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MINERALS YEARBOOK

FUELS

Volume II

1953

Prepared by the staff of the
BUREAU OF MINES
FUELS AND EXPLOSIVES DIVISION
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UNITED STATES DEPARTMENT OF THE INTERIOR

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FOREWORD

MINERALS YEARBOOK 1953 is published in three volumes to provide a more comprehensive review of mineral-industry activities than was possible when all data were bound in a single volume. The results of the decision to change from a one-volume to a three-volume publication with the MINERALS YEARBOOK 1952 have been gratifying because presentation of additional data has been possible with a format that permitted improvements in printing and binding. The MINERALS YEARBOOK will continue to record the year's progress and developments, with enough historical background to give full significance to current activities.

The three-volume YEARBOOK permits fuller coverage in all phases of the reports, but major expansion has been undertaken in the regional presentation (volume III) and in the review of technologic developments and problems in the commodity presentation (volumes I and II).

In the current three-volume presentation, volume I is composed of chapters on mineral commodities, both metals and nonmetals, but exclusive of the mineral fuels. Included also are a chapter reviewing these mineral industries, a statistical summary, and chapters on mining technology, metallurgical technology, trends in technology and operations, and employment and injuries.

Volume II, which is devoted to the mineral fuels, consists of chapters on each mineral-fuel commodity, as well as chapters reviewing the industry as a whole, a statistical summary, and an employment and injury presentation.

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 chapter recapitulating its statistics in summary form on a regional basis and another presenting employment and injury data regionally.

The Bureau of Mines wishes to acknowledge again the cooperation of industry and of many Government groups in the preparation of the YEARBOOK. Among the latter, some of the State geological surveys and mining bureaus have been of much assistance, particularly with their help in gathering and preparing the material that appears principally in volume III.

J. J. FORBES, *Director*.

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The chapters in this volume of the MINERALS YEARBOOK were prepared by the staff of the Fuels and Explosives Division of the Bureau of Mines. Those chapters dealing with coal and its products were prepared under the general supervision of T. W. Hunter, chief, Coal Branch; the chapters on petroleum and related commodities were prepared under the general supervision of R. A. Cattell, chief, Petroleum and Natural Gas Branch, and H. J. Barton, Petroleum and Natural Gas economics coordinator; data for Far Western States were compiled under the direction of E. T. Knudsen, Region III.

Because of the many sources of data presented, it is impossible to give credit to each source individually, but acknowledgment is here made of the ready and willing cooperation of producers and users of fuels who supplied data and of the business press, trade associations, scientific journals, international organizations, and State and Federal agencies. The United States Department of Commerce furnished data on foreign trade, and the United States Foreign Service provided information on foreign production and developments.

The mining and geology and related departments of the respective States and Alaska have been most cooperative and have made available supplementary and verifying information with respect to production and plant operations. For their assistance I am deeply grateful, and acknowledgment is made to the following State organizations which assisted with the canvasses of bituminous coal and lignite:

Alabama: Division of Safety and Inspection, Birmingham.
Alaska: Territorial Department of Mines, Juneau.
Arizona: State mine inspector, Phoenix.
Arkansas: State mine inspector, Fort Smith.
Colorado: Colorado Coal Mine Inspection Department, Denver.
Georgia: Department of Mines, Mining, and Geology, State Division of Conservation, Atlanta.
Illinois: State Department of Mines and Minerals, Springfield.
Indiana: Bureau of Mines and Mining, Terre Haute.
Iowa: State mine inspectors, Des Moines.
Kansas: State Mine Inspection Division, Pittsburg.
Kentucky: Kentucky Department of Mines and Minerals, Lexington.
Maryland: Maryland Bureau of Mines, Westernport.
Missouri: Division of Mine Inspection, Jefferson City.
New Mexico: State inspector of mines, Albuquerque.
North Dakota: State coal-mine inspector, Bismarck.
Ohio: Division of Mines and Mining, Ohio Department of Industrial Relations, Columbus.
Oklahoma: Chief mine inspector, Oklahoma City.
Pennsylvania: Pennsylvania Department of Mines, Harrisburg.
Tennessee: Tennessee Division of Mines, Knoxville.
Utah: Safety Division, Industrial Commission of Utah, Salt Lake City.
Virginia: Division of Mines, Virginia Department of Labor and Industry, Big Stone Gap.
Washington: Chief coal-mine inspector, Department of Labor and Industries, Seattle.
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Wyoming: State coal-mine inspector, Rock Springs.

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Michigan: Department of Conservation, Lansing.
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Arkansas: Arkansas Oil and Gas Commission, El Dorado.
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Illinois: Oil and Gas Division, and State Geological Survey Division, Urbana.
Kansas: State Geological Survey, Lawrence.
Maryland: Department of Geology, Mines, and Water Resources, Baltimore.
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Missouri: Division of Geological Survey and Water Resources, Department of Business and Administration, Rolla.
New York: New York State Science Service, Albany.
North Dakota: North Dakota Geological Survey, Grand Forks.
Ohio: Oil and Gas Section, Department of Natural Resources, Columbus.
Tennessee: Division of Geology, Department of Conservation, Nashville.
Virginia: Geological Survey Division, Department of Conservation and Development, Charlottesville.
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The foreign section on petroleum was assembled by F. X. Jordan, Petroleum Administrator for Defense, and James G. Kirby coordinated the preparation of petroleum statistics. Edward T. Knudsen compiled all petroleum data for the California district.

Mabel E. Winslow edited and prepared the copy for the printer and compiled the index.

Thelma Stewart reviewed the chapters for statistical accuracy and consistency among chapters and expedited the flow of work.

The world production tables were prepared under the supervision of Berenice B. Mitchell, of the Foreign Minerals Region, and data on international trade were assembled by Mae B. Price and Elsie D. Page, Foreign Minerals Region.

Other Bureau of Mines employees who substantially assisted authors of the chapters by compiling and checking data include Edith D. McKinney and Bertha M. Reynolds, of the Anthracite and Coke sections, and Gladys Hilton, Ann Mahoney, Zena M. Mohme, and Marie Sleighter, of the Petroleum and Natural Gas Branch.

Louis C. McCabe.

CONTENTS

PART I. GENERAL REVIEWS

Review of the Mineral-Fuel Industries in 1953

By T. W. Hunter and H. J. Barton

GENERAL SUMMARY

THE TOTAL new energy supply in the United States in 1953 increased more than 1 percent over 1952, to overcome the decline of the previous year. Although the percentage of the total contributed by coal and waterpower declined somewhat, these were offset by increases for crude petroleum and natural gas, as indicated in table 1. The preliminary figure of 39.2 quadrillion B.t.u. of total new energy supply in 1953 was second only to the alltime high to date of 39.5 quadrillion B.t.u. in 1951.

Resumption of the upward trend in overall energy supply that has prevailed generally since the end of World War II was consistent with the 5.4-percent rise in gross national product during the year—from

TABLE 1.—Energy supplied by mineral fuels and waterpower in the United States, 1952–53

[Trillion British thermal units [1] [2]]

	1952	Percent of total	1953 [3]	Percent of total	Change from 1952 (percent)
Pennsylvania anthracite	1,031	2.7	786	2.0	−23.8
Bituminous coal and lignite	12,231	31.5	11,981	30.6	−2.0
Total coal	13,262	34.2	12,767	32.6	−3.7
Crude petroleum:					
Domestic	13,282	34.2	13,671	34.9	+2.9
Imports [4]	2,041	5.3	2,220	5.6	+8.8
Total	15,323	39.5	15,891	40.5	+3.7
Natural gas (marketed production)	8,614	22.2	9,027	23.0	+4.8
Total petroleum and natural gas	23,937	61.7	24,918	63.5	+4.1
Total mineral fuels	37,199	95.9	37,685	96.1	+1.3
Waterpower	1,581	4.1	1,522	3.9	−3.7
Grand total	38,780	100.0	39,207	100.0	+1.1

[1] The unit heat values employed are: Anthracite, 12,700 B. t. u. per pound; bituminous coal and lignite, 13,100 B. t. u. per pound; petroleum, 5,800,000 B. t. u. per barrel; natural gas, 1,075 B. t. u. per cubic foot. Waterpower includes installations owned by manufacturing plants and mines, as well as Government- and privately-owned public utilities. The fuel equivalent of waterpower is calculated from the kilowatt-hours of power produced wherever available, as it is true of all public-utility plants since 1919. Otherwise, the fuel equivalent is calculated from the reported horsepower of installed water wheels, assuming a capacity factor of 20 percent for factories and mines and of 40 percent for public utilities.
[2] Includes gasoline, lubricants, and other products with which coal does not compete.
[3] Preliminary.
[4] Includes crude, residual, and distillate.

346.1 billion dollars in 1952 to 364.9 billion in 1953. Among contributing factors was the heavily increased consumption of fuels at coke ovens and at electric power utilities. In the consumption of fuels for generating electric energy during the 10 years ended in 1953 oil increased 358 percent, natural gas 242 percent, and coal 52 percent.

The production of bituminous coal declined 2 percent during the year to the figure of the mid-30's, and anthracite production dropped almost 24 percent to the lowest point since 1888. There was a correspondingly heavy decline in employment, and many mines were closed.

The daily average production of crude petroleum during 1953 was 2.9 percent greater than in 1952, continuing the long-term growth that has characterized the industry. Growth in the output of natural-gas liquids continued to exceed that for crude oil, and 1953 saw an increase of 6.8 percent. The 4.8-percent increase in marketed production of natural gas in 1953 was somewhat less than the rate of increase for several preceding years.

During the year the industry drilled over 48,000 wells, of which 25,762 were commercial oil producers, 3,806 gas wells, and the balance (almost 40 percent of the total), dry holes. This rate of success in drilling operations is comparable with that of recent years.

Income originated in the crude-petroleum and natural-gas industries continued to rise, in accordance with the trend for national

TABLE 2.—Salient statistics of the fuel industries in the United States, 1952–53

	1953	1952	Change from 1952 (percent)
Production:			
Bituminous coal million net tons	457.3	466.8	−2.0
Crude petroleum million bbl [1]	2,357.1	2,289.8	+2.9
Natural gas, marketed production billion cubic feet	8,396.9	8,013.5	+4.8
Anthracite million net tons	30.9	40.6	−23.9
Value of production:			
Bituminous coal, f. o. b. mine or plant million dollars	2,247.8	2,289.2	−1.8
Crude petroleum, value of production at wells do	6,327.1	5,785.2	+9.4
Natural gas, value at well do	772.5	625.0	+23.6
Anthracite, f. o. b. mine or plant do	299.1	379.7	−21.2
Consumption (apparent):			
Bituminous coal million net tons	426.8	418.8	+1.9
Crude petroleum, runs to stills million bbl	2,554.9	2,441.3	+4.7
Natural gas billion cubic ft	7,979.3	7,613.5	+4.8
Anthracite million net tons	28.0	35.3	−20.7
Stocks, year end:			
Bituminous coal do	85.3	81.8	+4.3
Crude petroleum million bbl	274.4	271.9	+0.9
Natural gas			
Anthracite million net tons [2]	4.2	4.7	−10.6
Imports:			
Bituminous coal million net tons [3]	0.2	0.3	−33.3
Crude petroleum million bbl.[4]	236.5	209.6	+12.8
Natural gas billion cubic ft.[4]	9.2	7.8	+17.9
Anthracite million net tons [3]	.031	.029	+6.9
Exports:			
Bituminous coal do	33.8	47.6	−29.0
Crude petroleum million bbl.[3]	19.9	26.7	−25.5
Natural gas billion cubic ft.[4]	24.0	27.5	−12.7
Anthracite million net tons [3]	2.7	4.6	−41.3
Employment:			
Bituminous coal, average number working daily	293,106	335,217	−12.6
Crude petroleum and natural gas (annual average in thousands)[5]	305.1	290.6	+5.0
Anthracite (average number employed)	57,862	65,923	−12.2

[1] Preliminary.
[2] Producers and estimated retail-dealer stocks only.
[3] U. S. Department of Commerce.
[4] Bureau of Mines data.
[5] Bureau of Labor Statistics, U. S. Department of Labor.

income during the past 3 years. Income in the coal industries, however, continued to decline, both in the absolute and as a percentage of the total national income.

Spurred by the continuing search for methods of reducing costs, increasing efficiency in production and utilization, and stimulating new markets and new opportunities for economic progress, there were important advances during the year in research and other developments pertaining to the respective mineral fuels. Included were increased mechanization of underground mining and coal preparation and a 52-percent increase in the production of coal by auger mining.

The most marked changes in oil production were in the Rocky Mountain area, where 1953 output was 19 percent greater than in 1952 compared with the 3-percent increase for the entire country, and in North Dakota and Nebraska, where production rose 172 percent. These sharp increases were attributable in part to the discovery and development of new fields but more particularly to completion of pipelines to carry the crude oils to refineries in the Chicago and St. Louis area.

In drilling, two States—California and Louisiana—attained new deeper producing depths in 1953, and California established a national record of 17,892 feet. New records also were established for dry holes in California, New Mexico, and New York; the national record of 21,482 feet was established in California. The average depth of all wells drilled reversed the long-term upward trend in 1953 and fell to 4,069 feet in 1953, or 63 feet less than the 1952 average.

TABLE 3.—Consumption of bituminous coal and lignite in the United States, 1952–53, by major consumer groups

[Thousand net tons]

Year	Electric power utilities [1]	Class I railroads [2]	Coke plants	Steel and rolling mills	Cement mills	Other industrials	Retail deliveries	Bunker foreign trade [3]	Total
1952	103,309	37,962	97,614	6,820	8,073	95,863	68,393	723	418,757
1953	112,283	27,735	112,874	6,207	8,362	97,437	61,295	605	426,798

[1] Federal Power Commission.
[2] Association of American Railroads.
[3] Bureau of Census, U. S. Department of Commerce.

TABLE 4.—Sales of fuel oils and natural gas in the United States, 1952–53, by major consumer groups

[Fuel oils—thousand barrels, natural gas—million cubic feet]

	Railroads	Vessels	Gas and electric power plants	Smelters, mines, and manufactures	Space heating and cooking	Military	Oil-company fuel	Miscellaneous	Total
Distillate fuel oil:									
1952	68,002	17,213	8,350	42,760	279,326	9,644	7,976	45,939	479,210
1953	75,246	16,898	6,825	42,384	283,100	9,569	7,755	47,067	488,844
Residual fuel oil:									
1952	40,489	110,412	70,497	158,373	79,151	37,185	54,421	5,745	556,273
1953	28,477	114,324	85,352	166,748	81,824	30,435	51,243	6,326	564,729
Natural gas:									
1952			[1] 910,117	3,455,687	2,137,635		2,020,156		7,613,478
1953			[1] 1,034,272	3,733,405	2,216,153		2,029,780		7,979,338

[1] Used at electric utility plants, includes gas other than natural; natural-gas component included under "Smelters, mines, and manufactures."

CONSUMPTION

Although the production of bituminous coal declined during 1953, United States consumption increased 2 percent, the production drop having resulted primarily from a decrease in foreign shipments and a further drop in consumption by class I railroads. The latter continued its downward trend as a result of the dieselization of lomomotives. Also, there was a further substantial drop in retail coal deliveries. These were more than offset, however, by strong increases in coal consumption at electric power utilities and coke ovens, and by a reversal of the downward trend in "other industrials." (See table 3.)

As the demand for industrial sizes of anthracite outruns supply, the continuing decline in anthracite consumption was due almost entirely to the loss of space-heating markets to competing fuels.

Consistent with the steadily increasing demand for electric energy, fuel consumption by electric power utilities in 1953 increased as follows: Fuel oil, 22 percent; natural gas, 13 percent; and coal, 8 percent.

Indicative of the continuing shift in the pattern of energy utilization from coal to liquid and gaseous fuels, during the decade 1944–53 the contribution of coal to the total annual energy supply decreased from 55.2 to 32.5 percent, while that of oil and natural gas increased from 28.7 to 40.6 percent and 11.9 to 23.0 percent, respectively. Waterpower remained relatively constant at approximately 4 percent.

Declining coal consumption in the various areas of energy utilization resulted primarily from the increased use of residual fuel oil in industrial markets, of distillate oils in space heating and locomotive-fuel markets, and of natural gas in both industrial and space-heating markets.

Factory sales of mechanical stokers for burning coal decreased almost 28 percent during the year, while shipments of domestic oil burners, boiler-burner units, and furnace-burner units increased 15.6 percent, according to data of the United States Department of Commerce.

The gains of 2.0 percent in sales of distillate fuel oils and 1.5 percent for residual fuel for 1953 were quite modest relative to the increases in other recent years. Railroad use of distillate (diesel) fuel oil was the only item of this grade showing a substantial increase (10.7 percent) but this was offset by a 29.7-percent decrease in railroad use of residual fuel, so that the total sales of fuel oils to railroads fell from 108 million barrels in 1952 to 104 million in 1953. Other changes for distillate fuel oils were relatively small, except that sales to gas and electric power plants fell 18.3 percent.

In addition to the sharp decrease in sales of residual fuel oil to railroads, military use of this product fell 18.2 percent in 1953, reflecting the lower rate of activity following cessation of hostilities in Korea. Sales to gas and electric power plants showed the sharpest increase—21.1 percent—demonstrating the availability of adequate supplies at attractive prices. Other changes in sales of residual fuel were relatively small, with increases prevailing.

All uses of natural gas increased in 1953 over 1952; the sharpest rises were 13.6 percent for generation of electricity and 8.0 percent for general industrial use. The overall increase of 4.8 percent compares with 2.0 percent for bituminous coal and lignite and 1.3 percent for distillate and residual fuel oils combined.

Irrespective of the gains of oil and natural gas in the overall mineral-fuels market, which includes gasoline and other uses for which coal is not competitive, coal still is the largest supplier of energy in the United States for industrial purposes.

EMPLOYMENT AND WORKING TIME

The average number of employees in the bituminous-coal and anthracite industries declined 12.6 and 12.2 percent, respectively, in 1953. The average daily working force in the bituminous-coal and lignite industry in 1953 totaled 293,106 men compared with 335,217 in 1952. In the anthracite industry the decline was from 65,923 to 57,862. Because of competitive pressures for continually advancing efficiency in coal production, it is significant that net tons mined per man-day in 1953 in the bituminous-coal and lignite industry was 8.17 compared to 7.47 in 1952. Output per man-year increased from 1,389 tons to 1,560.

In the anthracite industry the output per man-day increased from 3.06 tons in 1952 to 3.28 in 1953, owing principally to the increased percentage of strip production. Because fewer days were worked in 1953, however, the net tons mined per man per year was 535 in 1953 compared with 615 in 1952.

Total employment in the petroleum industry during 1953 was 1,673,200, about 5 percent more than in the preceding year. Of this total 305,100 were engaged in the production division, 236,300 in refining, 128,900 in transportation, 241,700 in wholesale distribution and 761,200 in retail distribution.

TABLE 5.—Hours worked and gross earnings of production workers in the fuel industries, 1949–53

[Bureau of Labor Statistics, U. S. Department of Labor]

	1949	1950	1951	1952	1953
Bituminous coal:					
Average weekly earnings	$63.28	$70.35	$77.79	[1] $78.09	$85.31
Average weekly hours	32.6	35.0	35.2	[1] 34.1	34.4
Average hourly earnings	$1.94	$2.01	$2.21	$2.29	$2.48
Anthracite:					
Average weekly earnings	$56.78	$63.24	$66.66	$71,19	$72.91
Average weekly hours	30.2	32.1	30.3	31.5	29.4
Average hourly earnings	$1.88	$1.97	$2.20	$2.26	$2.48
Petroleum and natural gas (except contract services):					
Average weekly earnings	$71.48	$73.69	$79.76	$85.90	$90.39
Average weekly hours	40.2	40.6	40.9	41.1	40.9
Average hourly earnings	$1.78	$1.82	$1.95	$2.09	$2.21

[1] Revised.

Both hourly and weekly earnings in all fuel industries have increased steadily since 1949. The average weekly hours worked in 1953 in the bituminous-coal industry increased from 34.1 in 1952 to 34.4 in 1953. For the anthracite industry the average weekly hours worked in 1953 was 29.4, the lowest for any of the years shown in table 5. In 1953 the bituminous-coal industry averaged 191 days of work as against 186 days in 1952. In the anthracite industry the average number of days worked declined from 201 to 163.

As wages influence the total production cost in the fuel industries, comparative wage increases granted by the respective branches of the fuel industries are significant. In 1953 the hourly earnings in the bituminous-coal industry increased 8.3 percent, in the anthracite industry 9.7 percent, and in petroleum and natural-gas production 5.7 percent. In absolute figures, hourly earnings in anthracite and bituminous were $2.48 and in petroleum $2.21. However, because of the more regular work in petroleum, weekly earnings in this industry were highest of the three—$90.39—followed by bituminous with $85.31 and anthracite with $72.91.

FUEL PRICES

Although the index of wholesale prices for all commodities decreased from 111.6 in 1952 to 110.1 in 1953 (see table 6), consistent with increased costs and value f. o. b. mines (from $4.90 to $4.92 in bituminous coal and $9.36 to $9.67 in anthracite), average coal prices for selected sizes rose during 1953.

The average price at the well for all crude petroleum rose from $2.53 in 1952 to $2.68 in 1953 as a result of the general increase of about 25 cents per barrel during June of the latter year. This was the first general price increase since 1948 and reflected the rising costs of finding and producing crude oil. For natural gas the 1953 average price at the wells of 9.2 cents per thousand cubic feet was 1.4 cents higher than in 1952. The increase was the largest on record, showing the rising demand for natual gas to supply the many large transmission pipelines that have been built in recent years.

The index of wholesale prices for petroleum products in 1953 was 112.7 percent of the 1947–49 base and 3.1 percent above the 1952 level. The increase over the preceding year was considerably less than the 5.5 percent rise in crude-oil prices.

TABLE 6.—Average monthly wholesale price indexes for fuels, 1948–53 (1947–49=100)

[Bureau of Labor Statistics, U. S. Department of Labor]

Fuel	1948	1949	1950	1951	1952	1953
Gas	102.4	101.5	98.2	100.7	103.7	107.8
Petroleum and petroleum products	111.7	100.1	103.7	110.5	109.3	112.7
Coal	106.2	105.8	106.2	108.4	108.7	112.8
Average index for all commodities	104.4	99.2	103.1	114.8	111.6	110.1

Convenience, as well as price, is a significant factor in the competition between and among the respective fuels. Another important factor that strongly influences fuels utilization is transportation cost. As compared with the relatively low cost of pipeline transmission of oil and natural gas, almost 80 percent of all bituminous coal is shipped via railroads—at rates in 1953 that added 68 percent to the coal cost f. o. b. mines. The average railroad freight-rate charge per net ton on bituminous coal and lignite in 1953 was $3.33, a decrease of 2 cents per ton from 1952.

TABLE 7.—Comparative fuel prices, 1952–53

Fuel	1952	1953	Change from 1952 (percent)
Bituminous coal:			
Average wholesale prices, dollars per net ton: [1]			
Prepared sizes	6.67	6.73	+0.9
Mine run	5.75	5.79	+0.7
Screenings	4.72	4.81	+1.9
Other average prices, dollars per net ton:			
Railroad fuel, f. o. b. mine [2]	4.59	4.77	+3.9
Average retail price [1]	(3)	14.95	----------
Cost of coal at merchant coke ovens	9.85	10.01	+1.6
Anthracite, average sales realization per net ton on Pennsylvania anthracite from breakers to points outside region, dollars:			
Chestnut	13.49	13.77	+2.1
Pea	10.16	10.43	+2.7
Buckwheat No. 1	7.94	9.33	+17.5
Petroleum and petroleum products:			
Crude petroleum, average price per barrel at well — dollars	2.53	2.68	+5.9
Gasoline, average dealers' net price (excluding taxes) of gasoline in 50 U. S. cities — cents per gallon [4]	15.27	15.95	+4.4
Residual fuel oil:			
No. 6 fuel oil, average of high and low prices in Philadelphia — dollars per barrel (refinery) [5]	2.49	2.34	−6.0
Bunker C, average price for all Gulf ports — dollars per barrel (refinery) [5]	1.76	1.82	+3.4
Distillate, fuel oil:			
Gas oil, average of high and low prices at Philadelphia — cents per gallon (refinery) [5]	9.6	10.1	+5.2
No. 2 distillate, average for all Gulf ports — cents per gallon (refinery) [5]	8.1	8.4	+3.7
Natural gas:			
Average U. S. value, at well — cents per thousand cubic feet	7.8	9.2	+17.9
Average U. S. value, at points of consumption — cents per thousand cubic feet	33.2	35.5	+6.9
Average wholesale price index for all commodities [1]	111.6	110.1	−1.3

[1] Bureau of Labor Statistics, U. S. Department of Labor.
[2] Interstate Commerce Commission.
[3] Comparable figure not available for 1952.
[4] The Texas Co.
[5] Platt's Oil Price Handbook.

At the beginning of 1953 there were 170,423 miles of crude oil and petroleum product pipe lines and 156,640 miles of natural-gas field, gathering, and transmission lines. The increased mileage does not fully represent the growing importance of these facilities, for each year sees larger pipe with greater carrying capacity installed.

