.8 million tons ($8.3 million), and Government-and-contractor, 8.0 million tons ($6.7 million). Completion of major construction at The Dalles and Chief Joseph Dam by the United States Army Corps of Engineers resulted in a 5.4-million-ton drop in sand and gravel used by that agency. This decline was offset somewhat by a 1.4-million-ton increase by the Washington State Highway Department. The net result was that the decrease in the Government-and-contractor category represented 3.7 million of the total 4.8-million-ton deficit for 1956. Commercial production comprised the balance (1.1 million tons).

As in 1955, production of sand and gravel was reported from 35 of Washington's 39 counties. Pierce County ranked first in output, with a total of over 3.3 million tons. Other counties reporting over 1 million tons were Grant, King, Spokane, and Douglas. Based upon tonnage, 64 percent of the output was used for road building

and maintenance, 30 percent for other construction purposes, and 6 percent for railroad ballast and miscellaneous uses.

TABLE 10.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956			Percent of change in—	
	Short tons	Value	Average	Short tons	Value	Average	Tonnage	Average value
COMMERCIAL OPERATIONS								
Sand and gravel:								
Building	4,343,545	$4,260,079	$0.98	4,477,346	$4,458,263	$1.00	+3	+2
Road material	3,782,348	3,452,094	.91	3,266,582	2,971,760	.91	−14	0
Railroad ballast	628,039	216,404	.34	574,438	391,064	.68	−9	+100
Other [1]	1,196,907	696,708	.58	516,938	435,986	.84	−57	+45
Total	9,950,839	8,625,285	.87	8,835,304	8,257,073	.93	−11	+7
GOVERNMENT-AND-CONTRACTOR OPERATIONS								
Sand and gravel:								
Building	4,692,626	4,246,947	.91	500,551	552,854	1.10	−89	+21
Road material	7,001,696	6,478,450	.93	7,505,937	6,227,201	.83	+7	−11
Total	11,694,322	10,725,397	.92	8,006,488	6,780,055	.85	−32	−8
TOTAL ALL OPERATIONS								
Sand and gravel:								
Building	9,036,171	8,507,026	.94	4,977,897	5,011,117	1.01	−45	+7
Road material	10,784,044	9,930,544	.92	10,772,519	9,198,961	.85	0	−8
Railroad ballast	628,039	216,404	.34	574,438	391,064	.68	−9	+100
Other [1]	1,196,907	696,708	.58	516,938	435,986	.84	−57	+45
Grand total	21,645,161	19,350,682	.89	16,841,792	15,037,128	.89	−22	0

[1] Includes glass, molding, engine, and ballast sands and sand and gravel used for miscellaneous unspecified purposes.

Sodium Sulfate.—Kearney Chemical Co., Inc., of Omak (Okanogan County), announced plans to recover sodium sulfate from mineral lakes in the vicinity. The salt was to be purified and dried at the lake sites. Use was to be made of this material in making Kraft paper.

Stone.—Gross output of stone in 1956 was 8.0 million tons valued at $11.6 million, compared with 6.6 million tons worth $10.6 million in 1955. The total was divided between commercial, 4.3 million tons ($7.8 million); and Government-and-contractor, 3.7 million tons ($3.8 million). Comparable figures for 1955 were commercial, 3.9 million tons ($8.0 million); and Government-and-contractor, 2.7 million tons ($2.6 million). The commercial advance (0.4 million tons) was brought about by large gains in output of basalt for roadstone, railroad ballast, and riprap and of crushed granite for riprap and rubble, and smaller advances for sandstone, mainly for metallurgical purposes, and for marble for terrazzo and roofing granules. In contrast, limestone production was about 11 percent below that in 1955. In the Government-and-contractor category, the increase (1.0 million tons) was attributed mainly to a larger quantity of stone used by the United States Army Corps of Engineers for riprap, roadstone, and miscellaneous purposes. Substantial gains also were made by the

Washington State Highway Department and the Bureau of Reclamation.

A limestone deposit north of Metaline (Pend Oreille County) was test-drilled by Hecla Mining Co. of Wallace, Idaho. The company conducted an exploration and development program to determine the extent and quality of the deposit. Big Smoke Uranium, Inc., of Spokane took leases on a large silica deposit on the Spokane Indian Reservation in southern Stevens County. The deposit was an outcrop that could be mined by open-pit methods.

TABLE 11.—Stone sold or used, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Agriculture (limestone)	(1)	(1)	(1)	(1)
Building (dimension)	6,496	$281,936	(1)	(1)
Concrete and roadstone	4,329,413	5,201,254	4,609,482	$5,601,685
Riprap	485,743	520,061	1,101,286	1,138,649
Railroad ballast	(1)	(1)	535,991	564,388
Other [2]	1,771,560	4,576,380	1,810,579	4,354,876
Total	6,593,212	10,579,631	8,057,338	11,659,598

[1] Included with "Other" to avoid disclosing individual company confidential data.
[2] Used at cement, paper, metallurgical and chemical plants, and sugar refineries and for other unspecified purposes.

Stone quarrying was active in 36 of the State's 39 counties. The value of stone mined in the three leading counties—Skagit, King, and Stevens—represented about one-third of the Washington total.

Limestone was produced by cement companies at quarries in Skagit, Stevens, Pend Oreille, Whatcom, and Chelan Counties and also by Roche Harbor Lime & Cement Co. and Everett Lime Co., San Juan County; Mitchell Bay Lime Co., Whatcom County; and Peter Janni & Sons, Stevens County.

Marble for use mainly as terrazzo and roofing granules was mined in Stevens County by Manufacturers Mineral Co. and Washington Non-Metallics, Inc.

The principal producers of granite were Morrison-Knudsen Co., Inc., King County; and Great Northern Railway Co., Snohomish County. Other output was reported from Pierce and Stevens Counties. Monumental granite was quarried in Spokane and Stevens Counties.

The Walker Cut Stone Co., Inc., operated its Wilkeson quarry, Pierce County, and marketed rough and dressed sandstone. Sandstone was quarried and crushed for use in manufacturing silicon carbide by Exploration & Development Associates (Los Altos, Calif.) at a deposit near Springdale (Stevens County). Mineral Products Co. produced crushed sandstone for refractory and special sand purposes from a deposit near Chewelah.

Crushed quartz, used as a constituent in producing ferrosilicon, was prepared by Pacific Silica Co., Spokane County. Traprock, for use mainly as roadstone, was mined in 17 counties; principal production was from King, Snohomish, and Cowlitz Counties.

Strontium.—Manufacturers Mineral Co. operated the Gene Dunlap (formerly Sykes) strontium mine on Fidalgo Island (Skagit County), producing a small quantity for use by chemical companies in the Pacific Northwest.

Talc and Soapstone.—The output and value of soapstone were 13 and 24 percent less, respectively, than in 1955. All production came from Skagit County operations of Northwest Talc & Magnesium Co., Clear Lake; and William Soren (formerly Skagit Talc Products Co.) and Herman Smith, both of Marblemount. The Northwest Olivine Co. Rainbow open pit was idle during 1956. Development was done by Cascade Talc & Silica Co. and Otto Binchus (both near Marblemount).

Most of the soapstone mined was ground for use in insecticides; other applications included fertilizer mix and paint filler. Northwest Talc & Magnesium Co. ground some of its production, and Manufacturers Mineral Co. processed purchased raw material. Two Oregon organizations (Stauffer Chemical Co. and Miller Products Co., both of Portland) also ground soapstone from Washington.

Vermiculite (Exfoliated).—Exfoliation of vermiculite purchased from Montana by Vermiculite-Northwest, Inc. (Spokane), increased slightly over 1955. The expanded product was used as insulation and as aggregate in concrete and plaster.

MINERAL FUELS

Carbon Dioxide.—Recovery of carbon dioxide from mineral waters by the Gas-Ice Corp. (Seattle) was about the same as in 1955. The company produced dry ice at plants in Klickitat County and at Ashland (Jackson County, Oreg.).

Coal.—Coal production was 22 percent below that in 1955, marking a continuous decline in output of this commodity since 1949; 11 mines supplied the total. Liquidation of the Northwest Improvement Co.—wholly owned subsidiary of Northern Pacific Railway Co.—began, and certain properties were transferred to the parent organization. According to the railway company, conversion to diesel power caused operations of the Northwestern Improvement Co. to dwindle to a point where liquidation was desirable. The mines of this company produced a substantial portion of the Washington total in 1956. Other major contributors included: Palmer Coking Coal Co., Inc., King County; and Roslyn Cascade Coal Co., Kittitas County. Smaller output was reported by B. & R. Coal Co., King County; and Tono Coal Mining Co. (formerly the Stoker Coal Co.) Thurston County.

High costs of operating and steadily declining market for Washington coal brought about by the availability of natural gas and competition from out-of-State producers figured prominently in the depressed output.

The feasibility of constructing and operating a steam-electric generating plant in the Roslyn area of Kittitas County was investigated for the Washington State Power Commission by an independent industrial engineering firm. The State power commission proposed construction of a steam-electric generating plant in this area to augment hydroelectric power during periods of short supply. The

proposed plant would require over 500,000 tons of coal annually from mines in the Roslyn area.

Peat.—Output of peat totaling 37,000 tons valued at $129,000 was slightly below that in 1955. Washington maintained its position as the second ranking peat-producing State in the Nation, being surpassed only by Florida. Most of the peat production was used for soil improvement; minor applications were as a medium for germinating seeds and starting cuttings and as a mulch.

Petroleum and Natural Gas.—Initial deliveries of natural gas from the San Juan oilfields of New Mexico were begun during the year. The arrival of natural gas drastically influenced the use of coal and oil in Washington for industrial purposes. A number of large industrial operations (including cement plants, brick and ceramic kilns, sugar refineries, pulp and paper mills, plywood driers, and metallurgical plants) shifted to natural gas for heating and industrial purposes. Construction of the West Coast Transmission Co., Ltd., pipeline from the Peace River oilfields of Canada was continued during the year. Expected delivery of natural gas through this pipeline was scheduled for late 1957.

During the year General Petroleum Corp. began a general development and expansion program at its Ferndale refinery that eventually would boost daily plant capacity from 35,000 to 48,000 barrels. The Texas Co. reportedly purchased a site at Marshes Point near Anacortes and was planning a $50-million, 35,000 barrel-per-day refinery for this location. Construction of the refinery was scheduled to begin in 1957. The U. S. Oil & Refining Co. announced plans to erect an oil refinery at Tacoma with an initial daily capacity of 6,000 to 7,000 barrels of crude.

REVIEW BY COUNTIES AND DISTRICTS

Adams.—Basalt was crushed by F. H. DeAtley & Co. at Lind for roadstone and railroad ballast, and contractors supplied the Bureau of Reclamation with basalt for the Columbia Basin project. The State highway department used basalt and gravel for paving, and county road crews mined gravel for highway maintenance. Sand and gravel for construction and paving was marketed by Pre Mix Concrete, Inc.

Asotin.—Traprock and paving gravel were the only mineral commodities produced in Asotin County. The State highway department was furnished roadstone and paving gravel by contractors, and county highway crews and one contractor produced gravel for road building.

Benton.—Basalt was quarried by the Spokane, Portland & Seattle Railway Co. for railroad ballast and by contractors for road use by the State and county highway departments and also for riprap at Bureau of Reclamation projects. These Government agencies also were furnished gravel for various purposes. Three commercial operators produced sand and gravel.

Chelan.—Installed capacity of the Alcoa primary-aluminum plant near Wenatchee was enlarged to 108,500 tons annually—an increase of 8,500 tons—through installation of additional pots in each of the 4 potlines.

TABLE 12.—Value of mineral production in Washington, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Adams	$130,237	$540,873	Stone, sand and gravel.
Asotin	6,105	261,885	Do.
Benton	150,624	492,568	Sand and gravel, stone.
Chelan	5,067,980	4,521,695	Copper, gold, stone, sand and gravel, zinc, silver, pumice, lead.
Clallam	252,954	552,720	Stone, sand and gravel.
Clark	543,938	375,866	Stone, sand and gravel, clays.
Columbia	170,291		
Cowlitz	371,988	535,599	Stone, sand and gravel.
Douglas	2,072,516	(1)	Sand and gravel, stone.
Ferry	(1)	(1)	Gold, silver, sand and gravel, copper, tungsten.
Franklin	668,901	492,742	Sand and gravel, stone.
Garfield	7,978	48,222	Stone.
Grant	1,989,670	2,076,128	Sand and gravel, diatomite, stone, pumice.
Grays Harbor	256,740	310,992	Sand and gravel, stone.
Island	109,459	147,780	Sand and gravel.
Jefferson	(1)	219,335	Stone, sand and gravel.
King	9,168,626	8,713,784	Cement, sand and gravel, stone, coal, clays, copper, gold, silver, pumice.
Kitsap	133,252	154,641	Sand and gravel, stone.
Kittitas	3,454,198	(1)	Coal, sand and gravel, diatomite, stone, gold, silver.
Klickitat	2,447,733	1,136,909	Sand and gravel, stone, carbon dioxide.
Lewis	991,267	543,143	Stone, sand and gravel, coal, clays.
Lincoln	121,138	431,483	Sand and gravel, stone, silver.
Mason	(1)	24,150	Stone, sand and gravel.
Okanogan	238,904	393,963	Sand and gravel, lead, gypsum, zinc, silver, stone, copper, epsomite, gold.
Pacific	151,211	239,923	Stone.
Pend Oreille	8,708,522	(1)	Zinc, lead, cement, stone, sand and gravel, silver, copper, gold.
Pierce	2,502,171	2,609,384	Sand and gravel, stone, clay, silver.
San Juan	(1)	(1)	Lime, stone.
Skagit	(1)	(1)	Cement, stone, sand and gravel, talc and soapstone, olivine, chromite, strontium.
Skamania	60,643	30,029	Stone, sand and gravel.
Snohomish	1,359,097	1,626,611	Sand and gravel, stone, clays, copper, gold, silver.
Spokane	5,305,504	(1)	Cement, sand and gravel, stone, clays, uranium.
Stevens	8,164,095	7,217,921	Zinc, magnesite, stone, lead, copper, sand and gravel, clays, silver, tungsten, gold, iron ore, uranium, grinding pebbles.
Thurston	387,086	185,315	Sand and gravel, coal, stone.
Wahkiakum	14,300	200,180	Stone, sand and gravel.
Walla Walla	211,210	212,553	Sand and gravel, stone.
Whatcom	(1)	(1)	Cement, stone, sand and gravel, clays.
Whitman	436,227	323,351	Stone, sand and gravel.
Yakima	759,572	837,689	Sand and gravel, stone, clays.
Undistributed [2]	14,433,727	29,054,111	
Total [3]	67,334,000	61,665,000	

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[2] Includes value of sand and gravel, stone, peat, and gem stones that cannot be assigned to specific counties and value of minerals for counties indicated in the table by footnote 1.

[3] Total adjusted to eliminate duplicating value of clays and stone.

Limestone for the Grotto (King County) plant of Northwestern Portland Cement Co. was quarried at Soda Springs. Basalt and granite, respectively, were supplied to the Bureau of Public Roads and the State highway department for roadstone. The General Stone Co. (formerly Wilkeson Wenatchee Stone Co.) did not produce any dimension sandstone from the Dry Gulch quarry during the year. Contractors provided paving and structural sands and paving gravel to the State for various purposes. Gravel for ballast was produced by the Great Northern Railway Co., and three commercial concerns processed sand and gravel. Pumice used mainly for making lightweight building block was mined by Arne Sorlie near Lakeside. The Wenatchee Brick & Tile Co. was inactive during the year.

Lake Chelan District.—Prospects for base-metal production in the State received a setback with the announcement by Howe Sound Co. that the Holden mine was to be closed. This mine has been the only

major copper producer in Washington. Rising costs and the drop in copper prices in the latter half of 1956 were factors leading to the decision to close the operation. The Holden deposit was discovered about 1900, but development was not begun until Howe Sound Co. acquired the property. Production was initiated in 1938, and output in the next 20 years totaled about 100,000 tons of copper, 20,000 tons of zinc, and substantial quantities of gold and silver. Ore was processed in a 2,000-ton flotation plant and the concentrate trucked over a mountain road 12 miles to Lake Chelan, then taken by boat 25 miles down the lake to Chelan for shipment to smelters.

The townsite of Holden was leased from the United States Forest Service with a provision that when the lease was terminated the buildings were to be removed or destroyed and the land allowed to return to its natural state. Exploration and development in 1956 at the mine totaled 7,271 feet of drifting and 19,480 feet of diamond drilling. An exploration project with DMEA financial assistance was continued with the objective of drifting on the main haulage level of the mine to undercut surface exposures of copper mineralization on Buckskin Mountain.

Wenatchee River District.—Production from the Lovitt Mining Co., Inc., Gold King mine continued at the same rate as in 1955. The mine was 1 of 3 major gold producers in the State. Exploration and development consisted of 4,434 feet of drifting, 1,506 feet of raising, and 22,446 feet of testhole drilling. Crude oil was shipped to a smelter.

Clallam.—Contractors furnished basalt for riprap to the United States Army Corps of Engineers and the National Park Service and granite for road maintenance to the State highway department. Paving gravel was provided for the Bureau of Public Roads and by county highway crews. Blake Sand & Gravel Co. (Sequim) and Pieler Construction Co. (Port Angeles) produced paving gravel.

Clark.—Aluminum Company of America expanded reduction opertions at Vancouver 2,500 tons annually to raise installed capacity to 97,500 tons. Fabricating facilities included a mill manufacturing aluminum rod, wire, and cable and an extrusion mill. Approximately 75 percent of the primary aluminum produced was processed further at Vancouver.

Basalt for riprap and roadstone was mined by Smithrock Quarry, Inc., and contractors furnished basalt to the State and county highway departments for road building. County highway crews produced gravel for road maintenance. Wilde Co. (Vancouver) processed molding sand, and four commercial operations provided sand and gravel for building, paving, and railroad ballast. Building brick and drain tile were manufactured by C. B. Muffett Brick & Tile Factory (Ridgefield) and Hidden Brick Co. (Vancouver) from locally mined clay. Plans were announced by the Edna Bay Pure Stone Co. for constructing a limeplant at Vancouver to process limestone from Edna Bay (Alaska). Silicon carbide was manufactured by Carborundum Co. at Vancouver from Oregon silica.

Cowlitz.—The Reynolds Metals Co. aluminum-reduction plant at Longview was the principal mineral-industry operation in Cowlitz County. Annual capacity was increased from 50,000 tons to 60,500.

Lakeside Bulldozing Co. and Weyerhaeuser Timber Co. quarried

basalt for roadstone and railroad ballast. Basalt for riprap and road building was supplied to the United States Army Corps of Engineers and the county highway department, respectively. Paving gravel was produced by county road crews, and contractors furnished structural and paving sands to the State highway department. Castle Rock Sand & Gravel Co., Woodland Sand & Gravel Co., and Guy Norris processed structural and paving gravels.

Douglas.—Keokuk Electro-Metals Co. produced silicon metal at its plant on the Columbia River at Rock Island and prepared to activate a fourth electric furnace.

The county maintained its position as the fourth ranking source of sand and gravel in Washington, in terms of value, despite a decrease to $1.4 million from $2.1 million in 1955. Contractors supplied the needs of the State highway department and United States Army Corps of Engineers for structural and paving sand and gravel. The Great Northern Railway Co. produced engine sand and gravel for ballast. Basalt for road building was furnished the Douglas County engineer and the State highway department.

Ferry.—Uranium prospectors were active in the Nancy Creek-Bisbee Mountain, Sherman Creek, and St. Peters Creek districts. Numerous occurrences of autunite, uranophane, and uraninite have been found in these districts; exploration work was done at several properties in 1955 and 1956. These districts comprised 1 of 3 areas where uranium occurrences are concentrated in the State; the other 2 areas were the Spokane Indian Reservation (Stevens County), and Mount Spokane (Spokane County). Development of uranium discoveries had not advanced as far in Ferry County as in the other two counties. Kelly Camp Tungsten Co. shipped a small quantity of tungsten concentrate from the Kelly Camp mine.

Danville District.—The Walla Walla group—a copper-gold prospect consisting of three claims on Big Goosmas Creek—was leased to Republic Copper Co. for further development. Exploration was planned to further open an ore exposure reportedly consisting of 16 inches of high-grade chalcopyrite and several additional feet of millable ore along a contact zone. Assays indicated values in copper, gold, and silver, with some platinum. The Granore Co. (United States subsidiary of Granby Mining, Smelting & Power Co., Ltd., of Copper Mountain, British Columbia) carried out a diamond-drilling program with a crew of six men at the old Lone Star copper mine in the same area. About 400,000 tons of 1 percent ore reportedly was available for open-pit mining, and an additional 200,000 tons of higher grade ore was established for underground mining at the property. The mine has been idle for the last 30 years, but in the period 1907–18 sizable tonnages of ore were produced by the British Columbia Copper Co., Ltd.

Republic District.—The Knob Hill mine and 400-ton flotation-cyanidation plant were active throughout 1956. The mine was the leading producer of gold and silver in Washington. A change in mining methods from overhand to horizontal cut-and-fill stoping was [illegible] to reduce the cost of development raising on the vein, which [illegible] 60-degree dip, and subsequent stoping alongside. The former

type of raise employed was 3 compartments wide with 2 chutes separated by a manway. An article [15] stated:

> The new over-and-under, or slot-type raise, is comprised of a manway against the hanging wall over an untimbered chute that extends to the foot-wall. As the subsequent horizontal cut-and-fill stopes rise at each side of the slot raise, the horizontal timbers in the raise are removed and replaced with timbers designed to support the hydraulically placed sand that fills the stopes.

Sand and gravel furnished to the State highway department for road maintenance was the only nonmetal production in the county.

Franklin.—Connell Sand & Gravel Co. and Pre Mix Concrete, Inc., produced sand and gravel for building and paving purposes, and the county highway department contracted for paving gravel. The Northern Pacific Railway Co. processed railroad ballast from basalt and gravel. Contractors provided the Bureau of Reclamation and State highway department with crushed stone.

Garfield.—Basalt—the only mineral commodity mined in the county—was crushed for use as roadstone by county highway crews.

Grant.—Sand and gravel for building and paving purposes was produced by five commercial operators and by contractors for the State and county highway departments. Diatomite was mined and prepared for marketing at the Quincy operation of the Kenite Corp. Output, which was higher than in 1955, was used for filtration, filler, insulation, and miscellaneous purposes. Basalt was furnished to the county highway department and Bureau of Reclamation for use as riprap and to the State highway department for riprap and roadstone. Pumice was mined by the Entiat Pumice Co. at the Stormy Creek deposit. Production was limited because of severe winter damage to the equipment and storage bunkers. A small quantity of pumicite produced by Superior Portland Cement, Inc., at the Sentinel Mountain pit was used as an additive in concrete.

Grays Harbor.—Structural sand, paving gravel, and crushed basalt for roadstone were produced by Quigg Bros.-McDonald, Inc. Swano Excavating Co. processed paving gravel, and contractors supplied the State and county highway departments with raprap (granite) and road gravel, respectively.

Island.—Structural sand and gravel and paving gravel were produced by Christoe Sand & Gravel Co. and Mount Vernon Sand & Gravel Co. County road crews prepared road gravel.

Jefferson.—The General Construction Co. quarried basalt for use as riprap and roadstone. Crushed basalt and crushed granite were supplied by contractors to the United States Army Corps of Engineers and the State highway department, respectively. The State and county highway departments also were furnished paving sand and gravel.

King.—Metal-processing companies active in the Seattle area included Bethlehem Pacific Coast Steel Corp., The Bunker Hill Co., Isaacson Iron Works, Northwest Steel Rolling Mills, Inc., and Pacific Car & Foundry Co.

In December Bethlehem Pacific Coast Steel Corp. released details of a $25 million expansion program, which was to increase the steelmaking capacity of its Seattle plant from 246,000 tons a year to 420,000. Five open-hearth furnaces fired by oil and gas were to be eliminated and replaced by two 100-ton electric furnaces, the largest

[15] Farmin, Rollin, Annual Review, Washington, Idaho, Oregon, California: Min. Eng., vol. 9, No. 2, February 1957, p. 183.

in the West. Also to be installed were a new 32-inch blooming mill to produce rolling-mill sizes from large ingot and a new rolling mill to replace the present 12-inch bar mill. The 22-inch rolling mill was to be modernized.

Beginning in the fall of 1959, electric power was to be supplied by the Seattle Light Department from the Gorge hydroelectric plant under construction on the Skagit River. Pending completion of the Gorge plant, power was to be supplied by Bonneville Power Administration, supplemented if necessary during periods of power shortages in a critical water year by steam-generated power from the Seattle Light Department. The two electric furnaces were rated at 25,000 kw. each on the basis of the power that would be drawn at the start of each melt. Average consumption on a year-round basis would be 16,000 kw.[16]

Isaacson Iron Works operated steel processing and fabricating facilities and added two bays for steel receiving and storage in the structural steel division.

Pacific Car & Foundry Co. maintained extensive foundry, forge, machine-shop, and steel-fabrication facilities. Production was utilized principally in manufacturing company-completed products, such as railroad cars, logging equipment, trucks, buses, and military vehicles. A new line of large rock- and ore-mover trucks for off-highway use was introduced by the company.

Northwest Lead Co. and the affiliated Associated Lead & Zinc Co. were fully acquired by The Bunker Hill Co. in 1956. The Bunker Hill Co., which operates base-metal mines and smelters at Kellogg, Idaho, had owned a controlling interest in the two concerns since 1931. Northwest Lead Co. became the Sales and Fabricating Division of The Bunker Hill Co. Manufacturing operations consisted of secondary-lead smelting and the fabrication and casting of a wide variety of lead products. Associated Lead & Zinc Co., which became known as the Chemical Products Division, continued to manufacture lead oxides, used in lead-acid storage batteries; litharge, for applications in ceramics and oil refining; and red lead, for paints and glassmaking.

Nonmetals and fuels valued at $8.6 million, a decrease of about $0.4 million below the 1955 level, continued to contribute to the rank of King County as the principal source of these commodities in Washington. The county continued to rank first in output value of cement and second in value of coal, dropped to second position in value of clays produced, and moved from third to second in value for both sand and gravel and stone output.

Limestone from Concrete (Skagit County) and Soda Springs (Chelan County) was used in cement by Superior Portland Cement, Inc. (Seattle) and Northwestern Portland Cement Co. (Grotto), respectively. Both companies employed locally mined miscellaneous clay in the process. Olympic Portland Cement Co., Ltd., Bellingham, Whatcom County, completed construction of a distributing plant on Harbor Island. Cement shipped by barge from the Bellingham plant was to be marketed in the Seattle area.