NATIONAL INCOME ORIGINATED, WAGES, AND SALARIES

As compared to an increase of 4.8 percent in national income originated during the year, income in the bituminous-coal and anthracite industries dropped 3.3 and 26.5 percent, respectively, below 1952. In the crude-petroleum and natural-gas industries income increased 8.1 percent.

Similarly, while total United States wages and salaries increased 7.0 percent, wages and salaries in the bituminous-coal and anthracite industries dropped 3.7 and 18.3 percent, respectively, owing to the heavy drop in employment. In the crude-petroleum and natural-gas industries there was an increase of 6.7 percent.

TABLE 8.—National income originated and wages and salaries in fuel industries, 1951–53

[U. S. Department of Commerce]

	Million dollars		
	1951	1952	1953
National income originated:			
Bituminous- and other soft-coal mining	1,809	1,544	1,493
Anthracite	276	249	183
Crude petroleum and natural gas	2,062	2,081	2,250
Total	4,147	3,874	3,926
United States national income	277,041	290,959	305,002
Total as a percent of the U. S. national income	1.5	1.3	1.3
Wages and salaries:			
Bituminous- and other soft-coal mining	1,425	1,255	1,209
Anthracite	237	224	183
Crude petroleum and natural gas	1,131	1,292	1,379
Total	2,793	2,771	2,771
Total United States wages and salaries	170,881	185,039	197,980
Total as a percent of total United States wages and salaries	1.6	1.5	1.4

ENERGY FUELS IN INTERNATIONAL TRADE

During the year exports of United States coal declined 30 percent. Shipments to Canada dropped over 2.4 million tons to continue the decline of the past few years, resulting largely from the increased availability of indigenous supplies of oil and natural gas. Similarly, increased coal production in most European countries during 1953, with other factors, resulted in a drop in coal exports to Europe of over 13 million tons. Consistent with economic resurgence abroad, however, it is anticipated that there will be a continuing export market for appreciable quantities of United States coal.

The trends of recent years in the foreign trade of the United States in crude-petroleum and petroleum products continued during 1953. Imports of crude petroleum were up 12.9 percent to 236.5 million barrels while product imports, principally residual fuel oil, rose 1.5 percent to 141.0 million barrels. Exports of crude oil dropped a quarter to 19.9 million barrels, the lowest figure since 1928. The downward trend in product exports was interrupted temporarily in 1951 and 1952 as the United States was called upon to supply some of the market of the Abadan refinery that was shut down by the expropriation action of the Iranian Government. However, in 1953 the downward trend resumed and United States product exports were off about 4 percent as new refineries, principally in Western Europe, took up the slack left by the withdrawal of Abadan.

WORLD REVIEW

COAL

The estimated world production of coal in 1953 (bituminous, anthracite, and lignite) was 1,964 million metric tons, an increase of 29 million tons over 1952. Most of the increased production is shown in the output of lignite. It is estimated that the most marked advances occurred in the U. S. S. R. and Soviet-bloc countries.

Whereas production in the United States continued to decline in 1953 because of lower consumption requirements and declining export demands, the total European coal production (including U. S. S. R. and its satellite countries) reached new high levels. Germany, Poland, and the U. S. S. R. had the largest share of the 1953 increases. France and the United Kingdom reported declines in coal output during the year.

Western Europe.—A common market for coal was established on February 10, 1953, when the European Coal and Steel Community achieved operational existence. Member countries of this organization are the Netherlands, Belgium, France (including the Saar), West Germany, Luxembourg, and Italy. Customs duties and all other restrictions on the distribution and sale of coal throughout the Community were abolished. The removal of restrictions resulted in a 20-percent increase in intermember-country coal movements in 1953 compared with 1952 and a reduction of approximately 10 million metric tons in imports, mostly from the United States.

In 1953 production declined from 473.7 to 470.4 million metric tons compared with 1952, largely because of mine labor disputes in France.

Coal imports from countries outside of the area, especially from the United States and Poland, fell sharply in recent years—35 million metric tons in 1951, 27.6 in 1952, and about 13.3 in 1953. Imports in 1952 and 1953 were only 5.7 and 2.8 percent, respectively, of the total coal consumption.

Apparent consumption in Western Europe was 476.5 million metric tons in 1953—a decrease of 9.5 million tons from 1952. Approximately 98 percent of the 1953 consumption requirements were met by indigenous production.

TABLE 9.—Trends in Western European coal productivity, 1951–53 [1]

Country	Number of workers underground (thousand)			Output per man-shift underground (metric tons)		
	1951	1952	1953	1951	1952	1953
Great Britain	540.0	555.0	562.0	1.632	1.608	1.615
West Germany	310.0	322.0	333.3	1.457	1.475	1.464
France [2]	204.0	204.0	200.0	1.298	1.353	1.482
Belgium	115.0	119.0	118.0	1.054	1.051	1.070
Netherlands	28.0	30.0	30.1	1.725	1.609	1.570

[1] Economic Commission for Europe—United Nations.
[2] Including the Saar.

Other Areas.—Coal output (including lignite) in the Far Eastern Pacific area, including Australia, New Zealand, and Communist China, amounted to about 128 million metric tons in 1953. A shortage of approximately 4 million tons in total requirements was indicated, however, mostly in coking and gas coal in Japan. All of this shortage was met largely by imports from the United States, with some smaller shipments from India and Indochina.

In the Union of South Africa and Southern Rhodesia coal production in 1953 increased nearly 1 million metric tons above the 1952 output, but demands were not fully met, and export sales were re-

TABLE 10.—World production of mineral fuels

[Coal—thousand metric tons, crude petroleum—thousand barrels, natural gas—million cubic meters]

Country	1952	1953
North America:		
Bituminous and anthracite	472,968	454,360
Lignite	4,627	4,420
Total	477,595	458,780
Crude petroleum	2,449,642	2,535,703
Natural gas	232,033	(1)
South America:		
Bituminous and anthracite	6,037	5,963
Lignite	(1)	(1)
Total	6,037	5,963
Crude petroleum	745,197	733,986
Natural gas	22,064	(1)
Europe: [2] [3]		
Bituminous and anthracite	833,611	845,785
Lignite	407,440	434,406
Total	1,241,051	1,280,191
Crude petroleum	423,588	477,023
Natural gas	1,870	(1)
Asia: [4]		
Bituminous and anthracite [2]	143,775	152,795
Lignite	3,313	3,419
Total	147,088	156,214
Crude petroleum	871,234	1,005,288
Natural gas	2,282	(1)
Africa:		
Bituminous and anthracite	32,314	33,132
Lignite	(1)	(1)
Total	32,314	33,132
Crude petroleum	17,561	17,903
Natural gas	----------	----------
Oceania:		
Bituminous and anthracite	20,693	19,595
Lignite	10,152	10,163
Total	30,845	29,758
Crude petroleum	1,734	1,759
Natural gas	----------	----------
World total:		
Bituminous and anthracite	1,509,398	1,511,630
Lignite	425,532	452,408
Total	1,934,930	1,964,038
Crude petroleum	4,508,956	4,771,662
Natural gas	258,249	----------

[1] Not available.
[2] Includes undetermined amounts of lignite.
[3] Includes U. S. S. R., Asiatic U. S. S. R., and Sakhalin.
[4] Excludes Asiatic U. S. S. R. and Sakhalin.

NOTE.—Data for natural gas are incomplete and include no estimate for U. S. S. R., although that country produces substantial quantities.

stricted to protect internal requirements. Full production capacity could not be attained because of serious shortages in railroad-car supply and other transport facilities.

PETROLEUM

With few exceptions crude-oil output in all major producing countries was greater in 1953 than in 1952, and new alltime records were established in most instances. Venezuela with production down 2.4 percent in 1953 and Mexico with a reduction of 5.3 percent were the notable exceptions to the general trend. The declines in these two countries are explained by the fact that during the latter half of 1951 and in 1952 they were supplying markets that had been supplied by Iran before expropriation of the Anglo-Iranian Oil Co. in the former year, but in 1953 other Middle East countries raised their production to reclaim these markets for the area. This is demonstrated by the increase of 50 percent in Iraq's production to a figure of 210.7 million barrels and 15 percent in Kuwait's to 314.6 million barrels. Notable also was the 13-percent rise in the estimated production of Soviet Russia, continuing the upward trend of recent years. Total world production rose 5.6 percent to 4.7 billion barrels.

The share of the United States in total world production of crude petroleum continued to fall to 49.7 percent in 1953 versus 50.9 percent in 1952. South America's share also fell to 15.4 percent compared with 16.6 percent, but the Middle East rose to 22.6 percent from 19.9 percent.

Statistical Summary of Mineral-Fuels Production

GENERAL SUMMARY

By Thelma K. Stewart

TABLES in this chapter summarize mineral-fuels production in the continental United States, defined as the 48 States and the District of Columbia, by individual fuels, both in terms of quantity and value of production. The total value of all mineral production, including mineral fuels, is also shown to provide an integrated summary of the mineral industries during 1953. For a detailed summary of all minerals other than fuels see volume I of the Minerals Yearbook.

The value of all mineral production by States, is given in table 3.

The stage of measurement of production used in this chapter is, generally speaking, "mine output," a term referring to minerals in the form in which they are extracted from the ground; however, statistics for some commodities included, for practical reasons, are measured at some other stage of processing. For example, bituminous-coal production includes all marketable production, excluding washery and other refuse, while anthracite production is measured at the sizing and cleaning stage.

Crude petroleum is measured at the time it is removed from the producing property, and natural-gas liquids are measured in the form in which they are shipped from the natural-gasoline or cycle plants. For precise descriptions of the stage of measurement, see the individual commodity chapters.

World production and the proportion of the total produced by the United States are given in table 4.

TABLE 1.—Value of mineral production in continental United States, 1926–53 [1] by mineral groups

[Million dollars]

Year	Mineral fuels	All other	Total	Year	Mineral fuels	All other	Total
1926	3,371	1,940	5,311	1940	2,662	1,536	4,198
1927	2,875	1,823	4,698	1941	3,228	1,879	5,107
1928	2,666	1,818	4,484	1942	3,568	2,055	5,623
1929	2,940	1,968	4,908	1943	4,028	1,903	5,931
1930	2,500	1,480	3,980	1944	4,574	1,736	6,310
1931	1,620	958	2,578	1945	4,569	1,662	6,231
1932	1,460	540	2,000	1946	5,090	1,972	7,062
1933	1,413	637	2,050	1947	7,188	2,422	9,610
1934	1,947	797	2,744	1948	9,502	2,771	12,273
1935	2,013	929	2,942	1949	7,920	2,660	10,580
1936	2,405	1,201	3,606	1950	8,689	[2] 3,173	[2] 11,862
1937	2,798	1,467	4,265	1951	9,779	[2] 3,750	[2] 13,529
1938	2,436	1,082	3,518	1952	9,615	[2] 3,777	[2] 13,392
1939	2,423	1,385	3,808	1953	10,249	4,132	14,381

[1] Data for 1925–46 are not strictly comparable with those for 1947–53, since for the earlier years the value of heavy clay products have not been replaced by the value of raw clays used in such products.
[2] Revised figure.

TABLE 2.—Mineral-fuels production in continental United States, 1950–53, by individual fuels

Mineral fuels	1950		1951		1952		1953	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Asphalt and related bitumens (native): Bituminous limestone and sandstone.....short tons..	1,484,676	3,522	1,378,434	4,159	1,570,698	4,688	1,440,544	4,349
Gilsonite.....do....	66,186	1,774	65,521	1,895	60,740	1,780	60,505	2,184
Carbon dioxide, natural (estimated).....thousand cubic feet..	472,334	369	547,436	161	737,000	226	670,600	203
Coal:								
Bituminous [1].....thousand short tons..	512,529	2,489,229	529,880	2,614,219	463,138	2,276,189	453,578	2,232,707
Lignite.....do....	3,370	8,112	3,291	8,044	3,017	7,212	2,851	6,785
Pennsylvania anthracite.....do....	44,077	392,398	42,670	405,818	40,583	379,714	30,949	299,140
Helium (shipments).....thousand cubic feet..	80,889	1,028	106,970	1,387	145,492	1,891	157,652	2,419
Natural gas.....million cubic feet..	6,282,060	408,521	7,457,359	542,964	8,013,457	623,649	8,396,916	774,966
Natural-gas liquids:								
Natural gasoline and cycle products.....thousand gallons..	4,606,518	321,832	4,971,834	369,718	5,102,244	371,468	5,327,448	406,242
LP-gases.....do....	3,035,844	97,773	3,627,834	138,443	4,285,386	161,692	4,692,870	191,598
Peat.....short tons..	130,723	1,143	194,416	1,489	210,582	1,730	204,209	1,618
Petroleum (crude).....thousand barrels..	1,973,574	4,963,380	2,247,711	5,690,410	2,289,836	5,785,230	2,357,082	6,327,100
Total mineral fuels	....	8,689,000	....	9,779,000	....	9,615,000	....	10,249,000
Total all other minerals	....	[2] 3,173,000	....	[2] 3,750,000	....	[2] 3,777,000	....	4,132,000
Grand total mineral production	....	[2] 11,862,000	....	[2] 13,529,000	....	[2] 13,392,000	....	14,381,000

[1] Includes small quantity of anthracite mined in States other than Pennsylvania. Excludes Alaska.
[2] Revised figure.

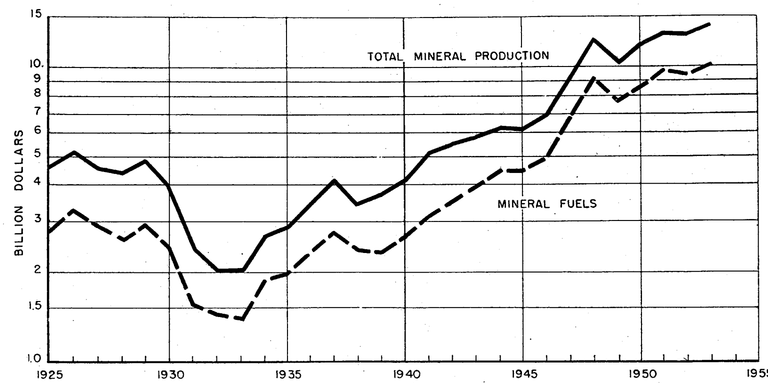


FIGURE 1.—Value of mineral production in continental United States, 1925–53.

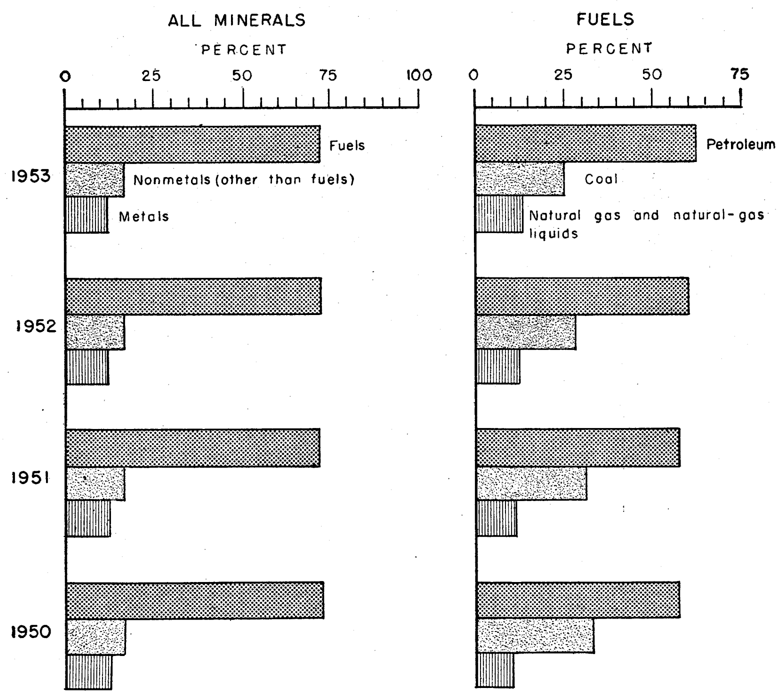


FIGURE 2.—Value of mineral production in continental United States, 1950–53, by mineral groups and by mineral fuels, in percent.

TABLE 3.—Value of mineral production in continental United States, 1950–53, by States, in thousand dollars, and principal minerals produced in 1953

State	1950	1951	1952	1953			
				Value	Rank	Percent of U. S. total	Principal minerals in order of value
Alabama	158, 975	164, 280	158, 382	187, 900	18	1. 31	Coal, iron ore, cement, stone.
Arizona	207, 406	243, 886	231, 702	256, 616	15	1. 78	Copper, zinc, cement, gold.
Arkansas	[1] 119, 642	[1] 119, 844	[1] 117, 687	125, 885	24	. 88	Petroleum, bauxite, natural-gas liquids, coal.
California	[1] 1, 056, 374	[1] 1, 210, 076	[1] 1, 215, 130	1, 392, 883	2	9. 69	Petroleum, natural-gas liquids, natural gas, cement.
Colorado	154, 898	179, 435	187, 589	211, 586	17	1. 47	Petroleum, molybdenum, coal, cement.
Connecticut	5, 675	6, 247	7, 125	7, 917	45	. 06	Stone, sand and gravel, lime, clays.
Delaware	522	584	677	659	48	. 01	Sand and gravel, stone, clays.
District of Columbia	60	82	7	15	49	([2])	Clays.
Florida	[1] 70, 717	[1] 76, 898	[1] 82, 878	92, 336	27	. 64	Phosphate rock, cement, stone, sand and gravel.
Georgia	44, 157	47, 555	52, 398	52, 397	32	. 36	Clays, stone, cement, sand and gravel.
Idaho	[1] 79, 329	[1] 83, 171	[1] 77, 848	66, 987	29	. 47	Lead, zinc, silver, phosphate rock.
Illinois	488, 144	489, 934	460, 005	461, 795	8	3. 21	Coal, petroleum, stone, cement.
Indiana	166, 632	174, 388	[1] 162, 031	169, 179	20	1. 18	Coal, petroleum, cement, stone.
Iowa	41, 773	47, 706	52, 481	52, 001	33	. 36	Cement, stone, sand and gravel, coal.
Kansas	368, 614	400, 087	403, 370	413, 243	9	2. 87	Petroleum, natural gas, cement, stone.
Kentucky	459, 956	442, 264	398, 446	381, 742	10	2. 66	Coal, petroleum, natural gas, stone.
Louisiana	693, 607	787, 678	[1] 848, 401	965, 237	4	6. 71	Petroleum, natural gas, natural-gas liquids, sulfur.
Maine	7, 461	8, 516	8, 981	10, 503	44	. 07	Cement, sand and gravel, stone, slate.
Maryland	[1] 22, 740	[1] 26, 153	26, 847	27, 085	38	. 19	Sand and gravel, cement, stone, coal.
Massachusetts	[1] 16, 110	[1] 17, 077	[1] 17, 812	17, 891	42	. 12	Stone, sand and gravel, lime, clays.
Michigan	[1] 230, 194	[1] 258, 471	[1] 254, 518	286, 487	14	1. 99	Iron ore, cement, petroleum, sand and gravel.
Minnesota	331, 567	[1] 432, 577	397, 441	542, 547	7	3. 77	Iron ore, sand and gravel, stone, manganiferous ore.
Mississippi	102, 945	103, 030	101, 875	107, 868	25	. 75	Petroleum, natural gas, cement, clays.
Missouri	113, 191	135, 249	140, 977	128, 297	23	. 89	Lead, cement, stone, lime.
Montana	[1] 103, 625	[1] 125, 948	[1] 121, 649	132, 185	22	. 92	Copper, petroleum, zinc, manganese ore.
Nebraska	14, 022	18, 469	20, 597	33, 281	37	. 23	Petroleum, cement, sand and gravel, stone.
Nevada	48, 499	57, 674	64, 231	73, 665	28	. 51	Copper, tungsten, gold, iron ore.
New Hampshire	1, 711	1, 295	[1] 1, 945	1, 805	46	. 01	Stone, sand and gravel, mica, feldspar.
New Jersey	[1] 46, 816	[1] 60, 099	[1] 57, 468	51, 948	34	. 36	Stone, sand and gravel, iron ore, zinc.
New Mexico	210, 294	256, 302	288, 500	330, 829	11	2. 30	Petroleum, potassium salts, copper, natural gas.
New York	[1] 156, 585	[1] 188, 816	[1] 180, 751	186, 868	19	1. 30	Cement, iron ore, stone, sand and gravel.
North Carolina	[1] 26, 338	29, 647	34, 726	38, 446	35	. 27	Stone, tungsten, sand and gravel, feldspar.
North Dakota	9, 614	10, 247	12, 057	19, 237	41	. 13	Petroleum, coal, sand and gravel, clays.
Ohio	274, 572	302, 612	292, 689	302, 843	12	2. 11	Coal, stone, lime, cement.
Oklahoma	527, 095	607, 486	621, 351	678, 160	6	4. 72	Petroleum, natural-gas liquids, natural gas, coal.

TABLE 3.—Value of mineral production in continental United States, 1950–53, by States, in thousand dollars, and principal minerals produced in 1953—Continued

State	1950	1951	1952	1953			
				Value	Rank	Percent of U. S. total	Principal minerals in order of value
Oregon	21, 542	28, 402	26, 674	24, 449	39	0. 17	Sand and gravel, cement, stone, diatomite.
Pennsylvania	1, 186, 212	1, 289, 226	[1] 1, 145, 633	1, 121, 579	3	7. 80	Coal, cement, stone, petroleum.
Rhode Island	1, 425	1, 278	1, 250	1, 462	47	. 01	Sand and gravel, stone, graphite.
South Carolina	11, 394	11, 286	14, 531	17, 771	43	. 12	Cement, clays, stone, sand and gravel.
South Dakota	32, 716	29, 652	30, 455	33, 896	36	. 24	Gold, stone, cement, sand and gravel.
Tennessee	[1] 90, 405	[1] 100, 047	[1] 100, 932	98, 050	26	. 68	Coal, cement, stone, phosphate rock.
Texas	[1] 2, 674, 456	[1] 3, 269, 199	[1] 3, 379, 808	3, 647, 806	1	25. 37	Petroleum, natural gas, natural-gas liquids, sulfur.
Utah	[1] 229, 966	257, 145	265, 501	298, 629	13	2. 08	Copper, coal, iron ore, gold.
Vermont	18, 563	18, 516	17, 891	20, 302	40	. 14	Stone, asbestos, slate, copper.
Virginia	137, 806	161, 252	164, 679	152, 777	21	1. 06	Coal, stone, cement, sand and gravel.
Washington	49, 055	54, 554	[1] 56, 139	54, 577	31	. 38	Cement, sand and gravel, zinc, stone.
West Virginia	[1] 829, 633	[1] 941, 748	[1] 825, 733	790, 110	5	5. 49	Coal, natural gas, petroleum, natural-gas liquids.
Wisconsin	41, 693	48, 350	55, 710	55, 271	30	. 38	Sand and gravel, stone, iron ore, cement.
Wyoming	[1] 177, 744	[1] 204, 357	[1] 206, 828	255, 906	16	1. 78	Petroleum, coal, clays, natural gas.
Total	[1]11, 862, 000	[1]13, 529, 000	[1]13, 392, 000	14, 381, 000	--------	100. 00	Petroleum, coal, iron ore, natural gas.

[1] Revised figure.
[2] Less than 0.005 percent.

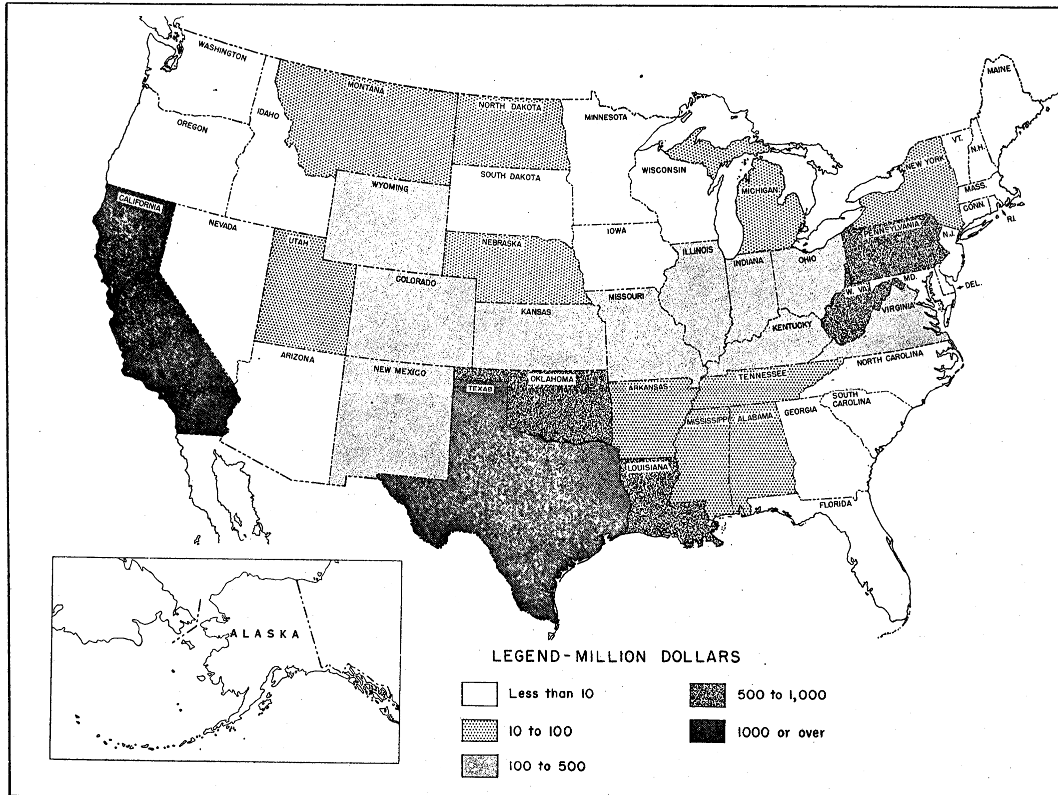


FIGURE 3.—Value of mineral-fuels production in continental United States and Alaska, 1953, by States.

TABLE 4.—Comparison of world and United States (including Alaska) production of principal fuels, 1952–53

(Compiled under the supervision of Berenice B. Mitchell of the Division of Foreign Activities, Bureau of Mines)

Fuel	1952			1953		
	World	United States		World	United States	
	Thousand metric tons		Percent of world	Thousand metric tons		Percent of world
Coal:						
Bituminous	1,362,600	420,771	31	1,371,900	412,258	30
Lignite	426,000	2,737	(1)	452,000	2,586	(1)
Pennsylvania anthracite	146,400	36,816	25	140,100	28,076	20
Coke (excluding breeze):						
Gashouse	[2] 34,000	41	(1)	[2] 34,000	211	(1)
Oven and beehive	207,000	61,919	30	224,000	71,519	32
Fuel briquets and packaged fuel	90,000	2,155	2	91,000	1,687	
Natural gas [3] million cubic meters	[4] 260,000	226,920	87	(5)	237,779	(5)
Peat	54,000	191	(1)	53,000	185	(1)
Petroleum (crude) thousand barrels	4,508,956	2,289,836	51	4,768,746	[6] 2,357,082	4

[1] Less than 1 percent.
[2] Includes low- and medium-temperature and gashouse coke.
[3] World total exclusive of U. S. S. R.
[4] Consumption estimated by the United Nations.
[5] Data not available.
[6] Final figure; supersedes preliminary figure given in commodity chapter.

Employment and Injuries in the Fuel Industries

By Seth T. Reese

INTRODUCTION

IN THIS CHAPTER of the Minerals Yearbook the injury and related employment experience of the coal-mining, coking, and oil and gas industries for 1953 is outlined and discussed. Each industry is treated separately, and no attempt has been made to combine data to show overall experience for the fuel section of the mineral industries, inasmuch as the inherent accident hazards for each of the three sections are not comparable. The employment and injury records for the mineral industries as a whole are discussed in Volume III.

COAL

The general injury experience in the Nation's bituminous-coal, lignite, and anthracite mines in 1953 was the most favorable ever recorded in the statistical history of the industry. Not only was the number of deaths and nonfatal injuries lower than in any other preceding year, but the rates at which those injuries occurred have never been equaled since complete data were originally collected in 1930.

The 460 fatal injuries in 1953 were 88 fewer than in 1952 and represented the lowest annual total since complete fatality statistics were first compiled. One major disaster (a single accident in which five or more men are killed) occurred in an Iowa mine as the result of a coal-dust explosion. Five were killed in the explosion. The number of nonfatal injuries during 1953 is estimated to be 26,275, or 13 percent less than in 1952.

Based upon the estimated output of 483 million tons of anthracite and bituminous coal, the fatal rate per million tons was improved to 0.95, the lowest annual rate in a statistical history extending back to 1910. The nonfatal-injury rate per million tons likewise was improved sharply to 54.40 in 1953. The tentative frequency rate—49.09 injuries (fatal and nonfatal) per million man-hours—was a 5-percent decrease from the 51.58 rate in 1952, the previous record low rate for the industry. Both the bituminous-coal and anthracite industries contributed to the record in 1953, as the frequency per million man-hours of the combined fatal and nonfatal rates in each industry fell to record low rates.

The average number of men at work daily at coal mines declined 13 percent to a total of 350,400 in 1953. The mines were active 199 days, or 10 more than during the previous year, but this increased activity was not sufficient to offset the decreased number of men

TABLE 1.—Employment and injury experience at coal mines in the United States, 1949–53

Industry and year	Average men working daily [1]	Average active mine-days [2]	Man-days worked	Man-hours worked	Number of injuries		Frequency rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
Bituminous-coal mines: [3]								
1949	409,431	165	67,551,942	533,165,522	494	27,548	0.93	51.67
1950	408,623	185	75,509,974	594,835,875	550	28,390	.92	47.73
1951	372,138	201	74,897,966	590,406,393	684	28,081	1.16	47.56
1952	338,719	186	63,027,967	497,914,065	449	23,719	.90	47.64
1953 [4]	296,100	203	60,161,000	473,960,000	396	21,820	.84	46.04
Anthracite mines:								
1949	75,875	196	14,885,115	109,310,226	91	7,857	.83	71.88
1950	74,616	211	15,721,460	116,553,682	93	8,874	.80	76.14
1951	69,767	207	14,467,428	106,841,000	101	7,472	.95	69.94
1952	62,610	207	12,974,567	95,784,245	99	6,355	1.03	66.35
1953 [4]	54,300	174	9,458,000	70,610,000	64	4,455	.91	63.09
Total coal mines:								
1949	485,306	170	82,437,057	642,475,748	585	35,405	.91	55.11
1950	483,239	189	91,231,434	711,389,557	643	37,264	.90	52.38
1951	441,905	202	89,365,394	697,247,393	785	35,553	1.13	50.99
1952	401,329	189	76,002,534	593,698,310	548	30,074	.92	50.66
1953 [4]	350,400	199	69,619,000	544,570,000	460	26,275	.84	48.25

[1] Average number of men at work each day mine was active. Because absenteeism and labor turnover are taken into consideration, this number is lower than number of men available for work, as measured by a count of names on payroll.
[2] Average in which operating time of each mine is weighted by average number of workers in mine.
[3] Includes lignite.
[4] Preliminary; based on an average of 80 percent coverage.

employed; as a result, the aggregate hours of work at coal mines declined 8 percent from 1952. The average miner during 1953 worked a 7.82-hour shift and accumulated a total of 1,554 hours of work, or 75 hours more than he did in 1952, owing primarily to the increased number of days worked; there was almost no change in the length of the shift in each year.

Bituminous-Coal Mines.—The safety record of the bituminous-coal industry during 1953 was better than in any year since 1930, when complete injury data were first available. The tentative rate of 46.88 injuries (fatal and nonfatal) per million man-hours for the coal industry was 3 percent below the rate of 48.54, the previous low record rate. The 396 fatalities at bituminous-coal mines were 53 fewer than in 1952 and were lower than in any other year in the statistical history of the industry. The fatality rate of 0.84 was the best on record, and for the fourth time since such rates were compiled in 1930 it was less than 1 per million man-hours of exposure. The 1953 fatality rate represented an improvement of 7 percent over 1952. The more favorable fatality experience at bituminous-coal mines is shown by the rate of 0.87 fatal injuries per million tons, which set a new low annual record for the industry. The estimated total of 21,820 nonfatal injuries was 8 percent lower than in 1952. The frequency rate for these nonfatal or lost-time injuries was 3 percent better than the previous year's rate and lower than in any year since 1930, when the data were first compiled. The frequency of occurrence of disabling injuries per million tons of coal mined also was improved to a rate of 48.17, the lowest on record. Of total fatalities at bituminous-coal mines, 349 occurred in underground workings, 26 at surface works associated with underground mines, and 21 at strip-pit operations. The total of 349 killed in underground workings was 10 percent lower than the 389 in 1952. All major accident agencies involved in underground fatalities showed a lower number of deaths in 1953 except electrical accidents. The hazards of falls of roof, rib, or face were controlled slightly more effectively in 1953, as the total of 234 fatalities from this agency was only 5 less than in 1952. Underground haulage accidents killed 78 men in 1953, a sharp reduction from the 101 deaths from this agency during the previous year. Two more men were killed from accidents involving electricity than from the same source in 1952.

Employment at bituminous-coal mines declined 13 percent to an average of 296,100 men working daily during 1953. However, due to an increase of 17 active mine days, the total man-hours worked fell only 5 percent. The average worker had a 7.88-hour shift, slightly less than his 7.90-hour shift the previous year, but the average workyear per man was 1,601 days, an increase of 131 hours over 1952, due mainly to the increase in the number of days the mines were active.

Anthracite Mines.—The injury experience at Pennsylvania anthracite mines improved over that in 1952 and was better than in any year since complete injury data were first available in 1930. The tentative frequency rate (fatal and nonfatal) was 64.00 injuries per million man-hours. A total of 64 fatalities occurred at anthracite mines, a reduction of 35 from 1952. No major disaster occurred in this section of the mining industry during the year. The fatality rate per million man-hours was reduced 12 percent from 1.03 in 1952 to 0.91 in 1953. Although the latter rate was 14 percent higher than the previously low record rate of 0.80 established in 1950, it was the fifth time in the last 6 years that less than 1 man has been killed per million man-hours of worktime or time exposure to hazards. Based upon an estimated production of 30,023,000 tons of coal mined, the frequency rate of 2.13 fatal injuries per million tons in 1953 was also the lowest on record for the industry. A total of 4,455 nonfatal injuries occurred at rates of 63.09 per million man-hours of exposure and 148.39 per million tons of coal produced—each an improvement over its corresponding rate for 1952.

At anthracite operations, 60 fatal injuries occurred in underground workings and 4 at surface works associated with deep mines. No one was killed at a stripping operation during the year—a notable achievement. The greatest saving in life came in haulage accidents. In 1952 this agency claimed 18 lives in the underground workings, whereas in 1953 only 2 men lost their lives from this cause. Falls of roof, face, or rib continued as the leading accident agency, taking a toll of 43 or 72 percent of all those killed in underground workings.

The average number of men working daily at anthracite mines decreased from 62,610 to 54,300, or 13 percent. Due principally to a declining market, the mines were active an average of 174 days or 33 less than in 1952. Aggregate worktime in the industry declined 26 percent to a total of 71 million man-hours. The average manshift was 7.47 hours in 1953, and the average employee worked 1,300 hours, 230 less than in 1952.

COKE

The coke-manufacturing industry established a new safety record during 1953, as the combined injury rate (fatal and nonfatal) was lower than ever before reported. The total number of injuries, fatal and nonfatal, was the lowest for any year since 1939 and the sixth lowest annual total since complete records of the industry were first made available in 1916. From reports submitted on 27,301 active coke ovens, the combined rates (fatal and nonfatal) were 6.69 injuries per million man-hours of worktime and 5.14 per million net tons of the manufactured product. Each rate, a sharp improvement over its corresponding rate of 8.82 and 7.59 in 1952, was affected by a 22-percent reduction in number of injuries, a 3-percent increase in man-hours of worktime, and a 15-percent increase in production.

TABLE 2.—Employment and injury experience at coke plants in the United States, 1949–53

Industry and year	Average men working daily [1]	Average active plant-days [2]	Man-days worked	Man-hours worked	Number of injuries		Frequency rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
Byproduct ovens:								
1949	21,141	349	7,373,684	58,822,239	7	581	0.12	9.88
1950	20,942	362	7,577,665	60,593,087	13	516	.21	8.52
1951	22,058	363	8,000,833	64,102,990	9	533	.14	8.31
1952	21,919	336	7,372,812	58,643,292	7	420	.12	7.16
1953	21,011	362	7,598,301	61,096,328	8	332	.13	5.43
Beehive ovens:								
1949	3,330	146	486,497	3,623,543		132		36.43
1950	3,405	210	714,470	5,267,918	1	264	.19	50.11
1951	3,657	228	833,496	6,087,503	1	235	.16	38.60
1952	3,322	170	566,307	4,159,945	1	126	.24	30.29
1953	2,429	201	487,233	3,580,299		93		25.98
All ovens:								
1949	24,471	321	7,860,181	62,445,782	7	713	.11	11.42
1950	24,347	341	8,292,135	65,861,005	14	780	.21	11.84
1951	25,715	344	8,834,329	70,190,493	10	768	.14	10.94
1952	25,241	315	7,939,119	62,803,237	8	546	.13	8.69
1953	23,440	345	8,085,534	64,676,627	8	425	.12	6.57

[1] Average number of men at work each day oven was active. Because absenteeism and labor turnover are taken into consideration, this number is lower than the number of men available for work, as measured by a count of names on payroll.
[2] Average in which operating time of each plant is weighted by average number of workers in the plant.

NOTE: All data are final.

Although the average number of men at work daily in the industry declined 7 percent to an average of 23,440 in 1953, the coke plants were active 30 days more than in 1952. The average shift worked at beehive and byproduct coke ovens was 8.00 hours, slightly higher than the 7.91-hour shift in 1952. For the year, the average cokeworker accumulated 2,759 hours of worktime, or 271 hours (11 percent) more than in the previous year.

Byproduct-Coke Plants.—At byproduct-coke plants, 8 persons were killed, and 332 were disabled for more than the remainder of the day on which they were injured. In number, this represents a reduction of 88 (21 percent) under the total casualties reported during 1952. The overall injury experience at byproduct-coke plants in 1953 was the best recorded in a 38-year statistical history of the industry. The combined rate (fatal and nonfatal) of 5.56 injuries per million man-hours was 24 percent lower than the 1952 rate of 7.28, and the rate of 4.31 injuries per million tons of product produced was 31 percent lower than its corresponding rate in 1952.

Although 124 fewer byproduct-coke ovens were active in 1953 and the average daily working force was reduced slightly, total worktime increased almost 2½ million man-hours (4 percent), and production rose to nearly 79 million net tons (15 percent), the greatest annual output on record. The average employee at byproduct-coke plants worked an 8.04-hour shift compared with a 7.95-hour shift in 1952 and accumulated a total of 2,908 hours or 233 more than during the preceding year. Byproduct-coke ovens were worked 26 more days than in 1952.

Beehive-Coke Ovens.—Operators of 11,311 active beehive-coke ovens reported a fatality-free record and 93 nonfatal injuries in 1953 for overall frequency rates of 25.98 injuries per million man-hours and 17.46 injuries per million tons of manufactured product. Both rates were the lowest ever recorded in a 38-year statistical history of the industry and were 15 and 39 percent better than the respective rates of 30.53 and 28.42 in 1952.

Beehive-coke ovens were operated at a lower capacity in 1953 than in 1952, with an average daily employment of 2,429 men, a reduction of 27 percent. Due to this decrease in work force and regardless of the fact that the ovens were worked 31 more days, the total man-hours of worktime decreased 14 percent to slightly better than $3^1/_2$ million. However, because of a sharp increase in productivity—1.074 tons per man-hour in 1952 to 1.488 in 1953—the production from beehive-coke ovens rose 19 percent. The average employee at beehive-coke ovens worked a 7.35-hour shift, the same as in 1952, but accumulated a total of 1,474 hours, or 222 more than in 1952, mainly owing to the increase in number of days the ovens were operated.

OIL AND GAS

The overall injury-frequency rate (fatal and nonfatal) for 1953 in the oil and gas industry was the lowest in a 12-year statistical history. The record rate of 11.57 injuries per million man-hours was also 9 percent better than in the preceding year. In all, 14,631 employees in the industry were fatally or nonfatally injured, a decrease of 984 (6 percent) compared with the total number of casualties in 1952. Of the total number of injuries in 1953, 179 were fatalities and permanent total disabilities, 607 were permanent partial disabilities, and 13,845 were temporary disabilities. The fatality-frequency rate increased in all departments, except in refining and marketing, whereas the nonfatal-injury rate decreased in all departments except production and pipeline (gas). The lowest combined frequency rate (fatal and nonfatal) was recorded for the refining department (6.59 per million man-hours) and the highest rate of 58.71 for drilling (the most hazardous department). The department showing the largest reduction in injury-frequency rate was exploration—from 20.09 in 1952 to 12.60 in 1953, or 37 percent.

Daily employment in the oil and gas industry increased almost 1½ percent in 1953 to an average of 594,398 men who worked slightly more than 1¼ billion man-hours, the greatest volume since statistics were first collected by the Bureau of Mines in 1942 and a gain of 3 percent over 1952. The average employee worked 2,127 hours during the year, or 32 more than in 1952.

TABLE 3.—Employment and injury experience in the oil and gas industry of the United States, 1949–53

Year	Average men working daily	Man-hours worked	Number of injuries		Frequency rates per million man-hours	
			Fatal	Nonfatal	Fatal	Nonfatal
1949	516,940	1,085,827,286	138	14,333	0.13	13.20
1950	517,787	1,081,518,593	109	13,500	.10	12.48
1951	539,095	1,147,903,959	142	15,130	.12	13.18
1952 [1]	586,138	1,227,984,429	150	15,465	.12	12.59
1953 [1]	594,398	1,264,019,756	179	14,452	.14	11.43

[1] Fatal and permanent total injuries combined.

CONCLUSION

From the foregoing accounts of the 1953 injury experience in the coal-mining, beehive and byproduct coking, and the oil and gas industries, it may be concluded that the fuels industry enjoyed its best year, from the safety standpoint, since statistics on injuries in each section have been compiled by the Bureau of Mines. The coal-mining industry, the coking industry, and the oil and gas industry each established new low overall injury-frequency rates, and the number of injuries, fatal and nonfatal, was approximately 5,000 fewer than was recorded in 1952, a commendable performance.

PART II. COMMODITY REVIEWS

A. Coal and Related Products

Coal—Bituminous and Lignite

By W. H. Young, R. L. Anderson, and E. M. Hall

GENERAL SUMMARY

THE BITUMINOUS-COAL and lignite industry showed mixed trends in 1953. Production, exports, and average number of men working daily decreased, whereas consumption, average value per ton, and output per man per day increased. As regards mechanization the percentages mechanically loaded and mechanically cleaned increased, while the percentages cut by hand, shot from solid, and mined by stripping dropped slightly.

Production.—The output of soft coal in 1953 was 457.3 million tons or 2 percent less than the 466.8 million tons produced in 1952. Smaller production in 1953 was largely the result of a sharp reduction in exports, as consumption in the United States increased slightly. Foreign demand, principally European, was off 29 percent, while domestic demand increased 2 percent.

Production fluctuated less during 1953 than in many years. There was only a slight seasonal variation in the spring, and the only major fluctuation resulted from the miners' vacation period of 10 days in midsummer. Man-days lost by strikes were the smallest since 1942. According to the Bureau of Labor Statistics, 413,000 man-days were lost from strikes in 1953 compared with 2.8 million in 1952.

Trend of Employment.—The continued decrease in employment was due both to the drop in production and to the increased output per man per day in 1953 compared with 1952. The average number of men working daily at bituminous-coal and lignite mines decreased from 335,217 in 1952 to 293,106 in 1953.

Index to Capacity.—As it is not possible for all mines to operate every working day in the year, a conservative figure of 280 days for calculating the potential capacity was suggested some years ago by the coal committee of the American Institute of Mining and Metallurgical Engineers. (See Minerals Yearbook, 1935, pp. 631–632.) The average output per day worked in 1953 was 2.4 million tons, which (if applied to 280 days) gives an annual potential output of 670 million tons compared with the actual production of 457.3 million tons.

Mechanization.—More coal was loaded mechanically at underground mines in the United States in 1953 than in 1952, and quantity increased from 76 percent of the total underground output in 1952 to 80 percent in 1953. Sales of underground loading equipment, in terms of capacity, were 14 percent greater in 1953 than in 1952.

Mechanical Cleaning.—The total capacity of mechanical-cleaning equipment sold for use at bituminous-coal mines in 1953 was estimated at 7,000 tons of cleaned coal per hour, a 20-percent decrease from the previous year.

Consumption.—Total consumption of bituminous coal and lignite in the United States was 8.0 million tons or 2 percent more in 1953 than in 1952. Five classes of consumers used more coal in 1953, while 4 classes of consumers used less than in 1952.

Trends of Fuel Efficiency.—The electric public-utility power plants continued to chalk up a new record in fuel efficiency. Pounds of coal per kilowatt-hour dropped from 1.10 in 1952 to 1.06 in 1953. The trend in fuel efficiency since 1919 is shown in table 63.

Competition With Oil and Gas.—Soft coal continued to meet serious competition from oil and gas. The relative rate of growth of coal, petroleum, natural gas, and waterpower, 1899 to 1953, is shown graphically in figure 20. As a percentage of total energy, bituminous coal and lignite represented the smallest proportion of total energy in their history while both petroleum and natural gas represented a higher proportion than ever before.

Electric-power utilities consumed 9 percent more bituminous coal, 22 percent more fuel oil, and 14 percent more gas in 1953 than in 1952.

TABLE 1.—Salient statistics of the bituminous-coal and lignite industry in the United States, 1952–53

[All tonnage figures represent net tons of marketable coal and exclude washery and other refuse]

	1952	1953	Change from 1952 (percent)
Production	466,840,782	457,290,449	−2.0
Consumption in the United States	418,757,000	426,798,000	+1.9
Stocks at end of year:			
Industrial consumers and retail yards	76,745,000	80,614,000	+5.0
Stocks on upper Lake docks	5,135,398	4,750,546	−7.5
Imports and exports: [1]			
Imports	262,268	226,900	−13.5
Exports	47,643,150	33,760,263	−29.1
Price indicators (average per net ton):			
Average cost of railroad fuel purchased, f. o b. mines [2]	$4.59	$4.77	+3.9
Average cost of coking coal at merchant coke ovens	$9.85	$10.01	+1.6
Average retail price [3]	(3)	$14.95	
Average railroad freight charge per net ton [2]	$3.35	$3.33	−.6
Average value f. o. b. mines	$4.90	$4.92	+.4
Equipment sold:			
Mobile loading machines	206	180	+19.9
Continuous mining machines		67	
Augers	(4)	57	
Scrapers	8	11	+37.5
Shuttle cars	428	437	+2.1
Conveyors:			
Mother	67	58	−13.4
Room or transfer	155	87	−43.9
Face	76	49	−35.5
Method of mining:			
Hand-loaded underground	87,431,370	71,221,990	−18.5
Mechanically loaded underground	268,993,989	278,328,982	+3.5
Mined at auger mines	1,505,667	2,290,908	+52.2
Mined by stripping	108,909,756	105,448,569	−3.2
Mechanically cleaned	227,264,630	241,758,577	+6.4
Number of mines	7,275	6,671	−8.3
Average number of days worked	186	191	+2.7
Average number of men working daily	335,217	293,106	−12.6
Production per man per day	7.47	8.17	+9.4
Fuel-efficiency indicator: Pounds of coal per kilowatt-hour at electric power plants [5]	1.10	1.06	−3.6

[1] U. S. Department of Commerce.
[2] Interstate Commerce Commission.
[3] Bureau of Labor Statistics, U. S. Department of Labor. Comparable figures not available for 1952.
[4] Data not available.
[5] Federal Power Commission.

Class I railroads decreased their consumption of coal 27 percent in 1953 and their purchases of fuel oil and diesel fuel 5 percent during the same period.

The manufacture of domestic coal-burning equipment is reflected in statistics published by the Bureau of Census. Factory sales of domestic stokers for burning bituminous coal decreased from 8,572 in 1952 to 6,801 in 1953. Shipments of domestic oil burners, boiler-burner units, and furnace-burner units increased from 744,619 (revised figure) in 1952 to 860,416 in 1953.

Stocks.—The reserve supply of bituminous coal and lignite in the hands of industrial consumers and retail coalyards increased from 76.7 million tons at the beginning of 1953 to 80.6 million tons at the end. The days' supply of stocks increased from 58 to 64. Stocks on the upper Lake docks decreased 384,852 tons during the year.

SCOPE OF REPORT

As in previous years, these data include all coal produced in Alaska and in the United States except Pennsylvania anthracite. The production in Alaska is included in the total production of the United States.

The statistics for 1953 are final and are based upon detailed annual reports of production and mine operation furnished by the producers. All but a small percentage of the output was covered by the reports submitted. For the remaining output not directly reported, which consisted chiefly of that from small mines, it has been possible to obtain reasonably accurate data from the records of the various State mine departments, which have statutory authority to require such reports, or, in a few instances, from railroad carloadings. Thus, the report represents complete coverage of all mines having an output of 1,000 tons a year or more. The report does not attempt to include many small mines that produce less than 1,000 tons a year. A special effort was made to collect production figures for these small mines in 1944. Although 1944 was a year of peak production, the total output of approximately 2,000 mines producing less than 1,000 tons each annually was only 0.1 percent of total production in the United States.

Throughout this chapter, "tons" refers to net short tons of 2,000 pounds, except the world table, which is in metric tons of about 2,205 pounds.

The "base-period" year, for comparative purposes, is usually the first year that a statistical series was started.