Glass and building sands were produced by Smith Bros. Silica Sand from a deposit near Auburn, and Cavanaugh Molding Sand Co. used a small quantity of molding sand from the Cedar Mountain

[16] Business Roundup, Jan. 9, 1957, p. 3.

operation near Renton. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. and the Northern Pacific Railway Co. dug gravel for railroad ballast and fill purposes. Paving gravel was mined by the City of Seattle Engineering Department and by contractors for the State highway department and United States Army Corps of Engineers. Eleven commercial concerns produced structural sand and gravel and paving gravel.

Stone was quarried by the Great Northern Railway Co. (basalt-ballast), by the Northern Pacific Railway Co. (basalt-riprap), and by contractors for the United States Army Corps of Engineers (basalt-riprap and roadstone) and the State highway department (granite-roadstone). Hemphill Bros., Inc., mined and crushed granite for use as poultry grit and roofing granules. Four commercial operators produced basalt and granite for riprap and roadstone; one concern marketed dimension basalt for landscaping.

Output of coal from the Landsburg, Franklin No. 10 and No. 12, and Kummer mines placed Palmer Coking Coal Co., Inc., first in the county and second in the State in production of this commodity. B. & R. Coal Co. Newcastle mine was second in output; Draghi Coal Co. and Macks Coal Co. also contributed to the county total. Peat was produced in the county.

Clays were mined by Gladding, McBean & Co. at four pits (Harris, Palmer, Newcastle, and Renton) for building brick and tile. Part of the output of the Harris pit was made into fire brick and block. Structural clay products also were manufactured by Abrahamson Brick Co., Builders Brick Co., and Seattle Brick & Tile Co. Flowerpots were marketed by Auburn Pottery Co., Inc.

Gypsum imported from Baja California (Mexico) was processed to wallboard, lath, and other gypsum products at the Kaiser Gypsum Co. plant in Seattle. A small quantity of screened pumicite for use as concrete aggregate was processed by Rainier Pumice Co. Soapstone from Skagit County was ground at the Manufacturers Mineral Co. plant in Seattle.

Taylor River District.—The Rainey copper mine was active from May through October. H & R Corp. of Everett (Snohomish County) leased the property on May 15 from Western States Copper & Uranium Corp. Ore was concentrated in a 50-ton flotation mill.

Kitsap.—Sand and gravel for structural and paving purposes was produced by crews of the county engineer and by three commercial operators. Contractors furnished the United States Army Corps of Engineers with sand and gravel and the State highway department with crushed granite for roadwork.

Kittitas.—Output of coal composed most of the county mineral-production value. Contributing to the coal mined were Northern Pacific Railway Coal Department (formerly Northwestern Improvement Co.) underground and surface mines and Roslyn Cascade Coal Co.

Gravel for railroad ballast was processed by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. Contractors furnished the State highway department with basalt for riprap and roadstone, and with paving sand and gravel.

Diatomite was mined by Western Ventures, Inc., at the Squaw Creek open pit near Ellensburg. The company sized, dried, milled, and sacked the material for sale as a filler.

Swauk District.—Gold ore was produced by Clarence B. Jordin and by Robert A. Bowman and Donald Price from the Ace-of-Diamonds and Anna May mines, respectively.

Klickitat.—The combined output value of sand and gravel and stone declined from $2.4 million in 1955 to $1.1 million in 1956. This decrease (principally in sand and gravel) was due almost entirely to completion of major construction at The Dalles Dam by the United States Army Corps of Engineers. Two commercial operators produced structural sand and gravel, and the Spokane, Portland & Seattle Railway Co. mined basalt for riprap and gravel for fill. Paving gravel and roadstone were used by county highway crews, and contractors supplied the needs of the United States Army Corps of Engineers for structural sand and gravel and riprap.

Natural carbon dioxide was recovered from mineral waters near Klickitat by the Gas-Ice Corp.

Lewis.—Basalt for railroad ballast was quarried by the Northern Pacific Railway Co., and basalt and structural sand and gravel were processed by the Pacific Sand & Gravel Co. Cowlitz Construction Co., Inc., produced paving gravel. Crews of the county road department provided most of their own requirements for roadstone and paving gravel. Contractors furnished the Bureau of Public Roads and State highway department with basalt and gravel for road maintenance. Clays mined by the Chehalis Brick & Tile Co. were made into building brick and tile at the company plant.

The Black Prince mine of Black Prince Coal Co. at Centralia was active.

Lincoln.—Paving gravel was produced by county road crews, and contractors supplied the State highway department with roadstone and gravel.

Deer Trail District.—Crystal City Mining Co. made a small shipment of lead ore from the Crystal City mine 22 miles north of Davenport.

Mason.—Crushed granite was furnished to the State highway department by contractors. Johns Creek Sand & Gravel Co. produced structural sand and gravel and paving gravel. County and State road crews used paving gravel for highway maintenance.

Okanogan.—Structural sand and gravel and paving gravel were produced by four commercial concerns. The State highway department used paving gravel and granite (riprap). Gypsite and a small quantity of epsomite for use as land plaster and as an ingredient in chemical fertilizer, respectively, were mined by Agro Minerals, Inc., of Tonasket.

A sodium sulfate deposit near Omak was under development by Kearney Chemical Co., Inc.

Conconully (Ruby) District.—Conconully Mines, Inc., operated the D ock lead-zinc mine from April to November. Sherman Mining iamond-drilled at its lead-zinc claims 3 miles west of Omak and d shaft development. Two new buildings were completed at ft site. Previous development at the property consisted of a t tunnel driven about 1953 higher on the mountain.

Pacific.—Crushed basalt was processed by four commercial operators and by county road crews for highway maintenance. Contractors supplied this material to the State highway department.

Pend Oreille.—This county was eighth in nonmetal-output value in 1956 compared with sixth rank in 1955. Operations of Lehigh Portland Cement Co. continued to be the major nonmetal activity in the county. Limestone for use at that plant was quarried at Metaline Falls. A field study to determine the size and quality of a limestone deposit north of Metaline Falls was made by the Hecla Mining Co., Wallace, Idaho. The Great Northern Railway Co. dug gravel for fill, county road crews prepared paving gravel, and Romero Bros. marketed building sand and gravel. Contractors supplied the requirements of the United States Army Corps of Engineers and the State highway department for road gravel.

Metaline District.—The Grandview mine, operated by American Zinc, Lead & Smelting Co. under a lease and profit-sharing agreement, was one of the largest base-metal mines in Washington. Zinc production was greater than in 1955, and lead recovery continued at the rate established in that year. According to the company annual report, an agreement was made to purchase mine equipment owned by Grandview Mines, Inc. A lease and purchase agreement also was entered into on the real estate owned by the Grandview firm. It was believed that the reserve of lead-zinc ore in the Grandview mine, coupled with indicated tonnage on adjoining mineral rights that were to be developed after the Grandview was mined out, was sufficient to maintain the mill at maximum capacity for 10 to 12 years. American Zinc, Lead & Smelting Co. also operated the Lead Hill mine 2 months in connection with the annual assessment requirements.

Terms of a new 2-year contract entered into early in March by American Zinc, Lead & Smelting Co. and the International Union of Mine, Mill & Smelter Workers covering the 65 workers at the Grandview mine were published.[17] The settlement, based on a similar contract signed by the union and Pend Oreille Mines & Metals Co. in the same district in December 1955, provided for wage increases retroactive to July 1, 1955, and ranging from 10½ to 36 cents per hour depending upon wage classification; an additional, seventh paid holiday; and other benefits.

Pend Oreille Mines & Metals Co. operated the Pend Oreille lead-zinc mine throughout 1956, producing more ore than any other operation in the State. An accelerated development program was continued to increase ore output to between 750,000 and 800,000 tons in 1957, which would permit capacity operation of the company 2,400-ton East mill. At the end of 1956 employment was 190 men, including 110 underground workers. In progress was extension of the incline shaft by 2,500 feet to make a total length of 6,300 feet. This work was to be completed by February 1957. Waste rock from shaft sinking was loaded into skips by a crawler-mounted rocker shovel, hoisted to an underground crusher, and brought to the surface by the ore conveyor-belt system.[18] Also planned was installation of another

[17] The Wallace Miner, Mar. 8, 1956, vol. 50, No. 6, p. 1.
[18] Work cited in footnote 15.

crushing station at the 1,100-foot level and a 1,500-foot extension of the ore conveyor belt.[19]

LaSota-Jones Lead & Zinc Corp. began exploration at its property in the upper Slate Creek area under a DMEA contract. Lead ore was produced from the Rocky Creek claims by Jensen & McNamee.

Newport District.—Lead ore was shipped by R. C. McKelvie from the Comstock mine, which had been idle 15 years.

Pierce.—The copper smelter of American Smelting and Refining Co. operated continuously and processed concentrate from foreign sources, as well as domestic ore, concentrate, and scrap.

Kaiser Aluminum & Chemical Corp. added 18 reduction cells to bring capacity of its Tacoma facility to 38,500 tons of primary aluminum per year. Ohio Ferro-Alloys Corp. produced silicon metal for the aluminum industry and several grades of ferrosilicon for the iron and steel industry at Tacoma.

The county regained its position as the leading source of sand and gravel in Washington. Output valued at $2.1 million topped the 1955 total of $1.9 million. Nine commercial concerns processed sand and gravel for structural and paving purposes. Crews of the county road department and city of Tacoma produced sand and gravel, and contractors furnished the requirements of the United States Army Corps of Engineers and State highway department for these products. Stone was quarried by the Harrison Bros. Co. (basalt-roadstone), Kendall Construction Co. (granite-roadstone), crews of city of Tacoma (basalt-roadstone) and county road department (basalt-riprap), and contractors for the State highway department (granite-roadstone).

The Walker Cut Stone Co. quarried sandstone and marketed it as rough and dressed architectural stone and in crushed form for riprap. Heavy clay products were manufactured by Builders Brick Co. from clay mined at the Clay City pit. In addition to activity in nonmetal mining, the county was an important chemical-manufacturing area. Active plants included Hooker Electrochemical Co., Pennsylvania Salt Manufacturing Co., Stauffer Chemical Co., and E. I. du Pont de Nemours & Co. Products included caustic soda and other sodium compounds, ammonium nitrate, superphosphate, sulfuric, hydrochloric, and nitric acids, ammonia, and hydrogen.

A small quantity of coal was mined by the Carbonado Coal Co.

San Juan.—Limestone mining provided the raw material for the major mineral industry in the county—lime production. Roche Harbor Lime & Cement Co. converted limestone to quicklime for building and for chemical and other industrial purposes. Some of the limestone was ground for use as agricultural stone. The mine and plant of the Roche Harbor Lime & Cement Co., the only producing lime plant in the State, was closed September 30 and dismantling of the plant was begun. Limestone from the McGraw-Kittinger quarry was marketed to paper mills by the Everett Lime Co.

Skagit.—Chromite ore was produced by Vernon Pratt from the C ress Island mine.

e position of the county with respect to nonmetal commodities ed unchanged from 1955. The county still ranked second in

[19] World, vol. 8, No. 13, December 1956, p. 85.

value of all nonmetals in the State, first in stone output, and second in cement production. Limestone quarried at the Concrete workings by Superior Portland Cement, Inc., was used in manufacturing cement at the local plant and at the company plant in King County.

Soapstone was mined by the Northwest Talc & Magnesium Co. at its Clear Lake and Dad's Girl operations and by William Soren and Herman Smith at their mines near Marblemount. Assessment work was done at the Binchus property in the same area. Cascade Talc & Silica Co. did considerable development at a soapstone deposit on the Cascade highway about 10 miles from Marblemount. Plans called for starting mining early in 1957. The rock would be trucked to a Great Northern Railway Co. siding at Rockport.

Contractors furnished crushed granite and gravel to the State highway department for its road program. Basalt for riprap and gravel for paving were prepared by county highway crews. The Great Northern Railway Co. used gravel for railroad ballast, fill, and structural purposes. Paving and structural sand and gravel was produced by Marine Asphalt Co., Inc., and Mount Vernon Sand & Gravel Co., respectively.

Olivine was mined at an open-pit operation near Hamilton by Northwest Olivine Co. The product was well received by the industry for use as foundry sand. Twin Sisters Magnesium & Chrome Corp. mined a test lot of olivine from the Alamether-Begonia open pit.

Manufacturers Mineral Co. worked its LaConner strontium deposit. The material was processed and marketed to chemical companies in the area.

Skamania.—Roadstone and riprap (basalt) were quarried by county road crews and for the United States Army Corps of Engineers, respectively. Paving gravel was used by the State and county highway departments.

Snohomish.—Structural and paving sand and gravel was produced by seven commercial operators, and road crews of the county and city of Everett prepared paving gravel. State highway department gravel requirements were supplied by contractors. The Associated Sand & Gravel Co. and Clifton & Applegate quarried basalt for road use and railroad ballast. State highway crews were furnished crushed granite for road maintenance.

Granite also was produced by the Great Northern Railway Co. for railroad ballast and rubble, and by Manufacturers Mineral Co. for poultry grit and roadstone. Limestone for agricultural purposes was mined by Miller Lime Co. at Gold Bar. Heavy clay products were made by Lowell Brick & Tile Co. from locally mined clays.

Glacier Peak District.—Exploration activity was continued during the summer by Bear Creek Mining Co. at the optioned Glacier Peak copper property with a crew of 25 men. About 5,000 feet of diamond drilling was completed.

Granite Falls District.—Copper ore was shipped by April Mines, Inc.

Index District.—Development of copper prospects was undertaken by Broken Ridge Mining Co. and Rosaia Mining Co.

Sultan District.—Kromona Mines Corp. shipped copper concentrate from its Kromona property.

Spokane.—Kaiser Aluminum & Chemical Corp. added 16 reduction cells at the Mead plant to increase capacity to 176,000 tons of primary aluminum annually. At the company Trentwood rolling mill, production of aluminum sheet and plate advanced to a new record high. Pacific Northwest Alloys, Inc., produced ferrochromium at Mead.

Daybreak Uranium, Inc., was the principal shipper of uranium ore. From August 1955 to September 1956 a total of 6,250 tons was consigned to the Vitro Chemical Co. processing plant at Salt Lake City, Utah, from the company Daybreak (Dahl) mine and Huffman lease on the western foothills of Mount Spokane. Shipments were discontinued in the fall, pending completion of the new uranium mill at Ford (Stevens County). Proved ore reserves of 46,300 tons were reported.[20] North Star Uranium, Inc., acquired the Lehmbecher lease in October and made a test ore shipment. Also active in the Mount Spokane area were Dahl Uranium Mine, Inc., Dawn Uranium & Oil Co., and Affiliated Mines, Inc. The last-named firm obtained a DMEA contract for an exploration project on the Sprague lease.

A new zinc oxide plant, property of Northwest Refining & Chemical Co., was nearing production. The installation was to use both carbonate-base ore from Stevens County and silicate-base material from Coeur d'Alene district. Manufactured products were to be zinc oxide, leaded zinc oxide, and agricultural chemicals.

The county continued to rank third in the State in value of nonmetal output. Cement manufacture by Ideal Cement Co. at Irvin was a major mineral industry in Spokane County during 1956. The company hauled limestone from its Limerock quarry near Marble (Stevens County) to the Irvin plant for processing. Iron ore for use in the cement process came from Stevens County; clay and shale of local origin also were used at the plant.

Structural and paving sand and gravel was produced by 6 commercial operators at 9 locations. The Great Northern Railway Co. processed gravel for fill purposes Contractors furnished paving gravel for State highway needs and gravel to satisfy partial requirements of the county road department. Crews of the county also mined paving sand and gravel.

Roy C. Keene & Son quarried and dressed monumental granite. Vein quartz (silica), used mainly for making ferrosilicon, was mined at the Latshaw quarry by Pacific Silica Co. Basalt for roadstone and railroad ballast was quarried by Carbon Bros., The Green Co., Inland Asphalt Co., and county road crews. Roadstone was furnished to the State highway department by contractors. Fire brick and block were made from clay mined at the Tiano pit by Charles & Frank Pirello. Gladding, McBean & Co. made refractories and heavy clay products from clay from the Mica pit. The Washington Brick & Lime Co. mined clays at the Freeman, Mason, and Olson pits for processing to heavy clay products. Gypsum from British Columbia was marketed as a retarder in cement and for agricultural applications by Columbia Gypsum Co., Ltd. Vermiculite

[20] Work cited in footnote 6, p. 354.

shipped from Libby, Mont., was expanded at Spokane by Vermiculite-Northwest, Inc.

Field offices of the Bureau of Mines and Geological Survey and the DMEA were in Spokane. Personnel from the first two agencies comprised the field teams through which property examinations and inspections were conducted in conjunction with the DMEA program of loans for mineral exploration. The AEC also maintained an office in Spokane.

Stevens.—In September, Dawn Mining Co. began constructing the first uranium-ore-processing plant in the Pacific Northwest. The 400-ton-daily-capacity mill, to cost $3 million, was being built at Ford, 20 miles east of the company Midnite mine on the Spokane Indian Reservation. Up to 100 tons of custom ore meeting grade and amenability requirements was to be treated daily, in addition to the Midnite mine output. The treatment process was to involve dissolving ground ore in sulfuric acid, thickening the resulting pulp, and running the solution through ion-exchange beds of ammonium resins. After absorbing its capacity of uranium, the resin was to be washed and the uranium removed by chemicals which were to restore the resin for reuse. The plant was to use 500 to 600 tons of acid monthly.[21] Ore totaling 160,000 tons annually was to be trucked from the Midnite mine to the mill, which was to operate 24 hours per day. Production from the Midnite mine was being stockpiled pending completion of the mill. The ore reserve was reported to exceed 500,000 tons.

Dawn Mining Co., owned jointly by Newmont Mining Corp. and Midnite Mines, Inc., also began developing an adjoining 458-acre tract known as Boyd's lease. Uranium ore was shipped to a Salt Lake City (Utah) processing plant by Daybreak Uranium, Inc., from the Lowley lease, 7 miles south of the Midnite mine. Northwest Uranium Mines, Inc., initiated a DMEA project at its uranium holdings, and several other concerns also were active on the reservation.

Addy Development Co. shipped a small quantity of tungsten concentrate from the Washington Metals property. Iron ore was mined at the Kulzer property for special cements.

Magnesite output by Northwest Magnesite Co. increased over the 1955 total. The steel industry's demand for refractory magnesia was responsible for the greater production by the Nation's principal magnesite operation.

Limestone for use by Ideal Cement Co. (Spokane County) was quarried near Marble. Peter Janni & Sons supplied limestone to the paper and metallurgical industries. Granite for retaining walls and paving sand and gravel were produced by J. A. Terteling & Sons, Inc. Marble for use as terrazzo chips, roofing granules, and whiting was quarried by Manufacturers Mineral Co. (June Echo, Parks Red, and Valley White quarries) and Washington Non-Metallics, Inc. (Wa-No-Me quarry). Sandstone was mined by Exploration & Development Associates (for silicon carbide) and Mineral Products Co. (for foundry and blast sands, and refractory and filter purposes).

Sand and gravel for various uses was processed by the Great Northern Railway Co. (railroad ballast and fill), Colville Valley Concrete Co. (construction and road building), and the Chewelah city street

[21] Engineering and Mining Journal, vol. 158, No. 6, June 1957, p. 126.

department (paving gravel). Contractors furnished the State with gravel for highway maintenance.

Clays mined by the Washington Brick & Lime Co. at the Clayton and A. B. pits was used to make heavy clay products. Grinding pebbles were produced near Chewelah by Mineral Products Co.

Chewelah District.—Bonanza Lead Co. milled copper ore from the Copper Mountain mine.

Northport (Aladdin) District.—Goldfield Consolidated Mines Co. operated the Deep Creek mine from January 1 to November 21, at which time the mine was shut down owing to high operating costs and the difficulty being met in marketing zinc concentrate—the major product. The company was able to sell only about half of the 800 tons of zinc concentrate produced each month at its Sierra Zinc mill. About 45 men were employed in mining, trucking, and milling. The operation, consisting of the Sierra Zinc mine and mill, the Anderson mine, and the Deep Creek mine, was acquired by the company in 1948. The Deep Creek mine supplied the bulk of the company output.

A. G. Lotze, lessee from Gladstone Mountain Mining Co., shipped high-grade lead ore from a new deposit disclosed through stripping at the Gladstone mine. The top of the chimney deposit was uncovered 10 feet beneath the surface in an area partly covered by an old compressor building which was torn down in 1956.[22] Open-pit operations were initiated, and later an 80-foot incline shaft was sunk. A fire in October burned out the shaft and forced a shutdown, but mining and shipping of ore were expected to be resumed early in 1957. Shipments totaled 393 tons of ore containing 536,300 pounds of lead.

An exploration project by Goldfield Consolidated Mines Co. at the open-pit Lead Trust mine was terminated on August 1. The mine was purchased by A. C. Neiman, the former owner, on October 1. Exploration and development by Pacific Northwest Mining Co. at the Lucille lead mine consisted of 176 feet of drifts and 51 feet of raise. A. C. Neiman leased the Red Top mine August 1 and milled 450 tons of lead-zinc dump ore from the property at the Admiral mill. Goldfield Consolidated Mines Co. operated its Sierra Zinc mine in August and September. Production was from a small open pit which was started southwest of the mill to explore an outcropping. The deposit proved too small to operate profitably.

Production by American Smelting and Refining Co. from the open-pit Van Stone zinc mine was at the rate of 30,000 tons per month and more than 2,000 tons of waste was handled daily. Mining was done 5 days a week. The work was under contract by Isbell Construction Co. with a 25- to 30-man crew. The American Smelting and Refining Co. mill crew and staff totaled 37 men.

Thurston.—Contractors and county road crews produced gravel for road building and maintenance. Paving sand and granite roadstone were furnished by contractors to the State highway department, and the United States Army Corps of Engineers contracted for requirements of paving gravel and basalt for slope protection. The Tono No. 1 mine of the Tono Coal Mining Co. was active.

[22] Wallace Miner, June 14, 1956, vol. 50, No. 20, p. 4.

Wahkiakum.—Contractors mined gravel and basalt for use by the State highway department in its road-building program.

Walla Walla.—Jones-Scott Co. produced sand and gravel for building purposes and gravel for paving from two pits. County road crews processed gravel and crushed stone for highway maintenance; contractors supplied the gravel and roadstone requirements of the State highway department.

Whatcom.—The county continued to rank fourth in the State in value of output of nonmetal commodities; and, as in the case of the three counties ranked above Whatcom, cement manufacture was the major mineral industry. Olympic Portland Cement Co., Ltd., quarried limestone at the Kendall quarry and mined clays for use at its Bellingham plant. Limestone also was mined by Mitchell Bay Lime Co. at the Maple Falls quarry. Output was marketed to paper mills.

Crushed granite and gravel for highway building were supplied by contractors to the State highway department. Crews of the county and city of Bellingham road departments produced sand and gravel for maintenance. The Bureau of Public Roads received paving gravel from contractors. Sand and gravel for building and road work was prepared by the Lind Gravel Co. and C. V. Wilder Co.

Whitman.—Crushed basalt was prepared for road building by F. R. Hewett & Co., J. F. Konen Construction Co., and county road crews. Basalt and paving gravel were furnished to the State highway department by contractors. Foley Ready-Mix Co. of Colfax produced sand and gravel for construction purposes.

Yakima.—Sand and gravel for construction and road building was produced by 10 commercial concerns. Joe Marston quarried granite for curbing and flagging. Crushed basalt was prepared by R. H. Sussex and county road crews and for the Bureau of Reclamation and State highway department by contractors. Clay for making heavy clay products was mined by Granger Clay Products Co., and bentonite for lining irrigation canals and sealing dams was produced by Calco Industrial Minerals.

The Mineral Industry of West Virginia

This chapter has been prepared under the cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of the Interior, and the West Virginia Geologic and Economic Survey.

By James R. Kerr [1] and Jean Pendleton [2]

WEST VIRGINIA mineral production in 1956 increased 24 percent compared with 1955. As in past years, the larger coal-production value (26 percent) was the primary factor in the increased State mineral wealth. The State was again the leading producer of bituminous coal, mining more than 30 percent of the Nation's total and producing almost 66 million tons more than Pennsylvania, the second-ranking State.

Although coal production was West Virginia's outstanding mineral industry, constituting 88 percent of the State total, 15 other mineral commodities were produced; the more important in value were natural gas, natural-gas liquids, stone, sand and gravel, cement, and petroleum.

Leading counties in value of total mineral output were McDowell, Logan, Wyoming, Raleigh, Marion, Fayette, and Mingo—all coal-producing areas.

TABLE 1.—Mineral production in West Virginia, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	707,433	$2,563,289	769,518	$2,449,208
Coal	139,167,889	653,388,287	155,890,449	824,042,644
Marl (calcareous)	(3)	(3)	1,685	967
Natural gas, million cubic feet	212,403	49,915,000	204,717	48,518,000
Natural-gas liquids:				
Natural gasoline, thousand gallons	35,756	2,352,000	35,728	2,594,000
LP-gases, do	286,871	6,376,000	240,989	12,031,000
Petroleum (crude), thousand 42-gallon barrels	2,320	7,080,000	2,179	8,411,000
Salt (common)	638,390	3,476,352	680,964	3,453,305
Sand and gravel	5,171,399	9,779,288	5,110,056	10,710,843
Stone	5,898,585	9,714,168	6,579,271	10,765,639
Value of items that cannot be disclosed: Abrasive stones (1955), bromine, calcium-magnesium chloride, cement, lime, recovered elemental sulfur, and values indicated by footnote 2		12,929,982		14,589,866
Total West Virginia [3]		755,512,000		935,074,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Total adjusted to avoid duplicating value of clays and stone used in cement and lime.

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REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—The production of bituminous coal in West Virginia increased 12 percent compared with 1955. Logan County continued to lead the State in output; and McDowell County, second in total output, led in the value of coal produced. Other leading counties were Wyoming, Kanawha, Marion, and Harrison. Increased demand in each of the major coal-consuming industries—metallurgy, utility, and export—contributed to the upswing in coal production.

Underground mining at 1,278 mines made up 89 percent of the State production. Of the total underground yield, 98 percent was cut by machines (including the 8 percent mined by continuous miners), and 88 percent was power-drilled. Most of the underground output was loaded by mechanical means (87 percent). Mobile loaders were the primary loading devices: Loading into shuttle cars, 66 percent; into mine cars, 11 percent; and onto conveyors, 7 percent. Continuous mining machines accounted for 9 percent, handloaded face or room conveyors, 6 percent, and duckbills and self-loading conveyors 1 percent of the production that was mechanically loaded.

Strip and auger mining at 185 and 95 mines, respectively, contributed 8 and 3 percent to the State total.

Over 96 percent of the State production was shipped by railways or waterways and the remainder by trucks and other facilities. Thirty-one percent was crushed and 13 percent treated, using principally calcium chloride and oil before shipment. Of the total production, 29 percent was mechanically cleaned (54 percent by jigs, 39 percent wet washing other than jigs, and 7 percent by pneumatic methods).