RESERVES [1]

TABLE 2.—Coal reserves of the United States, January 1, 1953, by States

[In million short tons]

State	Estimated original reserves					Reserves depleted to Jan. 1, 1953		Remaining reserves Jan. 1, 1953	Recoverable reserves Jan. 1, 1953 assuming 50-percent recovery
	Bituminous coal	Subbituminous coal	Lignite	Anthracite and semianthracite	Total	Production [1]	Production plus loss in mining, assuming past losses equal production		
Alabama [2]	67,570				67,570	861	1,722	65,848	32,924
Arkansas	1,396		90	230	1,716	94	188	1,528	764
COLORADO [3]	90,258	9,437		713	100,408	484	968	99,440	49,719
GEORGIA	100				100	12	24	76	38
ILLINOIS	[4] 137,321				[4] 137,321	[5] 156	[5] 312	137,009	68,504
INDIANA	37,293				37,293	1,039	2,078	35,215	17,607
Iowa	29,160				29,160	348	696	28,464	14,232
KANSAS	[4] 20,774		(6)		[4] 20,774	[5] 6	[5] 12	20,762	10,381
Kentucky	123,327				123,327	2,177	4,354	118,973	59,487
MARYLAND	[4] 1,200				[4] 1,200	[5] 2	[5] 4	1,196	598
MICHIGAN	297				297	[7] 46	77	220	110
Missouri	79,362				79,362	267	534	78,828	39,414
MONTANA	2,363	132,151	87,533		222,047	164	328	221,719	110,860
NEW MEXICO	10,948	50,801		6	61,755	123	246	61,509	30,754
NORTH CAROLINA	112				112	1	2	110	55
NORTH DAKOTA			350,910		350,910	77	154	350,756	175,378
Ohio	86,584				86,584	1,806	3,612	82,972	41,486
Oklahoma	54,951				54,951	166	332	54,619	27,309
PENNSYLVANIA	75,093			22,805	97,898	12,761	25,522	72,376	36,189
SOUTH DAKOTA			2,033		2,033	1	2	2,031	1,015
Tennessee	25,665				25,665	340	680	24,985	12,493
Texas	8,000		23,000		31,000	62	124	30,876	15,438
Utah	88,184	5,156			93,340	218	436	92,904	46,452
VIRGINIA	11,696			355	12,051	609	1,218	10,833	5,417
Washington	11,413	52,442		23	63,878	145	290	63,588	31,794
WEST VIRGINIA	116,618				116,618	5,428	10,856	105,762	52,881
WYOMING	13,235	[9] 108,319	(9)		121,554	383	766	120,788	60,395
Other States	[10] 820	[11] 15,500	[12] 50		16,370	9	18	16,352	8,176
Total	1,093,740	373,806	463,616	24,132	1,955,294	[13] 27,785	55,555	1,899,739	949,870

[1] Production, 1800–85, from The First Century and a Quarter of American Coal Industry, by H. N. Eavenson, privately printed, Pittsburgh, 1942; production, 1886–1952, from Geol. Survey Mineral Resources volumes and Bureau of Mines Minerals Yearbooks: unless otherwise indicated.
[2] Reserve estimate of States in lower case letters were prepared by, or under the direction of, M. R. Campbell before 1928.
[3] Reserve estimates of States in capital letters supersede earlier estimates by M. R. Campbell.
[4] Remaining reserves, January 1, 1950.
[5] Production, 1950–52.
[6] See discussion in text.
[7] Production, 1860 through 1949, Michigan Geological Survey Division, as cited in Geol. Survey Circ. 77, 1950, p. 56.
[8] Past losses assumed to be 40 percent of coal originally in the ground.
[9] Small reserves and production of lignite included under subbituminous coal.
[10] Includes Arizona, California, Idaho, and Oregon.
[11] Includes Arizona, California, and Oregon.
[12] Includes California and Louisiana.
[13] Somewhat less than total recorded production. See footnote 5.

[1] Averitt, Paul, Berryhill, Louise R., and Taylor, Dorothy A., Coal Resources of the United States: Geol. Survey Circ. 293, 1954.

THICKNESS OF BITUMINOUS-COAL AND LIGNITE SEAMS

The overall operating efficiency in bituminous-coal mining is affected by many physical conditions, such as the thickness and character of the coal seam, the dip or pitch of the seam, the depth of cover, the character of the roof and overlying strata, and mine water. Of these, the thickness of the coal seam is one of the more important items in determining the results achieved.

The Bureau of Mines has compiled and published detailed data on thickness of seam for coal mined in 1945 [2] and 1950.[3] An earlier study, based on data collected by the United States Coal Commission, was made on thickness of seam in 1920.[4] In the past 30 years the average seam thickness has not changed materially. The average thickness of all bituminous coal and lignite mined in 1920 was 63 inches; in 1945, 65 inches; and in 1950, 63 inches. As thick seams have been exhausted in the older fields, other thick seams have been opened in the newer fields.

Because of the importance of seam thickness in mining operations a summary of the data for 1950, the latest year available, is given here. The coal seam of moderate thickness presents the least mining difficulties. Any decided thinning limits production, decreases recovery, and therefore increases cost. Thickening of the seam in underground mining has the same effect; for, as the seam increases in thickness, it becomes necessary to maintain larger pillars, timbering becomes more difficult and finally impracticable, and roof control is almost impossible. The limited information available indicates that, for maximum recovery in underground bituminous-coal mines, the ideal seam thickness lies between 6 and 8 feet.

The 1950 data included in the following tables were compiled from annual reports of production and mine operation submitted by bituminous-coal and lignite producers to the Bureau of Mines. Estimates were made for seam thickness not specified by the producer. These estimates did not materially affect the accuracy of the final results.

Bituminous-coal and lignite is mined today from seams of exceedingly variable thickness—varying from less than 2 feet to more than 50 feet; however, a large majority of the mines produce coal from seams 3 to 6 feet thick. Table 3 presents the number of mines and production in 1950, classified by thickness. Figures are also shown separately for underground and strip mines. Coal near the surface in relatively thin seams that are not suited to underground mining frequently can be recovered by stripping. In 1950, 17 percent of strip production came from seams of less than 3 feet in thickness, whereas only 5 percent of the underground production came from seams less than 3 feet thick.

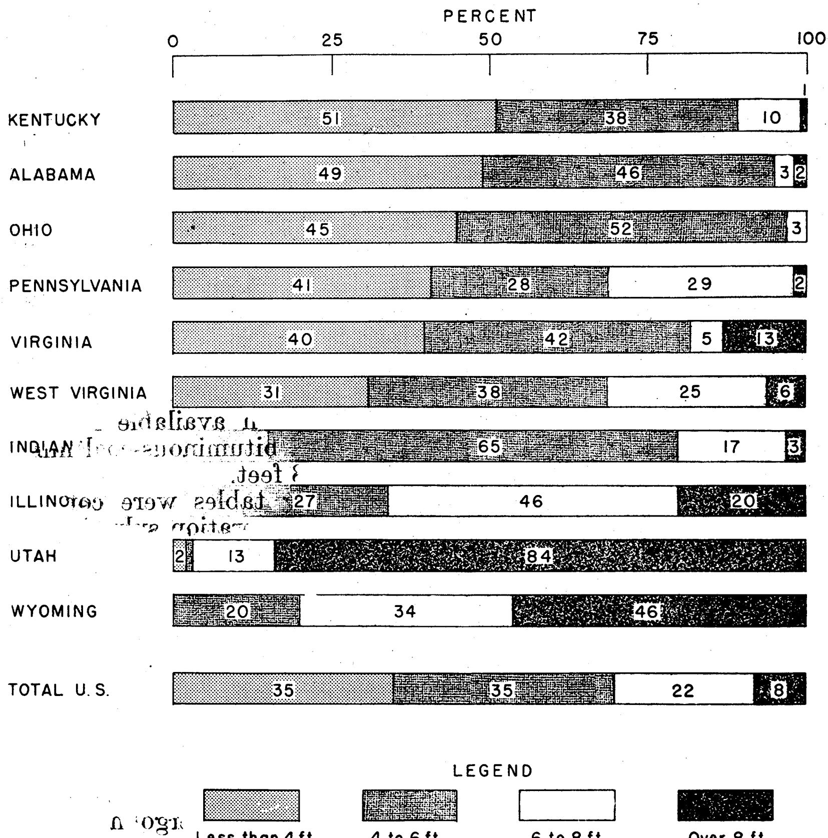
The average thickness of seam mined varied widely in the different States, ranging from 19.2 feet in Wyoming to 1.5 in Georgia. Figure 1 shows the percentage of bituminous-coal produced, by thickness of seam mined, in the 10 largest coal-producing States and the United States.

[2] Young, W. H. and Anderson, R. L., Thickness of Bituminous-Coal and Lignite Seams Mined in the United States in 1945: Bureau of Mines Inf. Circ. 7442, 1947, 17 pp.

[3] Young, W. H. and Anderson, R. L., Thickness of Bituminous Coal and Lignite Seams at All Mines, and Thickness of Overburden at Strip Mines in the United States in 1950: Bureau of Mines Inf. Circ. 7642, 1952, 18 pp.

[4] Hotchkiss, W. E., Warner, C. K., Plein, L. N., Dake, W. M., Anderson, R. L., Gallagher, J. J., and Schoenfeld, M. H., Mechanization, Employment, and Output per Man in Bituminous-Coal Mining: Work Projects Administration, National Research Project, vol. 1, 1939, p. 62.

States total in 1950. The States are arranged in order of the percentage of output mined from seams less than 4 feet thick. Table 4 gives details by States for strip and underground mines separately. Though there was considerable variation in thickness of seam at strip and underground mines, the strip mines generally operated in thinner seams. Strip mining was carried on in 11 States in coal seams having an average thickness of less than that in the deep mines in the same States. These 11 States produced 70 percent of the total strip output in 1950.



—Percentage of bituminous coal and lignite produced in the 10 largest producing States and total United States, 1950, by thickness of seams

TABLE 3.—Number and production of bituminous-coal and lignite mines in the United States, 1950, classified by thickness of seams mined

Thickness of seams mined (feet)	Underground mines				Strip mines				Total—all mines			
	Mines		Production		Mines		Production		Mines		Production	
	Number	Percent	Thousand net tons	Percent	Number	Percent	Thousand net tons	Percent	Number	Percent	Thousand net tons	Percent
Less than 2	55	0.7	678	0.2	83	4.4	3,199	2.6	138	1.5	3,877	0.8
2 to 3	904	12.0	17,790	4.5	387	20.7	17,869	14.5	1,291	13.7	35,659	6.9
3 to 4	3,960	52.4	108,412	27.6	607	32.5	31,922	25.8	4,567	48.4	140,334	27.2
4 to 5	1,272	16.8	77,471	19.7	311	16.6	30,987	25.1	1,583	16.8	108,458	21.0
5 to 6	542	7.2	58,990	15.0	202	10.8	16,125	13.1	744	7.9	75,115	14.5
6 to 7	386	5.1	63,080	16.1	139	7.4	13,360	10.8	525	5.6	76,440	14.8
7 to 8	207	2.7	33,504	8.5	43	2.3	1,506	1.2	250	2.6	35,010	6.8
8 and over	233	3.1	32,919	8.4	98	5.3	8,499	6.9	331	3.5	41,418	8.0
Total	7,559	100.0	392,844	100.0	1,870	100.0	123,467	100.0	9,429	100.0	516,311	100.0

TABLE 4.—Production and average thickness of seams mined at strip and underground bituminous-coal and lignite mines in the United States and Alaska, 1950, by States

[Exclusive of mines producing less than 1,000 tons]

State	Strip mines		Underground mines		Total all mines	
	Production (net tons)	Average thickness coal mined (feet)	Production (net tons)	Average thickness coal mined (feet)	Production (net tons)	Average thickness coal mined (feet)
Alabama	1,888,038	3.3	12,533,772	4.1	14,421,810	4.0
Alaska	130,737	3.2	281,718	4.8	412,455	4.3
Arizona			4,446	5.5	4,446	5.5
Arkansas	504,946	5.7	664,122	2.5	1,169,068	3.9
California (lignite)	(1)				(1)	
Colorado	406,713	8.3	3,851,787	7.4	4,258,500	7.5
Georgia			18,000	1.5	18,000	1.5
Illinois	17,612,423	5.0	38,678,498	7.1	56,290,921	6.4
Indiana	10,739,567	4.4	9,217,462	5.8	19,957,029	5.0
Iowa	1,190,511	4.9	700,900	4.4	1,891,411	4.7
Kansas	2,024,352	1.9	100,628	2.8	2,124,980	1.9
Kentucky	13,977,643	5.3	64,517,960	4.1	78,495,603	4.4
Maryland	161,054	4.7	486,869	4.4	647,923	4.5
Michigan			11,500	2.5	11,500	2.5
Missouri	2,635,424	3.3	327,657	3.2	2,963,081	3.2
Montana:						
Bituminous	1,708,149	23.0	759,887	5.7	2,468,036	17.7
Lignite	(1)		(1)		52,130	16.6
Total Montana	1,717,179	22.9	802,987	6.3	2,520,166	17.6
New Mexico			726,958	5.3	726,958	5.3
North Carolina			(1)		(1)	
North Dakota (lignite)	2,828,056	9.4	432,917	16.7	3,260,973	10.4
Ohio	22,775,193	3.8	14,985,898	4.7	37,761,091	4.2
Oklahoma	1,727,174	2.1	951,397	3.6	2,678,571	2.7
Oregon			1,384	7.5	1,384	7.5
Pennsylvania	26,426,597	3.7	79,443,524	5.3	105,870,121	4.9
South Dakota (lignite)	34,989	4.5	1,211	6.5	36,200	4.6
Tennessee	584,066	2.9	4,485,734	3.9	5,069,800	3.8
Texas (lignite)	18,169	12.0			18,169	12.0
Utah			6,669,896	11.5	6,669,896	11.5
Virginia	1,565,646	6.1	16,101,001	4.8	17,666,647	4.9
Washington	70,540	7.0	803,449	5.7	873,989	5.8
West Virginia	12,986,154	5.5	131,129,529	5.1	144,115,683	5.1
Wyoming	1,458,899	38.3	4,889,350	13.5	6,348,249	19.2
Other States	11,524	10.2	67,035	12.5	26,429	3.5
Total	123,466,564	5.1	392,844,489	5.4	516,311,053	5.3

[1] Included under "Other States" to avoid disclosure.

DOMESTIC PRODUCTION

The statistics in this report combine bituminous coal and lignite. Production figures for lignite are also shown separately in table 69.

The production of bituminous coal and lignite has fluctuated widely from year to year; the chief causes have been market demand and strikes. Domestic market demand is influenced primarily by general industrial conditions, but in recent years exports have had considerable effect on total production. During the last two world wars there was a heavy demand for coal. Since 1930 production has fluctuated between a low of 310 million tons in 1932 to 631 million tons in 1947, the highest production on record. The long-term trend in production, particularly since 1920, has been very greatly influenced by the inroads of competitive fuels and energy, such as oil, gas, and water power. Strikes, as mentioned above, are also a factor. The record of average days lost per man on strike from 1899 to 1953 is shown in table 14. Man-days lost by strikes within the past 10 years have fluctuated from a low of less than one-half million in 1953 to over 19 million in 1946.

The trend of average production of bituminous-coal and lignite per working day in 1944–53 is illustrated in figures 2 and 5. Production, realization, capacity, and net income of bituminous-coal and lignite mines in 1905–53 are shown graphically in figure 3.

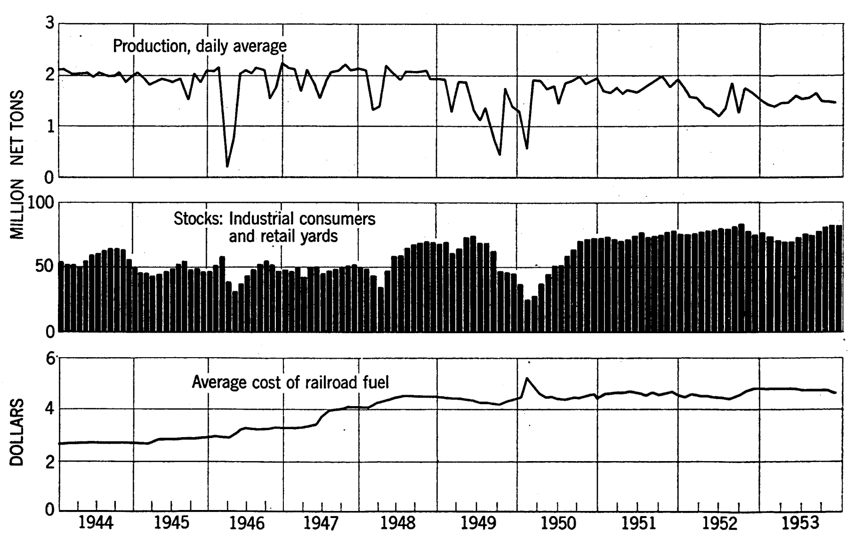


FIGURE 2.—Trends of production, stocks, and prices of bituminous coal and lignite in the United States, 1944–53.

TABLE 5.—Growth of the bituminous-coal and lignite-mining industry in the United States,[1] 1890–1953

Year	Production (net tons)	Value of production [2]		Number of mines	Capacity at 280 days (million tons)	Foreign trade [3]	
		Total	Average per ton			Exports (net tons)	Imports (net tons)
1890	111, 302, 322	$110, 420, 801	$0. 99	(4)	137	1, 272, 396	1, 047, 416
1891	117, 901, 238	117, 188, 400	. 99	(4)	148	1, 651, 694	1, 181, 677
1892	126, 856, 567	125, 124, 381	. 99	(4)	162	1, 904, 556	1, 491, 800
1893	128, 385, 231	122, 751, 618	. 96	(4)	174	1, 986, 383	1, 234, 499
1894	118, 820, 405	107, 653, 501	. 91	(4)	196	2, 439, 720	1, 286, 268
1895	135, 118, 193	115, 779, 771	. 86	2, 555	196	2, 659, 987	1, 411, 323
1896	137, 640, 276	114, 891, 515	. 83	2, 599	202	2, 515, 838	1, 393, 095
1897	147, 617, 519	119, 595, 224	. 81	2, 454	213	2, 670, 157	1, 442, 534
1898	166, 593, 623	132, 608, 713	. 80	2, 862	221	3, 004, 304	1, 426, 108
1899	193, 323, 187	167, 952, 104	. 87	3, 245	230	3, 897, 994	1, 409, 838
1900	212, 316, 112	220, 930, 313	1. 04	(4)	255	6, 060, 688	1, 911, 925
1901	225, 828, 149	236, 422, 049	1. 05	(4)	281	6, 455, 085	2, 214, 507
1902	260, 216, 844	290, 858, 483	1. 12	(4)	316	6, 048, 777	2, 174, 393
1930	282, 749, 348	351, 687, 933	1. 24	(4)	350	5, 835, 561	4, 043, 519
1904	278, 659, 689	305, 397, 001	1. 10	4, 650	386	7, 206, 879	2, 179, 882
1905	315, 062, 785	334, 658, 294	1. 06	5, 060	417	7, 512, 723	1, 704, 810
1906	342, 874, 867	381, 162, 115	1. 11	4, 430	451	8, 014, 263	2, 039, 169
1907	394, 759, 112	451, 214, 842	1. 14	4, 550	473	9, 869, 812	1, 892, 653
1908	332, 573, 944	374, 135, 268	1. 12	4, 730	482	11, 071, 152	2, 219, 243
1909	379, 744, 257	405, 486, 777	1. 07	5, 775	510	10, 101, 131	1, 375, 201
1910	417, 111, 142	469, 281, 719	1. 12	5, 818	538	11, 663, 052	1, 819, 766
1911	405, 907, 059	451, 375, 819	1. 11	5, 887	538	13, 259, 791	1, 972, 555
1912	450, 104, 982	517, 983, 445	1. 15	5, 747	566	16, 475, 029	1, 456, 333
1913	478, 435, 297	565, 234, 952	1. 18	5, 776	577	18, 013, 073	1, 767, 656
1914	422, 703, 970	493, 309, 244	1. 17	5, 592	608	17, 589, 562	1, 520, 962
1915	442, 624, 426	502, 037, 688	1. 13	5, 502	610	18, 776, 640	1, 703, 785
1916	502, 519, 682	665, 116, 077	1. 32	5, 726	613	21, 254, 627	1, 713, 837
1917	551, 790, 563	1, 249, 272, 837	2. 26	6, 939	636	23, 839, 558	1, 448, 453
1918	579, 385, 820	1, 491, 809, 940	2. 58	8, 319	650	22, 350, 730	1, 457, 073
1919	465, 860, 058	1, 160, 616, 013	2. 49	8, 994	669	20, 113, 536	1, 011, 550
1920	568, 666, 683	2, 129, 933, 000	3. 75	8, 921	725	38, 517, 084	1, 244, 990
1921	415, 921, 950	1, 199, 983, 600	2. 89	8, 038	781	23, 131, 166	1, 257, 589
1922	422, 268, 099	1, 274, 820, 000	3. 02	9, 299	832	12, 413, 085	5, 059, 999
1923	564, 564, 662	1, 514, 621, 000	2. 68	9, 331	885	21, 453, 579	1, 882, 306
1924	483, 686, 538	1, 062, 626, 000	2. 20	7, 586	792	17, 100, 347	417, 226
1925	520, 052, 741	1, 060, 402, 000	2. 04	7, 144	748	17, 461, 560	601, 737
1926	573, 366, 985	1, 183, 412, 000	2. 06	7, 177	747	35, 271, 937	485, 666
1927	517, 763, 352	1, 029, 657, 000	1. 99	7, 011	759	18, 011, 744	549, 843
1928	500, 744, 970	933, 774, 000	1. 86	6, 450	691	16, 164, 485	546, 526
1929	534, 988, 593	952, 781, 000	1. 78	6, 057	679	17, 429, 298	495, 219
1930	467, 526, 299	795, 483, 000	1. 70	5, 891	700	15, 877, 407	240, 886
1931	382, 089, 396	588, 895, 000	1. 54	5, 642	669	12, 126, 299	206, 303
1932	309, 709, 872	406, 677, 000	1. 31	5, 427	594	8, 814, 047	186, 909
1933	333, 630, 533	445, 788, 000	1. 34	5, 555	559	9, 036, 947	197, 429
1934	359, 368, 022	628, 383, 000	1. 75	6, 258	565	10, 868, 552	179, 661
1935	372, 373, 122	658, 063, 000	1. 77	6, 315	582	9, 742, 430	201, 871
1936	439, 087, 903	770, 955, 000	1. 76	6, 875	618	10, 654, 959	271, 798
1937	445, 531, 449	864, 042, 000	1. 94	6, 548	646	13, 144, 678	257, 996
1938	348, 544, 764	678, 653, 000	1. 95	5, 777	602	10, 490, 269	241, 305
1939	394, 855, 325	728, 348, 366	1. 84	5, 820	621	11, 590, 478	355, 115
1940	460, 771, 500	879, 327, 227	1. 91	6, 324	639	16, 465, 928	371, 571
1941	514, 149, 245	1, 125, 362, 836	2. 19	6, 822	666	20, 740, 471	390, 049
1942	582, 692, 937	1, 373, 990, 608	2. 36	6, 972	663	22, 943, 305	498, 103
1943	590, 177, 069	1, 584, 644, 477	2. 69	6, 620	626	25, 836, 208	757, 634
1944	619, 576, 240	1, 810, 900, 542	2. 92	6, 928	624	26, 032, 348	633, 689
1945	577, 617, 327	1, 768, 204, 320	3. 06	7, 033	620	27, 956, 192	467, 473
1946	533, 922, 068	1, 835, 539, 476	3. 44	7, 333	699	41, 197, 378	434, 680
1947	630, 623, 722	2, 622, 634, 946	4. 16	8, 700	755	68, 666, 963	290, 141
1948	599, 518, 229	2, 993, 267, 021	4. 99	9, 079	774	45, 930, 133	291, 337
1949	437, 868, 036	2, 136, 870, 571	4. 88	8, 559	781	27, 842, 056	314, 980
1950	516, 311, 053	2, 500, 373, 779	4. 84	9, 429	790	25, 468, 403	346, 706
1951	533, 664, 732	2, 626, 030, 137	4. 92	8, 009	736	56, 721, 547	292, 378
1952	466, 840, 782	2, 289, 180, 401	4. 90	7, 275	703	47, 643, 150	262, 268
1953	457, 290, 449	2, 247, 828, 694	4. 92	6, 671	670	33, 760, 263	226, 900

[1] Includes Alaska.
[2] Figures for 1890 to 1936 and 1939 exclude selling expense. Figures for 1937–38 and 1940–53 include selling expense.
[3] Figures for 1890 to 1914, inclusive, represent fiscal year ended June 30.
[4] Data not available.

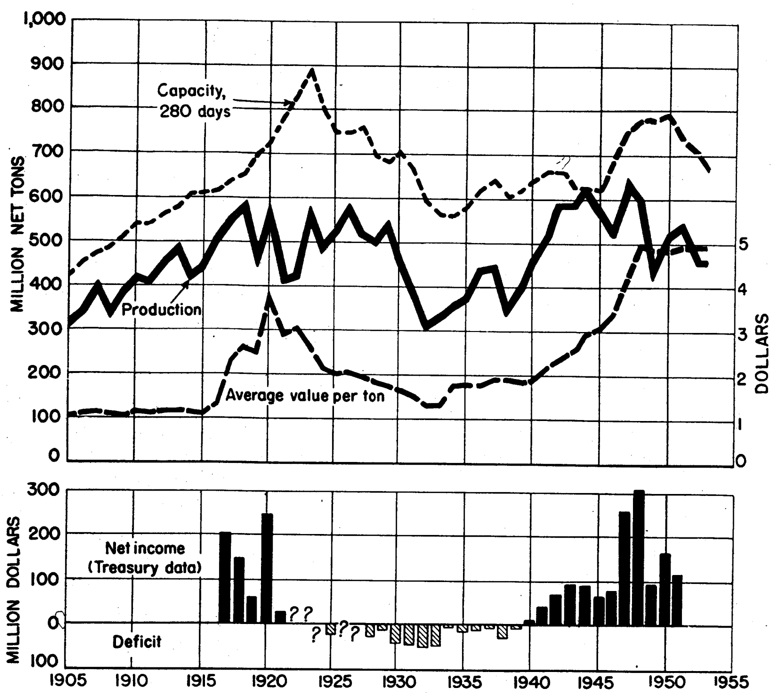


FIGURE 3.—Trends of bituminous-coal and lignite production, realization, mine capacity, and net income or deficit in the United States, 1905–33.