A noteworthy event in the coal industry was organization of American Coal Shipping, Inc., by the coal industry, the United Mine Workers Union, and the principal coal-hauling railroads to protect the growing and important coal-export market. Immediate plans of the organization were to enter the ocean-shipping business by acquiring ships of its own and placing them in the export coal trade. Other problems concerning international movement of American coal were to be studied by the group.

Another development was the formation by Pittsburgh Consolidation Coal Co. and Standard Oil Co. (Ohio) of the Mountaineer Carbon Co., a jointly owned concern, to operate a carbon-calcining plant at Cresap, W. Va., about 25 miles south of Wheeling on the Ohio River. The plant will have a yearly capacity of 165,000 tons of high-grade calcined carbon, to be used principally for electrodes in aluminum reduction plants and other electrometallurgical and chemical production. Initial operation was expected in January 1958. About 200,000 tons of coke will be supplied by a $25 million coal-processing plant adjacent to the calcined carbon plant. Cresap is in the center of the area of rapidly expanding aluminum and chemical industries on the Ohio River.

An important merger was announced by Pittsburgh Consolidation with The Pocahontas Fuel Co., effective January 1957. Pittsburgh Consolidation also announced acquisition of 15,000 acres of undeveloped coal reserves in West Virginia from the Lorain Coal & Dock Co., Cleveland.

TABLE 2.—Coal production in 1955–56, by counties, in short tons

County	1955		1956	
	Total production	Average value per ton	Total production	Average value per ton
Barbour	3,467,711	$3.93	3,810,696	$4.30
Boone	6,381,116	4.74	6,936,083	5.12
Braxton	126,132	3.18	102,743	4.45
Brooke	972,085	4.30	1,149,285	4.22
Clay	1,078,855	4.24	1,284,942	5.17
Fayette	7,410,756	4.79	8,096,501	5.78
Gilmer	150,691	3.25	265,483	4.27
Grant	65,403	4.56	67,420	4.73
Greenbrier	1,241,348	4.45	1,573,089	5.37
Harrison	8,425,514	3.67	10,062,494	4.16
Kanawha	9,088,770	4.53	10,623,660	4.81
Lewis	917,170	3.12	1,383,115	3.43
Logan	20,939,549	4.53	22,139,897	5.11
McDowell	18,848,329	5.62	19,923,834	6.48
Marion	9,040,725	4.90	10,292,362	5.24
Mason	152,338	2.92	194,417	3.45
Mercer	1,719,554	5.20	1,910,123	6.25
Mineral	36,076	3.56	132,514	4.11
Mingo	8,298,934	4.66	8,774,182	5.08
Monongalia	7,847,694	4.09	8,663,219	4.51
Nicholas	5,569,659	4.50	6,066,431	5.38
Pocahontas	366,533	5.97	479,035	5.74
Preston	2,402,412	3.27	2,742,249	3.53
Putnam	28,640	3.99	147,553	4.52
Raleigh	8,548,631	5.33	10,764,791	6.19
Randolph	1,256,851	5.24	1,027,129	5.64
Taylor	287,580	2.97	366,229	3.58
Tucker	(1)	(1)	135,266	3.53
Upshur	1,321,447	3.71	1,407,518	4.00
Wayne	125,290	3.72	108,816	3.75
Webster	856,048	5.61	1,212,848	5.60
Wyoming	10,522,890	5.03	12,250,204	5.86
Undistributed	1,673,158	4.16	1,796,321	4.57
Total	139,167,889	4.70	155,890,449	5.29

[1] Included with "Undistributed," which also includes data for Hancock, Lincoln (1955), Marshall, Ohio, Summers, and Tucker (1955) Counties.

TABLE 3.—Coal production in West Virginia, 1947–51 (average) and 1952–56

Year	Short tons	Value	Value per ton	Year	Short tons	Value	Value per ton
1947–51 (average)	155,010,882	$796,078,590	$5.14	1954	115,996,041	$541,369,652	$4.67
1952	141,713,059	741,421,131	5.23	1955	139,167,889	653,388,287	4.70
1953	134,105,310	693,593,645	5.17	1956	155,890,449	824,042,644	5.29

Coke and Coal Chemicals.—Five oven-coke plants, including 813 ovens, were active in 1956, producing 4,197,400 tons of coke. Other cokemaking facilities included 703 beehive ovens, of which 402 were in operating condition on December 31, producing 104,440 tons of beehive coke; and 41 newly activated slot-type ovens with an annual capacity of 280,000 tons of coke. Recovered products at coke ovens included 254,387 tons of coke breeze; 67,332,640 thousand cubic feet of coke-oven gas; 106,446,092 pounds of ammonium sulfate; 59,880,906 gallons of coke-oven tar; 18,114,860 crude gallons of light oil, which includes 9,857,263 gallons of benzene, 2,554,091 gallons of toluene, 759,922 gallons of xylene; and 237,844 gallons of solvent naphtha.

Petroleum and Natural Gas.—The output of petroleum and natural gas decreased slightly in 1956, dropping 6 and 4 percent, respectively, compared with 1955.

In 1956, 809 well completions were reported by 43 counties. Calhoun, Ritchie, Logan, and Lincoln Counties led in well completions (accounting for 44.5 percent of all completion). Of the 809 wells completed 519 were gas; 58 oil; 63 oil and gas; 36 water injection, brine, and pressure wells; and 133 dry holes. The average depth of wells completed was 2,720 feet. The estimated number of producing wells at the end of 1956 were 14,420 gas and 12,772 oil. Drilling depths ranged from 110 to 8,030 feet.

Mingo County with 30 gas wells, produced over 32 percent of the West Virginia total. Leading gas-producing counties were Mingo, Logan, Calhoun, Lincoln, and Tucker, in order of decreasing output. Leading oil-producing counties were Calhoun, Jackson, Ritchie, Wirt, Kanawha, and Pleasants.

Many Devonian-shale gas wells were drilled in the southwestern part of the State during the year, and additional wells to the Oriskany Sand and Big Lime (Greenbrier) were drilled. Directional drilling along the Ohio River tested sands underlying the river. Many new wells and several old ones (gas and oil) were being fractured in the State with favorable results.[3]

Natural-gas liquids, natural gasoline, and LP-gases were produced in West Virginia again in 1956.

METALS

Iron and Steel.—Weirton Steel Co., West Virginia's largest iron and steel producer, announced lighting of the world's largest open-hearth furnace. The 600-ton furnace was put into operation at the Weirton plant on the Ohio River.

Wheeling Steel Corp. announced a $65 million expansion of facilities, including the Benwood Works at Benwood, W. Va. The new steelmaking facilities will supplement the present open-hearth furnaces and eventually replace Bessemer converters. Modernization of the hot-strip mill and cold-rolling and finishing facilities will handle the increased ingotmaking capacity.

West Virginia Steel & Manufacturing Co. at Huntington was the remaining steel producer.

NONMETALS

Cement.—Both portland and masonry cements were produced during 1956. Output, which was shipped exclusively by rail, was consumed primarily in Maryland, Virginia, and West Virginia. Twelve kilns were active during the year, operating an average of 325 days. The Standard Lime & Cement Co. reported a new cement kiln and grinding equipment in operation in April 1956. Production increased 13 percent during the year owing chiefly to the large new kiln put into production by Standard Lime & Cement Co.

Clays.—Output of clays in West Virginia in 1956 originated at 4 underground mines and 8 open pits. Fire-clay production made up 56 percent of the tonnage and 89 percent of the value and miscellaneous clay the balance. Total output of clays increased 9 percent over that of the preceding year, but the total value of production did not increase at a proportional rate because of variations in values of clays from the preceding year. Business conditions remained normal,

[3] Tucker, R. C., Assistant State Geologist, Morgantown, W. Va., Oil and Gas Developments in W. Va., 1956.

and labor conditions were reported as good. Labor rates and selling price went up August 31, 1956. The Crescent Brick Co., Inc., announced the utilization of roof bolts as a roof-control measure at the underground Hardins Run mine near New Cumberland.

The chief use for fire clay, produced primarily in Hancock County, was for refractories (primarily firebrick and block) and for use in foundries and steelworks. Miscellaneous clay production, concentrated in Berkeley County, was used for heavy clay products and in portland and other hydraulic cements.

TABLE 4.—Clays sold or used by producers, 1947–51 (average) and 1952–56

Year	Fire clay		Miscellaneous clay		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1947–51 (average)	379, 530	$980, 130	323, 356	$261, 892	702, 886	$1, 242, 022
1952	621, 996	2, 072, 688	360, 034	348, 981	982, 030	2, 421, 669
1953	677, 005	2, 213, 376	291, 833	275, 562	968, 838	2, 488, 938
1954	290, 256	1, 171, 495	296, 864	279, 044	587, 120	1, 450, 539
1955	406, 025	2, 277, 163	301, 408	286, 126	707, 433	2, 563, 289
1956	428, 033	2, 171, 942	341, 485	277, 266	769, 518	2, 449, 208

Lime.—The production of lime in West Virginia was concentrated in Berkeley and Jefferson Counties. Output was largely quicklime for chemical and industrial uses and for refractory material; small quantities of hydrated lime were also produced. High-magnesium limestone (dolomite) was calcined to produce dead-burned dolomite for refractory purposes. Most of the output was calcined in bituminous-coal-fired rotary kilns. Much of the State output was destined for consumption in the iron and steel industry, either as a flux in open-hearth furnaces or for refractory material (furnace linings); hence, much of West Virginia lime production depends on fluctuations in the iron and steel industry.

Marl, Calcareous.—Low demand and adverse weather conditions held down the production of calcareous marl in 1956. The material produced was used for agricultural purposes.

Natural Salines.—Bromine compounds and the double salt calcium-magnesium chloride were prepared from well brines obtained near South Charleston. Westvaco Chlor-Alkali Division, Food Machinery & Chemical Corp., closed its wells from June 20 to August 4, 1956, causing a 15-percent drop in output.

Salt.—Well brines furnished the salt output for West Virginia in 1956. Four producers reported active wells during the year. Most of the salt was used in brine form in chemicals and not marketed as salt. Principal use for both brines and evaporated salt was in manufacturing chlorine and other chemicals. Although production rose slightly over the preceding year, the value of production dropped owing to a drop in the output of evaporated salt (the item of higher unit value) and an increase in the output of brines that had a low unit value.

Sand and Gravel.—The output of sand and gravel remained substantially the same as in 1955. Most producers reported little variation in demand, as prices and wages remained relatively constant. Some complained of lower profits due to the high costs of repair parts.

The larger part of the output was dredged from West Virginia rivers, as 14 operators reported dredges active during the year. Thirteen

fixed plants were also active during the year; most of them processed small tonnages. Sand and gravel production was reported from 19 counties. Major uses for the output were for building and paving purposes, glass sand, engine sand, molding, and grinding and polishing. Hancock and Morgan were the leading producing counties.

TABLE 5.—Sand and gravel sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Sand:				
Building	800,105	$1,080,401	(1)	(1)
Paving	1,191,328	1,305,433	965,409	$1,013,275
Engine	203,058	350,391	(1)	(1)
Fire or furnace	(1)	(1)	36,993	46,411
Gravel:				
Building	774,081	929,238	726,116	815,899
Paving	657,737	750,517	820,870	1,067,090
Other	122,139	164,540	16,590	20,627
Undistributed [2]	1,422,351	5,198,768	2,544,078	7,747,541
Total	5,171,399	9,779,288	5,110,056	10,710,843

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes glass sand, building sand (1956), molding sand, grinding and polishing sands, engine sand (1956), fire or furnace sand (1955), blast sand (1955), railroad-ballast sand and gravel, and other sand.

Stone.—Stone production, consisting largely of limestone, increased 12 percent. Limestone producers reported a good demand; they also stated that there were shortages in the fall in some areas when production was curtailed owing to adverse weather conditions. Prices rose slightly, reflecting increases in wages and costs of material and supplies.

Limestone output was reported by 16 companies in 9 counties. The most important use for the crushed product was as fluxing agent in blast and open-hearth furnaces. Companies affiliated with steel corporations were among the leading producers. Other major uses of the product were for concrete aggregate and roadstone and as an ingredient in cement and lime.

Crushed sandstone, which was used entirely as concrete aggregate and roadstone, was produced by 3 companies in 3 counties; some was produced for use as riprap and for concrete aggregate and roadstone by Government-and-contractor operations.

TABLE 6.—Crushed and broken stone sold or used by producers, 1955–56, by uses

Use	1955		1956	
	Short tons	Value	Short tons	Value
Flux	2,813,611	$4,689,624	2,864,147	$5,001,336
Concrete and roadstone	1,374,743	2,188,805	1,198,804	2,038,075
Railroad ballast	141,196	200,494	562,947	538,156
Agricultural (limestone)	57,666	133,152	61,487	136,192
Other [1]	182,184	564,401	240,725	674,446
Undistributed [2]	1,329,185	1,937,692	1,651,161	2,377,434
Total	5,898,585	9,714,168	6,579,271	10,765,639

[1] Limestone for miscellaneous uses (rock dust, glass, asphalt filler, stone sand, and chemical).
[2] Limestone for cement and lime.

Recovered Elemental Sulfur.—Brimstone was recovered as a by-product in the liquid purification of gas by the Koppers process and by the coke process. Production was reported from Kanawha and Monongalia Counties.

REVIEW BY COUNTIES

Barbour.—The two underground mines of Compass Coal Co. were by far the principal coal producers in the county. Other leading producers were the underground mines of Bethlehem-Cuba Iron Mines Co., Simpson Creek Collieries, Mountain Mining Co., Virgil Harris, Knight Coal Co.; and the strip pits of Grafton Coal Co., Coleman & Gay, L. E. Cleghorn, and the Mineral Coal Co., Inc., of West Virginia.

Berkeley.—Berkeley was the leading area in manufacturing cement and ranked second in both lime and limestone production. A considerable quantity of clay also was mined. The Martinsburg plant of the Standard Lime & Cement Co. was the preeminent cement-manufacturing site, producing vast quantities of portland cement and smaller quantities of masonry cement.

Standard Lime & Stone Co. and Jones and Laughlin Steel Corp., Blair Limestone Division (both of Martinsburg), quarried limestone primarily for use in their lime-manufacturing plants and as concrete aggregate, roadstone, blast-furnace flux, and railroad ballast. The J. E. Baker Co. (Inwood) and W. S. Frey (Martinsburg) reported limestone output for blast-furnace flux and as concrete aggregate and roadstone.

TABLE 7.—Value of mineral production in West Virginia, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value [2]
Barbour	$13,618,174	$16,403,853	Coal.
Berkeley	9,339,616	11,166,896	Cement, stone, lime, clays.
Boone	30,252,129	35,532,340	Coal.
Braxton	401,327	456,921	Do.
Brooke	4,497,622	4,917,172	Coal, sand and gravel.
Cabell	565,271	628,599	Sand and gravel, clays, stone.
Clay	4,569,073	6,639,908	Coal.
Fayette	(3)	46,824,387	Do.
Gilmer	489,597	1,133,567	Do.
Grant	(3)	(3)	Coal, stone.
Greenbrier	7,011,322	(3)	Do.
Hancock	(3)	(3)	Clays, sand and gravel, coal.
Harrison	30,957,419	41,827,138	Coal, sand and gravel.
Jackson	47,691	19,346	Sand and gravel.
Jefferson	(3)	(3)	Stone, lime, calcareous marl.
Kanawha	44,150,070	53,677,100	Coal, salt, sand and gravel, bromine, clays, calcium chloride, recovered elemental sulfur, stone.
Lewis	2,873,412	4,753,105	Coal, clays.
Lincoln	(3)	28,321	Sand and gravel.
Logan	94,848,884	113,196,260	Coal.
Marion	44,268,079	53,918,497	Do.
Marshall	(3)	(3)	Coal, salt.
Mason	(3)	(3)	Coal, salt, sand and gravel.
Mercer	9,076,810	12,028,159	Coal, stone, clays.
McDowell	105,920,522	129,101,318	Coal, stone.
Mineral	153,600	560,859	Do.
Mingo	(3)	44,590,749	Coal, sand and gravel.
Monongalia	33,015,365	39,987,329	Coal, stone, sand and gravel, recovered elemental sulfur.
Morgan	(3)	(3)	Sand and gravel.
Nicholas	(3)	(3)	Coal, stone, sand and gravel.
Ohio	(3)	(3)	Coal, sand and gravel.

See footnotes at end of table.

TABLE 7.—Value of mineral production in West Virginia, 1955–56, by counties [1]—Continued

County	1955	1956	Minerals produced in 1956 in order of value [2]
Pocahontas	$2,189,918	$2,748,213	Coal.
Preston	9,962,334	11,945,487	Coal, cement, stone.
Putnam	114,273	667,124	Coal.
Raleigh	(3)	66,649,707	Coal, sand and gravel.
Randolph	6,762,425	(3)	Coal, stone.
Summers	(3)	(3)	Do.
Taylor	853,069	1,311,734	Coal.
Tucker	(3)	484,292	Coal, sand and gravel.
Upshur	4,911,178	(3)	Coal, clays.
Wayne	488,457	431,541	Coal, sand and gravel.
Webster	4,805,674	6,796,401	Coal.
Wetzel	(3)	(3)	Sand and gravel.
Wood	313,731	736,338	Do.
Wyoming	52,919,776	71,777,127	Coal, sand and gravel.
Total fuels	65,723,000	71,554,000	
Undistributed	170,412,312	82,580,618	
Grand total	755,512,000	935,074,000	

[1] The following counties were not listed because no tonnage was reported: Calhoun, Doddridge, Hampshire, Hardy, Monroe, Pendleton, Pleasants, Ritchie, Roane, Tyler, and Wirt.
[2] Fuels, including natural gas, natural-gas liquids, and petroleum are not listed by counties but given as State total.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

Miscellaneous clay for heavy clay products was mined from the open pits of United Clay Products Co., North Mountain; and Continental Clay Products Co., Martinsburg.

Boone.—Of the 53 active coal mines, 47 were underground and supplied over 90 percent of total output. Eastern Gas & Fuel Associates and the Red Parrot Coal Co. were the leading underground producers, followed by Youghiogheny & Ohio Coal Co., Armco Steel Corp., Westmoreland Coal Co., Glogora Co., Anchor Coal Co., and Ridgeview Coal Co. The Red Parrot Coal Co. also mined considerable coal from an auger operation, as did Westmoreland Coal Co.

Braxton.—Output of coal (all from underground mines) was reported by the following eight producers, in order of decreasing tonnage: Barnett & Long Coal Co., Willis Coal Co., Cedar Creek Coal Co., Long Coal Co., Exploration Coal Co., Dobbins Coal Co., Fairmont-Shinnston Coal Co., and Cutlip & Straley Coal Co.

Brooke.—The underground mine of Windsor Power House Coal Co. yielded the bulk of coal output in Brooke County. The balance of production was mined from the strip and auger operations of K. & P. Construction Co.; the strip pits of Huberta Coal Co., Formis Coal Co., Stefkovich Bros., and Taylor Coal Co.; and the underground mines of Beech Bottom Coal Co., Liberty Colliery Co., Inc., Glen Brooke Coal Co., Fireside Fuel Co., Darwin Corp., Pot Rock Coal Co., and F. B. Olette Coal Co.

Fire or furnace sand and gravel was produced by The Brilliant Sand Co., Follansbee.

Cabell.—The most important mineral product of Cabell County was sand and gravel dredged from the Ohio River by the Ohio River Dredging Co., near Crown City; and Union Sand & Gravel, near Huntington. Output was used for building and paving purposes.

Barboursville Clay Manufacturing Co. (Barboursville) reported miscellaneous clay of red shale variety for use in heavy clay products.

A small quantity of crushed sandstone was produced by the city of Huntington for use in paving roads.

Clay.—Coal was mined from 5 underground mines and 1 strip pit in the county. Elk River Coal & Lumber Co. was the largest producer. Smaller underground mines were operated by Chemical Coal Co., Hickman Lumber Co., Osborne Brothers Coal Co., and Cannel Coal Co. Strip production was reported by Clay Coals, Inc.

Fayette.—Fayette County had 165 active coal mines in 1956, ranking 10th out of 36 coal-producing counties. Underground mines accounted for 90 percent of output. Primary producers, in order of decreasing tonnage, were New River & Pocahontas Coal Co., Eastern Gas & Fuel Associates, Milburn By-Products Coal Co., Southern Coal Corp., Ames Mining Co., The Gauley Mountain Coal Co., Electro-Metallurgical Co., Division of Union Carbon & Carbide Corp., and Royalty Smokeless Coal Co.

Gilmer.—The coal mined in Gilmer County was primarily from the strip pit of B. H. Swaney, Inc., and the strip and auger mines of R. & H. Coal Co. Small tonnages were reported from the underground mines of C. & L. Coal Co., L. & D. Coal Co., Little Kanawha Coal Co., R. & S. Coal Co., and Smith Coal Co.

Grant.—A small quantity of coal was produced from 12 mines, of which Stoney River Coal Co. mine was the largest.

Limestone for concrete aggregate, roadstone, and railroad ballast was quarried by Bean's Lime & Stone, Inc. (Petersburg). Oscar Keplinger (Maysville) also reported producing a small quantity of limestone for agricultural purposes.

Greenbrier.—The underground mines of Donegan Coal & Coke Co., Left Fork Fuel, Inc., and The Raine Lumber & Coal Co. and the strip mine of Lafayette Springs Coal Co. supplied over half of the county output. The balance of production was reported from 92 smaller mines.

The Acme Limestone Co. (near Fort Spring) quarried a large quantity of limestone for use as concrete aggregate, roadstone, railroad ballast, stone sand, dust for coal mines, chemicals, and agricultural purposes. The H. Frazier Co., Inc. (Fort Spring), reported limestone production for use as railroad ballast. Crushed sandstone for concrete and roadstone was quarried by West Virginia Conservation Commission.

Hancock.—Hancock County ranked first in the State in clay production. The leading fire-clay producer was Globe Brick Co., Newell, followed by Crescent Brick Co., and West Virginia Fire Clay Manufacturing Co., both of New Cumberland. Output was used for firebrick and block, foundries and steelworks, and mortar.

The Nos. 8 and 9 dredge operations of Dravo Corp. Keystone Division near Moscow continued to produce large quantities of sand and gravel for building and paving purposes. Owing to the company's high productivity, Hancock ranked second among the 19 sand- and gravel-producing counties.

A small quantity of coal was mined from the underground mine of A. A. A. L. W. Mining Corp. and the strip pit of M. & E. Coal Co.

Harrison.—Coal mining flourished in 1956, with 123 mines reporting over 10 million tons of coal—an increase of over 1.5 million from 1955. The underground mines of Consolidation Coal Co. and Compass Coal Co. supplied a large portion of output. Relatively high production also was reported by the underground mine of Galloway Land Co., the strip and auger operation of Tasa Coal Co., and the underground mine of Robey Run Coal Co.

Jackson.—Sand for paving roads was the principal product of Ravenswood Sand & Gravel Co. (Ravenswood). A small quantity of gravel for use as a filler and for building purposes also was produced by the company.

Jefferson.—Jefferson County was the leading area in limestone and lime production and the only source of calcareous marl in West Virginia. United States Steel Corp., Michigan Limestone Division (Millville), Jones & Laughlin Steel Corp., Blair Limestone Division (Harpers Ferry), and the Bakerton and Millville plants of Standard Lime & Cement Co. (near Engle and Millville, respectively) reported limestone quarried for metallurgical use, concrete and roadstone, railroad ballast, and agricultural purposes.

Standard Lime & Cement Co. reported lime for refractory material from the Millville plant and quicklime and hydrated lime from the Bakerton plant. Jones & Laughlin Steel Corp. calcined dolomite primarily for use as refractory material (dead-burned dolomite).

Calcareous marl was mined for agricultural purposes by West Virginia Lime Co. (Charles Town).

Kanawha.—Coal production composed 95 percent of the mineral value of Kanawha County. Salt, sand and gravel, natural salines (bromine and bromine compounds and calcium-magnesium chloride), clays, sulfur, and stone were the other minerals of value. Ninety percent of the coal was mined from 76 underground mines, 4 of which were operated by the Carbon Fuel Co., 9 by Truax-Traer Coal Co., and 4 by the Valley Camp Coal Co.—the 3 largest producers.

Westvaco Chlor Alkali Division of Food Machinery & Chemical Corp. near Charleston continued to produce vacuum-pan-evaporated salt to manufacture chlorine. The company also refined natural salines to obtain bromine compounds and calcium-magnesium chloride.

Sand and gravel for building and paving was produced by Pfaff & Smith Builders Supply Co. (Charleston). St. Albans Sand Co. (Calvert) produced engine sand and Charleston Sand Corp. (Big Chimney) building sand. The Zenith Sand Co., Inc., a former producer, discontinued operations.

West Virginia Brick Co. (Charleston) and Charleston Clay Products Co. mined fire clay for heavy clay products.

The E. I. du Pont de Nemours & Co., Inc., recovered sulfur in the liquid purification of gas from the company's Belle Works plant at Belle.

A small quantity of sandstone for concrete aggregate and roadstone was quarried by the West Virginia Conservation Commission.

Lewis.—The strip and auger operations of Bitner Fuel Co., the leading producer, and Keeley Construction Co. yielded the bulk of the coal output of Lewis County. The balance of production was reported from the strip pits of Swaney Contracting Co., Marino Coal

Co., Yochym Bros. Coal Co., and King Bros. Coal Co. and the underground mine of Weston State Hospital.

Miscellaneous clay for heavy-clay products was mined from open pits by Weston Brick & Coal Co., Weston; and Jane Lew Brick & Tile Co., Jane Lew.

Lincoln.—Engine sand was produced from the dredge operations of Davis & Adkins Sand Co. and Dean Coal & Sand Co., both of Ferrellsburg; and Guyan River Co., near Midkiff. The quarry of Hal Dial & Sons was idle.

Logan.—Logan County led, for the second consecutive year, in the production of coal. Nearly 75 percent of the 22 million tons mined was reported from the following companies operating a total of 25 mines: Island Creek Coal Co., Amherst Coal Co., Guyan Eagle Coal Co., Omar Mining Co., The Powellton Coal Co., The Lorado Coal Mining Co., and Jewell Eagle Coal Co.

Marion.—Virtually all of the coal in Marion County was mined underground. The county was one of the larger coal-producing areas primarily due to the high productivity of Bethlehem-Cuba Iron Mines, Eastern Gas & Fuel Associates, Consolidation Coal Co., Jamison Coal & Coke Co., and Rochester & Pittsburgh Coal Co. These companies represented nearly 90 percent of the county output of coal.

Marshall.—Of the three salt-producing counties of West Virginia, the largest production was from Marshall. The Natrium Chemical plant of Columbia Southern and the Solvay Process Division, Allied Chemical & Dye Corp., utilized brine from wells for chlorine and chemicals.

Coal was mined for commercial use from the underground operation of the Valley Camp Coal Co.; a small quantity was mined by the West Virginia State Penitentiary.