PRODUCTION BY MONTH AND WEEK

The figures on monthly and weekly production are estimates based upon (1) railroad carloadings of coal reported daily and weekly by all the important carriers, (2) shipments by river reported by the United States Army Engineers, (3) direct reports from a number of mining companies, and (4) monthly production statements compiled by certain local operators' associations and State mine departments. In computing the estimates allowance is made for commercial truck shipments, local sales colliery fuel, and for small truck mines producing over 1,000 tons a year. Preliminary estimates are made currently and published in Weekly Coal Reports. These preliminary estimates have proved reliable, and for many years the accuracy has been within approximately 1 percent of the final figure of total production, based upon a complete coverage of all mines producing over 1,000 tons a year. The preliminary estimate of production for 1953 was 453 million tons, and the final figure based on the canvass was 457 million tons—a difference of only 0.9 percent. The preliminary estimates are later revised to agree with the final total production based on the canvass. Thus, the monthly and weekly estimates of production, summarized in tables 6 to 9, represent final figures and vary slightly from the preliminary figures of production published currently in Weekly Coal Reports.

Monthly and weekly production of bituminous coal and lignite varies much more than annual production. The major cause for current fluctuations in production is strikes. During periods of major strikes approximately 80 percent of production is stopped. Even during periods of apparent labor peace many strikes occur each year. According to the Bureau of Labor Statistics, for the past 10 years, there was a low of 392 strikes in 1953 and a high of 792 strikes in 1944 in bituminous-coal and lignite mines.

In recent years the miners' vacation period has been marked by a sharp decline in production, as all miners under contract take their vacations during the latter part of June and the first few days in July.

Traditionally, there was a substantial seasonal decline in production of bituminous coal and lignite during the summer; however, in recent years this decline has been much less pronounced. The quantity of soft coal used for space heating is very small compared with earlier years, while some industrial consumers actually increase their consumption of coal in the summertime. Also, the heavy shipments of soft coal on the Great Lakes during the summer help to reduce the seasonal decline. Other minor causes of current fluctuations in production are "special" holidays and heavy snowstorms that make it difficult for the miners to report to work.

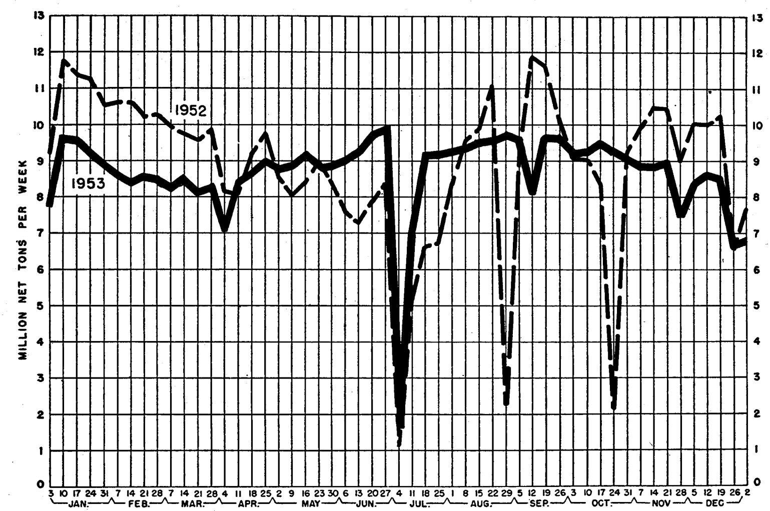


FIGURE 4.—Production of bituminous coal and lignite in the United States, 1952–53, by weeks.

TABLE 6.—Production of bituminous coal and lignite in the United States, 1952–53, with estimates by months

Month	Production (thousand net tons)		Maximum number of working days		Average production per working day (thousand net tons)	
	1952	1953	1952	1953	1952	1953
January	50, 116	39, 954	26	26	1, 928	1, 537
February	43, 902	34, 711	25	24	1, 756	1, 446
March	41, 120	36, 899	26	26	1, 582	1, 419
April	39, 253	37, 484	25. 3	25. 3	1, 552	1, 482
May	36, 592	37, 716	26. 4	25. 5	1, 386	1, 479
June	31, 581	39, 019	23. 8	24. 1	1, 327	1, 619
July	25, 916	35, 307	21. 8	22. 7	1, 189	1, 555
August	34, 313	40, 651	26	26	1, 320	1, 564
September	47, 076	41, 379	25	25	1, 883	1, 655
October	32, 871	40, 949	27	27	1, 217	1, 517
November	41, 195	35, 798	23. 3	23. 7	1, 768	1, 511
December	42, 906	37, 423	26	25. 3	1, 650	1, 479
Total	466, 841	457, 290	301. 6	300. 6	1, 548	1, 521

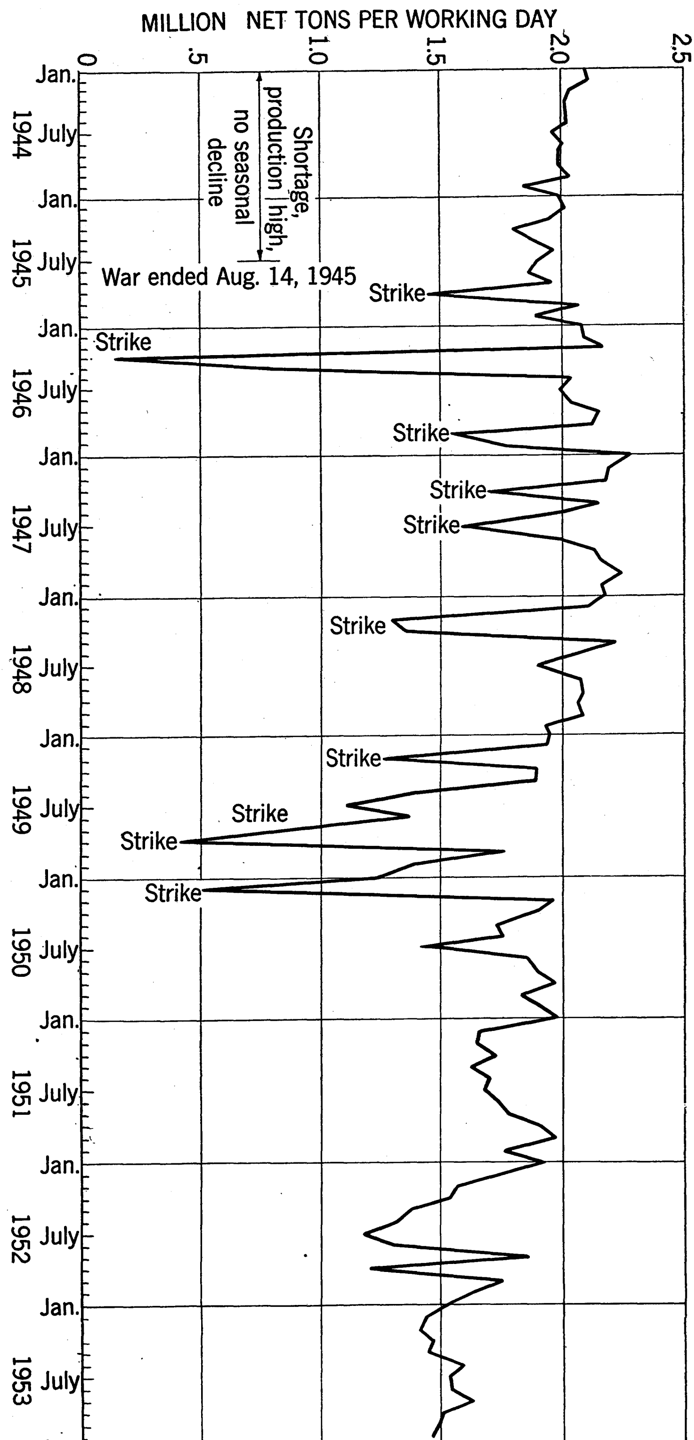


FIGURE 5.—Average production of bituminous coal and lignite in the United States per working day in each month, 1944–53.

TABLE 7.—Production of bituminous coal and lignite in the United States and Alaska in 1953, by States, with estimates by months, in thousand net tons

[Totals for year are based on final complete returns from all operators known to have produced 1,000 tons and over per year. In most cases monthly apportionment is based on current records of railroad carloadings and river shipments, supplemented by direct reports from local sources]

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alabama	1,172	1,047	1,161	1,033	1,034	994	921	1,081	1,102	1,091	946	950	12,532
Alaska	72	54	67	66	59	59	64	65	87	93	92	83	861
Arkansas	73	52	48	47	38	54	52	65	95	93	82	76	775
Colorado	391	329	288	240	185	182	171	243	308	385	388	465	3,575
Illinois	4,281	3,652	3,874	3,584	3,288	3,309	3,287	3,654	4,052	4,264	3,986	4,779	46,010
Indiana	1,653	1,496	1,501	1,253	1,163	1,175	999	1,190	1,305	1,225	1,285	1,568	15,813
Iowa	189	153	126	100	82	71	82	84	98	108	116	179	1,388
Kansas	198	151	133	113	112	140	127	138	131	145	154	173	1,715
Kentucky:													
Eastern	3,731	3,062	3,263	3,658	3,777	4,123	3,631	4,172	4,058	3,968	3,089	3,215	43,747
Western	1,815	1,545	1,587	1,602	1,600	1,796	1,747	1,838	2,022	1,983	1,813	1,965	21,313
Total Kentucky	5,546	4,607	4,850	5,260	5,377	5,919	5,378	6,010	6,080	5,951	4,902	5,180	65,060
Maryland	53	42	36	38	39	49	35	25	46	68	43	56	530
Missouri	278	211	196	175	141	160	143	162	203	222	242	260	2,393
Montana:													
Bituminous	132	159	137	138	131	135	142	132	165	163	177	237	1,848
Lignite	2	2	2	2	2	2	2	2	2	2	2	3	25
Total Montana	134	161	139	140	133	137	144	134	167	165	179	240	1,873
New Mexico	55	55	64	60	43	40	30	37	42	36	24	28	514
North Dakota (lignite)	309	245	247	193	159	159	159	167	235	286	302	342	2,803
Ohio	2,759	2,522	2,901	3,160	3,368	3,373	2,926	3,123	3,019	2,921	2,404	2,261	34,737
Oklahoma	206	174	174	142	147	182	138	195	222	200	183	205	2,168
Pennsylvania	8,264	7,745	7,985	7,854	7,786	7,754	6,926	8,077	8,120	8,207	7,203	7,410	93,331
South Dakota (lignite)	2	2	2	2	2	2	1	2	2	2	2	2	23
Tennessee	486	424	414	394	414	428	387	533	527	530	441	489	5,467
Utah	583	463	505	520	539	537	363	619	670	645	560	540	6,544
Virginia	1,586	1,355	1,390	1,553	1,540	1,724	1,644	1,850	1,847	1,777	1,460	1,393	19,119
Washington	74	72	59	59	40	69	40	49	56	56	60	56	690
West Virginia:													
Southern [1]	7,532	6,177	6,981	7,517	7,873	8,145	7,393	8,891	8,631	8,368	6,975	6,984	91,467
Northern [2]	3,562	3,086	3,321	3,580	3,810	3,929	3,567	3,862	3,851	3,563	3,261	3,246	42,638
Total West Virginia	11,094	9,263	10,302	11,097	11,683	12,074	10,960	12,753	12,482	11,931	10,236	10,230	134,105
Wyoming	493	434	436	399	343	427	329	394	482	546	506	456	5,245
Other States [3]	3	2	1	2	1	1	1	1	1	2	2	2	19
Total	39,954	34,711	36,899	37,484	37,716	39,019	35,307	40,651	41,379	40,949	35,798	37,423	457,290

[1] Includes operations on the N. & W., C. & O., Virginian, T. & O. C., B. C. & G., and the B. & O. in Kanawha, Mason, and Clay Counties.
[2] Rest of State, including the Panhandle district and Grant, Mineral, and Tucker Counties. [3] Includes Arizona and Georgia.

TABLE 8.—Production of bituminous coal and lignite in the United States in 1953, by districts, with estimates by months, in thousand net tons

[Districts as defined in the Bituminous Coal Act of April 26, 1937 (50 Stats. 72, 91–94), and modifications thereto]

[Totals for year are based on final complete returns from all operators known to have produced 1,000 tons and over per year. In most cases monthly apportionment is based on current records of railroad carloadings and river shipments, supplemented by direct reports from local sources]

District	January	February	March	April	May	June	July	August	September	October	November	December	Total
1. Eastern Pennsylvania	3,360	3,038	3,089	3,046	3,010	3,200	2,932	3,267	3,274	3,227	3,066	3,042	37,551
2. Western Pennsylvania	4,980	4,770	4,954	4,869	4,840	4,629	4,052	4,861	4,918	5,071	4,202	4,445	56,591
3. Northern West Virginia	3,285	2,845	3,062	3,302	3,513	3,623	3,290	3,560	3,550	3,286	3,007	2,994	39,317
4. Ohio	2,759	2,522	2,901	3,160	3,368	3,373	2,926	3,123	3,019	2,921	2,404	2,261	34,737
5. Michigan	----	----	----	----	----	----	----	----	----	----	----	----	----
6. Panhandle	254	220	237	255	272	280	254	276	275	254	232	231	3,040
7. Southern Numbered 1	3,637	3,005	3,412	3,628	3,790	3,973	3,620	4,360	4,225	4,121	3,439	3,435	44,645
8. Southern Numbered 2	9,535	7,871	8,498	9,362	9,676	10,303	9,306	10,907	10,661	10,344	8,378	8,482	113,323
9. West Kentucky	1,815	1,545	1,587	1,602	1,600	1,796	1,747	1,838	2,022	1,983	1,813	1,965	21,313
10. Illinois	4,281	3,652	3,874	3,584	3,288	3,309	3,287	3,654	4,052	4,264	3,986	4,779	46,010
11. Indiana	1,653	1,496	1,501	1,253	1,163	1,175	999	1,190	1,305	1,225	1,285	1,568	15,813
12. Iowa	189	153	126	100	82	71	82	84	98	108	116	179	1,388
13. Southeastern	1,337	1,191	1,300	1,166	1,173	1,139	1,051	1,261	1,280	1,270	1,095	1,115	14,378
14. Arkansas-Oklahoma	164	129	124	110	103	134	113	151	192	181	162	166	1,729
15. Southwestern	591	459	427	367	335	402	347	409	459	479	499	548	5,322
16. Northern Colorado	98	91	63	52	28	21	26	26	39	97	117	151	809
17. Southern Colorado	338	283	277	237	192	194	170	248	304	318	291	337	3,189
18. New Mexico	11	10	12	12	8	7	5	6	7	7	5	6	96
19. Wyoming	493	434	436	399	343	427	329	394	482	546	506	456	5,245
20. Utah	583	463	505	520	539	537	363	619	670	645	560	540	6,544
21. North-South Dakota	311	247	249	195	161	161	160	169	237	288	304	344	2,826
22. Montana	134	161	139	140	133	137	144	134	167	165	179	240	1,873
23. Washington	146	126	126	125	99	128	104	114	143	149	152	139	1,551
Total	39,954	34,711	36,899	37,484	37,716	39,019	35,307	40,651	41,379	40,949	35,798	37,423	457,290

TABLE 9.—Production of bituminous coal and lignite in the United States, 1952–53, with estimates by weeks

1952				1953			
Week ended—	Production (thousand net tons)	Maximum number of working days	Average production per working day (thousand net tons)	Week ended—	Production (thousand net tons)	Maximum number of working days	Average production per working day (thousand net tons)
Jan. 5	[1] 7,446	[1] 4	[2] 1,848	Jan. 3	[1] 2,041	[1] 2	[2] 1,547
Jan. 12	11,890	6	1,982	Jan. 10	9,764	6	1,627
Jan. 19	11,451	6	1,909	Jan. 17	9,733	6	1,622
Jan. 26	11,333	6	1,889	Jan. 24	9,372	6	1,562
Feb. 2	10,487	6	1,748	Jan. 31	9,044	6	1,507
Feb. 9	10,599	6	1,767	Feb. 7	8,764	6	1,461
Feb. 16	10,623	6	1,771	Feb. 14	8,527	6	1,421
Feb. 23	10,251	6	1,709	Feb. 21	8,732	6	1,455
Mar. 1	10,344	6	1,724	Feb. 28	8,688	6	1,448
Mar. 8	9,911	6	1,652	Mar. 7	8,292	6	1,382
Mar. 15	9,776	6	1,629	Mar. 14	8,654	6	1,442
Mar. 22	9,560	6	1,593	Mar. 21	8,315	6	1,386
Mar. 29	9,868	6	1,645	Mar. 28	8,440	6	1,407
Apr. 5	8,172	5.3	1,542	Apr. 4	7,198	5.3	1,358
Apr. 12	8,094	6	1,349	Apr. 11	8,567	6	1,428
Apr. 19	9,219	6	1,537	Apr. 18	8,782	6	1,464
Apr. 26	9,782	6	1,630	Apr. 25	9,105	6	1,518
May 3	8,583	6	1,431	May 2	8,854	6	1,476
May 10	7,993	6	1,332	May 9	8,917	6	1,486
May 17	8,348	6	1,391	May 16	9,196	6	1,533
May 24	8,902	6	1,484	May 23	8,856	6	1,476
May 31	8,351	5.4	1,546	May 30	8,923	5.5	1,622
June 7	7,616	6	1,269	June 6	9,105	6	1,518
June 14	7,288	6	1,215	June 13	9,322	6	1,554
June 21	7,935	6	1,323	June 20	9,794	6	1,632
June 28	8,430	5.5	1,533	June 27	9,972	5.6	1,781
July 5	1,128	1	1,128	July 4	1,647	1	1,647
July 12	5,200	5.1	1,020	July 11	6,989	5.2	1,344
July 19	6,644	6	1,107	July 18	9,246	6	1,541
July 26	6,733	6	1,122	July 25	9,262	6	1,544
Aug. 2	8,336	6	1,389	Aug. 1	9,353	6	1,559
Aug. 9	9,465	6	1,578	Aug. 8	9,449	6	1,575
Aug. 16	9,822	6	1,637	Aug. 15	9,620	6	1,603
Aug. 23	11,006	6	1,834	Aug. 22	9,661	6	1,610
Aug. 30	2,207	6	368	Aug. 29	9,834	6	1,639
Sept. 6	9,238	5	1,848	Sept. 5	9,684	6	1,614
Sept. 13	11,895	6	1,983	Sept. 12	8,177	5	1,635
Sept. 20	11,617	6	1,936	Sept. 19	9,735	6	1,623
Sept. 27	10,081	6	1,680	Sept. 26	9,724	6	1,621
Oct. 4	9,143	6	1,524	Oct. 3	9,289	6	1,548
Oct. 11	9,153	6	1,526	Oct. 10	9,341	6	1,557
Oct. 18	8,415	6	1,403	Oct. 17	9,581	6	1,597
Oct. 25	2,185	6	364	Oct. 24	9,340	6	1,557
Nov. 1	9,294	6	1,549	Oct. 31	9,180	6	1,530
Nov. 8	9,991	5.5	1,817	Nov. 7	8,930	6	1,488
Nov. 15	10,541	5.8	1,817	Nov. 14	8,918	5.7	1,565
Nov. 22	10,518	6	1,753	Nov. 21	9,056	6	1,509
Nov. 29	9,071	5	1,814	Nov. 28	7,507	5	1,501
Dec. 6	10,150	6	1,692	Dec. 5	8,462	6	1,410
Dec. 13	10,125	6	1,688	Dec. 12	8,691	6	1,449
Dec. 20	10,336	6	1,723	Dec. 19	8,596	6	1,433
Dec. 27	6,600	5	1,320	Dec. 26	6,754	4.3	1,571
Jan. 3	[1] 5,695	[1] 3	[2] 1,547	Jan. 2	[1] 6,307	[1] 4	[2] 1,358
Total	466,841	301.6	1,548	Total	457,290	300.6	1,521

[1] Figures represent output and number of working days in that part of the week included in the calendar year shown. Total production for the week ended January 3, 1953, was 7,736,000 net tons, and for January 2, 1954, 6,790,000 net tons.

[2] Average daily output for the entire week and not for working days in the calendar year shown.

SUMMARY BY STATES

Over a period of years thcre have been wide variations in production in different States. Table 10 gives production, by States, during the past 10 years and the year of maximum output for each State. As a background for comparison, total production in the United States reached its peak in 1947. Georgia, a small producer, reached its peak output in 1903. Maryland, one of the oldest coal-producing States, Arkansas, and Michigan all reached their maximum production in 1907. It is most significant that nine States, including Illinois and Pennsylvania, reached their peak during World War I, 1917–18. In striking contrast, Kentucky and West Virginia attained their maximum output in 1947. However, West Virginia ranked first in terms of production in 1953, followed by Pennsylvania, Kentucky, and Illinois in the order listed. Total output from the earliest record to the end of 1953, by States, is given in the last column of table 10. Here Pennsylvania ranks first, followed by West Virginia, Illinois, and Kentucky.

A summary of detailed statistics, by State and by Coal Act district, is given in tables 11 and 12. These tables make possible easy comparisons between State and district for such strategic items as production, number of mines, disposition of coal, average value per ton, number of men working, days worked and output per man per day. As fluctuation seems to be the key characteristic of the soft coal industry, it is not surprising to find wide variations among the States in most of the strategic items mentioned. Most variations, generally speaking, are explained in terms of physical conditions, extent of mechanization, or market demand.

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TABLE 10.—Bituminous coal and lignite produced in the United States, by States, 1944–53, with production of maximum year and cumulative production from earliest record to end of 1953, in thousand net tons

State	Maximum production		Production by years										Total production from earliest record to end of 1953
	Year	Quantity	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	
Alabama	1926	21, 001	18, 752	18, 236	16, 183	19, 048	18, 801	12, 934	14, 422	13, 597	11, 383	12, 532	874, 212
Arkansas	1907	2, 670	1, 972	1, 854	1, 631	1, 871	1, 662	962	1, 169	1, 107	873	775	95, 300
Colorado	1917	12, 483	8, 168	7, 621	5, 914	6, 358	5, 631	4, 636	4, 259	4, 103	3, 623	3, 575	486, 681
Georgia	1903	416	24	43	114	7	20	([1])	([1])	([1])	([1])	14	([1])
Illinois	1918	89, 291	76, 792	73, 011	63, 469	67, 860	65, 342	47, 208	56, 291	54, 200	45, 790	46, 010	3, 333, 574
Indiana	1918	30, 679	27, 962	25, 183	21, 697	25, 449	23, 849	16, 550	19, 957	19, 451	16, 350	15, 812	1, 056, 858
Iowa	1917	8, 966	2, 141	2, 046	1, 788	1, 684	1, 670	1, 725	1, 891	1, 630	1, 381	1, 388	344, 023
Kansas	1918	7, 562	3, 369	3, 228	2, 493	2, 745	2, 538	2, 031	2, 125	1, 961	2, 029	1, 715	273, 881
Kentucky	1947	84, 241	71, 356	69, 593	66, 553	84, 241	82, 084	62, 583	78, 495	74, 972	66, 114	65, 060	2, 240, 415
Maryland	1907	5, 533	1, 870	1, 763	2, 003	2, 051	1, 661	668	648	589	588	530	262, 180
Michigan	1907	2, 036	140	126	80	14	13	12	11	7	------	------	46, 391
Missouri	1917	5, 671	4, 779	3, 983	3, 733	4, 236	4, 023	3, 647	2, 963	3, 269	2, 955	2, 393	269, 048
Montana (bituminous and lignite)	1944	4, 844	4, 844	4, 467	3, 723	3, 178	2, 898	2, 766	2, 520	2, 345	2, 070	1, 873	166, 071
New Mexico	1918	4, 023	1, 744	1, 484	1, 280	1, 443	1, 364	1, 004	727	783	760	514	124, 224
North Carolina	1922	79	------	------	------	------	------	([1])	([1])	([1])	([1])	------	([1])
North Dakota (lignite)	1950	3, 261	2, 366	2, 522	2, 555	2, 760	2, 961	2, 967	3, 261	3, 224	2, 984	2, 803	79, 912
Ohio	1920	45, 878	33, 877	32, 737	32, 314	37, 548	38, 708	30, 961	37, 761	37, 949	36, 209	34, 737	1, 844, 338
Oklahoma	1920	4, 849	3, 209	2, 909	2, 647	3, 421	3, 462	3, 022	2, 679	2, 223	2, 193	2, 168	168, 038
Pennsylvania	1918	178, 551	146, 052	132, 965	125, 497	147, 079	134, 542	89, 215	105, 870	108, 164	89, 181	93, 331	7, 762, 337
Tennessee	1942	8, 158	7, 266	6, 271	5, 618	6, 258	6, 483	4, 172	5, 070	5, 401	5, 265	5, 467	345, 515
Texas (bituminous and lignite)	1913	2, 429	[2] 109	[2] 80	[2] 56	[2] 61	[2] 57	[2] 49	[2] 18	------	------	------	60, 929
Utah	1947	7, 429	7, 119	6, 679	5, 994	7, 429	6, 813	6, 160	6, 670	6, 136	6, 140	6, 544	223, 356
Virginia	1952	21, 579	19, 514	17, 235	15, 527	20, 171	17, 999	14, 584	17, 667	21, 400	21, 579	19, 119	633, 888
Washington	1918	4, 082	1, 524	1, 357	991	1, 118	1, 220	899	874	857	844	690	145, 714
West Virginia	1947	176, 157	164, 704	152, 035	144, 020	176, 157	168, 862	122, 610	144, 116	163, 310	141, 713	134, 105	5, 544, 987
Wyoming	1945	9, 847	9, 540	9, 847	7, 635	8, 051	6, 412	6, 001	6, 348	6, 430	6, 088	5, 245	387, 572
Other States [3]	------	------	383	342	407	386	443	502	499	557	729	890	68, 668
Total	1947	630, 624	619, 576	577, 617	533, 922	630, 624	599, 518	437, 868	516, 311	533, 665	466, 841	457, 290	26, 838, 112

[1] Included under "Other States."
[2] Lignite only.
[3] Includes Alaska.