Mason.—Output of coal was reported from four underground mines operated by Lieving Coal Co. (the primary producer), Richard Coal Co., Hudson Bros. Coal Co., and J. F. Icenhower.

Evaporated salt was produced by the Liverpool Salt Co. near Hartford.

Sand and gravel was produced by Pete Roush for The Letart Sand & Gravel Co., Inc. (near Letart). Output was used for cinder and concrete block and for paving roads.

McDowell.—McDowell County ranked second in coal production and reported more active mines than any other county in the State. Of a total of 171 mines—all producing over 1,000 tons—154 were underground, 10 strip, and 7 auger. Three-fourths of the coal produced came from underground mines of United States Steel Corp., Pocahontas Fuel Co., Inc., Island Creek Coal Co., Olga Coal Co., New River & Pocahontas Consolidated Coal Co., and Eastern Gas & Fuel Associates.

Sandstone was quarried and crushed at the Superior plant of Brown & Wright near Princeton for concrete and roadstone.

Mercer.—The three mines of American Coal Co. of Allegany County (underground, strip, and auger) yielded the bulk of coal output in the county. Substantial quantities also were reported from the underground mines of Crozer Coal & Land Co., Weyanoke Coal & Coke Co., and Winding Gulf Coals, Inc.

Bluefield Limestone Co. (Bluefield) produced crushed limestone for concrete aggregate and roadstone.

Miscellaneous clay was mined by Virginia Brick & Tile Co., Princeton, for heavy-clay products.

Mineral.—Seven mines reported coal production; 6 were deep operations, and 1 was a strip mine. The combined output from Mastellar Coal Co. and the Pine Swamp Mining Co. accounted for the bulk of the output.

Limestone for concrete and agricultural purposes was quarried by Earl L. Spencer of Keyser.

Mingo.—The principal commodity of Mingo County was coal, primarily from the seven underground mines of Island Creek Coal Co. Considerable tonnages also were mined from the underground and auger mines of Sycamore Coal Co.; the underground and strip mines of Ames Coal Co.; and the underground mines of Gay Mining Co., Kimberling Collieries Co., Lando Coal Corp., Crystal Block Coal & Coke Co., and Burning Springs Collieries Co.

Guyan Valley Sand Co. (Gilbert) produced engine sand for mine locomotives.

Monongalia.—Coal production, exceeding 8 million tons, was mined almost entirely from underground mines (99.9 percent). Output from Christopher Coal Co. mines composed the major proportion of the output. The Valley Camp Coal Co., South Union Coal Co., and Trotter Coal Co. produced considerable tonnages.

Limestone for concrete and roadstone—the primary uses—and for stone sand and agricultural use was quarried by Greer Limestone Co. (Greer).

Decker's Creek Sand Co. (Morgantown), produced glass and engine sands and grinding and polishing sands at the company fixed plant near Greer.

Recovered sulfur was obtained from liquid purification of gas at the Morgantown plant of Olin Mathieson Chemical Corp.

Morgan.—Sandstone, ground principally for use as glass sand, was quarried by the Pennsylvania Glass Sand Corp. (Berkeley Springs). Molding, grinding, and engine sands were other commodities produced.

Nicholas.—The largest producers of coal (the leading mineral of the county) were Johnstown Coal & Coke Co., Potters Creek Coal Co., Imperial Smokeless Coal Co., Tioga Coal Corp., and Richwood Sewell Coal Co. Excavators, Inc., and Tasa Coal Co. mined the bulk of the strip coal.

Keeley Construction Co. quarried sandstone near Clarksburg for concrete and roadstone.

Nettie Sand Co. (Nettie) continued to produce sand for building purposes.

Ohio.—Virtually all coal production was mined from the two underground operations of Valley Camp Coal Co. The balance of output was a small quantity reported by the Dependable Coal Co.

Sand and gravel for building purposes was dredged from the Ohio River near Wheeling by H. L. Seabright Co.

Pocahontas.—Most of the coal output in the county was from the underground mines of Maust Coal & Coke Co. The remainder was reported from underground mines of Harris Coal Co., Ellis Coal Co.,

the strip pit of Beckley Coal & Coke Co., and the auger operation of Erickson & Bowers.

Preston.—The strip mine of Kingwood Mining Co. was the largest coal operation, followed by underground mines of Kray Coal Co. and the Industrial Coal Co.

Limestone was quarried by the Alpha Portland Cement Co. for manufacturing cement at the company Manheim plant. A small quantity of sandstone was produced as concrete aggregate and roadstone at Terra Alta by Paul E. Garbart.

Putnam.—The strip mine of Whit Coal Co. was the primary source of coal output. The balance of production was obtained from the small underground operations of H. S. B. Thomas, D. G. Thomas, C. E. Lane, J. E. Holloway, and George Muck Coal Co. and the auger mine of Yonker Coal Co.

Raleigh.—Owing to a 26-percent increase in production, Raleigh County rose from sixth to fourth place among the coal-producing counties. The bulk of output was mined underground; the primary producers were Eastern Gas & Fuel Associates, The New River Co., Slab Fork Coal Co., Armco Steel Corp., Lillybrook Coal Co., Raleigh-Wyoming Mining Co., and C. H. Meade Coal Co.

The Table Rock Sand Co. (Crow) and Grandview Sand Co. (Beaver) produced sand for building.

Randolph.—Bethlehem Cuba Iron Mines was the primary producer of deep-mined coal, and Roaring Creek Coal Co. was the largest strip producer. Substantial tonnages also were reported from the deep mines of Three Fork Coal Co. and Norton Coal Co.

Limestone was quarried and crushed by Elkins Limestone Co. (Elkins) principally for use in concrete and roadstone, and also for agricultural purposes.

Summers.—A small quantity of coal was produced in the county from the underground mines of Flanagan Coal & Lumber Co. and Springdale Coal Co.

The West Virginia Conservation Commission reported output of a small quantity of limestone for use as concrete aggregate and roadstone.

Taylor.—The strip mine of C. & P. Coal Co. was the major source of coal in the county. Relatively large tonnages also were mined from the strip pit of Sinsel Coal Co. and the underground mines of Wendel Coal Co. and Mearns Mining Co.

Tucker.—Virtually all of the coal was strip-mined by Thomas Engineering Co. and North East Mining Co. A small output of deep-mined coal was reported by Pierce Coal Co.

Sand and gravel for use as building and paving material was produced by the Fairfax Sand & Crushed Stone Co. near Thomas.

Upshur.—Coal and clay were taken from mines in Upshur County. Nearly 78 percent of the coal output was mined from the underground operations of Reppert-Fairmont Coal Co. (the primary producer), Peck's Run Coal Co., Hackers Creek Coal Co., Redstone Coal Mining Co., Inc., and Badger Coal Co.

Fire clay was reported by Buckhannon Brick Co. (Buckhannon). The product was used for building tile and brick and drain tile.

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Wayne.—Coal was produced from underground mines operated primarily by Trace Fork Coal Co., Big Lynn Coal Co., and Fry Bros. Coal Co. Smaller tonnages were mined by Andrew J. Frey Coal Co., Russell Coal Co., Fry & Napier Coal Mining Co., and Southern Coal Co.

Engine sand was produced by Laval Sand Co., Inc., near Fort Gay.

Webster.—The underground mines of Pardee & Curtain Lumber Co., Williams River Coal Co., and Elk Lick Coal Co. were the principal coal-producing properties in the county. The balance of output was supplied by 6 additional deep mines and 3 auger operations.

Wetzel.—Wetzel County was an important area in production of sand and gravel for building and paving purposes. Output was reported by the Ohio Valley Sand Co. and the Ohio River Sand & Gravel Corp., both of New Martinsville.

Wood.—Wood was the third-ranking county in sand and gravel production. Output for use in building and paving was reported by Kanawha Sand Co. (Parkersburg) and Duquesne Sand Co., operating a dredge on the Ohio River. The Ohio River Sand & Gravel Corp. (Parkersburg) produced paving gravel.

Wyoming.—Eighty-four mines producing over 12 million tons of coal kept Wyoming County one of the leading areas for coal mining. The three largest companies—all operating underground mines—were Pocahontas Fuel Co., Eastern Gas & Fuel Associates, and Semet-Solvay Division, Allied Chemical & Dye Corp. Other deep mines producing substantial tonnages were Island Creek Coal Co., American Coal Co. of Allegany County, and Crozer Coal & Land Co.

Casto & Lackey reported producing engine sand from a dredge at Baileysville.

The Mineral Industry of Wisconsin

This chapter has been prepared under a cooperative agreement for the collection of mineral data, between the Bureau of Mines, Department of the Interior, and the Geological Survey of Wisconsin.

By Lenox H. Rand[1]

MINERAL production in Wisconsin in 1956, valued at nearly $66 million, was virtually the same as in 1955. Notable increases in the production and value of zinc, lead, and lime were offset by declines in production and value of iron ore, sand and gravel, and cement. Reduced output of iron ore undoubtedly was due to the 36-day steel strike in mid-1956. Exploration near Butternut, Ashland County, by a group of companies indicated iron-bearing formations that may be amenable to economic beneficiation. Samples of this material were shipped to Hibbing, Minn., for testing. The stable price structure of lead and zinc in 1956, at levels permitting profitable exploitation, stimulated production from Wisconsin mines. The 1956 output represents a peak for lead since 1920 and for zinc since 1927.

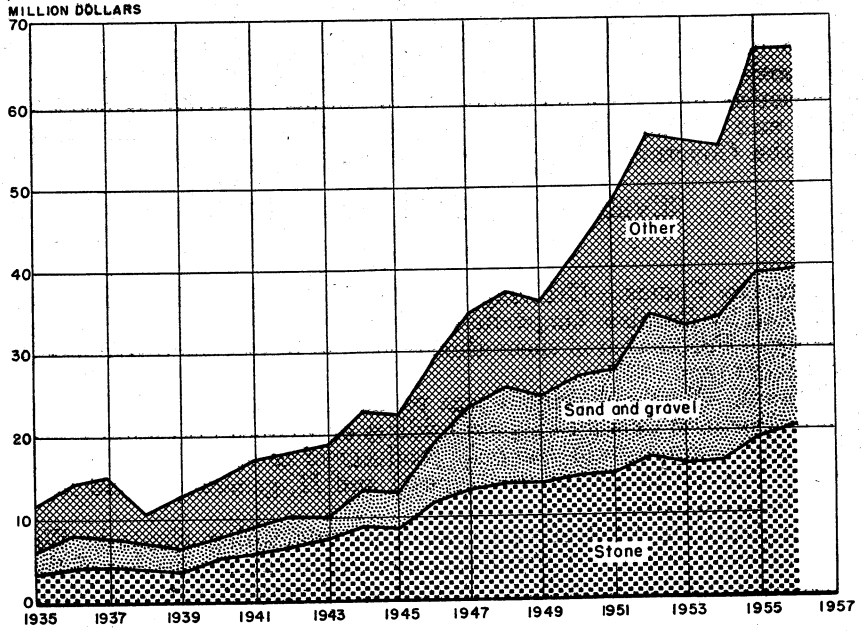

FIGURE 1.—Value of sand and gravel, stone, and total value of all minerals produced in Wisconsin, 1935–56.

[1] Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

Owing to completion of two new cement plants in Milwaukee in 1956, the output of this important mineral will increase considerably in future years.

TABLE 1.—Mineral production in Wisconsin, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stones (grinding pebbles)	681	$21,111	1,093	$31,150
Clays	165,088	166,030	163,089	172,087
Iron ore (usable)—long tons, gross weight	1,886,029	(2)	1,488,361	(2)
Lead (recoverable content of ores, etc.)	1,948	580,504	2,582	810,748
Lime	134,635	1,767,563	(2)	(2)
Marl, calcareous	14,087	7,330	11,074	5,603
Sand and gravel	27,978,335	19,958,450	27,715,171	19,097,155
Stone	[3] 12,180,452	[3] 18,843,272	11,125,875	20,401,884
Zinc (recoverable content of ores, etc.)	18,326	4,508,196	23,890	6,545,860
Value of items that cannot be disclosed: Abrasive stone (tube-mill liners), basalt (1955), cement, gem stone (1955), and values indicated by footnote 2		20,528,432		19,450,726
Total Wisconsin [4]		65,813,000		65,860,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Figure withheld to avoid disclosing individual company confidential data.
[3] Excludes basalt; included with "Value of Items that cannot be disclosed."
[4] Total adjusted to eliminate duplicating value of clays and stone.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

The only DMEA contract for minerals exploration in effect in Wisconsin in 1956 was the contract with Paul Gille for lead-zinc exploration in Lafayette County. This project started January 6, 1955, and terminated June 29, 1956. The total cost was $24,846 with the Government sharing 50 percent of the cost.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasive Stones.—Grinding pebbles and tube-mill liners were produced by Baraboo Quartzite Co. from a quartzite deposit in Sauk County. Production of these abrasive stones in 1956 increased nearly 68 percent over 1955.

Cement.—Portland cement was produced in Manitowoc by Manitowoc Portland Cement Co., a subsidiary of Medusa Portland Cement Co. The company was the only producer of cement in the State in 1956. The entire output was types I and II, general-use and moderate-heat cements.

Completion in 1956 of two cement-manufacturing plants in Wisconsin should result in a significant increase in the production of that universally used commodity. A unit of Marquette Cement Manufacturing Co., of Chicago, with an annual capacity of 1.25 million barrels, was erected almost in the heart of downtown Milwaukee. This plant is the first installation in the United States using the ACL (Allis-Chalmers-Lellep) process, developed by Allis-Chalmers Manu-

facturing Co. Substantial savings in fuel costs, dust recovery, and space requirements are predicted. The principal innovations in this process are pelletization, drying, and partial calcination of the raw mix before it enters the kiln for final burning. Reportedly, dust from the kiln is greatly reduced, a shorter kiln is used, and fuel is saved. The second plant, that of Universal Atlas Cement Co., of New York, also in Milwaukee, will grind cement clinker shipped from Buffington Cement Harbor, Lake County, Ind.

Total shipments of cement, and value thereof, decreased slightly below those in 1955. The average mill value per barrel in 1956 was $2.98 compared with $2.89 in 1955.

Clays.—Miscellaneous clay for manufacturing cement and heavy clay products was produced by eight companies from pits in Brown, Dunn, Fond du Lac, La Crosse, Manitowoc, Marathon, Racine, and Waupaca Counties. The total value of clays produced in 1956 increased over 1955.

Lime.—(Total shipments and value of quick and hydrated lime increased in 1956.) During the year 8 lime plants were operated by 5 companies in Brown, Calumet, Dodge, Douglas, Fond du Lac, and Manitowoc Counties. Over 73 percent of the total production was for chemical and industrial uses, such as insecticides, metallurgy, water purification, sewage treatment, paper manufacture, and polishing compounds. Approximately 24 percent was for building uses, including masonry mortar and finishing lime. The remainder was for agricultural use. Average value per ton of lime sold in Wisconsin in 1956 was $14.70 compared with $13.13 in 1955.

Marl, Calcareous.—Production of marl decreased substantially in 1956 compared with 1955. Output was reported by seven operators in Portage, Waupaca, and Waushara Counties. Sales in 1956 were for agricultural use. The average value per ton of marl sold in 1956 was $0.51 compared with $0.52 in 1955.

Perlite.—No crude perlite was produced in Wisconsin in 1956. However, crude perlite produced in Colorado was expanded at plants in Milwaukee and Outagamie Counties, chiefly for lightweight aggregate in plaster and concrete.

Pyrite Sinter.—Vinegar Hill Zinc Co. of Platteville shipped pyrite sinter for use in cement. The pyrite sinter was produced at the company sulfuric acid plant during World War II and shortly thereafter. The 1956 shipments nearly exhausted the accumulated stock.

Sand and Gravel.—The output of sand and gravel in Wisconsin in 1956, as in 1955, was approximately 28 million short tons. Production was reported from 57 of the 71 counties. Approximately 58 percent was produced at commercial and the remainder at Government-and-contractor operations. Wisconsin ranked eighth in the Nation in sand and gravel production in 1956.

About 72 percent of the sand and gravel output in Wisconsin in 1956 was used in building and paving. Substantial quantities were used for railroad ballast and molding purposes. Smaller quantities of special-type sands were consumed in sand blasting, engine use, filler, glass manufacture, and filter uses.

Approximately 88 percent of the quantity produced in the State was hauled by truck; the remainder was transported by rail and water.

The 10 leading commercial producers in 1956 listed alphabetically

were: Consumers Co., Racine; Hartland Sand & Gravel Co., Hartland; Jaeger Sand & Gravel Co., Inc., Milwaukee; Janesville Sand & Gravel Co., Janesville; Koepke Sand & Gravel Co., Appleton; Edw. Lutz Sand & Gravel, Milwaukee; F. F. Mengel Co., Wisconsin Rapids; Portage-Manley Sand Co., Rockton; A. J. Reiske Sons Co., Milwaukee; and Valley Sand & Gravel Co., Waukesha.

TABLE 2.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:[1]						
Glass	32,136	$22,045	$0.69	17,286	$10,215	$0.59
Molding	860,504	1,567,675	1.82	913,030	1,758,440	1.93
Building	2,500,203	1,920,510	.77	2,489,064	2,051,064	.82
Engine	491	736	1.50	(3)	(3)	
Paving	1,387,897	1,097,148	.79	1,515,207	1,144,674	.76
Blast	52,918	109,857	2.08	(2)	(2)	
Filter	55	260	4.73	(2)	(2)	
Railroad ballast	13,525	7,345	.54	(2)	(2)	
Filler	4,065	2,033	.50	(2)	(2)	
Other	752,725	371,269	.49	685,677	411,284	.60
Undistributed[3]				144,714	203,596	
Total sand	5,604,519	5,098,878	.91	5,764,978	5,579,273	.97
Gravel:						
Building	3,758,245	2,989,827	.80	3,166,769	2,635,983	.83
Paving	4,369,709	3,524,375	.81	5,483,759	4,173,792	.76
Railroad ballast	984,750	465,116	.47	821,067	413,587	.50
Other	410,598	319,903	.78	761,901	498,689	.65
Total gravel	9,523,302	7,299,221	.77	10,233,496	7,722,051	.75
Total sand and gravel	15,127,821	12,398,099	.82	15,998,474	13,301,324	.83
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building				53,393	31,288	.59
Paving	4,089,935	1,466,961	.36	4,371,022	1,535,876	.35
Total sand	4,089,935	1,466,961	.36	4,424,415	1,567,164	.35
Gravel:						
Building	170,872	81,972	.48	342,657	145,955	.43
Paving	8,589,707	6,011,418	.70	6,949,625	4,082,712	.59
Total gravel	8,760,579	6,093,390	.70	7,292,282	4,228,667	.58
Total sand and gravel	12,850,514	7,560,351	.59	11,716,697	5,795,831	.49
ALL OPERATIONS						
Sand	9,694,454	6,565,839	.68	10,189,393	7,146,437	.70
Gravel	18,283,881	13,392,611	.73	17,525,778	11,950,718	.68
Grand total	27,978,335	19,958,450	.71	27,715,171	19,097,155	.69

[1] Includes friable sandstone.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes blast, engine, filler, filter, grinding and polishing, and railroad-ballast sand (1956).

Stone.—Stone output in Wisconsin in 1956 included limestone, granite, sandstone and quartzite, basalt, and miscellaneous stone. Production in 1956 was more than 11 million short tons—1 million short tons less than in 1955.

Limestone is widely distributed throughout the State. Dimension limestone, for structural and architectural use, rubble, and flagging, was produced in Brown, Door, Fond du Lac, La Crosse, Manitowoc, Racine, Rock, Vernon, and Waukesha Counties. Crushed or broken limestone was produced in 39 counties in 1956. Output was chiefly for concrete aggregate and roadstone and agricultural, industrial, and chemical uses.

The 10 leading commercial producers of limestone in 1956 listed alphabetically were: Consumers Co., Racine; Courtney & Plummer, Inc., Neenah; Ray De Cleene's Stone Quarry, De Pere; Fond du Lac Stone Co., Fond du Lac; Franklin Stone Products, Milwaukee; Halquist Lannon Stone Co., Sussex; Edward Kraemer & Sons, Plain; Milwaukee Limestone Products Co., Milwaukee; Quality Limestone Products, Inc., Sussex; and Waukesha Lime & Stone Co., Inc., Waukesha.

TABLE 3.—Limestone sold or used by producers in 1955–56, by uses [1]

Use	1955			1956		
	Quantity	Value		Quantity	Value	
		Total	Average per unit of measure		Total	Average per unit of measure
Dimension:						
Rough construction short tons	5,185	$23,961	$4.62	6,004	$75,154	$12.52
Rubble do	11,607	41,299	3.56	9,311	29,713	3.19
Rough architectural cubic feet	89,458	187,098	2.09	38,083	27,936	.73
Dressed (cut and sawed) do	547,218	1,121,259	2.05	844,731	1,444,120	1.71
Flagging do	51,608	51,441	1.00	108,595	127,579	1.17
Total dimension equivalent short tons [2]	71,855	1,425,058	19.83	94,628	1,704,502	18.01
Crushed and broken:						
Riprap short tons	36,573	47,677	1.30	112,254	110,642	.99
Flux do	(3)	(3)	(3)	(3)	(3)	(3)
Refractory do	25,000	30,120	1.20			
Concrete aggregate and roadstone short tons	9,935,936	9,263,502	.93	8,224,587	8,395,414	1.01
Railroad ballast do	142,354	172,713	1.21	225,918	269,416	1.19
Agriculture do	886,536	1,257,112	1.42	1,090,045	1,472,126	1.35
Other uses do	321,937	399,161	1.24	346,800	431,484	1.24
Total crushed and broken short tons	11,348,336	11,170,285	.98	9,999,604	10,589,082	1.06
Grand total do	11,420,191	12,595,343	1.10	10,094,232	12,293,584	1.22

[1] Includes both commercial and Government-and-contractor production.
[2] Average weight of 160 pounds per cubic foot used to convert cubic feet to short tons.
[3] Included with "Other" to avoid disclosing individual company confidential data.

Dimension granite was produced by eight companies in Marathon, Marinette, Marquette, and Waushara Counties. Output was chiefly for building and monumental purposes. Crushed granite for concrete aggregate and other uses was produced in Waushara and Wood Counties.

Production of dimension sandstone was recorded in Dunn, Marathon, Waushara, and Wood Counties in 1956. Output was employed for flagging, rubble, and rough construction and as dressed stone.

Crushed sandstone and quartzite were produced in Marathon, Oconto, Sauk, and Wood Counties for abrasives, concrete aggregate, refractory stone, riprap, and roofing granules. Production of sandstone and quartzite in 1956 totaled 571,910 short tons valued at $5,196,785.

Crushed basalt was produced in Marinette and Polk Counties, chiefly for roofing granules, but also for concrete aggregate, riprap, railroad ballast, and filter rock.

A small quantity of miscellaneous stone for riprap was produced in St. Croix County in 1956. Output was from Government-and-contractor operations and totaled 3,046 short tons valued at $1,219.

METALS

Iron Ore.—The prolonged midyear steel strike had an adverse effect on iron-ore shipments from Wisconsin in 1956. Although production was only slightly less than in 1955, iron-ore shipments decreased 21 percent. Steel production declined from 93 percent of average rated ingot capacity in 1955 to 89.8 percent in 1956.

Three companies again accounted for the entire output of the State. On the Gogebic range in Iron County, Oglebay, Norton & Co. and Pickands Mather & Co. operated underground at the Montreal mine and Cary mine, respectively. On the Menominee range in Florence County Zontelli Bros., Inc., operated the Meress open-pit mine.

Stocks of iron ore at Wisconsin mines totaled 99,430 long tons at the beginning of 1956. Production during the year exceeded shipments by 63,077 long tons; thus year-end stocks were 162,507 long tons. Excluding 294 tons of concentrate, all ore produced in 1956 was of direct shipping grade.

TABLE 4.—Iron-ore production and shipments, 1952–56

Year	Number of mines	Production (long tons)	Shipments (long tons)	Iron content of shipments natural (percent)
1952	2	1,495,109	1,485,845	52.56
1953	3	1,756,150	1,655,331	52.48
1954	2	1,491,470	1,428,910	52.81
1955	3	1,588,523	1,886,029	52.03
1956	3	1,551,438	1,488,361	52.49

Most of the iron ore shipped from Wisconsin mines in 1956 went by rail to ore docks at Ashland, Wis., and Escanaba, Mich., then by water to lower Lake ports. About 4 percent was shipped entirely by rail to consuming centers.

Throughout 1956 Lake Erie base prices of iron ore per long ton were: High Phosphorus, $10.85; Mesabi Non-Bessemer, $10.85; Mesabi Bessemer and Old Range Non-Bessemer, $11.00 and Old Range Bessemer, $11.25. These prices include transportation costs from the mines to lower Lake ports. Transportation costs are not included in the total value of mineral output in Wisconsin. The base prices are established for ores containing 51.5 percent iron (natural) and, for Bessemer ores, less than 0.045 percent phosphorus (dry). Ores with more than 0.18 percent phosphorus (dry) are classed as High Phos-

phorus. Variations in grade and physical structure call for premiums or penalties.

Preliminary drilling, sampling, and testing of iron-bearing material in areas of high anomalies in Ashland County indicated sizable iron formations that may be a source of low-grade iron ore for large-scale mining and beneficiation.

Lead and Zinc.—The 1956 output in Wisconsin of 2,582 tons of lead and 23,890 tons of zinc (in terms of recoverable metal) was the largest in nearly 3 decades and represented increases of 33 and 30 percent, respectively, over the 1955 figures of 1,948 tons of lead and 18,326 tons of zinc. Adequate and stable prices and sustained demand were important factors in the gain. Except for a few days in the first week of 1956, prices for lead and zinc remained steady throughout the year at 16 and 13.5 cents per pound, respectively. All production was from southwestern Wisconsin in Grant, Iowa, and Lafayette Counties.

Active operations numbered 14 lode mines and 5 tailing dumps. The leading producers were: American Zinc, Lead & Smelting Co., (Vinegar Hill Division), Eagle-Picher Co., Ivey Construction Co., and Piquette Mining & Milling Co. Drifting totaled 1,594 feet and churn drilling 16,686 feet. Aerial electromagnetic surveys were conducted in the Plattsville area, but no new discoveries were publicized.

TABLE 5.—Mine production of lead and zinc, 1947–51 (average) and 1952–56, in terms of recoverable metals

	Mines producing		Material treated		Lead		Zinc		Total value
	Lode	Tailings	Ore (short tons)	Tailings[1] (short tons)	Short tons	Value	Short tons	Value	
1947–51 (average)	33	2	254,389	61,531	961	$307,957	9,372	$2,744,539	$3,052,496
1952	24	10	670,332	82,146	2,000	644,000	20,588	6,835,216	7,479,216
1953	29	3	534,882	19,133	2,094	548,628	16,830	3,870,900	4,419,528
1954	7	11	523,755	39,799	1,261	345,514	15,534	3,355,344	3,700,858
1955	10	5	583,731	31,831	1,948	580,504	18,326	4,508,196	5,088,700
1956	14	5	828,579	139,346	2,582	810,748	23,890	6,545,860	7,356,608

[1] Partly estimated.

TABLE 6.—Mine production of lead and zinc in 1956, by months, in terms of recoverable metals, in short tons

Month	Lead	Zinc	Month	Lead	Zinc
January	210	1,515	August	220	2,255
February	280	1,925	September	185	2,155
March	240	2,030	October	260	2,300
April	240	1,960	November	205	2,035
May	250	2,055	December	192	2,085
June	120	1,660			
July	180	1,915	Total	2,582	23,890

REVIEW BY COUNTIES

Adams.—Gravel for building and road construction was produced in the county by A. T. Riese, at a portable plant near Wisconsin Dells.

Barron.—Clyde Lilly (Poskin) produced sand and gravel for building and road construction. The county agricultural commission produced crushed limestone for agricultural use.

TABLE 7.—Value of mineral production in Wisconsin, 1955–56, by counties [1]

County	1955	1956	Minerals produced in 1956 in order of value
Adams	(2)	(2)	Sand and gravel.
Ashland	(2)		
Barron	$240,758	(2)	Stone, sand and gravel.
Brown	1,044,906	$932,160	Sand and gravel, lime, stone, clays.
Buffalo	230,893	164,697	Stone.
Burnett	47,950	47,464	Sand and gravel.
Calumet	88,480	104,790	Sand and gravel, stone, lime.
Chippewa	67,458	12,375	Sand and gravel.
Clark	145,912	139,905	Do.
Columbia	1,311,519	(2)	Sand and gravel, stone.
Crawford	160,263	81,014	Stone, sand and gravel.
Dane	3,646,765	1,252,801	Sand and gravel, stone.
Dodge	653,103	735,146	Lime, sand and gravel, stone.
Door	201,873	129,596	Sand and gravel, stone.
Douglas	(2)	(2)	Lime, sand and gravel.
Dunn	38,503	(2)	Sand and gravel, clays, stone.
Florence	(2)	(2)	Iron ore.
Fond du Lac	777,544	992,725	Stone, sand and gravel, lime, clays.
Forest	69,244	48,151	Sand and gravel.
Grant	963,312	1,855,685	Zinc, stone, lead, sand and gravel.
Green	392,638	379,873	Stone, sand and gravel.
Green Lake	519,881	473,818	Sand and gravel.
Iowa	261,367	916,278	Zinc, stone, lead, sand and gravel.
Iron	(2)	(2)	Iron ore, stone, sand and gravel.
Jackson	17,904	27,777	Sand and gravel.
Jefferson	108,016	135,748	Do.
Juneau	124,632	85,091	Stone, sand and gravel.
Kenosha	180,142	151,246	Sand and gravel.
Kewaunee	(2)		
La Crosse	131,657	133,291	Stone, sand and gravel, clays.
Lafayette	4,572,435	5,374,963	Zinc, lead, sand and gravel, stone.
Langlade	129,973	141,540	Sand and gravel.
Lincoln	(2)	92,684	Do.
Manitowoc	6,225,176	6,616,324	Cement, sand and gravel, lime, clays, stone.
Marathon	5,072,452	4,782,256	Stone, sand and gravel, clays.
Marinette	(2)	(2)	Stone.
Marquette	212,764	(2)	Stone, sand and gravel.
Milwaukee	1,447,599	1,768,056	Do.
Monroe	67,103	146,442	Stone.
Oconto	210,606	227,202	Sand and gravel, stone.
Oneida	110,147	160,338	Sand and gravel.
Outagamie	395,850	426,786	Sand and gravel, stone.
Ozaukee	262,773	283,953	Sand and gravel.
Pepin	17,219	(2)	Stone.
Pierce	253,985	368,160	Sand and gravel, stone.
Polk	341,028	567,562	Stone, sand and gravel.
Portage	306,532	(2)	Sand and gravel, marl.
Price	16,335	4,713	Sand and gravel.
Racine	(2)	(2)	Stone, sand and gravel, clays.
Richland	(2)	(2)	Stone.
Rock	1,329,687	1,349,234	Sand and gravel, stone.
Rusk	64,641	91,165	Sand and gravel.
St. Croix	449,390	348,668	Sand and gravel, stone.
Sauk	1,590,790	2,290,910	Stone, sand and gravel, abrasives.
Sawyer	67,201	43,444	Sand and gravel.
Shawano	248,386	346,603	Sand and gravel, stone.
Sheboygan	396,792	301,943	Do.
Taylor	(2)	(2)	Sand and gravel.
Trempealeau	140,189	139,774	Stone.
Vernon	454,731	(2)	Stone, sand and gravel.
Vilas	44,798	42,324	Sand and gravel, stone.
Walworth	229,357	285,405	Do.
Washburn	863		
Washington	837,460	659,260	Sand and gravel, stone.
Waukesha	4,940,994	5,347,862	Do.
Waupaca	(2)	(2)	Stone, sand and gravel, clays, marl.
Waushara	30,030	(2)	Stone, marl.
Winnebago	1,425,720	1,803,948	Sand and gravel, stone.
Wood	22,323	151,191	Stone.
Undistributed [3]	22,473,449	23,552,872	
Total	65,813,000	[4] 65,860,000	

[1] Bayfield and Eau Claire Counties are not listed because no production was reported.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[3] Includes sand and gravel and stone that cannot be assigned to specific counties, and values indicated by footnote 2.
[4] Total adjusted to eliminate duplicating value of clays and stone.

Brown.—Clay for heavy clay products was produced by Duck Creek Brick Co. and Hockers Bros. Brick & Tile Co. (Green Bay). Quicklime and hydrated lime were produced by the Western Lime & Cement Co., Milwaukee, at its Green Bay plant. The plant has five shaft kilns and a batch-type hydrator. Sales were for chemical and industrial uses.

The bulk of the sand and gravel output of the county, was used for building and road construction. Sand was produced for glass and "Other" uses and gravel for railroad ballast. Producers in 1956 included Daanen & Janssen, De Pere; Alvin Destree, O. K. Sand & Gravel Co., Schuster Construction Co., Allard & Van Nelson, and Frank Van Nelson, Green Bay; Ed Kocken, West De Pere; Peters Trucking Co., Suamico; W. B. Sheedy Construction Co., Pulaski; and Wm. Winkler & Sons Construction Co., Greenleaf.

Daanen & Janssen (De Pere) crushed limestone for concrete aggregate. Ray De Cleene's Stone Quarry and the Scray Quarry (De Pere) reported output of dimension and crushed limestone for rough architectural use, flagging, house stone veneer, rubble, and concrete aggregate.

Buffalo.—Crushed limestone for agricultural purposes and concrete aggregate was produced by H. E. Kochenderfer, Cochrane; Edward Kraemer & Sons, Plain; and Neuheisel Lime Works, Eau Claire, near Mondovi.

Burnett.—Sand and gravel was produced by the county highway department for road construction.

Calumet.—The Western Lime & Cement Co. (Milwaukee) produced quicklime and hydrated lime at its High Cliff plant near Sherwood. The plant has three shaft kilns and a batch-type hydrator. Sales were chiefly for building and agricultural purposes. The company produced crushed limestone from its High Cliff quarry for use in its lime plant and as concrete aggregate.

Output of sand and gravel for building and road construction and gravel for railroad ballast was reported by Arnold M. Ortlepp, Chilton; and Quality Sand & Gravel Co., Wrightstown, near Brillion. The county highway commission crushed limestone and produced gravel for concrete aggregate and road construction.

Chippewa.—Chippewa Sand & Gravel Co. produced building sand and gravel near Chippewa Falls.

Clark.—Paul Bros. (Owen) and Plautz Bros. Sand & Gravel Co. (Willard, near Greenwood) produced sand and gravel for building, road construction, and other uses. The county highway department produced and contracted for sand and gravel for road construction.

Columbia.—Sand for molding use was produced by Francis James, Doylestown; and Portage-Manley Sand Co., of Rockton, near Portage. The county highway commission produced road-construction gravel.

Dann & Wendt (Rio) operating the De Puy quarry, crushed stone for agricultural purposes and concrete aggregate.

Crawford.—Building sand and gravel was produced near Prairie du Chien by Prairie Sand & Gravel Co. Glass sand and building gravel was produced by Frank Mezera (Eastman, near Prairie du Chien).

Limestone for agricultural use and concrete aggregate was reported by Edward Kraemer & Sons, Plain; Ward & Monroe, Steuben; and Loren J. Slaght, Eastman, at the Pomerening quarry.

Dane.—Sand and gravel was produced in Dane County chiefly for building and road construction. Operators reporting output in 1956 were as follows: Boehnen, Inc., Cross Plains; Capital Sand & Gravel Corp., Madison Sand & Gravel Co., Rein & Schultz, Inc., Speedway Sand & Gravel Co., and Stewart Watson Construction Co., Madison; General Silica Co., Milwaukee, near Mount Horeb; Harltand-Verona Gravel Co., Verona; Charles Langer & Son, Waterloo; Rein & Dahl, Inc., and Sundby Sand & Gravel Co., Stoughton; August Shemanek, Black Earth; George Wendtlandt, Mineral Point, near Mount Horeb; and the county highway department. Commercial producers of crushed limestone for agricultural use, concrete aggregate, railroad ballast, and riprap were: Baumgardt Construction Co., Dodgeville; Boehnen, Inc., Cross Plains; Raemisch Quarry, Madison, near Verona; Stewart Watson, of Madison, near Mount Horeb; Alva Brumm, Hammersley Stone Co., Madison Stone Co., Inc., and Wingra Stone Co., Madison; Carpenters Quarry, Cambridge; Kuhnau & Hosig Bros., Spring Green, near Roxbury; and Quan & Kaupanger, Stoughton.

Dodge.—Western Lime & Cement Co. operated its lime plant at Knowles and sold hydrated lime for agricultural, building, chemical, and industrial uses. The plant has five shaft kilns and 1 batch- and 1 continuous-type hydrator. Mayville White Lime Works produced quicklime at Mayville for building, chemical, and industrial uses. The company had two shaft kilns at its plant. Both companies quarried limestone for agricultural purposes, concrete aggregate, flux, lime, mineral food, riprap, and other uses. Melvin Voigt (Ashippun) was credited with gravel for building and road construction. Sand and gravel for road construction was produced by and for the county highway commission.

Door.—Adamski & Fischer Quarry (Sturgeon Bay) produced dimension limestone for flagging and house stone veneer. The county highway department crushed limestone and gravel for concrete aggregate and road construction.

Douglas.—Cutler-Laliberte-McDougall Corp., at Superior, sold quicklime for building, chemical, and industrial uses. The company has two rotary kilns at the plant.

Sand and gravel for road construction was produced by the city engineer, Superior, and the county highway department.

Dunn.—Menomonie Brick Co. (Menomonie) mined clay for heavy clay products.

Red Cedar Sand & Gravel Co. reported sand and gravel produced for building and other uses at its plant near Menomonie.

Output of dimension sandstone for dressed stone and rubble was reported by the Downsville Cut Stone Co., Downsville.

Florence.—Iron ore was shipped from the Meress mine by Zontelli Bros., Inc. (Ironton, Minn.). The mine is an open pit near Florence in the Menominee range.

Fond du Lac.—Miscellaneous clay for heavy clay products was produced by Oakfield Shale Brick & Tile Co.

Western Lime & Cement Co. (Milwaukee) produced quicklime and hydrated lime at its Eden plant for building, agricultural, chemical, and industrial uses. The plant has five shaft kilns and a continuous-type hydrator. The company operated a limestone quarry nearby, and produced crushed limestone for lime and paper mills.

Sand and gravel, chiefly for building and road construction, was produced by Lake View Sand & Gravel Co., Fond du Lac, near Peebles; M. A. Leiberg, Oakfield; Schroeder Bros. Sand & Gravel, Kiel, near St. Cloud; and the county highway department.

Dimension limestone was produced in the county for cut stone, flagging, stone veneer, rough architectural use, construction, and sawed stone. Crushed stone was produced for agricultural purposes, concrete aggregate, and other uses. Producers in 1956 were Fond du Lac Stone Co. and Hamilton Stone Co., Fond du Lac; Edward Kraemer & Sons, Plain; and Nellis Limestone Quarry, Inc., Ripon.

Forest.—Gravel for railroad ballast was produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad. The county highway department produced road gravel.

Grant.—Lead, sand and gravel, stone, and zinc were produced in Grant County in 1956.

Lead and zinc were produced by the Piquette Mining & Milling Co. (St. Louis, Mo.) at the Piquette No. 2 mine. A small quantity of zinc concentrate was produced by the P. V. C. Mining Co. (Platteville).

Pyrite sinter was shipped by Vinegar Hill Zinc Co. (Platteville).

Becker & Tuckwood (Lancaster, near Cassville), George Wendtlandt (Mineral Point), and the county highway department produced sand and gravel for building and road construction.

Crushed limestone for agricultural purposes, concrete aggregate, and railroad ballast was produced by Becker & Tuckwood, Lancaster; Dell Needham, Fennimore; Piquette Mining & Milling Co. (St. Louis, Mo.), Potosi; E. C. Schroeder Co., Inc. (McGregor, Iowa), at the C. B. & Q. R.R. quarry at Wyalusing; Loren J. Slaght, Prairie du Chien, at the Millville quarry; George Wendtlandt, Mineral Point; Zenz & Sturmer, Bloomington; and the county highway commission.

Green.—Output of sand and gravel for building, road construction, and other uses was reported by Henry Altmann and Green County Sand & Gravel Co., Inc. (Monroe). The county highway commission produced and contracted for sand and gravel for road construction.

Crushed stone for agricultural use and concrete aggregate was reported by Rees Construction Co., Ted Stauffacher, Monroe; and P. W. Ryan Sons, Janesville.

Green Lake.—Output of sand, chiefly for molding, glass manufacture, and building, and gravel for building and road construction was reported in the county in 1956. Producers included Kolpin & Peterson Gravel Co., C. A. Chier Sand Co., Edward Chier, Chier St. Marie Co., F. B. Dubberstein & Sons, Inc., and A. F. Gelher Co., Inc., all of Berling; Fox Valley Sand & Gravel, Ripon, near Manchester; Kopplin & Kinas Co., Inc., Green Lake; Clifford Maginnis, Dalton; and Paul Polenska & Son, Manchester.

Iowa.—Lead and zinc concentrates were produced by Eagle-Picher Co. (Miami, Okla.) from the Linden mine and Ivey Construction Co. (Mineral Point) from the Graysville mine. Output of zinc concentrate was also reported from the Cocker mine by Miffin Mining Co., Inc. (Boscobel).

George Wendtlandt (Mineral Point) operating at various locations, reported gravel for road construction. Ivey Construction Co.,

George Wendtlandt (Mineral Point), Wonn & Martin (Cobb), and the county highway commission crushed limestone for agricultural use and concrete aggregate.

Iron.—Iron ore was produced by Oglebay Norton & Co. and Pickands Mather & Co., which operated the Montreal and Cary mines. Both mines are underground, in the Gogebic iron range. Output from the Montreal mine, which has produced for 50 years, was the lowest in 10 years.

The county highway department produced gravel for road construction.

Edward Kraemer & Sons (Plain) crushed limestone for concrete aggregate.

Jackson.—Chas. Marek, Sr. (Merrillan) and H. T. Smith (Hixton), both operating near Black River Falls, produced sand and gravel for building and road construction.

Jefferson.—Sand and gravel for building, road construction, and other uses was credited to Evenson & Rude, Cambridge; Hausz Bros., Fort Atkinson; and the county highway commission.

Juneau.—The county highway commission crushed stone for concrete aggregate and produced and contracted for road-construction sand and gravel.

Kenosha.—Building and road-construction sand and gravel was produced in the county by Bloss Sand & Gravel, Salem; Sam Sorenson, Woodworth; and the director of parks, Kenosha.

La Crosse.—The Meir Brick Co. mined clay from the George Schmitz property near La Crosse for heavy clay products.

Kammel-Smith Sand & Gravel Co. (La Crosse) produced sand and gravel for building. The county highway department produced sand for building and road construction.

The county highway department crushed stone for concrete aggregate.

Lafayette.—Mineral products of the county in 1956 were lead, sand and gravel, stone, and zinc.

The leading producer of both lead and zinc in the State was Eagle-Picher Co. The company produced lead and zinc from the Shullsburg and Winskell mines and zinc ore from the Birkett-Bastian-Andrews mine. Vinegar Hill Division, American Zinc, Lead & Smelting Co., produced lead and zinc ore from the Blackstone, Coulthard, Hancock, and Temperly mines. The Temperly mine began production in 1956. Other producers of zinc and/or lead in 1956 included Murray & Richards, John Schroeder Mining Co., Southwestern Wisconsin Mining Co., Blue Jay Mining Co., C. F. Witters, New Teasdale Mining Co., and Little Five Mining Co.

George Wendtlandt crushed stone for agricultural use and produced gravel for road use from several pits in the county.

Langlade.—Duffek Sand & Gravel, Inc., operating a sand and gravel plant near Antigo, reported output for building and road construction. The county highway department produced sand and gravel for road use.

Lincoln.—Merrill Gravel & Construction Co. produced sand and gravel for building and other uses and the county highway department produced gravel for road use.

Manitowoc.—The Manitowoc Portland Cement Co. produced portland cement at Manitowoc. The company operated 4 kilns ranging in length from 160 to 350 feet and all 10 feet in diameter. The company also produced clay, which it used in cement.

Quicklime and hydrated lime were credited to the Rockwell Lime Co. for building, chemical, and industrial uses. The company has one rotary kiln and a batch-type hydrator at its plant The company cushed limestone for agricultural purposes, concrete aggregate, and lime. Valders Lime & Stone Co. produced quicklime for building and agricultural purposes. The company plant has five shaft kilns. Dimension limestone was produced for rubble, rough architectural stone, cut stone, and house stone veneer and crushed stone for riprap and concrete aggregate.

Output of sand and gravel for building, road construction, and other uses was reported by R. & J. Fricke Co., Kasper Construction Co., and Fred Radandt Sons, at plants Nos. 1 and 2, all of Manitowoc; Norman Schema, Schroeder Bros. Sand & Gravel, Kiel; the city of Manitowoc; and the county highway department.

R. & J. Fricke Co. and the city of Manitowoc produced limestone for concrete aggregate.

Marathon.—Clay, granite, sand and gravel, and sandstone were produced in the county in 1956.

Marshfield Brick & Tile Co (Marshfield) mined clay for heavy clay products.

Producers of granite in the county in 1956 for monumental and architectural use included Anderson Bros. & Johnson Co., Cold Spring Granite Co., Lake Wausau Granite Co., Prehn Granite Quarries, Inc., and Red Wausau Granite Co.

Output of sand and gravel for building, railroad ballast, road construction, and other uses were reported by Mrs. John Gesicki, Sr., and Mike Wisnewski, Edgar; Lotz Sand & Gravel Co., and Riverside Gravel Co., Wausau.

Ellis Quarries, Inc. (Stevens Point), and Minnesota Mining & Mfg. Co. (St. Paul) produced dimension sandstone for rubble, dressed stone, and flagging and crushed stone for abrasives, riprap, and other uses.

Marinette.—Central Commercial Co. (Chicago, Ill.), crushed basalt near Pembine for roofing granules.

E. A. Mundt Granite Co. produced rough granite near Marinette for monumental use.

Marquette.—Dimension granite for monumental purposes was produced by Montello Granite Co. Edward Kraemer & Sons (Plain), crushed stone for concrete aggregate.

The county highway department produced gravel for road construction.

Milwaukee.—Output of filter sand and sand and gravel for building, road construction, railroad ballast, and other uses was reported by Ray Anderson Sand & Gravel Co., Moritz Sand & Gravel, and Sweeney Sand & Gravel Corp., all of Hales Corners, and Fink Sand & Gravel, Emma Kleist, Merget Sand & Gravel, A. J. Reiske Sons Co., Walter W. Rowe Sand & Gravel, and State Washed Sand & Gravel Co., Milwaukee.

Crushed limestone for use as concrete aggregate was produced by

Franklin Stone Products, Manegold Stone Co., Milwaukee Limestone Products Co., and Wauwatosa Stone Co., all of Milwaukee.

Monroe.—Ray Frings (Tomah), Otto Meyer (Sparta), and Schendel Bros. (Norwalk), crushed limestone for agricultural use and concrete aggregate.

Oconto.—Sand and gravel for road construction and other uses was produced by Belongia Construction Co., Oconto; Asa Foster, of Little Suamice, near Gillett; John Jaworski, Sobieski; and the county highway department.

The county highway department produced sandstone for concrete aggregate.

Oneida.—Dean B. Ekstrom, Musson Bros., Inc. (Rhinelander), Fox Valley Construction Co. (Appleton, near Minocqua), and the county highway department produced sand and gravel for building, road construction, and other uses.

Outagamie.—Sand and gravel for building, road construction, and other uses was produced by Landwehr & Hackl, Seymour; M. R. K. Construction Co., Inc., Kaukauna, near Seymour; and Sell Bros., Appleton.

Black Creek Limestone Co., Black Creek, and Landwehr & Hackl, Seymour, crushed limestone for agricultural use and concrete aggregate.

Ozaukee.—Kleist Sand & Gravel Co., Ozaukee Sand & Gravel Co. (Milwaukee, near Cedarburg), Muehlberg Gravel Co. (Port Washington), and the county highway department produced sand and gravel for building and road construction.

Pepin.—Edward Kraemer & Sons (Plain) and Neuheisel Lime Works (Eau Claire) crushed limestone for agricultural use and concrete aggregate.

Pierce.—Maiden Rock Silica Sand Co. produced blast sand near Maiden Rock. Bay City Sand Co., Inc. (Bay City) produced sand for blasting, grinding and polishing, engine, filter, molding, and other uses. Output of building sand and gravel was reported by River Falls Sand & Gravel Co. (River Falls). The county highway department produced sand and gravel for building and road construction.

Limestone for agricultural use and concrete aggregate was crushed by Baumgardt Construction Co., Dodgeville; Sanders Stone & Lime Co., Mount Horeb; and Pierce County Agricultural Stabilization & Conservation, Ellsworth.

Polk.—Output of crushed and broken basalt for concrete aggregate, railroad ballast, riprap, and other uses was reported by Dresser Trap Rock Co.

Jorgenson Construction Co. (Luck) and the county highway department produced sand and gravel for building, road construction, and other uses.

Polk County Agricultural Department (Balsam Lake) produced crushed limestone for agricultural and other uses.

Portage.—Clifford W. Caldwell (Waupaca) and Bert G. Somers Marl Excavator (Stevens Point) produced calcareous marl for agricultural use.

Output of sand and gravel for building, railroad ballast, road construction, and other uses was reported by F. F. Mengel Co., Wisconsin Rapids, near Custer; Gilford Wimme, Stevens Point; and the county highway department.

Price.—The Minneapolis, St. Paul & Sault Ste. Marie Railroad produced gravel for railroad ballast.

Racine.—The county highway commission crushed basalt for rough construction use.

Clay for heavy clay products and foundries was produced by Union Grove Drain & Tile Co.

Hillside Sand & Gravel Co. (Racine) and the county highway department produced sand and gravel for road use.

Consumers Co. (Department 383, Racine) crushed stone for asphalt filler, agricultural use, concrete aggregate, flux, magnesia plants, railroad ballast, and riprap. The county highway commission produced stone for rough construction.

Richland.—Edward Kraemer & Sons (Plain) and the county highway commission crushed limestone for concrete aggregate.

Rock.—Sand and gravel producers in Rock County in 1956 included the following: Atlas Sand & Gravel Co. and Janesville Sand & Gravel Co., Janesville; Chicago, Milwaukee, St. Paul & Pacific Railroad Co., Chicago; Consumers Co., Department 387, of Chicago, near Beloit; Luety Bros., Beloit; Edgerton Sand & Gravel Co., Edgerton; William J. Kennedy & Son, Footville, near Janesville; and the county highway department. Output was used for building, railroad ballast, and road construction.

Dimension limestone used as rubble and crushed stone for agriculture, concrete aggregate, and riprap was produced by Frank Bros., Milton Junction; Little Limestone Co., Peter J. Roth, and P. W. Ryan Sons, Janesville; Quam & Kaupanger, Stoughton, near Clinton; and the county highway department.

Rusk.—The county highway department produced sand and gravel for road construction.

St. Croix.—Ground sand for filler and sand and gravel, chiefly for building and road construction, were produced by Casey Gravel Works, New Richmond; Ed J. Leary Construction Co., River Falls; and the county highway department.

Ed J. Leary Construction Co. (River Falls), Wilson Rock & Limestone Co. (Wilson), and Pierce County Stabilization & Conservation (Ellsworth) produced crushed stone for agricultural use and concrete aggregate. The county highway department produced crushed limestone and miscellaneous stone for riprap.

Sauk.—Quartzite for refractory use was produced by Baraboo Quartzite Co., General Refractories Co., and Harbison-Walker Refractories Co. The Baraboo Quartzite Co. also produced grinding pebbles and tube-mill liners.

Deppe Lumber Co. (Baraboo) produced road gravel, and the county highway commission produced and contracted for sand and gravel for road construction.

Limestone for agricultural purposes and concrete aggregate was produced by Edward Kraemer & Sons, Plain, and Matoushek Bros., Prairie du Sac.

Sawyer.—The county highway department produced sand and gravel for road construction.

Shawano.—Sand and gravel for building, road construction, and other uses was produced by Murphy Sand & Gravel, Bonduel; Riemer Sand & Gravel, Cecil; Loyal Weishoff, Clintonville; M. J. Zimmerman Construction Co., Shawano; and the county highway commission.

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Edward Kraemer & Sons (Plain), and the county agricultural committee (Shawano) produced limestone for concrete aggregate and agricultural purposes.

Sheboygan.—Sand and gravel producers in the county in 1956 were Cascade Sand & Gravel Co., Cascade; Crystal Lake Crushed Stone Co., Sheboygan; Elkhart Moraine Sand & Gravel Co. (of Elkhart), near Elkhart Lake and Glenbeulah; and the county highway department. Output was chiefly for building, railroad ballast, road construction, and other uses.

The county agricultural agent produced limestone for agricultural purposes and concrete aggregate.

Taylor.—Zenether Bros. & Haenel (Westboro), produced gravel for road construction.

Trempealeau.—Limestone for agricultural use, concrete aggregate, and riprap was produced by Neuheisel Lime Works, Eau Claire; and Clarence Weiss, La Crosse.

Vernon.—Crushed limestone, chiefly for agricultural use and concrete aggregate, was produced by Ellefson Bros., Viroqua; and Edward Kraemer & Sons, Plain. The county highway commission produced dimension limestone for rough construction and rubble and sand for road construction.