TABLE 11.—Number of mines, production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by States

[Exclusive of mines producing less than 1,000 tons]

State	Number of active mines	Disposition of coal produced (net tons)					Average value per ton [3]	Average number of men working daily					Average number of days worked	Number of man-days worked	Average tons per man per day
		Shipped by rail or water [1]	Trucked to railroad or waterway for further shipment	Shipped by truck	Used at mine [2]	Total quantity		Underground	Surface			Total			
									At auger mining	In strip pits	All others				
Alabama	248	9,707,506	725,263	1,104,117	995,175	12,532,061	$6.33	7,993	-------	622	1,796	10,411	200	2,077,579	6.03
Alaska	9	750,382	69,355	38,200	3,534	861,471	9.81	187	-------	105	107	399	258	102,780	8.38
Arizona	1	-------	-------	5,140	-------	5,140	6.25	9	-------	-------	1	10	189	1,887	2.72
Arkansas	39	696,776	46,313	31,283	835	775,207	7.93	833	-------	153	183	1,169	122	142,095	5.46
Colorado	123	2,461,391	218,175	820,801	74,483	3,574,850	5.37	2,108	-------	67	1,058	3,233	174	563,536	6.34
Georgia	6	-------	-------	14,100	-------	14,100	5.00	23	-------	-------	2	25	161	4,035	3.49
Illinois	212	39,821,398	494,249	5,181,929	512,315	46,009,891	3.95	12,426	-------	1,504	6,178	20,108	169	3,398,518	13.54
Indiana	83	13,715,144	60,764	1,532,057	504,520	15,812,485	3.94	2,957	-------	1,251	1,721	5,929	182	1,079,399	14.65
Iowa	77	495,037	240,941	648,876	3,152	1,388,006	3.79	526	-------	266	188	980	179	175,402	7.91
Kansas	28	1,490,190	27,211	195,539	2,064	1,715,004	4.14	91	-------	336	220	647	169	109,661	15.64
Kentucky	1,688	52,115,018	6,478,439	6,266,855	200,166	65,060,478	4.66	37,140	42	1,751	7,585	46,518	175	8,130,135	8.00
Maryland	84	83,239	82,843	358,188	6,320	530,590	4.60	383	13	151	48	595	171	101,695	5.22
Missouri	56	1,953,664	16,785	420,712	2,143	2,393,304	4.12	375	-------	396	335	1,106	158	174,704	13.70
Montana:															
Bituminous	13	1,797,521	582	44,400	5,831	1,848,334	2.64	303	-------	51	172	526	151	79,192	23.34
Lignite	6	-------	-------	24,688	115	24,803	3.77	14	-------	4	3	21	156	3,272	7.58
Total Montana	19	1,797,521	582	69,088	5,946	1,873,137	2.66	317	-------	55	175	547	151	82,464	22.71
New Mexico	24	394,251	19,810	98,904	816	513,781	6.00	434	-------	12	74	520	186	96,854	5.30
North Dakota (lignite)	46	2,169,057	-------	353,294	280,207	2,802,558	2.36	79	-------	289	213	581	188	109,054	25.70
Ohio	522	23,029,673	1,628,383	9,894,633	184,084	34,736,773	3.78	6,554	42	3,518	3,115	13,229	212	2,805,508	12.38
Oklahoma	43	1,994,559	87,224	85,193	618	2,167,594	6.10	855	-------	400	261	1,516	197	298,365	7.26
Pennsylvania	1,411	65,453,979	8,035,963	14,259,916	5,581,013	93,330,871	5.53	50,773	37	6,318	10,929	68,057	206	14,011,324	6.66
South Dakota (lignite)	2	-------	-------	23,671	-------	23,671	3.47	-------	-------	12	2	14	196	2,750	8.61
Tennessee	529	3,201,649	894,525	1,333,102	37,293	5,466,569	4.60	5,175	34	437	726	6,372	156	993,446	5.50
Utah	58	5,656,543	246,111	460,014	181,477	6,544,145	5.76	3,049	-------	-------	941	3,990	219	874,986	7.48
Virginia	293	14,623,335	2,986,257	1,243,485	265,973	19,119,050	5.34	12,064	28	344	2,316	14,752	184	2,717,588	7.04
Washington	18	483,366	71,353	119,829	15,283	689,831	7.32	539	-------	53	215	807	186	150,362	4.59
West Virginia	1,021	121,836,916	6,427,617	2,400,471	3,440,306	134,105,310	5.17	69,698	368	3,183	15,736	88,985	194	17,229,645	7.78
Wyoming	31	4,986,181	6,007	142,600	109,784	5,244,572	4.53	1,847	-------	172	587	2,606	197	513,451	10.21
Total	6,671	368,916,775	28,864,170	47,101,997	12,407,507	457,290,449	4.92	216,435	564	21,395	54,712	293,106	191	55,947,223	8.17

[1] Includes coal loaded at mine directly into railroad cars or river barges.

[2] Includes coal used by mine employees, taken by locomotive tenders at tipple, used at mine for power and heat, transported from mine to point of use by conveyor or tram, made into beehive coke at mine, and all other uses at mine.

[3] 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.)

TABLE 12.—Number of mines, production, value, men working daily, days active, man-days and output per man per day at bituminous-coal and lignite mines in the United States, 1953, by districts

[Districts as defined in the Bituminous Coal Act of April 26, 1937 (50 Stats. 72, 91–94), and modifications thereto: exclusive of mines producing less than 1,000 tons]

District	Number of active mines	Disposition of coal produced (net tons)					Average value per ton [3]	Average number of men working daily					Average number of days worked	Number of man-days worked	Average tons per man per day
		Shipped by rail or water [1]	Trucked to railroad or waterway for future shipment	Shipped by truck	Used at mine [2]	Total quantity		Underground	Surface			Total			
									At auger mining	In strip pits	All others				
1. Eastern Pennsylvania	970	24, 281, 953	6, 672, 025	5, 129, 941	1, 467, 326	37, 551, 245	$5. 14	20, 331	44	4, 356	4, 947	29, 678	189	5, 607, 525	6. 70
2. Western Pennsylvania	538	41, 401, 392	1, 518, 405	9, 551, 281	4, 120, 050	56, 591, 128	5. 79	30, 999	6	2, 173	6, 071	39, 249	218	8, 553, 936	6. 62
3. Northern West Virginia	381	34, 301, 412	3, 023, 486	1, 073, 518	919, 050	39, 317, 466	4. 60	14, 870	137	1, 628	3, 731	20, 366	191	3, 883, 483	10. 12
4. Ohio	522	23, 029, 673	1, 628, 383	9, 894, 633	184, 084	34, 736, 773	3. 78	6, 554	42	3, 518	3, 115	13, 229	212	2, 805, 508	12. 38
5. Michigan	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
6. Panhandle	24	1, 646, 336	61, 277	412, 324	920, 687	3, 040, 624	4. 34	1, 577	------	157	257	1, 991	182	362, 588	8. 39
7. Southern Numbered 1	327	41, 956, 784	1, 551, 779	290, 697	845, 595	44, 644, 855	5. 96	30, 688	92	976	6, 508	38, 264	194	7, 438, 736	6. 00
8. Southern Numbered 2	2, 393	94, 329, 271	10, 598, 374	7, 158, 055	1, 236, 891	113, 322, 591	5. 14	70, 569	235	1, 864	13, 752	86, 420	181	15, 671, 773	7. 23
9. West Kentucky	154	18, 764, 062	1, 071, 015	1, 457, 191	21, 135	21, 313, 403	3. 35	4, 463	8	878	1, 866	7, 215	190	1, 369, 907	15. 56
10. Illinois	212	39, 821, 398	494, 249	5, 181, 929	512, 315	46, 009, 891	3. 95	12, 426	------	1, 504	6, 178	20, 108	169	3, 398, 518	13. 54
11. Indiana	83	13, 715, 144	60, 764	1, 532, 057	504, 520	15, 812, 485	3. 94	2, 957	------	1, 251	1, 721	5, 929	182	1, 079, 399	14. 65
12. Iowa	77	495, 037	240, 941	648, 876	3, 152	1, 388, 006	3. 79	526	------	266	188	980	179	175, 402	7. 91
13. Southeastern	493	10, 340, 432	1, 134, 546	1, 907, 227	995, 512	14, 377, 717	6. 10	9, 752	------	774	2, 006	12, 532	190	2, 377, 499	6. 05
14. Arkansas-Oklahoma	62	1, 580, 362	88, 677	59, 183	835	1, 729, 057	7. 33	1, 156	------	379	283	1, 818	147	267, 502	6. 46
15. Southwestern	104	4, 554, 827	88, 856	673, 544	4, 825	5, 322, 052	4. 44	998	------	906	716	2, 620	175	457, 323	11. 64
16. Northern Colorado	18	390, 325	------	392, 760	25, 843	808, 928	4. 36	528	------	17	119	664	146	96, 660	8. 37
17. Southern Colorado	113	2, 465, 317	218, 175	456, 722	49, 173	3, 189, 387	5. 73	1, 891	------	50	992	2, 933	184	538, 414	5. 92
18. New Mexico	17	------	19, 810	75, 363	283	95, 456	5. 46	132	------	12	22	166	164	27, 203	3. 51
19. Wyoming	31	4, 986, 181	6, 007	142, 600	109, 784	5, 244, 572	4. 53	1, 847	------	172	587	2, 606	197	513, 451	10. 21
20. Utah	58	5, 656, 543	246, 111	460, 014	181, 477	6, 544, 145	5. 76	3, 049	------	------	941	3, 990	219	874, 986	7. 48
21. North-South Dakota	48	2, 169, 057	------	376, 965	280, 207	2, 826, 229	2. 37	79	------	301	215	595	188	111, 804	25. 28
22. Montana	19	1, 797, 521	582	69, 088	5, 946	1, 873, 137	2. 66	317	------	55	175	547	151	82, 464	22. 71
23. Washington	27	1, 233, 748	140, 708	158, 029	18, 817	1, 551, 302	8. 70	726	------	158	322	1, 206	210	253, 142	6. 13
Total	6, 671	368, 916, 775	28, 864, 170	47, 101, 997	12, 407, 507	457, 290, 449	4. 92	216, 435	564	21, 395	54, 712	293, 106	191	55, 947, 223	8. 17

[1] Includes coal loaded at mine directly into railroad cars or river barges.
[2] Includes coal used by mine employees, taken by locomotive tender at tipple, used at mine for power and heat, coal transported from mine to point of use by conveyor or tram, coal made into beehive coke at mine, and all other uses at mine.
[3] 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.)

NUMBER AND SIZE OF MINES

The unit in the statistical record is the mine, and operating companies are requested to make a separate report for each mine because its location is definitely known and can be related to a specific district or county; its identity can be followed through successive changes of ownership; and it is the natural operating unit from the point of view of cost, mechanical equipment, mining practice, and output per man per day. Since some companies operate two or more mines the number of mines is much greater than the number of operating companies.

Over a period of many years bituminous-coal and lignite mines have been increasing in size. The tendency toward larger mines has been influenced by more extensive mechanization. In 1924, when less than 1 percent of the underground production was loaded mechanically, only 18 percent of production came from mines having an annual output of 500,000 tons and over. Thirty years later—by 1953—80 percent of the underground production was loaded mechanically, and 44 percent of total production came from mines having an annual output of 500,000 tons and over. Larger stripping shovels have also influenced the development of larger mines.

Although almost half of the production of bituminous coal and lignite comes from very large mines, there are many small mines. Table 13 classifies the mines by size of output in each State in 1953. Figure 6 shows the percentage of number of mines and percentage of production in each size class. It is very significant that the small mines—those producing less than 10,000 tons per year—constituted 54 percent of the total number of mines and only 3 percent of total output. On the other hand, the large mines—those producing over 500,000 tons per year—constituted only 3 percent of the total number of mines and 44 percent of the total production.

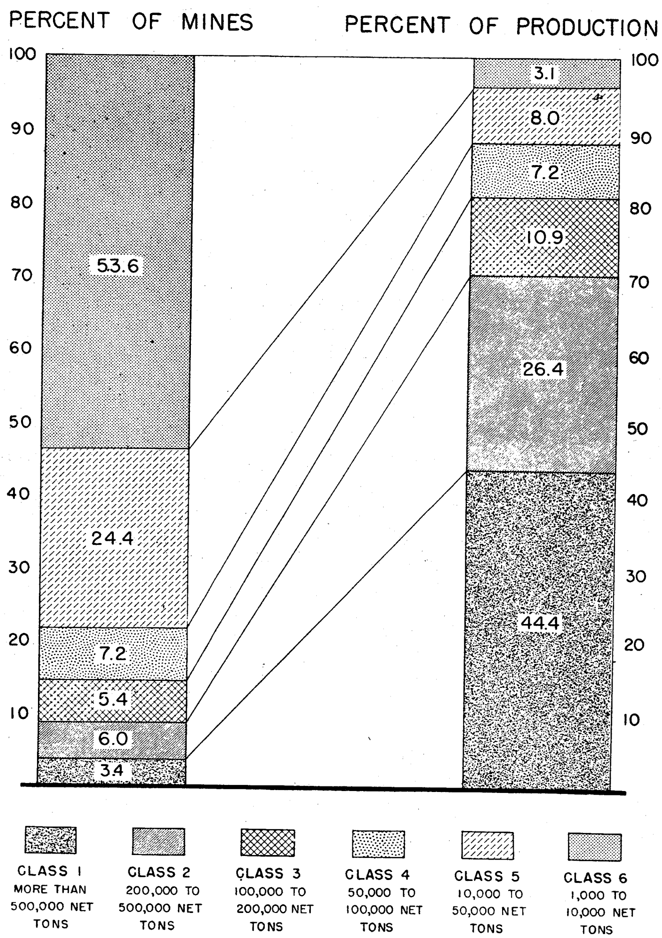

FIGURE 6.—Percentage of number of mines and of production of bituminous-coal and lignite mines in the United States, 1953, by size of output.

TABLE 13.—Number and production of bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and size of output

[Exclusive of mines producing less than 1,000 tons]

State	Class 1—500,000 tons and over				Class 2—200,000 to 500,000 tons				Class 3—100,000 to 200,000 tons			
	Mines		Production		Mines		Production		Mines		Production	
	Number	Percent	Net tons	Percent	Number	Percent	Net tons	Percent	Number	Percent	Net tons	Percent
Alabama	6	2.4	5,563,586	44.4	9	3.6	2,725,295	21.8	10	4.0	1,204,568	9.6
Alaska					2	22.2	498,068	57.8	1	11.1	199,463	23.2
Arizona												
Arkansas					1	2.6	214,749	27.7				
Colorado					3	2.4	1,139,325	31.9	5	4.1	810,392	22.7
Georgia												
Illinois	34	16.0	33,255,623	72.3	26	12.3	8,835,088	19.2	10	4.7	1,474,906	3.2
Indiana	11	13.3	8,388,334	53.0	14	16.9	5,024,418	31.8	8	9.6	1,165,775	7.4
Iowa					1	1.3	235,011	17.0				
Kansas					3	10.7	1,248,867	72.8	2	7.2	284,684	16.6
Kentucky	32	1.9	24,879,955	38.2	51	3.0	15,562,397	23.9	54	3.2	8,257,684	12.7
Maryland												
Missouri	1	1.8	619,348	25.9	4	7.1	1,100,175	46.0	3	5.4	397,232	16.6
Montana (bituminous and lignite)	1	5.3	1,421,139	75.9					2	10.5	280,176	14.9
New Mexico					1	4.2	359,728	70.0				
North Dakota (lignite)					6	13.0	1,996,295	71.2	3	6.5	474,877	16.9
Ohio	18	3.4	15,869,475	45.7	19	3.6	6,021,464	17.3	35	6.7	4,783,339	13.8
Oklahoma					4	9.3	880,518	40.6	4	9.3	619,644	28.6
Pennsylvania	42	3.0	42,954,622	46.0	59	4.2	18,844,943	20.2	74	5.2	10,179,102	10.9
South Dakota												
Tennessee					6	1.2	1,524,608	27.9	7	1.3	945,661	17.3
Utah	3	5.2	2,130,511	32.5	8	13.8	2,775,370	42.4	6	10.3	894,550	13.7
Virginia	9	3.1	6,978,670	36.5	15	5.1	4,591,137	24.0	23	7.9	3,106,284	16.2
Washington									2	11.1	288,261	41.8
West Virginia	66	6.5	58,216,059	43.4	160	15.7	45,307,804	33.8	108	10.6	14,411,968	10.7
Wyoming	3	9.7	2,587,268	49.3	6	19.4	1,975,490	37.7	1	3.2	104,440	2.0
Total	226	3.4	202,864,590	44.4	398	6.0	120,860,750	26.4	358	5.4	49,883,006	10.9

TABLE 13.—Number and production of bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and size of output—Continued

[Exclusive of mines producing less than 1,000 tons]

State	Class 4—50,000 to 100,000 tons				Class 5—10,000 to 50,000 tons				Class 6—less than 10,000 tons				Total		
	Mines		Production		Mines		Production		Mines		Production		Mines	Production (net tons)	
	Number	Percent	Net tons	Percent	Number	Percent	Net tons	Percent	Number	Percent	Net tons	Percent		Total	Average per mine
Alabama	19	7.7	1,368,221	10.9	46	18.6	965,632	7.7	158	63.7	704,759	5.6	248	12,532,061	50,533
Alaska	1	11.1	69,482	8.1	4	44.5	91,569	10.6	1	11.1	2,889	.3	9	861,471	95,719
Arizona	--	--	--	--	--	--	--	--	1	100.0	5,140	100.0	1	5,140	5,140
Arkansas	3	7.7	215,345	27.8	11	28.1	260,455	33.6	24	61.6	84,658	10.9	39	775,207	19,877
Colorado	8	6.5	573,728	16.0	34	27.6	778,337	21.8	73	59.4	273,068	7.6	123	3,574,850	29,064
Georgia	--	--	--	--	--	--	--	--	6	100.0	14,100	100.0	6	14,100	2,350
Illinois	17	8.0	1,125,246	2.5	40	18.9	938,130	2.0	85	40.1	380,898	.8	212	46,009,891	217,028
Indiana	7	8.4	609,500	3.8	22	26.5	519,494	3.3	21	25.3	104,964	.7	83	15,812,485	190,512
Iowa	6	7.8	402,848	29.0	24	31.2	524,885	37.8	46	59.7	225,262	16.2	77	1,388,006	18,026
Kansas	--	--	--	--	6	21.4	101,775	5.9	17	60.7	79,678	4.7	28	1,715,004	61,250
Kentucky	77	4.6	4,781,176	7.4	345	20.4	7,383,477	11.3	1,129	66.9	4,195,789	6.5	1,688	65,060,478	38,543
Maryland	2	2.4	107,676	20.3	13	15.5	197,361	37.2	69	82.1	225,553	42.5	84	530,590	6,317
Missouri	--	--	--	--	8	14.3	149,600	6.2	40	71.4	126,949	5.3	56	2,393,304	42,738
Montana (bituminous and lignite)	1	5.3	59,220	3.2	3	15.8	54,510	2.9	12	63.1	58,092	3.1	19	1,873,137	98,586
New Mexico	--	--	--	--	3	12.5	68,410	13.3	20	83.3	85,643	16.7	24	513,781	21,408
North Dakota (lignite)	1	2.2	53,784	1.9	8	17.4	158,591	5.7	28	60.9	119,011	4.3	46	2,802,558	60,925
Ohio	53	10.2	3,638,027	10.5	154	29.5	3,469,818	10.0	243	46.6	954,650	2.7	522	34,736,773	66,546
Oklahoma	5	11.6	371,589	17.2	10	23.3	230,138	10.6	20	46.5	65,705	3.0	43	2,167,594	50,409
Pennsylvania	119	8.4	8,287,938	8.9	437	31.0	10,153,652	10.9	680	48.2	2,910,614	3.1	1,411	93,330,871	66,145
South Dakota	--	--	--	--	1	50.0	20,524	86.7	1	50.0	3,147	13.3	2	23,671	11,836
Tennessee	8	1.5	549,733	10.1	55	10.4	969,815	17.7	453	85.6	1,476,752	27.0	529	5,466,569	10,334
Utah	3	5.2	200,120	3.1	18	31.0	480,466	7.3	20	34.5	63,128	1.0	58	6,544,145	112,830
Virginia	29	9.9	1,883,988	9.9	93	31.7	1,950,312	10.2	124	42.3	608,659	3.2	293	19,119,050	65,253
Washington	3	16.7	209,521	30.4	6	33.3	153,562	22.2	7	38.9	38,487	5.6	18	689,831	38,324
West Virginia	116	11.3	8,056,878	6.0	284	27.8	6,684,834	5.0	287	28.1	1,427,767	1.1	1,021	134,105,310	131,347
Wyoming	6	19.3	408,334	7.8	4	12.9	125,796	2.4	11	35.5	43,244	.8	31	5,244,572	169,180
Total	484	7.2	32,972,354	7.2	1,629	24.4	36,431,143	8.0	3,576	53.6	14,278,606	3.1	6,671	457,290,449	68,549

EMPLOYMENT AND PRODUCTIVITY

The historical record of employment, days worked, output per man per day, and mechanization for 1890 to 1953 is given in table 14. The trend of these items for 1905 to 1953 is shown graphically in figure 7. Beginning with 1946, the figures on employment represent the average number of men working daily. Each mine is asked to report the total number of man-shifts worked during the year and the number of calendar days the mine was active during the year. The total man-shifts are divided by the total days the mine was active to determine the average number of men working daily. Before 1946 each mine was asked to report the average number of men on the rolls per pay period and number of days the mine worked. In this instance men employed were multiplied by number of days to determine total man-shifts. Therefore the figures on employment, beginning with 1946, are not strictly comparable with those before 1946. Sample tests indicate that the two sets of figures, however, are reasonably comparable with the earlier series, resulting in figures only about 2 percent greater than those for the later series.

The bituminous-coal and lignite industry became highly mechanized in a comparatively short period. Mechanization has had a profound influence on productivity or output per man per day and in turn caused a substantial reduction in the number of men employed. Since the cost of labor is approximately two-thirds of the cost of producing soft coal, the continued high wages following World War I stimulated interest in methods of reducing costs. Also, the coal industry faced a declining market owing to increased efficiency in burning coal and to the first serious encroachment of competition from other fuels. Considerable progress had been made by 1924 in certain underground operations in substituting more efficient forms of mechanical power for animal or man power. Previous advances had centered around improvement in undercutting seams, and in haulage, hoisting, ventilation, screening, and mechanical cleaning. By 1924 approximately 70 percent of the underground production was undercut by machine. However, in that year by far the largest task underground—the heavy labor of shoveling coal into mine cars, was done almost entirely by hand, and less than 1 percent was loaded by machine. Likewise, the mining of soft coal by stripping, which required no hand shoveling, was in its infancy and was less than 3 percent of the total output in 1924. Thus, the urge to reduce labor costs stimulated years of experimentation on underground loading machines and led to development of bigger and better stripping shovels.

In a short period of only 30 years a mechanical revolution occurred in the bituminous-coal and lignite industry. The proportion of soft coal mechanically loaded underground increased from less than 1 percent in 1924 to 80 percent in 1953. The production mined by stripping increased from less than 3 percent of the total output in 1924 to over 23 percent in 1953. It is therefore not surprising to discover that, during the same period, output per man per day almost doubled, increasing from 4.56 tons in 1924 to 8.17 tons in 1953. With this tremendous increase in productivity, fewer men were required. With only a 5-percent decrease in production from 1924 to 1953 there was a 53-percent reduction in men employed.