Vilas.—The Chicago & Northwestern Railway Co. produced gravel for railroad ballast. Road-construction gravel was produced by the county highway department.

Edward Kraemer & Sons (Plain), produced limestone for concrete aggregate.

Walworth.—Sand and gravel for building, road construction, and other uses was reported by B. R. Amon & Sons, Mann Bros. Sand & Gravel, Inc., Elkhorn; George Booth, Elmer Harness, Delavan; Delavan Sand & Gravel Co., Inc. (of Milwaukee), near Delavan; Lake Geneva Sand & Gravel Co., Fontana; R. W. Miller, Lake Geneva; and Leroy Stoflet & Sons, Inc., East Troy.

H. E. Wheeler (Elkhorn) crushed stone for agricultural purposes and concrete aggregate.

Washington.—Sand and gravel output in the county in 1956 was chiefly for building, railroad ballast, road construction, and other uses. Producers included John B. Jacklin, Richfield; Kleist Sand & Gravel Co. and Ozaukee Sand & Gravel Co., Milwaukee; Northern Sand & Gravel Co., Fred C. Schultz & Son, and West Bend Ready Mix, all of West Bend; O. & W. Gravel Co. (of Port Washington), Newburg; Palmer Crushing Corp., Slinger; Leroy Schmidt, Germantown; and the county highway commission.

The county highway commission also crushed limestone for concrete aggregate.

Waukesha.—Sand and gravel was produced in the county in 1956 for building, railroad ballast, road construction, and other uses. Operators who reported output in 1956 were Wm. Buege, Jaeger Sand & Gravel Co., Inc., Edw. Lutz Sand & Gravel Co., and Northwest Sand & Gravel Co., Milwaukee; Frank Clark & Sons, West Allis; Consumers Co. (Department 322, of Racine), near Oconomowoc; Hales Corners Gravel, Hales Corners; Hartland Sand & Gravel Co., Hartland; Kohler Bros. Sand & Gravel Co., and Valley Sand & Gravel Co., Waukesha; A. W. Nowatske, Mukwonago; Frank Pernat, Jr.,

and O. Earl Rolefson, Oconomowoc; Walter D. Pett, Eagle; H. Turner & Son, Boscobel; Vogt, Inc., Okauchee; and the county highway department.

Limestone was produced in the county for various uses. Dimension limestone for rough construction, dressed stone, flagging, and rubble was produced by the following operators in 1956: Conco Building Products, Inc., Fonda Lannon Stone Co., Joecks Bros. Stone Co., Johnson & Sons, Kinkler Bros. Lannon Stone Co., Meadow Hill Quarries, Inc., Midwest Lannon Stone Co., Weather Rock Lannon Stone Quarry, West Side Stone Co., White Rock Lannon Stone Co., and Wisconsin Lannon Stone Corp., all of Lannon; Dudovick Lannon Stone Co., Milwaukee; Halquist Lannon Stone Co. and Quality Limestone Products Co., Inc., Sussex; Holmes Stone Works, Perrens Quarry, and Waukesha Lime & Stone Co., Inc., Waukesha; Ideal Lannon Stone Co., Colgate; and Milwaukee Lannon Stone Co. and Sussex Lannon Corp., Pewaukee. Crushed and broken limestone was produced by Conco Building Products, Inc., and West Side Stone Co., Lannon; Halquist Lannon Stone Co. and Quality Limestone Products, Inc., Sussex; Milwaukee Lannon Stone Co., Pewaukee; and Waukesha Lime & Stone Co., Inc., Waukesha. Output was used chiefly for agriculture, asphalt filler, concrete aggregate, fertilizer, filters, flux, railroad ballast, and riprap.

Waupaca.—Hockers Brick Co. (New London) produced clay for heavy clay products.

Clifford W. Caldwell (Waupaca), operating at Stratton Lake, produced calcareous marl for agricultural use.

C. H. Peters (of Fremont, near Readfield) and Howard W. Waite (Clintonville) produced gravel for building and road construction and sand for other uses.

Limestone for agricultural use and concrete aggregate was produced by C. H. Peters (of Fremont) at Caladonia.

Waushara.—Calcareous marl for agricultural use was produced by Theodore Anderson, Wild Rose; Gaylord Dehling and William Edwards, Wautoma; Leo Hendricksen, Red Granite; and Thomas Lundberg, Coloma.

Lohrville Stone Co. (Lohrville) produced dimension granite for rough monumental use and rubble; crushed granite for concrete aggregate; and dimension sandstone for rough construction, dressed stone, and rubble.

Winnebago.—Sand and gravel for building, road construction, and other uses was produced by Courtney & Plummer, Neenah; Friedrich & Loots, Oshkosh; Koepke Sand & Gravel Co. and Schulz Sand & Gravel, Inc., Appleton; and the county highway department.

Output of crushed and broken limestone for agricultural use, asphalt filler, concrete aggregate, railroad ballast, and riprap was reported by Badger Highways Co., Inc., Menasha; The Consumers Co. (of Racine), Oshkosh; and Courtney & Plummer, Inc., Neenah.

Wood.—Ellis Quarries, Inc., Felix Klesmith (Stevens Point), and Tony Schmick (Wisconsin Rapids) produced dimension sandstone for dressed stone, flagging, rough construction, and rubble and crushed sandstone for riprap.

The county highway department crushed granite for other uses.

The Mineral Industry of Wyoming

This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States, Department of the Interior, and the State Geological Survey of Wyoming.

By Frank J. Kelly,[1] William H. Kerns,[1] and Breck Parker [1]

THE MINERALS produced in Wyoming in 1956 were valued at $316.9 million, a $19.1 million increase over 1955 and an alltime high for the State. A part of this gain resulted from the inclusion, for the first time, of a value for uranium production; however, the bulk of the increase was due to important increases in the value of the liquid fuels. The number of persons employed in the mineral industry reached 10,700, or 300 more than in 1955, and wages totaling $49.9 million were paid.

In 1956 mineral fuels was the dominant group among all minerals produced and supplied 88 percent of the total value. In this group petroleum was the most important and furnished 92 percent. Petroleum output rose 5 percent over 1955; natural gas and LP-gases increased 8 percent, and natural gasoline 21 percent. Coal output declined 13 percent from 1955.

The nonmetals group of minerals comprised 10 percent of the total value of all minerals. Total value of nonmetals was $31.8 million—only 6 percent greater than in 1955. The construction materials were hardest hit as the result of a temporarily decreasing demand for these products. Among the 12 nonmetals produced, gypsum declined 49 percent; pumice decreased 42 percent; sand and gravel, 1 percent; and sodium sulfate, 27 percent. Cement, clays, sodium carbonate, stone, and sulfur increased slightly; only phosphate rock gained significantly in output.

Metals constituted an extremely small part of mineral activity in the State. Iron ore furnished the greater part of value in metals, followed by uranium, gold, tungsten, copper, beryl, vanadium, and silver. Exploration and development of uranium properties were the principal activities in metals. In the intensified search for uranium, private drilling tripled that in 1955 and totaled more than 1.2 million feet. As a result of this and previous drilling, ore reserves for the State totaled 2.3 million tons at an average grade of 0.22 percent contained U_3O_8 —3.8 percent of the total United States reserve estimate.

[1] Commodity-industry analyst, Region III, Bureau of Mines, Denver, Colo.

TABLE 1.—Mineral production in Wyoming, 1955–56 [1]

Mineral	1955		1956	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	1,035,560	$10,923,521	1,053,452	$11,831,981
Coal	2,926,593	11,845,252	2,553,380	9,920,177
Copper (recoverable content of ores, etc.)			3	2,550
Feldspar long tons			1,201	8,195
Gem stones	(2)	57,000	(2)	75,000
Gold (recoverable content of ores, etc.) troy ounces	52	1,820	762	26,670
Gypsum	22,373	89,493	11,380	45,521
Iron ore (usable) long tons, gross weight	748,831	(3)	(3)	(3)
Natural gas million cubic feet	77,819	6,615,000	84,398	7,258,000
Natural-gas liquids:				
LP-gases thousand gallons	46,106	1,961,000	49,338	2,337,000
Natural gasoline do	40,290	2,775,000	48,859	3,160,000
Petroleum (crude) thousand 42-gallon barrels	99,483	239,750,000	104,830	255,785,000
Phosphate rock long tons	54,958	345,451	119,230	721,341
Pumice	(3)	(3)	45,517	37,859
Sand and gravel	3,952,119	3,977,677	3,904,000	2,935,500
Silver (recoverable content of ores, etc.) troy ounces	20	18	154	139
Sodium carbonates	(3)	(3)	[4] 337,851	[4] 8,345,000
Stone	1,303,399	2,033,800	1,332,866	2,076,282
Sulfur, recovered elemental long tons	120,697	3,206,353	121,161	3,214,428
Tungsten 60-percent WO_3 basis			2	6,500
Uranium ore	(5)	(5)	107,400	2,100,000
Value of items that cannot be disclosed: Beryllium concentrate (1956), cement, sodium sulfate, vanadium (1956), and values indicated by footnote [3]		14,982,945		7,830,922
Total [6]		297,752,000		316,897,000

[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Weight not recorded.
[3] Figure withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed".
[4] Includes crude and calcined trona.
[5] Figure not released by Atomic Energy Commission.
[6] Total has been adjusted to eliminate duplicating value of raw materials used in manufacturing cement.
[7] Figure excludes uranium as indicated in footnote reference 5.

TABLE 2.—Average unit value of selected mineral commodities in Wyoming, 1955–56 [1]

Commodity	1955	1956	Commodity	1955	1956
Clays short ton	$10.548	$11,232	Petroleum (crude) [3] 42-gallon barrel	$2.410	$2.440
Coal do	4.047	3.885	Sand and gravel short ton	1.006	.752
Gold [2] troy ounce	35.000	35.000	Silver [4] troy ounce	.905+	.905+
Gypsum short ton	4.000	4.000	Stone short ton	1.560	1.558
Natural gas thousand cubic feet	.085	.086	Sulfur, recovered elemental long ton	26.565	26.530
Natural-gas liquids:					
LP-gases gallon	.043	.047			
Natural gasoline do	.069	.065			

[1] Prices are based on average value f. o. b. mines or mills reported by the producers except as otherwise noted.
[2] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[3] Value at wells.
[4] Treasury buying price for newly mined silver July 1, 1946, to date—$0.9050505.

Defense Minerals Exploration Administration (DMEA) Program.—The participation in exploration projects in search of reserves of strategic and critical minerals by the DMEA reached $173,200 in 1956 compared with $140,900 in 1955. Four contracts were signed in both years (all for uranium), with 75-percent Government participation in each case.

New Plants and Important Developments.—Construction of a coal-fired thermal-electric plant was started in midyear at Glenrock. Coal was to be obtained from deposits 15 miles north of Glenrock.

During 1956 in Wyoming the Green River basin was the center of gas-drilling activity, which furnished over half of the gas discoveries and three-fourths of the gas-development wells. The Pacific Northwest pipeline from the San Juan basin of New Mexico to the Pacific Northwest States and the Colorado Interstate Gas Co. 22-inch branch-line connection from east of Green River (Wyo.) to Denver (Colo.) were completed. In addition, the Big Piney area was connected to the Pacific Northwest system by a 10-inch feeder line.

A new plant that recovered natural-gas liquids at Newcastle during 1956 increased to 11 the number of facilities extracting LP-gases and natural gasoline from wet gas.

TABLE 3.—DMEA contracts executed in 1956 [1]

County and contractor	Property	Contract	
		Date	Total amount
Fremont			
Antelope Mines	Ray, Ames, and Ann claims	Sept. 20	$48,460
Charles M. Coleman & Associates	Clyde, Marsh, and Longport groups of claims.	Apr. 11	9,492
Vitro Minerals Corp	George and Ver claims	June 14	64,816
Fremont and Natrona			
Shoni Uranium Corp	Jackneese and Blackstone claims	Apr. 19	50,436
Total			173,204

[1] All contracts for uranium; Government participation, 75 percent.

In the petroleum industry, discovery of a productive zone in the Tensleep formation in the East Salt Creek field and production from the Phosphoria formation in the Torchlight field were important developments. The number of active petroleum refineries was reduced to 10 during the year because a plant at Glenrock was closed. San Francisco Chemical Co. announced construction of a new $750,000 phosphate-rock plant at Leefe—a highlight of the year in the nonmetal industry. A third shaft was sunk to a depth of 1,600 feet at the Westvaco trona mine of Intermountain Chemical Co. for use in augmenting the mine's ventilation system. This shaft will permit the company to proceed on a pillar-recovery program, which will nearly double the recovery of ore without greatly affecting the production rate. The Neiber Dome sulfur plant of Signal Oil & Gas Co. was also completed in 1956.

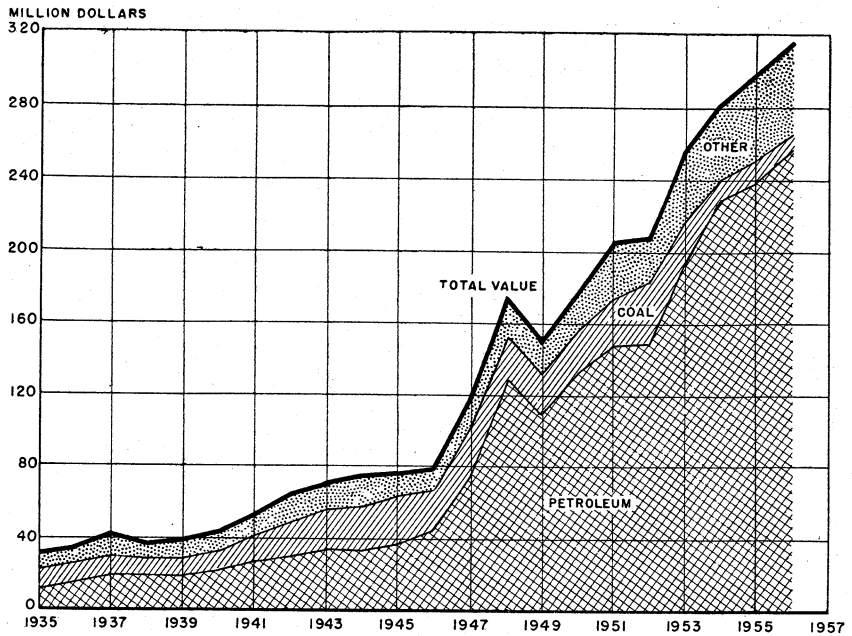

FIGURE 1.—Value of petroleum, coal, and total value of all minerals produced in Wyoming, 1935–56.

In metals, the Columbia-Geneva Steel Division of United States Steel Corp. signed contracts with independent companies for exploring and developing an iron-ore deposit in the South Pass area. The uranium ore-buying station of the Atomic Energy Commission (AEC) at Riverton was active throughout 1956, but purchases were restricted because plans for constructing a 400-ton-per-day mill at Split Rock and a 750-ton-per-day plant in the Gas Hills area were announced.

EMPLOYMENT AND INJURIES

Employment.—Data in this section were procured from the Bureau of Labor Statistics, United States Department of Labor, and the Employment Security Commission of Wyoming. The term "mining" includes exploration and development of mineral properties, the removal of overburden, the extraction of minerals occurring naturally (including petroleum and natural gas), quarrying, well operation, and milling (crushing, screening, washing, flotation, etc.), and other preparation needed to render the material marketable.

Mining employment decreased from a high of 10,500 men in 1953 to 8,900 in 1955 and 8,700 in 1956. The principal cause for this decline was the reduction in the number of men engaged in coal mining. Had it not been for the discovery of uranium and subsequent exploration, development, and mining, as well as the increase in oil- and gas-well drilling during this period, the effect of the closing of so many coal mines would have adversely affected mining employment to a much greater extent.

TABLE 4.—Mining and contract construction employment in Wyoming, 1952–56

(in thousands)

[U. S. Department of Labor]

	1952	1953	1954	1955	1956
Mining	9.9	10.5	9.4	8.9	8.7
Bituminous and other soft coal	2.8	2.5	1.2	.9	.7
Crude petroleum and natural gas	6.1	6.7	7.0	6.7	6.5
Other	1.0	1.3	1.2	1.3	1.5
Contract construction	6.8	6.2	6.2	6.3	6.9

In discussing employment in mining in the State, consideration should be given to the contract construction category. This group includes engineering-project contractors who are engaged chiefly in constructing highways, streets, bridges, and tunnels, waterpower projects, sewer-disposal and drainage systems, airfields, and other heavy construction, which involves either the movement of large masses of earth or the quarrying of sand and gravel. As these contractors produced most of the sand and gravel, part of this group of men should be considered with mining employment. Exact figures on the number of men employed in the contract-construction industry and engaged in sand and gravel and stone quarrying are not available, but a 10- to 15-percent estimate would be reasonable. Data on men employed by general contractors in extracting sand and gravel were lacking because the labor force which produced this commodity was engaged only incidentally in quarrying and preparing sand and gravel. Accordingly, accurate records are not kept by the industry.

Wages and hours.—In 1956 the hourly rate for mine labor rose to $2.45 compared with $2.32 in 1955. Within this labor group bituminous- and other soft-coal workers received the largest increase—25 cents per hour compared with 13 cents for crude-petroleum and natural-gas employees and 6 cents for the other mining group. However, because of a shorter workweek average weekly earnings in the coal industry were the lowest of the mining group as a whole.

Wyoming workers in the coal and other mining groups worked fewer hours per week at a higher hourly rate than the average United States worker. On the other hand, employees in crude-petroleum and natural-gas industries worked more hours per week at a lower hourly rate than the United States average.

TABLE 5.—Hours and gross weekly earnings for mining employees in Wyoming 1955–56

[U. S. Department of Labor]

	Average weekly hours		Average hourly earnings	
	1955	1956	1955	1956
Production of petroleum and coal	39.9	40.6	$2.53	$2.74
Mining	41.3	41.3	2.32	2.45
Bituminous and other soft coal	31.1	32.9	2.58	2.83
Crude petroleum and natural gas	43.6	42.6	2.31	2.44
Other	41.7	42.9	2.21	2.27
Construction	39.5	39.7	2.34	2.49

Injuries.—The State inspector of coal mines of Wyoming reported [2] that there were two fatalities in coal mines and none in noncoal mines. Also, the report shows that there were 25 nonfatal accidents at coal mines and 26 at noncoal mines. The two fatal accidents occurred during haulage operations. The classification of causes of nonfatal accidents was as follows: Haulage, 9; slipping and falling, 11; lifting, 2; flying and falling objects, 15; straining, 2; mechanical, 5; and miscellaneous, 7.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Coal production from 23 active mines in 9 counties totaled 2.6 million tons and was 13 percent less than in the previous year. Continuing decline in output from mines in Sweetwater County supplied most of the loss in production. Decreases were reported from all counties in the State except Campbell and Lincoln. Output from 8 strip mines was 1.5 million tons—the same as in 1955.

Construction of a coal-fired thermal-electric plant was started in midyear at Glenrock, in Converse County. The plant (of 100,000-kilowatt capacity) was to be supplied with coal from strippable deposits 15 miles north of Glenrock.

TABLE 6.—Production of coal, 1955–56, by counties

(Exclusive of mines producing less than 1,000 tons)

County	1955 Short tons	1955 Average value per ton [1]	1956 Short tons	1956 Average value per ton [1]
Campbell	349,566	$1.21	373,958	$1.21
Carbon	192,493	3.54	164,003	3.88
Converse	8,040	3.37	6,608	3.26
Fremont	3,624	6.57	2,061	6.60
Hot Springs	17,442	6.94	16,425	7.69
Johnson	1,393	4.50	1,177	4.50
Lincoln	645,720	2.87	690,097	2.91
Sheridan	437,222	3.38	411,407	3.26
Sweetwater	1,271,093	5.69	887,644	5.99
Total	2,926,593	4.05	2,553,380	3.89

[1] Value received or charged for coal f. o. b. mine, including selling cost. (Includes value for coal not sold but used by producer, such as mine fuel and coal coked, as estimated by producer at average prices that might have been received if such coal had been sold commercially).

Natural Gas.—Marketed production of natural gas in 1956 was 84.4 billion cubic feet compared with 77.8 billion in the preceding year.

Major producing fields were the Worland (Washakie), Church Buttes (Uinta and Sweetwater), Salt Creek (Natrona), Beaver Creek (Fremont), Big Sand Draw (Fremont), and Baxter Basin (Sweetwater). Of a total of 75 gas-producing fields, these 6 yielded over half of the State output.

The Green River basin continued to be the center of gas-drilling activity; 7 of 12 gas discoveries and 30 of 40 gas-development wells were reported from the Basin area. Five of the discoveries were near the Baxter Basin fields of Sweetwater County; development

[2] Fearn, Lyman (State coal-mine inspector), Annual Report of the State Inspector of Coal Mines of Wyoming, Year Ending Dec. 31, 1956: 47 pp.

activity was concentrated in the Big Piney area of Sublette County.

The Pacific Northwest pipeline and the Colorado Interstate Gas Co. branch-line connection to Denver were completed in 1956. The Big Piney area was connected to the Pacific Northwest system in August by a 10-inch feeder line.

Natural-Gas Liquids.—Output of natural gasoline and liquefied-petroleum gases was 98.7 million gallons valued at $5.5 million. Ten plants were extracting natural-gas liquids at the beginning of 1956, and one new plant was placed in operation at Newcastle in Weston County during the year.

Petroleum.—Wyoming oilfields yielded 104.8 million barrels of crude petroleum in 1956, a 5-percent increase over the previous year. Most of the increased output came from fields of the Big Horn basin; the major decline in production was in the Clareton trend of Weston and Niobrara Counties.

Exploration activity resulted in 1.35 million feet of drilling (the same as in 1955), although the number of holes was greater—289 compared with 262 in 1955. Development activity contributed 2.67 million feet of drilling, compared with 3.13 million in the previous year.

Some of the important exploration results were discovery of production in the Tensleep formation in the East Salt Creek field of Natrona County and production from the Phosphoria formation in the Torchlight field in Big Horn County. Interest in the Donkey Creek area of southeastern Crook County was also considerably higher than in the previous years.

One of Wyoming's 11 refineries was closed in 1956. The Glenrock plant in Converse County was closed in January and was being gradually dismantled. The plant at Lovell in Big Horn County was closed at the end of April. The Big Horn Refining Co. acquired the Ohio Oil refinery at Lovell and operated it from October through December 1956.

TABLE 7.—Production of crude petroleum, 1955–56, by counties

[In thousand barrels]

County	1955	1956	Leading fields in order of 1956 production
Albany	505	436	Quealy, Herrick, Little Laramie.
Big Horn	12,570	12,804	Bonanza, Garland, Byron.
Campbell	3	7	Bertha.
Carbon	2,372	2,408	Wertz, Rock River, Big Medicine Bow.
Converse	6,468	6,275	Glenrock-S, Big Muddy, Cole Creek-S.
Crook	13	189	Donkey Creek, Kara, Grasshopper Butte.
Fremont	13,203	14,140	Steamboat Butte, Big Sand Draw, Beaver Creek.
Goshen	82	88	Torrington.
Hot Springs	13,620	14,396	Hamilton Dome, Grass Creek, Gebo.
Johnson	7,573	7,307	Sussex, Meadow Creek, Sussex-W, Dugout.
Laramie	384	468	Horse Creek, Pine Bluffs, Borie.
Lincoln	84	87	La Barge.
Natrona	6,161	7,234	Salt Creek, Grieve Unit, Sage Spring Creek.
Niobrara	1,845	1,684	Lance Creek, Little Buck Creek, Mule Creek.
Park	20,211	22,655	Elk Basin, Oregon Basin, Frannie.
Sheridan	1,010	1,203	Ash Creek-S, Ash Creek.
Sublette	388	389	La Barge, Tiptop, La Barge-N.
Sweetwater	4,900	4,828	Lost Soldier, Wertz, Church Buttes.
Uinta	92	88	Church Buttes, Spring Valley.
Washakie	2,118	3,787	Cottonwood Creek, Worland, Slick Creek.
Weston	5,881	4,010	Clareton, Mush Creek-W, Mush Creek.
Other fields		347	
Total	99,483	104,830	

TABLE 8.—Wildcat and development completions in 1956, by counties

[Oil and Gas Journal]

County	Oil	Gas	Dry	Total
Wildcat completions:				
Albany			1	1
Big Horn	1	1	20	22
Campbell			10	10
Carbon		1	11	12
Converse	2		8	10
Crook	3		13	16
Fremont	1	1	36	38
Goshen			13	13
Hot Springs	1		8	9
Johnson	1		14	15
Laramie			12	12
Lincoln		1	2	3
Natrona	5	2	39	46
Niobrara	1		10	11
Park	2		16	18
Platte			4	4
Sheridan			5	5
Sublette		1	5	6
Sweetwater		5	9	14
Uinta			1	1
Washakie			16	16
Weston	1		6	7
Total wildcats	18	12	259	289
Development completions:				
Albany			2	2
Big Horn	15	1	8	24
Campbell	1			1
Carbon	1	2	4	7
Converse	30		11	41
Crook	18		14	32
Fremont	44	1	6	51
Goshen	1		4	5
Hot Springs	50		8	58
Johnson	46		12	58
Laramie	3		4	7
Lincoln	3		1	4
Natrona	88		33	121
Niobrara	2	1	4	7
Park	22	3	6	31
Sheridan			1	1
Sublette	1	28	7	36
Sweetwater	1	2	4	7
Washakie	41	1	3	45
Weston	63	1	39	103
Total development	430	40	171	641
Total all drilling	448	52	430	930

NONMETALS

Cement.—Output of portland cements continued to be an important indicator of the industrial growth of Wyoming during 1956. Shipments reached an alltime high, and the total value was 13 percent greater than in 1955. Demand for types I, II, and III, high-sulfate-resistance (type V), oil-well, and waterproof-portland forced the price per barrel of finished cement up to $3.49, compared with $3.11 in 1955. Limestone, shale, sandstone, and gypsum mined locally constituted the major raw materials required by Monolith Portland Midwest Co. for its Laramie plant. One 343-foot rotary kiln operated at optimum capacity throughout the year.

Clays.—Production of all types of clays totaled $11.8 million in 1956, an 8-percent increase over 1955. Bentonite valued at $11.6

million provided most of the total value, and Wyoming led the States reporting production of this type of clay. Crook County continued to be the leading producing area, followed by Big Horn, Weston, Natrona, and Johnson Counties. Three companies reporting shipments of over 100,000 tons were Baroid Division (National Lead Co.), Magnet Cove Barium Corp., and Wyodak Chemical Division (Federal Foundry Supply Co.).

TABLE 9.—Shipments of bentonite, 1947–51 (average) and 1952–56

Year	Short tons	Value	Year	Short tons	Value
1947–51 (average)	370,747	$3,979,139	1954	742,453	$9,339,755
1952	692,853	9,168,708	1955	825,810	10,721,577
1953	670,756	9,861,321	1956	847,266	11,624,185

Of the total output of bentonite in 1956, 523,900 tons was used in rotary-drilling mud, 242,300 tons at foundries and steelworks, 15,000 tons for export, 13,400 tons in filtering and clarifying, and 500 tons in chemicals. The remaining 52,200 tons was used as concrete admixture (sealing dams, etc.), insecticides and fungicides, and miscellaneous other uses.

Miscellaneous clay was mined in Big Horn and Sheridan Counties by Lovell Clay Products Co. and Sheridan Pressed Brick & Tile Co. for building brick and other heavy clay products. Miscellaneous clay was also quarried in Albany County by Monolith Portland Midwest Co. for cement and by Great Western Aggregates, Inc., for lightweight aggregate. The latter company plant did not reach full productive capacity in 1956.

Feldspar.—Feldspar production in 1956, valued at $8,200, consisted of 1,200 long tons of potash feldspar mined by R. V. McGuire at the Casper Mountain mine (Natrona County), and Olett Mining Co. at the Johnson mine (Laramie County). The entire mine production was shipped to the Denver (Colo.) grinding plant of International Minerals & Chemical Corp.

Gem Stones.—Better statistical coverage and increased interest in collecting gem and ornamental stones swelled the value of this commodity group to $75,000 in 1956 compared with $57,000 in 1955. Stones collected during the year included agate, petrified wood, jade, jasper, epidote, thulite, and silicified turritella. Fremont County furnished the greater part of the total value, followed by Sweetwater, Park, Albany, Carbon, Natrona, Johnson, and Uinta Counties.

Gypsum.—Total output of gypsum in Wyoming in 1956 dropped from 22,400 tons in 1955 to 11,400 tons in 1956—a decrease of 49 percent. Two companies supplied all mine production; Wyoming Construction Co. in Albany County mined 11,000 tons of gypsum for cement, and Wyoming-Gulf Sulphur Co., Park County, quarried 400 tons of gypsum for agricultural purposes. A decline in mine production for the latter company from 12,000 tons in 1955 to 400 tons in 1956 accounted for the drop in State output.

Phosphate Rock.—The continuing strong demand for phosphate rock for agricultural purposes boosted the output of crude rock in Wyoming to 119,000 long tons in 1956, a more than twofold increase over 1955. It was mined in the State only at the Leefe mine of San Francisco Chemical Co. A fluosolids roasting plant at the Leefe property treated the entire Wyoming mine output and crude ore produced in Utah. San Francisco Chemical Co. announced in 1956 construction of a $750,000 plant at Leefe to upgrade ores from Utah and Wyoming. This plant climaxes more than 2 years of research at the Colorado School of Mines Research Foundation of Golden. At this new facility finely ground ore will be mixed with liquid chemicals to free phosphates from lower grade ores. By upgrading the ore in the existing "B" plant (roasting or fluosolids process), many carbonaceous materials are driven off as gases in the separation, enabling the company to utilize another 5-foot layer of phosphate rock. The new "C" plant permits an additional 6-foot layer to be worked. The new process can be used independently or in conjunction with the "B" plant. The company also announced a $2-million program to improve the efficiency of mining its thin-bedded deposits in the Intermountain area.

Pumice.—Production of volcanic scoria continued to decline in 1956; shipments of 45,500 tons represented the output of Tongue River Stone Co.—the only active producer in the State. The decrease in sales was due to adverse economic conditions, present for many years. Substitute materials of more constant quality, increasing costs of production, and a swing to the use of lightweight aggregate are some reasons for the decline. Of the 45,500 tons of scoria mined in 1956, only 1,600 tons was used as concrete aggregate, whereas 43,900 tons was utilized as railroad ballast. The latter use fluctuates considerably from year to year and does not provide a stable outlet for the industry. The Superior Pumice Co. and Sheridan Wyoming Coal Co., producers in 1955, were idle during 1956.

Sand and Gravel.—The output of sand and gravel in Wyoming during 1956 remained relatively stable compared with 1955. Of the 3.9 million tons produced in 1956, 3.1 million (79 percent) was Government-and-contractor production used in constructing and maintaining highways. Output by contractors and Governmental agencies, reported in 23 out of the 24 counties in the State, was valued at $2.2 million. In comparison, commercial production was 801,500 tons quarried in 15 counties and valued at $721,500. Ninety-three percent of the commercial output was washed, crushed, screened, or otherwise prepared; only 90 percent of the Government-and-contractor production was processed.

The principal commercial producers were Gilpatrick Construction Co., Inc., and Casper Concrete Co., Inc. The more active contractors for Government agencies were Knisely-Moore Co., Big Horn Construction Co., Boatright-Smith, Read Construction Co., W. E. Barling, Inc., and Northwestern Engineering Co.

TABLE 10.—Sand and gravel sold or used by producers, 1955–56, by classes of operations and uses

Class of operation and use	1955			1956		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Structural	72,631	$103,357	$1.42	86,000	$125,000	$1.45
Paving	23,703	29,853	1.26	32,500	34,000	1.05
Other				7,000	1,000	.14
Total sand	96,334	133,210	1.38	125,500	160,000	1.27
Gravel:						
Structural	197,517	263,049	1.33	142,000	185,000	1.30
Paving	555,757	367,512	.66	500,000	367,500	.74
Railroad ballast	201,708	47,339	.23	34,000	9,000	.26
Total gravel	954,982	677,900	.71	676,000	561,500	.83
Total sand and gravel	1,051,316	811,110	.77	801,500	721,500	.90
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Structural	27,020	30,970	1.15	1,500	1,500	1.00
Paving	745	1,960	2.63	24,000	36,000	1.50
Total sand	27,765	32,930	1.19	25,500	37,500	1.47
Gravel:						
Structural	61,623	68,730	1.12	25,000	26,000	1.04
Paving	2,811,415	3,064,907	1.09	3,052,000	2,150,500	.70
Total gravel	2,873,038	3,133,637	1.09	3,077,000	2,176,500	.71
Total sand and gravel	2,900,803	3,166,567	1.09	3,102,500	2,214,000	.71
ALL OPERATIONS						
Sand	124,099	166,140	1.34	151,000	197,500	1.31
Gravel	3,828,020	3,811,537	1.00	3,753,000	2,738,000	.73
Grand total	3,952,119	3,977,677	1.01	3,904,000	2,935,500	.75

Sodium Carbonate and Sulfate.—Trona (natural soda ash) retained its rank as second only to clays as the most important nonmetal mineral in Wyoming. The output of sodium carbonate (excluding sales of crude and calcined trona) was 313,000 tons valued at $7.7 million in 1956 compared with 319,000 tons with a value of $7 million in 1955. Sales of crude and calcined trona furnished 24,500 tons valued at $625,000. The rapid development and expansion of the mine and processing facilities at Westvaco (Sweetwater County) by Intermountain Chemical Co. were major factors in the economy of the county as well as the State, and this company in 1956 was the largest single employer in the Wyoming mining industry. One of the latest developments at this deposit was completion of a third shaft to a depth of 1,600 feet. This shaft will be used to augment the ventilation system at the underground workings and will permit Intermountain to proceed on a pillar-recovery program. This program will nearly double the recovery of ore from the mine without greatly affecting the production rate.

Another development in 1956 was the beginning of solution mining of selected beds of trona. Hot water is injected under pressure into a well and allowed to percolate through the trona rock, dissolving the sodium minerals. The solution is removed through another well a few hundred feet away and then piped to the reduction plant for recovering the soda ash. The operation was experimental, and the potential commercial possibilities will depend on the underground behavior of the water, chemical impurities, and operating difficulties experienced.

Two companies—William E. Pratt and Iowa Soda Products Co.—shipped Glauber's salt, which was produced from old dry-lake brines in Carbon and Natrona Counties. The most important use for sodium sulfate was in manufacturing kraft paper and paperboard, but it also was consumed in processing rayon, wool, and other textile fibers, in dyes, and for many other chemical uses.

Stone.—A breakdown of the 1,333,000 tons of various types of stone quarried in Wyoming revealed that crushed limestone totaled 1,053,000 tons, crushed granite 216,000 tons, crushed miscellaneous stone 56,000 tons, crushed sandstone 7,000 tons, and dimension limestone 178 tons. The principal uses in order, were railroad ballast (500,000 tons), road construction (409,000 tons), and cement, sugar refining, mineral food, flux, and miscellaneous applications (424,000 tons).

Crushed limestone was produced in 18 counties, and the major producers were Guernsey Stone Co., Monolith Portland Midwest Co., and Great Western Sugar Co. Crushed granite was quarried in Laramie, Sweetwater, and Park Counties, and the principal producer was Morrison-Knudsen Co. Crushed miscellaneous stone was also reported for two counties; the Sheridan Wyoming Coal Co. as contractor for the Chicago, Burlington & Quincy Railroad was the major quarry operator. Crushed sandstone was produced in Platte, Park, and Washakie Counties by C. F. Lytle Co., Federal Bureau of Reclamation, D. M. Manning, and Long Construction Co.

Sulfur (Recovered Elemental).—Shipments of elemental sulfur in Wyoming rose to 121,200 long tons compared with 120,700 tons in 1955. Plant production reports indicate a decline in shipments for Jefferson Lake Sulphur Co., Big Horn County; and Seaboard Oil Co. and Stanolind Oil & Gas Co., Park County. However, a 12-percent increase in sales by the Texas Gulf Sulphur Co. more than offset the decreases for other companies and resulted in a net gain in shipments for the industry.

The Neiber Dome plant of Signal Oil & Gas Co. (Washakie County) was completed during 1956; 9,300 tons of elemental sulfur was produced at this facility and at the Stockham Federal plant constructed by the same company in 1955; sulfur was stockpiled, and no shipments were made during 1956.

METALS

Beryllium.—International Minerals & Chemical Corp. made a small shipment of beryl (beryllium concentrate) to the Government General Services Administration (GSA) Custer (S. Dak.) Purchase Depot from the Catherine No. 1 mine in Natrona County in 1956.

Gold, Copper, and Silver.—The increased output of gold, copper, and silver in Wyoming in 1956 was significant because although its value was small in relation to other commodities, it showed renewed activity in this phase of the mineral industry in Wyoming. The production came from 1 active mine in each of 3 counties—Carbon, Fremont, and Lincoln—and cleanup activities at a mill in Fremont County. Gold and copper ores were shipped directly to a smelter from the Platt mine (new in 1956) in Carbon County by R. H. Platt & H. V. Morris. Elayer Co., Inc., treated ore from the Duncan mine in Fremont County in its new 60-ton-per-day mill which was completed and tested in December 1955. The Pioneer Carissa Gold Mines, Inc., shipped to a smelter a small quantity of material, which was recovered from a cleanup of the Carissa mill (Fremont County). Blake G. Holley shipped a small quantity of copper ore to the American Smelting and Refining Co. smelter at Garfield (Utah) from the Lake Creek mine 19 miles north of Cokeville in Lincoln County.

TABLE 11.—Mine production of gold, silver, copper, and lead, 1947–51 (average) 1952–56, and total, 1867–1956, in terms of recoverable metals [1]

Year	Mines producing		Material sold or treated [2] (short tons)	Gold (lode and placer)		Silver (lode and placer)		Copper		Lead		Total value
	Lode	Placer		Fine ounces	Value	Fine ounces	Value	Short tons	Value	Short tons	Value	
1947–51 (average)	1	1	1,747	400	$13,993	26	$23	------	------	------	------	$14,016
1952	------	1	------	1	35	------	------	------	------	------	------	35
1953	1	1	2	1	35	11	10	1	$574	------	------	619
1954	2	------	1,445	407	14,245	74	67	1	590	------	------	14,902
1955	1	------	206	52	1,820	20	18	------	------	------	------	1,838
1956	3	------	3,202	762	26,670	154	139	3	2,550	------	------	29,359
1867–1956	------	------	(3)	81,263	1,952,533	75,080	52,148	16,331	5,688,086	14	$1,486	7,694,253

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped directly to smelters during the calendar year indicated.
[2] Does not include gravel washed.
[3] Figure not available.

Iron Ore.—Declining iron-ore output (shipments) in Wyoming in 1956 resulted partly from a labor strike throughout July at the Colorado Fuel & Iron Corp. steel mill at Pueblo, Colo., which used the entire output of hematite iron ore from its Sunrise mine in the Hartville district (Platte County, Wyo.). Minor fluctuations in output from year to year can be attributed to the demand for steel and carryover of stocks at the steel plant.

Magnetite Products Corp., which began operations November 29 at the Cobar No. 1 mine in Albany County, mined a small quantity of magnetite for use as a coating of underwater pipelines and transmission lines.

The Columbia-Geneva Steel Division of United States Steel Corp. had taken major steps toward opening up a new source of iron ore in the South Pass area of southwest Wyoming. During 1956 contracts were completed with the Centennial Development Co. of Eureka, Utah, for exploration and development work at the mine. In addition, the company made test shipments of the ore to its mill

at Provo, Utah, and to Duluth, Minn. According to company officials, construction of a 30-mile railroad from the Union Pacific mainline to the deposit would be necessary to fully develop the property for commercial use of the ore.

TABLE 12.—Shipments of iron ore, total 1900–51 and by years, 1952–56

Year	Long tons	Year	Long tons
1900–51	24,671,605	1954	458,237
1952	484,945	1955	748,831
1953	654,285	1956	(1)

[1] Figure withheld to avoid disclosing company confidential data.

Rare-Earth Metals.—Exploration and research in the rare earths were carried on principally by the United States Yttrium, Inc., at Laramie. This company purchased some combined rare-earth oxides from the Rare Earth Chemical Co. at Mead, Colo., for experimental work. Although recovery of separate oxides was made, no sales were reported.

Titanium.—An extensive exploration program begun in 1951 by the Union Pacific Railroad Co. on the titaniferous-magnetite deposits in the Iron Mountain area of the Laramie Range northwest of Laramie continued during 1956. The company reported that the ore reserves were estimated at 230 million tons, containing 20 million tons of titanium, in the 4,500-acre area controlled by the firm.

Tungsten.—The entire output of tungsten in Wyoming in 1956 came from the new mining operation of Warren Oil & Uranium Corp. of Fort Worth, Tex., at the old Robeson tungsten mines on Hoodoo Creek above the Quien Sabe ranch in the Copper Mountains section of central Wyoming. The ore was trucked to the Pioneer Carissa mill near South Pass City for treatment. The concentrate was sold to Wah Chang Corp. and Minerals Engineering Co.

Uranium.—For the 12 months beginning July 1, 1955, uranium mines in Wyoming produced 98,790 tons of ore averaging 0.22 percent contained U_3O_8. This tonnage represented 5 percent of the domestic total. Production data are based on information supplied to the Federal Bureau of Mines by the AEC. The most important producing area was Fremont County, followed by Converse, Campbell, and Carbon Counties.

Ore reserves for the State, as of November 1, 1956, totaled 2.3 million tons at an average grade of 0.22 percent contained U_3O_8.[3] Wyoming was credited with 3.8 percent of the total United States reserve estimate, which includes measured, indicated, and inferred tonnages.

Two contracts for mill construction in Wyoming were negotiated during the year with the AEC—a 400-ton-per-day mill was under construction at Split Rock by the end of the year, and a 750-ton-per-day mill was scheduled for construction in the Gas Hills area.

[3] Grand Junction (Colo.) Operations Office, Statistics on Domestic Uranium Production and Ore Reserves: AEC Release 178 Dec. 13, 1956.

TABLE 13.—Mine production of uranium ore in Wyoming during July 1955–June 1956 [1]

County	July–December, 1955			January–June, 1956		
	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)
Albany	2	(2)	(2)	1	(2)	(2)
Big Horn	1	(2)	(2)	3	(2)	(2)
Campbell	23	2,867	18,715	20	3,014	13,138
Carbon	3	(2)	(2)	4	(2)	(2)
Converse	10	(2)	(2)	12	(2)	(2)
Crook	9	(2)	(2)	5	(2)	(2)
Fremont	47	28,355	121,111	28	44,578	204,984
Johnson	5	214	441	9	(2)	(2)
Natrona	3	(2)	(2)	4	(2)	(2)
Niobrara	3	65	138	1	(2)	(2)
Sweetwater	1	(2)	(2)	1	(2)	(2)
Washakie	1	(2)	(2)			
Weston				1	(2)	(2)
Undistributed		9,864	41,625		9,833	42,718
Total	108	41,365	182,030	89	57,425	260,840

[1] Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.
[2] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."

During the latter part of the year, shipments to the AEC ore-buying station at Riverton were restricted because of the announced plans for the Gas Hills and Split Rock mills. This restrictive action avoided an excess stockpile of ore, which would later have to be reshipped to the processing plants.

Reports of private drilling showed that exploration activity in Wyoming tripled that of 1955 and totaled more than 1.2 million feet. Of this total footage, 60 percent was drilled in Fremont County, 20 percent in Converse, 10 percent in Campbell, and 5 percent in Carbon.

Four DMEA contracts for uranium exploration in Wyoming were executed during 1956; details are shown in table 3.

Vanadium.—A small quantity of vanadium was recovered from Wyoming uranium-vanadium ores shipped to the mill at Grand Junction, Colo. Most of the Wyoming uranium ores treated did not contain enough vanadium to warrant its recovery; however, a few deposits (in Campbell, Fremont, and Big Horn Counties) are known to contain more than 1.0 percent V_2O_5.

REVIEW BY COUNTIES

Albany.—The value of mineral production in Albany County continued upward and reached $5.4 million in 1956. Shipments of types I, II, and III, high-sulfate-resistance, oil well, and waterproof-portland cements contributed most of the value. Finished cement was hauled to consumers by truck and rail to points in Wyoming, Colorado, Idaho, Nebraska, New Mexico, and Texas. The average price per barrel in 1956 was $3.49 compared with $3.11 in 1955. Shale and crushed limestone quarried near the plant supplied part of the raw materials required. Gypsum produced locally by the Wyoming Construction Co. also was used to manufacture cement. Fluorspar, mill scale, pyrite cinders, and other miscellaneous raw materials were purchased from outside the county.

Petroleum was produced from five fields in Albany County and ranked second in value as a mineral commodity. A small quantity of natural gas was also reported. The Ohio Oil Co. produced natural-gas liquids in a plant at Rock River.

Great Western Aggregates, Inc., quarried shale from a deposit south of Laramie and trucked the crude ore to its shale-bloating plant adjacent to the Monolith cement plant.

TABLE 14.—Value of mineral production in Wyoming, 1955–56, by counties

County	1955	1956	Minerals produced in 1956 in order of value
Albany	$5,175,657	$5,365,047	Cement, petroleum, stone, clays, sand and gravel, gypsum, iron ore, gem stones.
Big Horn	33,181,201	34,593,845	Petroleum, clays, sulfur, sand and gravel, stone.
Campbell	606,921	624,441	Coal, sand and gravel, petroleum.
Carbon	6,657,027	6,713,246	Petroleum, coal, sand and gravel, stone, sodium sulfate, copper, gem stones, gold, silver.
Converse	15,632,671	15,340,568	Petroleum, coal, sand and gravel.
Crook	4,136,889	5,956,804	Clays, petroleum, sand and gravel, stone.
Fremont	32,063,315	34,888,506	Petroleum, sand and gravel, stone, gem stones, gold, coal, tungsten concentrate, copper, silver.
Goshen	390,701	377,650	Petroleum, sand and gravel, stone.
Hot Springs	33,019,352	35,369,539	Petroleum, coal, sand and gravel, stone.
Johnson	18,463,539	18,012,913	Petroleum, clays, sand and gravel, coal, stone, gem stones.
Laramie	1,936,702	2,039,512	Petroleum, stone, sand and gravel.
Lincoln	2,684,013	3,088,868	Coal, phosphate rock, petroleum, sand and gravel, stone, copper, silver, gold.
Natrona	15,184,799	18,101,568	Petroleum, sand and gravel, clays, sodium sulfate, stone, feldspar, beryllium concentrate, gem stones.
Niobrara	4,534,102	4,149,325	Petroleum, sand and gravel, stone.
Park	49,729,321	56,045,075	Petroleum, sulfur, sand and gravel, stone, gypsum, gem stones.
Platte	5,646,008	4,923,367	Iron ore, stone, sand and gravel.
Sheridan	4,114,943	4,423,113	Petroleum, coal, sand and gravel, pumice clays.
Sublette	989,060	1,018,320	Petroleum, sand and gravel, stone.
Sweetwater	26,561,629	25,526,781	Petroleum, sodium carbonate, coal, sand and gravel, gem stones, stone.
Teton	126,175	119,255	Sand and gravel, stone.
Uinta	242,780	229,220	Petroleum, sand and gravel, stone, gem stones.
Washakie	7,320,331	11,657,056	Petroleum, sulfur, sand and gravel, stone.
Weston	18,336,363	12,955,598	Petroleum, clays, sand and gravel, stone.
Yellowstone Park	8,770		
Undistributed [1]	11,822,061	15,377,687	
Total [2]	297,752,000	316,897,000	

[1] Includes value of natural gas, natural-gas liquids, sand and gravel, stone, gem stones, vanadium, and uranium.

[2] Total adjusted to eliminate duplicating the value of raw materials used in cement.

Sand and gravel output consisted of 18,000 tons of commercial production quarried by C. F. Yeoman and M. C. Justesen and 64,000 tons of Government-and-contractor output produced by C. J. Abbott, C. L. Hubner, Knisely-Moore Co., Larsen-Meyer Construction Co., and J. A. McPherson & Co., Inc., as contractors for the Wyoming State Highway Department. Ben Nott reported the collection of agate at the Bean ranch.

A small quantity of magnetite was mined by Magnetite Products Corp. from the Cobar No. 1 mine.

During the first half of 1956 uranium ore was shipped from the Desert Rose lease by Lincoln W. Sexton.

Big Horn.—Big Horn County oilfields along the northeastern flank of the Big Horn basin yielded 12.8 million barrels of crude petroleum. Nine-tenths of the county petroleum output was derived from the

Bonanza, Garland, and Byron fields. In the Torchlight field Stanolind Oil & Gas Co. discovered and produced from the Phosphoria formation. At Lovell the Ohio Oil Co. closed its refinery at the end of April. In October the plant was purchased by Big Horn Refining Co. and operated in October through December 1956.

In addition, the area was a source of natural gas produced largely from the Manderson and Five Mile fields. Natural-gas liquids and sulfur were recovered from the gas in plants at Manderson. The Manderson sulfur plant of Jefferson Lake Sulphur Co. completed its first full year of operation in 1956. This facility processed sour natural gas in conjunction with the natural-gas-liquids plant of Mobil Producing Co. A Modified Claus process was used to recover hydrogen sulfide from the natural gas, and in Wyoming it was the only plant that stored its sulfur in a molten state. When shipments of the finished product were made, the molten sulfur was drawn from the storage tank and fed to a multidecked rotating drier, where water passing between steel plates crystallized the sulfur. After crystallization the solidified mass was fed to a storage bin. The company also used the conventional pond or pool-type finished-product storage.

Magnet Cove Barium Corp. and Wyo-Ben Products Co. continued to mine and process crude bentonite for use in oil-well-drilling mud, foundries and steelworks, insecticides and fungicides, and chemicals and for export. Total output of ground material increased 15 percent in 1956 as a result of a strong demand for this commodity. Lovell Clay Products Co. quarried miscellaneous clay from an open pit near Lovell. The raw clay was trucked to the company brick plant at Lovell and used in building brick and other structural clay products.

Sand and gravel production in 1956 resulted from contracts let by the United States Bureau of Public Roads and the Wyoming State Highway Department. Knisely-Moore Co. was the contractor for the Federal agency and W. E. Barling, Inc., S. Birch & Sons Construction Co., and Alfred E. Matheson were the contractors for the State highway department. Stone output used as riprap consisted of 1,000 tons of crushed limestone supplied to the Wyoming State Highway Department by S. Birch & Sons Construction Co. and Forgey Bros. Co.

During the first 6 months of the year, uranium ore was shipped from the Mike No. 10 by Feusner & Sons and the Tri Pacer No. 4 and No. 5 by the Super Cub Mining Co.

Campbell.—Coal, sand and gravel, uranium, and petroleum comprised the minerals produced in Campbell County in 1956.

Output from stripping by the Wyodak Coal Co. continued to increase and furnished the county production of coal. Employment for the year averaged 27 men, who worked 307 days.

Uranium-ore shipments from 20 properties were made to Edgemont (S. Dak.), Riverton (Wyo.), and to a lesser extent Grand Junction (Colo.) during the first 6 months of the year. Total tonnage for the period was 3,014 tons of ore, with an average grade of 22 percent contained U_3O_8. The Colorado No. 1 (Price Exploration Co.), KM No. 1 (Charles Kelley), E & K No. 1 (Edwards & Kelley), and Phil No. 12 (Globe Mining Co.) claims furnished three-quarters of the production for the half year.

Sand and gravel production in 1956 reached 193,000 tons; Mullinax Engineering Co. quarried commercial paving gravel; Big Horn Construction Co., Husman Bros., Inc., Knisely-Moore Co., Richardson Construction Co., and M. S. Torbert & Son (contractors for the State highway department) prepared Government-and-contractor paving gravel.

A small quantity of petroleum was produced from the Bertha field.

Carbon.—Petroleum was produced from 11 Carbon County oilfields; the Wertz field (which lies both in Carbon and Sweetwater Counties), Rock River field, and Big Medicine Bow field were the most important sources of oil, supplying over 80 percent of the county total. The county was also a source of natural gas. At Sinclair the Sinclair Refining Co. operated the largest refinery in the State.

Three mines produced coal in 1956; two were strip mines. The mines, Nugget No. 1 (strip), Hannah No. 2 (strip), and Thomas, employed an average of 33 men.

In terms of value, sand and gravel was the major nonmetal produced in Carbon County during 1956. Production consisted of 16,000 tons of paving sand and gravel quarried by R. J. Voerding & Co. and 110,100 tons of paving sand and gravel produced by State highway department crews and private contractors. The firms holding highway contracts with the Wyoming State Highway Department were W. E. Barling, Inc., Knisely-Moore Co., and Larsen & Meyer Construction Co. Stone production comprised 123,000 tons of crushed limestone produced under contract for the State highway department and the city of Casper. The major contractors were Boatright & Smith and W. E. Barling, Inc.

Iowa Soda Products Co. produced 173 tons of sodium sulfate (Glauber's salt) in 1956 at Rawlins. H. L. Harvey, Halsey Kortes, and Root's Hobby Business collected jade, agate, and petrified wood valued at $315.

During the first half of the year the Fremont Uranium Corp. shipped uranium ore from the Cedar Hills No. 6 claim. Small shipments were also reported from three other properties.

R. H. Platt & H. V. Morris recovered gold, silver, and copper (combined value, $2,107) from 10 tons of gold ore and 8 tons of copper ore mined from the Platt mine in Carbon County.