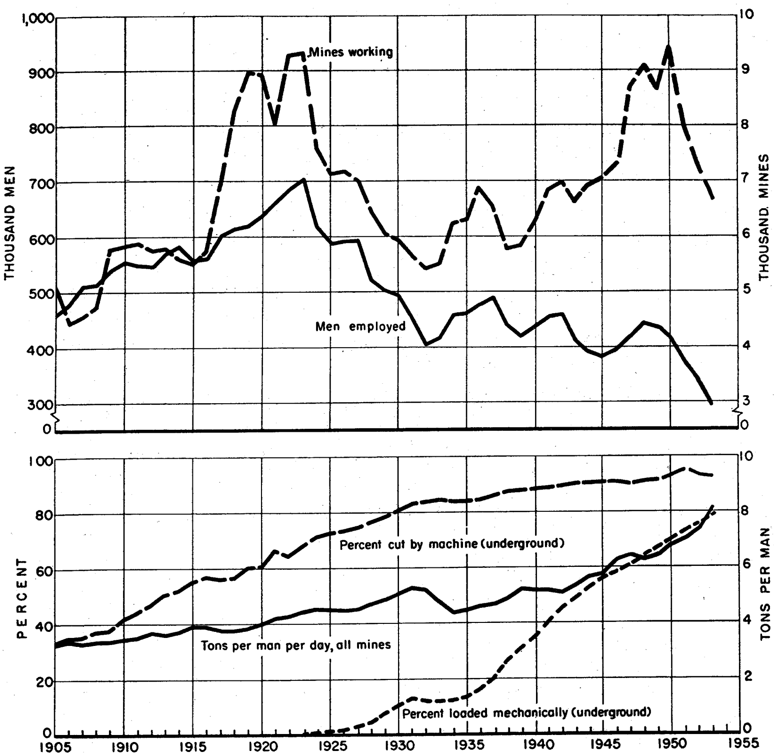

FIGURE 7.—Trends of employment, mechanization, and output per man at bituminous-coal and lignite mines in the United States, 1905–53.

TABLE 14.—Growth of the bituminous-coal- and lignite-mining industry in the United States, 1890–1953

Year	Men employed	Average number of days worked	Average days lost per man on strike	Net tons per man— Per day	Net tons per man— Per year	Percentage of underground production— Cut by machines [1]	Percentage of underground production— Mechanically loaded	Percentage of total production— Mechanically cleaned [2]	Percentage of total production— Mined by stripping
1890	192, 204	226	(3)	2. 56	579	(3)	(3)	(3)	(3)
1891	205, 803	223	(3)	2. 57	573	5. 3	(3)	(3)	(3)
1892	212, 893	219	(3)	2. 72	596	(3)	(3)	(3)	(3)
1893	230, 365	204	(3)	2. 73	557	(3)	(3)	(3)	(3)
1894	244, 603	171	(3)	2. 84	486	(3)	(3)	(3)	(3)
1895	239, 962	194	(3)	2. 90	563	(3)	(3)	(3)	(3)
1896	244, 171	192	(3)	2. 94	564	11. 9	(3)	(3)	(3)
1897	247, 817	196	(3)	3. 04	596	15. 3	(3)	(3)	(3)
1898	255, 717	211	(3)	3. 09	651	19. 5	(3)	(3)	(3)
1899	271, 027	234	46	3. 05	713	22. 7	(3)	(3)	(3)
1900	304, 375	234	43	2. 98	697	24. 9	(3)	(3)	(3)
1901	340, 235	225	35	2. 94	664	25. 6	(3)	(3)	(3)
1902	370, 056	230	44	3. 06	703	26. 8	(3)	(3)	(3)
1903	415, 777	225	28	3. 02	680	27. 6	(3)	(3)	(3)
1904	437, 832	202	44	3. 15	637	28. 2	(3)	(3)	(2)
1905	460, 629	211	23	3. 24	684	32. 8	(3)	(3)	(3)
1906	478, 425	213	63	3. 36	717	34. 7	(3)	2. 7	(3)
1907	513, 258	234	14	3. 29	769	35. 1	(3)	2. 9	(3)

For footnotes, see end of table.

TABLE 14.—Growth of the bituminous-coal- and lignite-mining industry in the United States, 1890–1953—Continued

Year	Men employed	Average number of days worked	Average days lost per man on strike	Net tons, per man—		Percentage of underground production—		Percentage of total production—	
				Per day	Per year	Cut by machines [1]	Mechanically loaded	Mechanically cleaned [2]	Mined by stripping
1908	516,264	193	38	3.34	644	37.0	(3)	3.6	(3)
1909	543,152	209	29	3.34	699	37.5	(3)	3.8	(3)
1910	555,533	217	89	3.46	751	41.7	(3)	3.8	(3)
1911	549,775	211	27	3.50	738	43.9	(3)	(3)	(3)
1912	548,632	223	35	3.68	820	46.8	(3)	3.9	(3)
1913	571,882	232	36	3.61	837	50.7	(3)	4.6	(3)
1914	583,506	195	80	3.71	724	51.8	(3)	4.8	0.3
1915	557,456	203	61	3.91	794	55.3	(3)	4.7	.6
1916	561,102	230	26	3.90	896	56.9	(3)	4.6	.8
1917	603,143	243	17	3.77	915	56.1	(3)	4.6	1.0
1918	615,305	249	7	3.78	942	56.7	(3)	3.8	1.4
1919	621,998	195	37	3.84	749	60.0	(3)	3.6	1.2
1920	639,547	220	22	4.00	881	60.7	(3)	3.3	1.5
1921	663,754	149	23	4.20	627	66.4	(3)	3.4	1.2
1922	687,958	142	117	4.28	609	64.8	(3)	(3)	2.4
1923	704,793	179	20	4.47	801	68.3	0.3	3.8	2.1
1924	619,604	171	73	4.56	781	71.5	.7	(3)	2.8
1925	588,493	195	30	4.52	884	72.9	1.2	(3)	3.2
1926	593,647	215	24	4.50	966	73.8	1.9	(3)	3.0
1927	593,918	191	153	4.55	872	74.9	3.3	5.3	3.6
1928	522,150	203	83	4.73	959	76.9	4.5	5.7	4.0
1929	502,993	219	11	4.85	1,064	78.4	7.4	6.9	3.8
1930	493,202	187	43	5.06	948	81.0	10.5	8.3	4.3
1931	450,213	160	35	5.30	849	83.2	13.1	9.5	5.0
1932	406,380	146	120	5.22	762	84.1	12.3	9.8	6.3
1933	418,703	167	30	4.78	797	84.7	12.0	10.4	5.5
1934	458,011	178	15	4.40	785	84.1	12.2	11.1	5.8
1935	462,403	179	[4] 7	4.50	805	84.2	13.5	12.2	6.4
1936	477,204	199	21	4.62	920	84.8	16.3	13.9	6.4
1937	491,864	193	[4] 19	4.69	906	(3)	20.2	14.6	7.1
1938	441,333	162	13	4.89	790	87.5	26.7	18.2	8.7
1939	421,788	178	36	5.25	936	87.9	31.0	20.1	9.6
1940	439,075	202	8	5.19	1,049	88.4	35.4	22.2	9.2
1941	456,981	216	27	5.20	1,125	89.0	40.7	22.9	10.7
1942	461,991	246	7	5.12	1,261	89.7	45.2	24.4	11.5
1943	416,007	264	[4] 15	5.38	1,419	90.3	48.9	24.7	13.5
1944	393,347	278	[4] 5	5.67	1,575	90.5	52.9	25.6	16.3
1945	383,100	261	[4] 9	5.78	1,508	90.8	56.1	25.6	19.0
1946	[5] 396,434	214	[4] 23	6.30	1,347	90.8	58.4	26.0	21.1
1947	[5] 419,182	234	[4] 5	6.42	1,504	90.0	60.7	27.7	22.1
1948	[5] 441,631	217	[4] 16	6.26	1,358	90.7	64.3	30.2	23.3
1949	[5] 433,698	157	[4] 15	6.43	1,010	91.4	67.0	35.1	24.2
1950	[5] 415,582	183	[4] 56	6.77	1,239	[6] 91.8	69.4	38.5	23.9
1951	[5] 372,897	203	[4] 4	7.04	1,429	[6] 93.4	73.1	45.0	22.0
1952	[5] 335,217	186	[4] 6	7.47	1,389	[6] 92.8	75.6	48.7	23.3
1953	[5] 293,106	191	[4] 3	8.17	1,560	[6] 92.3	79.6	52.9	23.1

[1] Percentages for 1890–1913, inclusive, are of total production, as a separation of strip and underground production is not available for those years.
[2] For 1906–26, inclusive, these percentages are exclusive of coal cleaned at central washeries operated by consumers.
[3] Data not available.
[4] Bureau of Labor Statistics, U. S. Department of Labor
[5] Average number of men working daily.
[6] Revised.

TABLE 15.—Average output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and by underground, auger, and strip mining

State	Mined underground			Mined by auger mining			Mined by stripping			Total production	
	Net tons	Percentage of total	Average tons per man per day	Net tons	Percentage of total	Average tons per man per day	Net tons	Percentage of total	Average tons per man per day	Net tons	Average tons per man per day
Alabama	10,916,929	87.1	5.64				1,615,132	12.9	11.35	12,532,061	6.03
Alaska	426,841	49.5	6.00				434,630	50.5	13.73	861,471	8.38
Arizona	5,140	100.0	2.72							5,140	2.72
Arkansas	395,645	51.0	3.63				379,562	49.0	11.51	775,207	5.46
Colorado	3,206,584	89.7	5.87				368,266	10.3	21.59	3,574,850	6.34
Georgia	14,100	100.0	3.49							14,100	3.49
Illinois	29,329,204	63.7	11.05				16,680,687	36.3	22.41	46,009,891	13.54
Indiana	6,182,020	39.1	9.82				9,630,465	60.9	21.40	15,812,485	14.65
Iowa	413,823	29.8	4.07				974,183	70.2	13.23	1,388,006	7.91
Kansas	29,705	1.7	2.80				1,685,299	98.3	17.02	1,715,004	15.64
Kentucky	54,668,876	84.0	7.13	71,996	0.1	16.98	10,319,606	15.9	22.34	65,060,478	8.00
Maryland	301,917	56.9	3.86	6,338	1.2	2.39	222,335	41.9	10.65	530,590	5.22
Missouri	151,096	6.3	2.80				2,242,208	93.7	18.56	2,393,304	13.70
Montana:											
Bituminous	427,195	23.1	6.59				1,421,139	76.9	98.83	1,848,334	23.34
Lignite	22,148	89.3	7.67				2,655	10.7	6.88	24,803	7.58
Total Montana	449,343	24.0	6.64				1,423,794	76.0	96.42	1,873,137	22.71
New Mexico	497,056	96.7	5.29				16,725	3.3	5.77	513,781	5.30
North Dakota (lignite)	161,438	5.8	8.13				2,641,120	94.2	29.61	2,802,558	25.70
Ohio	12,984,933	37.4	7.95	139,047	.4	17.95	21,612,793	62.2	18.57	34,736,773	12.38
Oklahoma	874,166	40.3	4.43				1,293,428	59.7	12.82	2,167,594	7.26
Pennsylvania	73,055,110	78.3	5.88	100,451	.1	16.46	20,175,310	21.6	12.79	93,330,871	6.66
South Dakota (lignite)							23,671	100.0	8.61	23,671	8.61
Tennessee	4,722,503	86.4	5.08	68,790	1.2	11.15	675,276	12.4	11.60	5,466,569	5.50
Utah	6,544,145	100.0	7.48							6,544,145	7.48
Virginia	17,543,520	91.8	6.70	271,882	1.4	26.69	1,303,648	6.8	14.74	19,119,050	7.04
Washington	600,258	87.0	4.25				89,573	13.0	9.78	689,831	4.59
West Virginia	122,536,777	91.4	7.40	1,632,404	1.2	30.54	9,936,129	7.4	16.08	134,105,310	7.78
Wyoming	3,539,843	67.5	7.90				1,704,729	32.5	26.08	5,244,572	10.21
Total	349,550,972	76.4	7.01	2,290,908	.5	25.30	105,448,569	23.1	17.62	457,290,449	8.17

UNDERGROUND MINING

The four major activities in underground mines are: Cutting, drilling (and blasting), loading, and haulage.

The first major step in recovering coal underground is to undercut the coal seam. As indicated in table 14, the major portion (over 92 percent) is cut by machine. A small amount of coal is still undercut by hand or shot from the solid. In 1953 continuous mining machines, which also do the cutting, accounted for 3 percent of total underground output.

The second step is to drill the shot holes preparatory to blasting the coal down. Here again, mechanical power has been rapidly replacing old fashioned hand drills. The trend in use of power drills, 1940 to 1953, is shown in table 17 and details by States for 1953 in table 18. By 1953 the shot holes were power drilled for 84 percent of total underground production. Electric power drills accounted for virtually all tonnage, although compressed-air drills are still used in a few mines.

The next major step is loading the coal onto underground haulage equipment. This task is so important that it is given special treatment in the section on Mechanical Loading.

The final procedure underground is haulage of the mined coal from the face to the shaft bottom or tipple. The statistical record of underground haulage equipment is given in tables 19 to 22, and a brief résumé of the historical trend and the extent of the use of each type is given below.

Animals, most frequently mules, were the chief motive power for drawing small mine cars underground before 1880. From 1880 to 1900 production expanded rapidly, the size of mines increased, and distances underground became greater, creating a need for more efficient transportation.

Rope-haulage units were first installed about 1870 and replaced mules on mainline haulage in a number of mines. A few steam locomotives were employed underground at about the same time rope haulage was introduced. Compressed-air locomotives were introduced in 1875. Electric mine locomotives were first employed in 1887, but their use was rather limited until about 1900. After 1905 the number of electric locomotives increased rapidly. A gasoline locomotive was first used in an underground mine in 1898, but few installations were made because of the dangers involved in their operation. Although diesel mine locomotives have been used for many years in coal mines in Europe, very few have been employed in United States coal mines.

The use of animals for underground haulage in coal mines declined sharply in the last 30 years. In 1953 there were only 5,354 animals in bituminous-coal and lignite mines compared with over 36,000 in 1924. The animals, mostly mules, used in 1953 were in the very small mines.

Electric locomotives had become established as the predominant type of underground haulage by 1924 and have retained this position. There were 12,765 trolley locomotives in 1924 and 11,311 in 1953. The number of battery locomotives declined from 1,515 in 1924 to 678 in 1953. The "other types" of locomotives have become insignificant.

Rope-haulage units were not very important in 1924 but achieved very substantial growth in later years. The underground haulage units reported here include both portable and stationary hoists but exclude scraper hoists, shaft and main-slope hoists, and hoists used for car shifting at conveyor heads or slope conveyors.

Belt-conveyor haulage has grown rapidly. The total length of "mother" conveyors in underground bituminous-coal and lignite mines increased from 98 miles in 1945 to 304 in 1953. Table 22 shows 1953 data on "mother" conveyors, by States. West Virginia, Kentucky, and Pennsylvania use the largest number of "mother" conveyors. Production at mines using "mother" conveyors increased from 9 percent of the total underground output in 1945 to 29 percent in 1953.

The number of shuttle cars in use in underground bituminous-coal and lignite mines has increased rapidly in recent years. Data thereon were first collected for 1949, and the number in use increased from 2,767 in 1949 to 4,222 in 1953. Virtually all shuttle cars are used in conjunction with mobile loaders or continuous-mining machines. In 1953 there were 2,195 mobile loading machines and many continuous-mining machines in bituminous-coal mines that loaded into shuttle cars.

TABLE 16.—Underground production of bituminous coal and lignite in the United States and Alaska, 1953, by State and method of mining

State	Cut by hand and shot from solid		Cut by machines				Mined by continuous mining machines		Total underground (net tons)
	Net tons	Percentage of total underground	Net tons	Percentage of total underground	Number of coal-cutting machines	Average output per machine (net tons)	Net tons	Percentage of total underground	
Alabama	1,141,145	10.5	9,096,159	83.3	299	30,422	679,625	6.2	10,916,929
Alaska	426,841	100.0	-----	-----	-----	-----	-----	-----	426,841
Arizona	-----	-----	5,140	100.0	1	5,140	-----	-----	5,140
Arkansas	22,487	5.7	373,158	94.3	62	6,019	-----	-----	395,645
Colorado	697,832	21.8	2,398,361	74.8	337	7,117	110,391	3.4	3,206,584
Georgia	14,100	100.0	-----	-----	-----	-----	-----	-----	14,100
Illinois	107,679	.4	27,665,637	94.3	388	71,303	1,555,888	5.3	29,329,204
Indiana	65,101	1.1	6,116,919	98.9	142	43,077	-----	-----	6,182,020
Iowa	155,894	37.7	257,929	62.3	36	7,165	-----	-----	413,823
Kansas	3,299	11.1	26,406	88.9	8	3,301	-----	-----	29,705
Kentucky	4,078,227	7.5	50,096,595	91.6	1,708	29,331	494,054	.9	54,668,876
Maryland	127,814	42.3	174,103	57.7	28	6,218	-----	-----	301,917
Missouri	18,135	12.0	132,961	88.0	30	4,432	-----	-----	151,096
Montana:									
Bituminous	1,738	.4	425,457	99.6	31	13,724	-----	-----	427,195
Lignite	22,148	100.0	-----	-----	-----	-----	-----	-----	22,148
Total Montana	23,886	5.3	425,457	94.7	31	13,724	-----	-----	449,343
New Mexico	40,295	8.1	456,761	91.9	42	10,875	-----	-----	497,056
North Dakota (lignite)	6,627	4.1	154,811	95.9	5	30,962	-----	-----	161,438
Ohio	113,612	.9	11,607,365	89.4	443	26,202	1,263,956	9.7	12,984,933
Oklahoma	27,777	3.2	846,389	96.8	104	8,138	-----	-----	874,166
Pennsylvania	2,446,496	3.3	65,007,094	89.0	2,572	25,275	5,601,520	7.7	73,055,110
Tennessee	1,648,422	34.9	3,074,081	65.1	141	21,802	-----	-----	4,722,503
Utah	40,243	.6	6,368,956	97.3	185	34,427	134,946	2.1	6,544,145
Virginia	1,196,021	6.8	16,291,911	92.9	495	32,913	55,588	.3	17,543,520
Washington	201,089	33.5	170,355	28.4	38	4,483	228,814	38.1	600,258
West Virginia	2,301,156	1.9	118,656,126	96.8	3,631	32,679	1,579,495	1.3	122,536,777
Wyoming	10,341	.3	3,403,682	96.1	234	14,546	125,820	3.6	3,539,843
Total	14,914,519	4.3	322,806,356	92.3	10,960	29,453	11,830,097	3.4	349,550,972

TABLE 17.—Use of power drills for shot holes in underground bituminous-coal and lignite mines in the United States, 1940–53

[Production in thousand net tons]

Year	Number of mines using power drills	Number of power drills		Production in working places where shot holes are power drilled				Total production at mines using power drills
		Electric	Compressed air	Electric drills	Compressed air drills	Total	Percentage of total underground	
1940	1,172	6,613	1,378	189,534	7,548	197,082	47.2	321,965
1941	1,266	7,697	1,502	230,841	6,372	237,213	51.7	359,578
1942	1,364	8,482	1,564	274,880	6,650	281,530	54.6	406,055
1943	1,376	8,930	1,630	293,599	6,206	299,805	58.7	415,514
1944	1,501	9,755	1,903	317,049	7,066	324,115	62.5	425,872
1945	1,504	10,267	1,855	298,867	3,919	302,786	64.7	384,234
1946	1,702	10,968	1,884	275,835	2,899	278,734	66.2	349,556
1947	2,522	12,940	1,449	349,113	2,753	351,866	71.6	415,414
1948	2,798	13,970	1,312	335,001	1,872	336,873	73.2	399,442
1949	2,923	14,087	1,411	249,941	1,388	251,329	75.7	284,287
1950	3,112	14,277	1,282	284,904	1,757	286,661	73.0	345,792
1951	3,027	14,231	1,345	322,345	2,300	324,645	78.0	379,165
1952	2,830	13,468	1,292	281,549	2,499	284,048	[1] 79.7	325,174
1953	2,501	12,054	1,054	291,297	1,865	293,161	83.9	321,461

[1] Revised.

TABLE 18.—Use of power drills for shot holes in underground bituminous-coal and lignite mines in the United States and Alaska, 1953, by States

State	Number of mines using power drills	Number of power drills		Production in working places where shot holes are power drilled (net tons)				Total production at mines using power drills (net tons)
		Electric	Compressed air	Electric drills	Compressed-air drills	Total	Percentage of total underground	
Alabama	75	476	33	9,303,957	----------	9,303,957	85.2	10,116,880
Alaska	3	12	31	199,463	227,378	426,841	100.0	426,841
Arizona	1	1	--------	5,140	----------	5,140	100.0	5,140
Arkansas	12	31	19	75,394	----------	75,394	19.1	349,998
Colorado	73	337	53	2,311,652	----------	2,311,652	72.1	2,974,993
Illinois	124	628	2	27,697,330	----------	27,697,330	94.4	27,840,275
Indiana	36	201	--------	6,069,270	----------	6,069,270	98.2	6,141,869
Iowa	17	32	--------	176,704	----------	176,704	42.7	207,840
Kentucky	800	2,223	56	45,918,495	----------	45,918,495	84.0	50,860,040
Maryland	6	14	--------	34,920	----------	34,920	11.6	88,788
Missouri	6	9	--------	89,873	----------	89,873	59.5	89,873
Montana:								
Bituminous	12	33	1	427,195	----------	427,195	100.0	427,195
Lignite	3	9	--------	20,527	----------	20,527	92.7	20,527
Total Montana	15	42	1	447,722	----------	447,722	99.6	447,722
New Mexico	8	55	--------	429,286	----------	429,286	86.4	435,508
North Dakota (lignite)	4	9	--------	157,075	----------	157,075	97.3	157,075
Ohio	180	497	1	11,276,632	----------	11,276,632	86.8	11,672,679
Oklahoma	9	92	3	811,721	----------	811,721	92.9	833,583
Pennsylvania	382	2,332	307	56,320,125	533,606	56,853,731	77.8	66,401,841
Tennessee	42	142	12	2,176,069	364,189	2,540,258	53.8	2,861,492
Utah	50	258	--------	6,363,288	----------	6,363,288	97.2	6,515,683
Virginia	81	490	28	11,963,433	----------	11,963,433	68.2	13,438,129
Washington	10	42	125	129,855	407,871	537,726	89.6	579,233
West Virginia	532	3,758	380	105,929,372	331,524	106,260,896	86.7	115,478,290
Wyoming	20	373	2	3,410,049	----------	3,410,049	96.3	3,537,390
Total	2,486	12,054	1,053	291,296,825	1,864,568	293,161,393	83.9	321,461,162

TABLE 19.—Number of underground bituminous-coal and lignite mines and number of haulage units in use, in the United States, in selected years [1]

Units	1924	1946	1948	1949	1950	1951	1952	1953
Underground mines	7,352	5,888	7,108	6,798	7,559	6,225	5,632	5,034
Locomotives:								
Trolley	[2] 12,765	14,110	14,617	14,090	13,822	13,327	12,545	11,311
Battery	1,515	1,011	904	928	949	900	812	678
Other types	443	110	74	59	62	51	41	45
Total	14,723	15,231	15,595	15,077	14,833	14,278	13,398	12,034
Rope-haulage units:								
Portable	(3)	4,084	3,886	3,904	4,225	3,875	3,584	2,838
Stationary	(3)	1,009	1,044	1,073	1,037	916	852	727
Total	649	5,093	4,930	4,977	5,262	4,791	4,436	3,565
Shuttle cars:								
Cable reel	(3)	(3)	(3)	2,144	2,782	3,191	3,382	3,797
Battery	(3)	(3)	(3)	623	512	567	462	425
Total	(3)	(3)	(3)	2,767	3,294	3,758	3,844	4,222
"Mother" conveyors	(3)	457	755	860	1,013	1,094	1,066	1,042
Animals	36,352	10,185	10,834	10,313	10,033	7,478	6,555	5,354

[1] Exclusive of lignite and Virginia semianthracite mines in 1946, 1948, and 1949.
[2] Includes combination trolley and battery locomotives.
[3] Data not available.