Converse.—Output of petroleum (6.3 million barrels) from 7 oilfields furnished the major part of mineral value attributed to Converse County in 1956. The Carter Oil Co. was credited with a wildcat discovery in the Shawnee area (T. 34 N., R. 69 W.); production came from the Mesaverde formation.

Continental Oil Co. closed its refinery at Glenrock in January and was gradually dismantling the refinery at year end.

Uranium-ore shipments from 12 properties were made to the mill at Edgemont, S. Dak., in the first half of the year. The most productive properties were the Pat No. 8 operated by Kerr-McGee Oil Industries, Inc., and the Turnercrest No. 1 and No. 2 operated by Sundance Petroleum & Uranium Co.

The source of coal production in the county was the Antelope strip mine operated by the Best Coal Co.

Sand and gravel production in Converse County totaled 18,000 tons

valued at $8,000; the entire output was used in road construction. During the summer ground was broken for a new coal-fired thermal-electric plant at Glenrock by the Pacific Power & Light Co. The new plant, of 100,000-kw. capacity, reportedly will be supplied with fuel from strippable coal deposits 15 miles north of Glenrock. The coal is in 2 seams 25 and 35 feet thick and has a heat content of 7,800–8,000 B. t. u. per pound. Stripping ratios are expected to be less than 2 : 1.

Crook.—The total value of minerals produced in Crook County continued to rise; all commodities increased significantly in both quantity and value of output. Heading the list of important commodities was bentonite. Output in 1956 reached 404,000 tons valued at $5.3 million—a gain of 27 percent in tonnage and 32 percent in value over 1955. Open pits were mined by the Baroid Division, National Lead Co.; Wyodak Chemical Division, Federal Foundry Supply Co.; Eastern Clay Products Department, International Minerals & Chemical Corp.; American Colloid Co.; and Black Hills Bentonite Co. Bentonite-grinding plants were operated by National Lead Co. and Black Hills Bentonite Co., and the remaining crude material was processed at company-owned plants in other counties or at Belle Fourche, S. Dak.

Petroleum output gained substantially as a result of renewed interest in the Donkey Creek area. The field was originally discovered in 1953, but no substantial development was undertaken until 1956. True Oil Co. drilled 11 development wells in the field, one of which was dry. An additional producing well was drilled by The Texas Co.

Two new fields were discovered in 1956. The West Moorcroft field, producing from the Muddy sandstone, was discovered by the Owanah Oil & Development Co. The Glenwood Oil Co. was credited with discovering a productive zone from both the Lakota and Dakota formations in the Barton field.

Sand and gravel production also increased significantly over 1955 owing largely to more highway-construction activity in the county. Government-and-contractor output reached 238,000 tons, quarried by Big Horn Construction Co., Black Hills Constructors, Inc., Northwestern Engineering Co., and Summit Construction Co. as contractors for the Wyoming State Highway Department. All commercial production was reported by Mullinax Engineering Co. Some contractors for the State highway department quarried 4,200 tons of crushed limestone.

Uranium ore was shipped from several properties to the Edgemont (S. Dak.) mill in the first half of the year; the Busfield lease of Sodak Uranium & Mining Co., Inc., and the New Haven group of claims of Homestake Mining Co. furnished most of the ore.

Fremont.—Fremont County was a source of 11 mineral commodities in 1956. In addition to petroleum, which was the most valuable, uranium, natural gas, construction materials, gem stones, coal, gold, and other metals were produced within the county.

The chief sources of petroleum were the following fields, which produced over 1 million barrels during the year: Steamboat Butte, Big Sand Draw, Beaver Creek, Winkleman Dome, and Happy Springs; 16 other fields also yielded crude petroleum. Two of the above fields—Beaver Creek and Big Sand Draw and the Riverton

Dome field were important sources of natural gas. Natural gasoline was extracted at the Sand Draw plant by Northern Utilities Co.

Two discoveries (1 oil and 1 gas) were made during the year; both represented new productive areas in established fields. A new oil zone was found in the Crooks Gap field and a new gas zone in the South Sand Draw field.

Fremont County was Wyoming's most important uranium-producing area. During the year two mill-construction contracts were negotiated with the AEC. The first—a 400-ton-per-day plant—was under construction at Split Rock by the Lost Creek Oil & Uranium Co. The company operated properties in the Crooks Gap district and expected to meet ore requirements from its own operations plus ore commitments from operators in both the Crooks Gap and the Gas Hills districts. In the Gas Hills, the Lucky Mc Uranium Corp. (a subsidiary of Utah Construction Co.) negotiated a contract for a 750-ton-per-day mill. Ore for the latter mill was to be supplied from the Lucky Mc mine and other properties in the Gas Hills. When the plans for the two mills were announced, companies shipping to the Riverton buying station were placed on a quota basis to avoid excessive stockpiling of ore, which would later have to be reshipped to mills.

During the first 6 months of the year the more productive deposits were as follows:

Mine:	*Operator*
Bountiful No. 1	Valley-Dean Corp.
Bountiful No. 9	Two States Uranium Co.
Bullrush No. 5	Savanna Construction Co.
Dick No. 19	Globe Mining Co.
George No. 12	Do.
George No. 14	Do.
John No. 2	Vitro Minerals Corp.
Lucky Mc No. 2	Lucky Mc Uranium Corp.
Lucky Mc No. 20	Do.
Phil No. 3	Globe Mining Co.

The listed properties, all in the Gas Hills district, supplied more than three-quarters of the total ore produced in the county during the 6-month period. Other productive areas were the Crooks Gap district and Copper Mountain area.

The major nonmetals produced in the county continued to be construction materials—sand and gravel and stone. Gem stones valued at $54,000 were also reported. Sand and gravel and stone were produced by contractors for the State highway department and the Federal Bureau of Reclamation, except for a small quantity of commercial sand and gravel. Fremont County was again the center of the gem or ornamental-stone industry of the State. The types of stone collected in 1956 were predominantly jade, but epidote, thulite, agate, petrified wood, and jasper were also reported.

Elayer Co., Inc., mined 3,161 tons of gold ore containing some silver and copper from the Duncan mine and treated it in the company mill on the property. Material containing gold and some silver was recovered from a cleanup of the Carissa mill by Pioneer Carissa Gold Mines, Inc., and shipped to a smelter.

The Warren Oil & Uranium Corp. (Fort Worth, Tex.) reopened the old Robeson mines (sec. 22, T. 40 N., R., 93 W.) in the Owl Creek

Mountains northeast of Shoshoni in Fremont County. It was the only producer of tungsten in Wyoming in 1956. The ore was treated at the Pioneer Carissa mill near South Pass City.

Goshen.—Petroleum was produced from the Torrington field. During the year 13 wildcat holes were completed; none were successful. In the Torrington field, 5 development wells were drilled; only 1 was productive.

Construction and maintenance of highways by the construction crews of the Goshen County Highway Department and State highway department through private contractors resulted in the production of 255,000 tons of paving sand and gravel. The major contractors were Northwestern Engineering Co., Knisely-Moore Co., and Alfred E. Matheson. In addition, the Goshen Irrigation District produced 2,000 tons of paving sand and gravel for the Federal Bureau of Reclamation. Stone output amounted to 465 tons of crushed limestone used for riprap and quarried by contractors for the State highway department.

Hot Springs.—Mineral commodities produced in Hot Springs County in 1956 were petroleum, coal, sand and gravel, and natural gas; petroleum supplied virtually the entire total value. The major producing oilfields were the Hamilton Dome, Grass Creek, Gebo, Murphy Dome, and Golden Eagle; these 5 fields produced 90 percent of the county output of crude petroleum. Skelly Oil Co. was credited with discovery of the East Blue Springs field; oil was produced from the Phosphoria formation. Development drilling was concentrated in the Hamilton Dome and the Grass Creek fields. At Thermopolis Empire State Oil Co. operated a 5,000-barrel-per-day refinery on crude oil from the Hamilton Dome field.

The Roncco Coal Co. (Roncco mine) and the Grass Creek Coal Co. (Grass Creek or T & T mine) produced coal.

Taggart Construction Co., as contractor for the State highway department, was the only producer of sand and gravel in Hot Springs County during 1956. Stone production consisted of 2,700 tons of crushed limestone produced by Taggart Construction Co. and C. M. Smith; dimension limestone quarried by Husman Bros., Inc.; and crushed miscellaneous stone produced by C. M. Smith. All stone output for 1956 was used in constructing and maintaining highways.

Johnson.—Petroleum was produced from eight fields in Johnson County. Almost the entire output came from the Sussex, Meadow Creek, and West Sussex-Dugout fields; the Meadow Creek field was also a source of natural gas. During the year, Shell Oil Co. discovered the South Crazy Woman field, which yielded oil from the Tensleep formation. The remaining mineral fuel—coal—was produced from the Clear Creek No. 2 mine by the Clear Creek Coal Co.

In the first half of the year uranium ore was shipped from nine properties in Johnson County. Most productive of these properties were the Hanna No. 1 and Tyfil No. 1 mined by Sundance Petroleum & Uranium Co. and the Alice Mae Nos. 1 and 2 mined by Cram, Jones, Hansaker, & Swanson.

Nonmetals contributed only a small part of the total value of minerals produced in the county during 1956. Bentonite mined by Benton Clay Co. and milled at Casper was sold as a constituent of rotary-drilling mud. Paving gravel for highway construction was produced

by some highway contractors. Ornamental stone, consisting of 150 pounds of petrified wood, was collected by Crane's Rock Shop, and Boatright & Smith quarried 270 tons of crushed limestone for the State highway department.

Laramie.—Crude petroleum was produced from 4 fields (Horse Creek, Pine Bluffs, Borie, and Tracy) in 1956 and totaled 472,000 barrels. The Borie field was also a source of natural gas.

At Cheyenne, Frontier Refining Co. refined crude petroleum from oilfields of the Big Horn, Powder River, and Denver-Julesburg basins.

Laramie County was the leading producer of stone and ranked second in output of sand and gravel. Stone production comprised crushed granite quarried by Morrison-Knudsen Co. at its Horse Creek mine. The output was used mostly as railroad ballast and also as riprap, fill, poultry grit, and chips. Crushed limestone was mined by Great Western Sugar Co., Read Construction Co., and some contractors for the Wyoming State Highway Department. Commercial output of limestone was used mainly in refining sugar; a substantial tonnage was used for concrete aggregate, railroad ballast, mineral food, riprap, and flux. Government-and-contractor output was employed solely as riprap. The 372,000 tons of sand and gravel was entirely Government-and-contractor production reported by Big Horn Construction Co., Blanchard Construction Co., Knisely-Moore Co., J. A. McPherson & Co., Inc., Platte Valley Construction Co., and Read Construction Co. All material was washed or otherwise prepared and used by these contractors under contracts with the State highway department.

Lincoln.—Mineral products of Lincoln County in 1956 were, in order of value: Coal, phosphate rock, petroleum, sand and gravel, stone, natural gas, copper, and gold.

Output of coal increased to 690,000 tons in 1956. The Kemmerer Coal Co. (active at the Elkol strip mine and the Brilliant No. 8 underground mine) was the major producer. In addition, coal was produced from the Blind Bull mine by the Blind Bull Coal Co. Average employment at these 3 mines was 145 men.

The Lincoln County part of the La Barge field continued to be a source of crude petroleum. Three successful development wells were completed in the southern part of the field by Vaughan B. Connelly in 1956. The La Barge field was also a source of natural gas.

Nonmetals made up 28 percent of the total value of all minerals produced in Lincoln County. Phosphate rock was the most important nonmetal and was valued at $721,000—a more than twofold increase over 1955. The San Francisco Chemical Co. was the only active mining company; all output came from the Leefe mine. Sand and gravel production valued at $133,000 was chiefly Government-and-contractor output for the Wyoming State Highway Department. Highway-construction activities resulted in quarrying 6,100 tons of crushed limestone for riprap and roadstone by Big Horn Construction Co. and Rissler & McMurrey Co., Inc.

The Lake Creek mine near Cokeville in Lincoln County was mined from August 12 to October 10 by Blake G. Holley of Ogden, Utah. A total of 22 tons of ore, 13½ tons averaging 2.5 percent copper and 8½ tons averaging 3.4 percent copper was mined and shipped to the American Smelting and Refining Co. smelter at Garfield, Utah.

Natrona.—Natrona County oil production, principally from the Salt Creek field, yielded 60 percent of the county total; 23 other fields produced crude petroleum. The Salt Creek field was also an important source of the Wyoming natural-gas supply.

Five oil and two gas discoveries were reported in 1956; the most important appeared to be the Sinclair Oil & Gas Co. oil-productive zone in the Tensleep formation in the East Salt Creek field. The well reportedly flowed at nearly 2,000 barrels per day on initial testing.

Three refineries were operated at Casper by Standard Oil Co. of Indiana, The Texas Co., and Socony-Mobil Oil Co. At Midwest, Stanolind Oil & Gas Co. operated a natural-gas-liquids plant.

Sand and gravel continued to be the most important nonmetal in value. Output in 1956 reached 380,000 tons; 152,000 was commercial production quarried and prepared by the Casper Concrete Co., Malloy Construction Co., Mullinax Engineering Co., and See Ben Realty Co. In comparison, Government-and-contractor production was 228,000 tons of paving sand and gravel produced by crews of the State highway department and private contractors engaged in roadwork for the highway department. The Benton Clay Co. mined bentonite, which it milled at its Casper plant. Sales in 1956 were 74 percent greater than in 1955, and the ground bentonite was employed as rotary-drilling mud and for sundry other uses.

Natrona County was the principal source of sodium sulfate in the State. William E. Pratt recovered Glauber's salt from a deposit near Casper.

Government-and-contractor production for highway use contributed 1,150 tons of crushed limestone. Agate and petrified wood were collected and valued at $160. For the first time in many years, crude feldspar was mined and sold in 1956. Mine-run ore was quarried by R. V. McGuire from the Casper Mountain mine, and shipments were made to the Denver (Colo.) grinding plant of International Minerals & Chemical Corp.

Uranium ore was shipped from 4 properties during the first 6 months of the year. Most productive of the properties was the Aljob Mining Co. Aljob No. 9 in the eastern part of the Gas Hills district.

International Minerals & Chemical Corp. produced beryllium concentrate (beryl) from the Catherine No. 1 mine. The concentrate was hand-sorted and sold to the Government (GSA) Custer (S. Dak.) Purchase Depot.

Niobrara.—Crude oil was produced from eight fields; Lance Creek, Little Buck Creek, and Mule Creek fields were the most important. The Lance Creek and East Lance Creek fields were sources of natural gas. One refinery was operated at Lusk by the C & H Refinery Co.; the refinery processed crude oil from the Lance Creek field.

At Manville, Continental Oil Co. operated a natural-gasoline plant. During 1956 construction was begun on a new natural-gas-liquids plant to replace the existing Continental facilities. The new unit will be owned by Continental Oil Co., Argo Oil Co., and the Ohio Oil Co. (the operator).

Owing to a shift in highway-construction work, output of sand and gravel in 1956 declined to 51,000 tons—less than half of the 1955 total. Mullinax Engineering Co. was the commercial operator, and

Lamb Construction Co. and J. A. McPherson & Co., Inc., were the producer-contractors for the Wyoming State Highway Department. Crushed limestone for highway use totaled 146 tons.

J. L. Starns shipped uranium ore from the Silver Cliff property.

Park.—Park County was the State's most important crude-oil-producing area and supplied 22 percent of the Wyoming total in 1956. The county was an important source of natural gas and elemental sulfur. Construction materials, natural-gas liquids, gypsum, and gem stones also were produced.

The most important oilfields, in terms of production, were the Elk Basin, Oregon Basin, and Frannie, which yielded 80 percent of the county output; production was also reported from 22 other fields. Major natural-gas-producing fields were Elk Basin, Heart Mountain, and Silvertip.

The Husky Oil Co. operated one refinery at Cody. At Elk Basin a natural-gas-liquids plant and sulfur-recovery unit were operated by the Stanolind Oil & Gas Co. At Powell, the Seaboard Oil Co. recovered sulfur from natural gas.

The recovery of elemental sulfur in liquid purification of sour natural gas continued to dominate the nonmetal mineral industry of Park County. Sales of sulfur in 1956 dropped to 22,500 tons (a decrease of 26 percent from 1955), but production declined only 1 percent; the excess of output over shipments was stockpiled. The producing companies were Seaboard Oil Co. at Silvertip and Stanolind Oil & Gas Co. at Elk Basin. Construction-materials production consisted of 4,000 tons of commercial paving sand and gravel and 173,000 tons of Government-and-contractor paving sand and gravel, along with 2,800 tons of crushed granite, limestone, miscellaneous stone, and sandstone. All stone output was reported by contractors for highway construction. Agricultural gypsum was produced by the Wyoming-Gulf Sulphur Co. of Cody; output resulted from experiments to recover sulfur from native sulfur-gypsum ore. Ornamental stones—agate and petrified wood—valued at $660 were collected by Ted Ebert.

Platte.—Colorado Fuel & Iron Corp. continued to mine iron ore (hematite) from its Sunrise mine and to ship the ore directly to its plant at Pueblo, Colo., for production of steel. Output in 1956 was less than in 1955 because of a labor strike throughout July at the company steel mill.

The Guernsey Stone Co. quarried crushed limestone—the most important nonmetal in Platte County during 1956. Output was 361,000 tons, an 18-percent increase over 1955. The production was used mostly as railroad ballast and also as concrete aggregate and riprap. C. F. Lytle Co. quarried and crushed 6,800 tons of sandstone for riprap. Sand and gravel production consisted of 79,000 tons of paving gravel quarried by D. W. Hopkins, J. A. McPherson & Co., Inc., and Read Construction Co. as contractors for the Wyoming State Highway Department.

Sheridan.—Crude oil was produced from the Ash Creek and South Ash Creek fields and supplied two-thirds of the value of county mineral production.

Coal was produced at three mines—the Big Horn strip mine (Big Horn Coal Co.), the Welch strip mine (Welch Coal Co.), and the

Storm King underground mine (Storm King Coal Co.). The mines employed an average of 79 men during 1956.

Because of a shift in the location of highway-construction work, output of sand and gravel declined to 89,500 tons in 1956—a 42-percent drop from 1955. Big Horn Construction Co. and Alfred E. Matheson were contractors for the Wyoming State Highway Department, and Basil Dean, Mullinax Engineering Co., and Sheridan Sand & Gravel Co., Inc., furnished the commercial output. The shutdown of the Sheridan Wyoming Coal Co. scoria-mining operation reduced the tonnage of volcanic scoria (pumice) in Sheridan County during 1956 to 45,500 tons. The Tongue River Stone Co. was the only company actively producing scoria for railroad ballast and concrete aggregate. Clay production consisted of 1,600 tons of miscellaneous clay mined by the Sheridan Pressed Brick & Tile Co. and used in building brick and other structural-clay products at its Sheridan plant.

Sublette.—Oilfields yielding petroleum in 1956 were: La Barge, Tiptop, North La Barge, Big Piney, and Hogsback. The major source of natural gas was the Big Piney field. In August a 10-inch gasline was completed to connect the Big Piney field with the Pacific Northwest pipeline. Belco Petroleum Corp. did extensive development drilling in the field.

Carruth & Son, Inc., Rasmussen Bros., Studer Construction Co., and L. H. Weber, as contractors for the State highway department, produced 149,000 tons of paving sand and gravel, and L. H. Weber quarried 36 tons of crushed limestone. Both the stone and sand and gravel mined in 1956 were consumed in constructing highways.

Sweetwater.—Sweetwater County mineral products were principally petroleum, trona, coal, and natural gas. The county was the Nation's major source of trona and Wyoming's chief source of coal and natural gas. Construction materials, gem stones, uranium, and natural-gas liquids were also produced.

Sweetwater County petroleum output came from the Lost Soldier, Wertz, Church Buttes, and Hiawatha fields. Major gas-producing fields were the Baxter Basin, Canyon Creek, Church Buttes, Lost Soldier, and Hiawatha.

Exploration drilling during the year resulted in discovery of the Twin Rocks field (sec. 29, T. 21 N., R. 103 W.) by Carter Oil Co., the North Baxter Basin extension (sec. 23, T. 20 N., R. 104 W.) and the Chimney Rock field (sec. 12, T. 18 N., R. 102 W.) by Mountain Fuel Supply Co., and the Potter Mountain field (sec. 12, T. 14 N., R. 103 W.) by British-American Oil Producing Co.

In the fall, the Colorado Interstate Gas Co. completed a 22-inch branch-line connection from the Pacific Northwest pipeline to Denver, Colo. A natural-gas-liquids plant was operated at Baroil by Sinclair Oil & Gas Co.

Coal production declined sharply and totaled 0.9 million tons compared with 1.3 million in 1955. Cutbacks in production were recorded at mines operated by the Union Pacific Coal Co. and the Colony Coal Co. The Nugget No. 2 strip mine, 1 of the 2 mines operated by the latter company, was idle most of the year. The total average coal-mine employment for the county in 1956 was 563 men, compared with 655 men in the preceding year. Major producing

properties in 1956 were the Superior D. O. Clark and Stansbury mines of the Union Pacific Coal Co. and the Rainbow No. 3 mine of the Gunn-Quealy Coal Co.

Next to petroleum the mining of trona (natural sodium carbonate) and the subsequent reduction to soda ash constituted the most important single activity of the mineral industry of the county as well as the State. Shipments of soda ash and crude and calcined trona reached 338,000 tons valued at $8.3 million in 1956 compared with 319,000 tons valued at $7 million in 1955. Most of the 49,500 tons of sand and gravel production reported in 1956 was essentially commercial structural sand and gravel quarried by Layos & Layos, although some structural sand and paving gravel were produced for the Federal Bureau of Reclamation and the Wyoming State Highway Department by Sharrock & Pursel, Rasmussen Bros., and Don VanDeburg.

In addition, all of the crushed granite was classified as Government-and-contractor output and quarried by Sharrock & Pursel for the State highway department. No scoria (pumice) was mined in 1956 because of the shutdown of the Superior Pumice Co., Inc., operation near Superior. Gem or ornamental stones valued at $13,900 were collected and consisted of jade, agate, turritella, moss agate, petrified wood, and petrified and agatized algae.

Uranium ore was shipped from the Lucky Turk No. 15 claim by the Black Buttes Uranium Co. during the first 6 months of the year.

Teton.—The total value of mineral production in Teton County in 1956 was made up of 103,500 tons of sand and gravel quarried by Gibbons & Reed, Northwestern Engineering Co., Strong & Co., and Don VanDeburg, contractors for the Federal Bureau of Public Roads and the State highway department; and 10,100 tons of crushed limestone quarried by the Utah-Idaho Sugar Co. and used solely in refining sugar.

Uinta.—Natural gas from the Church Buttes field was the most valuable mineral commodity produced in Uinta County. The gas was piped in large part to Salt Lake City, Utah, through lines of the Mountain Fuel Supply Co. The same company also operated a natural-gasoline plant at Church Buttes.

Petroleum was produced from the Church Buttes and Spring Valley fields.

Sand and gravel production in Uinta County during 1956 resulted from highway contracts let by the Wyoming State Highway Department; F. R. Knowlton & Son and Don VanDeburg were the contract producers. Stone production consisted of 78 tons of dimension limestone quarried by F. R. Knowlton & Son for use as rough construction stone. In addition, 25 pounds of petrified wood was collected by E. Witka in the Carter area.

Washakie.—Mineral products of Washakie County in 1956 were petroleum, sulfur, natural gas and associated liquid products, and construction materials.

The major producing oilfields were the Cottonwood Creek, Worland, Slick Creek, and Murphy Dome. A sharp increase in production from the Cottonwood Creek field furnished the 79-percent increase in petroleum output for the county. In 1956 a major program of

development drilling was carried out in the Cottonwood Creek field by the Stanolind Oil & Gas Co.

The Worland field (Wyoming's leading producer of natural gas) and the Neiber Dome field were the major sources of natural gas in the county. At Worland, Pure Oil Co. operated a natural-gas-liquids plant and transmitted hydrogen sulfide gas to the Texas Gulf Sulphur Co. sulfur plant nearby.

Sulfur continued to rank second in terms of value of output in Washakie County during 1956, and shipments of elemental sulfur were 12 percent greater than in 1955. Although three plants were operated during 1956, only the Texas Gulf Sulphur Co. reported sales of finished product. Construction work at the Neiber Dome plant of Signal Oil & Gas Co. was completed during the year and, coupled with the Stockham Federal facility (built in 1955) of the same company, productive capacity of the industry increased considerably. A total of 9,300 long tons of elemental sulfur was recovered at both plants (Signal Oil & Gas Co.), but no shipments were made.

Other nonmetal production consisted of 18,500 tons of sand and gravel quarried by Niel Sorenson and Mullinax Engineering Co. for resale and Taggart Construction Co. for use under contracts with the State highway department and the Federal Bureau of Public Roads. Stone output resulted from contracts let by the State highway department to McClellan & MacQueen, Inc., and Taggart Construction Co. and by the Federal Bureau of Reclamation to D. M. Manning and Long Construction Co.; crushed limestone and crushed sandstone were the types of stone produced.

Weston.—The Clareton and Black Thunder areas of the Clareton Trend plus the West Mush Creek and Skull Creek fields were the major oil-producing fields of Weston County in 1956. Continued development drilling in the Clareton Trend placed Weston County second only to Natrona County in number of development wells successfully completed, although drilling activity was half that of 1955. County production dropped sharply during the year, mainly owing to curtailed output from the Clareton and Black Thunder areas; decreased output, however, was characteristic of all but a few of Weston County's 15 fields.

At Newcastle the Sioux Oil Co. refinery underwent modification to increase yields of the lighter petroleum fractions. In addition, the company constructed and placed in operation a natural-gasoline plant. The dry gas from the plant was used as fuel for the refinery. A second natural-gasoline plant was also operated at Newcastle by the Mountain Valley Corp.

Uranium ore was shipped during the first 6 months of the year from a school-section lease by C. L. Wicker.

Weston County ranked third as a producing area for bentonite. Three of the major producers in the State operated mines at Osage and Upton, and two grinding plants processed the crude ore at Clay Spur and Upton. The Baroid Division of National Lead Co., Wyodak Division of Federal Foundry Supply Co., and American Colloid Co. reported shipments totaling 185,500 tons valued at $3.1 million. Major uses for the ground product included rotary-drilling mud, bonding agent at foundries and steelworks, concrete admixture (sealing dams, etc.), and other applications.

Sand and gravel produced in 1956 consisted of 82,000 tons of paving gravel produced by Mullinax Engineering Co. for resale and by Big Horn Construction Co., Black Hills Constructors, Inc., Inland Construction Co., and Knisely-Moore Co. as contractors for the Wyoming State Highway Department. Highway-construction contracts let by the State highway department resulted in the production of 2,000 tons of crushed limestone by the Inland Construction Co.; the crushed stone was used as riprap on a road project.