TABLE 20.—Number of haulage units in use in underground bituminous coal and lignite mines in the United States and Alaska, 1952–53, by States

State	Locomotives						Shuttle cars				Rope-haulage units				"Mother"-conveyor units		Animals	
	Trolley		Battery		Other types		Cable reel		Battery		Portable		Stationary					
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
Alabama	401	401	6	5	-	-	131	134	13	15	15	17	31	19	30	26	219	276
Alaska	-	-	10	12	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Arizona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Arkansas	10	9	16	15	1	-	-	3	-	-	1	9	20	13	8	8	23	14
Colorado	126	104	76	71	1	1	30	37	22	23	65	40	79	64	8	4	270	190
Georgia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	5
Illinois	751	577	193	114	2	1	330	328	29	29	5	5	43	34	63	88	353	245
Indiana	227	184	4	4	-	-	62	85	51	34	-	-	14	10	2	1	59	48
Iowa	9	6	-	1	-	2	-	-	-	-	-	-	17	15	-	-	113	114
Kansas	-	-	2	-	-	-	-	-	-	-	-	-	2	1	-	-	11	9
Kentucky	1, 763	1, 521	50	29	8	4	536	588	52	52	106	117	98	69	163	170	1, 838	1, 526
Maryland	10	7	2	3	-	-	-	-	-	-	-	-	4	1	-	-	105	91
Missouri	2	1	3	3	-	1	-	-	-	-	-	-	2	5	-	-	46	38
Montana:																		
Bituminous	57	48	1	1	-	-	4	6	-	-	2	2	6	8	2	1	5	5
Lignite	-	-	-	-	-	-	-	-	2	2	-	-	1	1	-	-	2	2
Total Montana	57	48	1	1	-	-	4	6	2	2	2	2	7	9	2	1	7	7
New Mexico	17	17	25	25	-	-	-	-	-	-	-	-	20	24	-	-	26	24
North Dakota (lignite)	8	8	-	-	-	-	-	-	-	-	-	-	1	1	-	-	24	21
Ohio	467	397	15	15	1	-	153	149	2	-	39	33	18	26	31	28	255	228
Oklahoma	13	15	8	7	-	-	4	4	-	-	5	1	8	7	5	6	17	11
Pennsylvania	3, 252	3, 024	174	155	13	12	642	812	103	96	2, 819	2, 146	258	209	182	159	1, 429	1, 139
South Dakota	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tennessee	186	132	6	2	-	1	29	35	-	-	11	4	11	12	8	13	358	432
Utah	154	191	20	21	1	1	101	127	13	16	12	4	36	33	20	18	41	29
Virginia	697	654	17	13	-	6	97	128	3	1	41	46	25	20	23	19	333	200
Washington	42	40	5	3	-	-	10	-	-	-	9	1	20	15	-	-	11	9
West Virginia	4, 187	3, 809	172	175	14	16	1, 239	1, 336	160	145	333	313	77	83	515	493	1, 004	690
Wyoming	166	166	7	4	-	-	14	25	12	12	121	100	61	56	6	8	5	6
Total	12, 545	11, 311	812	678	41	45	3, 382	3, 797	462	425	3, 584	2, 838	852	727	1, 066	1, 042	6, 555	5, 354

TABLE 21.—Number and production of underground bituminous-coal and lignite mines using "mother" conveyors and number and length of units in use, in the United States, 1945–53 [1]

Year	Number of mines	Production (net tons)	Number of units in use	Average length (feet)	Total length (miles)
1945	117	40, 189, 857	359	1, 438	97. 6
1946	161	46, 022, 710	457	1, 484	128. 5
1947	199	70, 690, 920	594	1, 470	165. 3
1948	270	81, 821, 361	755	1, 460	208. 8
1949	314	69, 947, 713	860	1, 514	246. 7
1950	374	92, 413, 644	1, 013	1, 538	294. 9
1951	372	99, 643, 003	1, 094	1, 568	325. 0
1952	358	92, 168, 992	1, 066	1, 526	308. 2
1953	322	100, 155, 249	1, 042	1, 541	303. 9

[1] Includes all belt conveyors 500 feet and over in length used for underground transportation of coal, except main-slope conveyors. Excludes lignite and Virginia semianthracite mines in 1945–49, inclusive.

TABLE 22.—Number and production of underground bituminous-coal and lignite mines using "mother" conveyors, and number and length of units in use in the United States, 1952–53, by States [1]

State	Number of mines		Production (net tons)		Number of units in use		Average length (feet)		Total length (miles)	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
Alabama	8	5	1, 466, 616	1, 424, 043	30	26	1, 262	1, 223	7. 2	6. 0
Arkansas	2	2	136, 659	93, 614	8	8	1, 003	1, 003	1. 5	1. 5
Colorado	4	2	207, 237	129, 483	8	4	1, 288	1, 775	2. 0	1. 3
Illinois	20	24	8, 242, 000	15, 328, 960	63	88	1, 561	1, 717	18. 6	28. 6
Indiana	1	1	106, 194	325, 526	2	1	1, 275	1, 000	. 5	. 2
Kentucky	66	62	18, 646, 233	20, 676, 028	163	170	1, 685	1, 768	52. 0	56. 9
Montana (bituminous)	2	1	397, 546	174, 276	2	1	700	500	. 3	. 1
Ohio	10	9	3, 153, 379	1, 321, 804	31	28	1, 750	1, 609	10. 3	8. 5
Oklahoma	3	3	457, 288	509, 582	5	6	1, 800	1, 458	1. 7	1. 7
Pennsylvania	53	46	11, 736, 717	12, 540, 789	182	159	1, 526	1, 535	52. 6	46. 2
Tennessee	4	4	826, 157	868, 251	8	13	1, 750	1, 508	2. 7	3. 7
Utah	7	5	1, 432, 889	1, 418, 737	20	18	1, 133	1, 050	4. 3	3. 6
Virginia	12	9	3, 029, 262	2, 713, 860	23	19	2, 029	2, 538	8. 8	9. 1
West Virginia	162	144	39, 642, 325	39, 946, 737	515	493	1, 471	1, 438	143. 4	134. 2
Wyoming	4	5	2, 688, 490	2, 683, 559	6	8	2, 033	1, 550	2. 3	2. 3
Total	358	322	92, 168, 992	100, 155, 249	1, 066	1, 042	1, 526	1, 541	308. 2	303. 9

[1] Includes all mines using belt conveyors, other than main-slope conveyors, 500 feet and over in length for underground transportation of coal.

AUGER MINING

The most recent development in soft-coal recovery is auger mining. Many strip mines, particularly in the rough terrain of the Appalachian region, gradually encounter overburden so thick that continued stripping becomes economically impractical. These strip mines have vast areas of coal seams exposed along what is known as the "high wall." After much experimentation, huge augers were designed to bore horizontally into the exposed solid seam of coal, much as a carpenter's auger bores into wood. These large augers, 16 to 52 inches in diameter, are mounted on movable frames and bore big holes horizontally into the coal seam from 100 to more than 200 feet. The coal from the auger falls into a conveyor and is elevated into a truck. This type of mining is generally known as high-wall auger mining.

Auger mining was begun about 1945, but separate data on the number of augers in use and tons produced by auger mining were first collected for 1952. Table 24 compares auger mining with other types of mining for 1952 and 1953.

Although coal recovery by means of augers is a comparatively new type of mining, 4 manufacturers shipped 57 coal augers in 1953. Virtually all of these augers were sold for use in high-wall mining.

Auger mining at soft-coal mines in the United States averaged 25 tons per man per day in 1953. The average was 18 tons at strip mines and 7 tons at underground mines. (See table 24.) Under very favorable operating conditions exceptionally high tons per man per day were achieved; several auger mines in West Virginia averaged over 40 tons per man per day in 1953.

A few coal-recovery augers were used in underground bituminous-coal mines, and the production from these was included with coal loaded mechanically underground.

TABLE 23.—Auger-mining operations in the bituminous-coal and lignite fields of the United States, 1953, by State and county

State and county	Number of auger mines	Equipment in use (number of units)				Mined by augers (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Augers	Power shovels	Power drills	Bull-dozers		At auger mining	All others	Total			
Kentucky:												
Magoffin and Pike	3	3			3	61,423	34	2	36	99	3,560	17.25
Muhlenberg	1	1			1	10,573	8		8	85	680	15.55
Total Kentucky	4	4			4	71,996	42	2	44	96	4,240	16.98
Maryland:												
Allegany	1	1			1	1,170	3		3	169	507	2.31
Garrett	2	2			2	5,168	10	1	11	195	2,147	2.41
Total Maryland	3	3			3	6,338	13	1	14	190	2,654	2.39
Ohio:												
Athens	3	3		1	4	47,618	12	6	18	132	2,373	20.07
Belmont	1	2		2	2	43,317	10	2	12	247	2,964	14.61
Carroll	2	2	1		2	29,039	9		9	130	1,173	24.76
Columbiana	1	1				2,450	2		2	30	60	40.83
Jefferson	1	1			1	2,348	5		5	54	270	8.70
Tuscarawas	1	1			1	14,275	4		4	227	908	15.72
Total Ohio	9	10	1	3	10	139,047	42	8	50	155	7,748	17.95
Pennsylvania:												
Armstrong	1	1			2	65,129	12	2	14	265	3,710	17.55
Butler and Greene	2	2			2	9,081	6	1	7	83	578	15.71
Clearfield	1	1			1	3,150	6		6	75	450	7.00
Elk	2	2			2	18,017	5		5	150	751	23.99
Indiana	1	1			1	5,074	8	1	9	68	612	8.29
Total Pennsylvania	7	7			8	100,451	37	4	41	149	6,101	16.46
Tennessee:												
Claiborne	2	2	1		3	67,110	30	5	35	172	6,010	11.17
Scott	1	1			1	1,680	4		4	40	160	10.50
Total Tennessee	3	3	1		4	68,790	34	5	39	158	6,170	11.15

TABLE 23.—Auger-mining operations in the bituminous-coal and lignite fields of the United States, 1953, by State and county—Continued

State and county	Number of auger mines	Equipment in use (number of units)				Mined by augers (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Augers	Power shovels	Power drills	Bull-dozers		At auger mining	All others	Total			
Virginia:												
Dickenson	1	1			1	208,377	7	18	25	226	5,659	36.82
Lee	1	1			1	56,000	17	2	19	200	3,800	14.74
Wise	1	1			1	7,505	4		4	182	728	10.31
Total Virginia	3	3			3	271,882	28	20	48	212	10,187	26.69
West Virginia:												
Barbour	4	5			5	205,208	23	7	30	170	5,100	40.24
Fayette	7	9		2	7	52,737	47		47	47	2,187	24.11
Harrison	12	13			15	675,841	87	39	126	154	19,441	34.76
Kanawha	4	6	3	1	7	174,600	52	6	58	150	8,703	20.06
Logan	2	2			2	6,456	10		10	40	396	16.30
McDowell	4	4			3	34,397	21		21	69	1,446	23.79
Mercer	4	5			4	36,685	19	1	20	125	2,507	14.63
Mingo	3	5	4	3	6	227,433	30	2	32	156	5,002	45.47
Monongalia	1	1			1	4,903	5		5	45	225	21.79
Nicholas	1	1			1	2,048	3		3	29	87	23.54
Preston	1	1			1	8,000	3		3	200	600	13.33
Raleigh	6	6			6	124,509	39		39	121	4,710	26.44
Randolph	1	2			1	28,687	7	1	8	192	1,536	18.68
Upshur	2	2			2	10,983	9	2	11	43	478	22.98
Wyoming	2	2			2	39,917	13		13	80	1,041	38.34
Total West Virginia	54	64	7	6	63	1,632,404	368	58	426	125	53,459	30.54
Total United States	83	94	9	9	95	2,290,908	564	98	662	137	90,559	25.30

STRIP MINING

In mining coal by stripping, the overburden (dirt and rock) above the coal seam is stripped off with large power shovels, leaving the seam exposed. Then the coal is loaded out (usually by smaller power shovels) directly into trucks for haulage to the tipple, the railroad ramp, or the final destination. In most coal fields of the United States, some coal seams are near enough to the surface to make mining by stripping economically feasible.

Historical Trends.—The rapid growth of coal stripping has been one of the outstanding developments in the soft-coal industry in recent years. This type of mining depended upon development and improvement of adequate power shovels. Coal stripping had a very modest beginning, and by 1914, only 35 strip mines were in operation. The output of these mines in 1914 was only 0.3 percent of the total production in the United States. The shortage of coal and the high price of coal during World War I stimulated development of larger and more efficient stripping shovels. Stripping continued a gradual growth and by 1940 furnished approximately 10 percent of total production. World War II gave stripping another stimulus, and by 1953 over 23 percent of the total output of bituminous coal and lignite came from strip mines.

Strip mines have two very substantial advantages over underground mines. First, the output per man per day in strip mines has been approximately three times larger than in underground mines (see fig. 8), resulting in lower cost per ton and making possible the second advantage—lower price. (See fig. 9.) For the past 10 years the f. o. b. mine value of strip coal has ranged from 16 percent to 29 percent lower than for underground coal. In 1953 the average value f. o. b. mine for underground coal was $5.27 per ton and for strip coal only $3.75 per ton, giving strip coal an advantage of $1.52 per ton in the market.

Equipment.—The phenomenal growth of strip mining outlined above was made possible by development of larger, improved equipment. More efficient stripping equipment, of course, was most important, but improved power drills for shot holes in overburden and larger, sturdier trucks for hauling the coal from strip pits to tipples or ramps also promoted more efficient operation.

While shovels were growing larger they were also being made more flexible in operation. The first major advance was development of the full-revolving type, which could dig and dump in any direction; it was introduced in 1911. The second improvement that furthered flexible operation was adoption of crawler or caterpiller traction. By 1920 most shovels were being equipped with crawler traction. Next came development of large-type dragline excavators, followed by the carryall scrapers. In recent years bulldozers have come into popular use around strip mines, and data were collected on number in use for the first time in 1953. Figures on stripping and loading equipment in use in 1941–53 are given in table 25.

There has been considerable change in the type of power used by shovels and draglines. Most early shovels used steam power. Beginning in 1932, figures have been collected on type of power. (See table 27.) Since 1940, the number of steam and gasoline shovels has been decreasing while electric- and diesel-powered shovels have been increasing.

The size of stripping shovels has been gradually increasing for many years. Beginning with 1941 strip operators were asked to classify their shovel dippers or buckets by size. The number of shovels with bucket capacity exceeding 12 cubic yards increased from 64 shovels in 1941 to 111 in 1953. This still does not give a complete picture, as several shovels in this classification were of over 40 cubic yards in bucket capacity.

There has also been remarkable improvement in power drills for shot holes in overburden. The drills are being made sturdier, easier to move, and capable of drilling deeper, larger holes in harder rock. The use of power drills in overburden has been increasing in recent years as a result of the heavier overburden and expansion into areas where it is necessary to drill and blast before stripping. The average thickness of overburden rose from 31.6 feet in 1946 to 39 feet in 1950.[5] As indicated in table 28, the percentage of total strip production from mines using power drills increased from 67 in 1946 to 76 in 1953.

Closely paralleling, if not surpassing, the improvements in stripping and drilling equipment has been the building of larger, improved trucks for hauling the coal from the strip pit to the tipple or railroad ramp. The early trucks were of only 1- and 2-ton capacity and had great difficulty in going over rough terrain or climbing steep grades. Present-day trucks, many especially designed for use in strip pits, are much larger—some of over 40-ton capacity—and are very sturdy and efficient in operation. Beginning with 1948 strip operators were asked to report the number of trucks, their average capacity, and the distance coal was hauled from pit to tipple. Since approximately three fourths of the total strip production was reported on questionnaires returned to the Bureau of Mines, the average capacity of trucks and average distance coal was hauled, as given in table 30, probably are representative. From 1948 to 1953 the average size of trucks and the average distance hauled both increased steadily each year. Details on truck haulage, by States, in 1953 are given in table 31.

The details on stripping operations by State and county are shown n table 32.

[5] Young, W. H., and Anderson, R. L., Thickness of Bituminous-Coal and Lignite Seams at All Mines and Thickness of Overburden at Strip Mines in the United States in 1950: Bureau of Mines Inf. Circ. 7642, 1952, 18 pp.

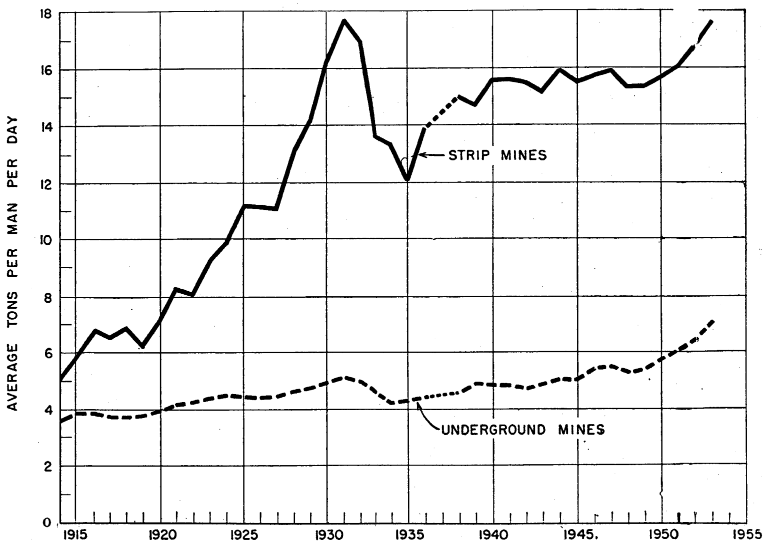

FIGURE 8.—Average tons per man per day at bituminous-coal mines in the United States, 1914–53, by strip mines and underground mines.

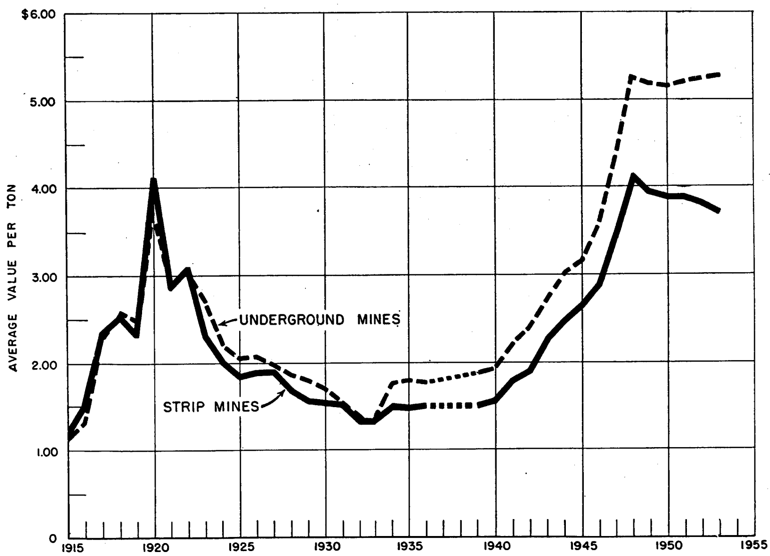

FIGURE 9.—Average value per ton, f. o. b. mines, of bituminous coal and lignite produced in the United States, 1915–53, by strip mines and underground mines.

TABLE 24.—Growth of strip mining at bituminous-coal and lignite mines in the United States, 1914–53, compared with underground and auger mining

Year	Production (thousand net tons)				Percentage of total mined by stripping	Average tons per man per day				Average value per ton f. o. b. mine				Number of strip mines	Number of power shovels and draglines
	Underground mines	Auger mines	Strip mines [1]	Total		Underground mines	Auger mines	Strip mines [1]	Total	Underground mines	Auger mines	Strip mines [1]	Total		
1914	421,423	----------	1,281	422,704	0.3	3.71	----------	5.06	3.71	(2)	----------	(2)	$1.17	[3] 35	48
1915	439,792	----------	2,832	442,624	.6	3.90	----------	5.81	3.91	$1.13	----------	$1.18	1.13	[3] 60	87
1916	498,587	----------	3,933	502,520	.8	3.88	----------	6.67	3.90	1.32	----------	1.51	1.32	[3] 79	111
1917	546,001	----------	5,790	551,791	1.0	3.75	----------	6.52	3.77	2.26	----------	2.34	2.26	[3] 126	182
1918	571,098	----------	8,288	579,386	1.4	3.76	----------	6.81	3.78	2.58	----------	2.54	2.58	[3] 165	276
1919	460,225	----------	5,635	465,860	1.2	3.82	----------	6.21	3.84	2.49	----------	2.33	2.49	[3] 168	287
1920	559,807	----------	8,860	568,667	1.5	3.97	----------	7.20	4.00	3.74	----------	4.12	3.75	[3] 174	312
1921	410,865	----------	5,057	415,922	1.2	4.18	----------	8.28	4.20	2.89	----------	2.87	2.89	[3] 155	279
1922	412,059	----------	10,209	422,268	2.4	4.24	----------	8.09	4.28	3.02	----------	3.07	3.02	272	379
1923	552,625	----------	11,940	564,565	2.1	4.43	----------	9.32	4.47	2.69	----------	2.31	2.68	263	442
1924	470,080	----------	13,607	483,687	2.8	4.50	----------	9.91	4.56	2.20	----------	2.00	2.20	234	420
1925	503,182	----------	16,871	520,053	3.2	4.45	----------	11.18	4.52	2.05	----------	1.84	2.04	227	389
1926	556,444	----------	16,923	573,367	3.0	4.42	----------	11.13	4.50	2.07	----------	1.89	2.06	237	410
1927	499,385	----------	18,378	517,763	3.6	4.47	----------	11.06	4.55	1.99	----------	1.90	1.99	255	455
1928	480,956	----------	19,789	500,745	4.0	4.61	----------	13.02	4.73	1.87	----------	1.69	1.86	250	415
1929	514,721	----------	20,268	534,989	3.8	4.73	----------	14.08	4.85	1.79	----------	1.57	1.78	200	411
1930	447,684	----------	19,842	467,526	4.3	4.93	----------	16.21	5.06	1.71	----------	1.54	1.70	218	341
1931	363,157	----------	18,932	382,089	5.0	5.12	----------	17.68	5.30	1.54	----------	1.51	1.54	235	314
1932	290,069	----------	19,641	309,710	6.3	4.99	----------	16.95	5.22	1.31	----------	1.32	1.31	255	332
1933	315,360	----------	18,270	333,630	5.5	4.60	----------	13.59	4.78	1.34	----------	1.33	1.34	289	389
1934	338,578	----------	20,790	359,368	5.8	4.23	----------	13.28	4.40	1.76	----------	1.49	1.75	344	458
1935	348,726	----------	23,647	372,373	6.4	4.32	----------	12.01	4.50	1.79	----------	1.47	1.77	368	507
1936	410,962	----------	28,126	439,088	6.4	4.42	----------	13.91	4.62	1.77	----------	1.49	1.76	381	562
1937	413,780	----------	31,751	445,531	7.1	(2)	----------	(2)	4.69	(2)	----------	(2)	1.94	449	(2)
1938	318,138	----------	30,407	348,545	8.7	4.60	----------	15.00	4.89	(2)	----------	(2)	1.95	465	737
1939	357,133	----------	37,722	394,855	9.6	4.92	----------	14.68	5.25	1.88	----------	1.49	1.84	537	914
1940	417,604	----------	43,167	460,771	9.4	4.86	----------	15.63	5.19	1.94	----------	1.56	1.91	638	1,071
1941	459,078	----------	55,071	514,149	10.7	4.83	----------	15.59	5.20	2.23	----------	1.79	2.19	769	1,321
1942	515,490	----------	67,203	582,693	11.5	4.74	----------	15.52	5.12	2.41	----------	1.90	2.36	834	1,438
1943	510,492	----------	79,685	590,177	13.5	4.89	----------	15.15	5.38	2.75	----------	2.28	2.69	1,004	1,839
1944	518,678	----------	100,898	619,576	16.3	5.04	----------	15.89	5.67	3.01	----------	2.48	2.92	1,240	2,312

1945	467, 630	----------	109, 987	577, 617	19. 0	5. 04	----------	15. 46	5. 78	3. 16	----------	2. 65	3. 06	1, 370	2, 439
1946	420, 958	----------	112, 964	533, 922	21. 1	5. 43	----------	15. 73	6. 30	3. 59	----------	2. 87	3. 44	1, 445	2, 744
1947	491, 229	----------	139, 395	630, 624	22. 1	5. 49	----------	15. 93	6. 42	4. 35	----------	3. 47	4. 16	1, 750	3, 254
1948	460, 012	----------	139, 506	599, 518	23. 3	5. 31	----------	15. 28	6. 26	5. 26	----------	4. 11	4. 99	1, 971	3, 712
1949	331, 823	----------	106, 045	437, 868	24. 2	5. 42	----------	15. 33	6. 43	5. 18	----------	3. 94	4. 88	1, 761	3, 576
1950	392, 844	----------	123, 467	516, 311	23. 9	5. 75	----------	15. 66	6. 77	5. 15	----------	3. 87	4. 84	1, 870	3, 877
1951	416, 047	(2)	117, 618	533, 665	22. 0	6. 08	(2)	16. 02	7. 04	5. 21	(2)	3. 88	4. 92	1, 784	3, 810
1952	[4] 356, 425	1, 506	108, 910	466, 841	23. 3	6. 37	20. 07	16. 77	7. 47	5. 24	4. 31	3. 81	4. 90	1, 643	3, 527
1953	349, 551	2, 291	105, 448	457, 290	23. 1	7. 01	25. 30	17. 62	8. 17	5. 27	4. 15	3. 75	4. 92	1, 554	3, 409

[1] Includes power strip pits proper and excludes horse stripping operations and mines combining stripping and underground in the same operation for the years 1914–42, inclusive. The years 1943–53, inclusive, include data on all strip mines.
[2] Data not available.
[3] Exclusive of horse stripping operations.
[4] Revised.

TABLE 25.—Number and production of bituminous-coal and lignite strip mines, and units of stripping and loading equipment in use, in the United States, 1941–53

Year	Number of strip mines	Mined by stripping (net tons)	Number of power shovels and dragline excavators							Number of carry-all scrapers	Number of bulldozers
			By capacity (in cubic yards) of dipper or bucket				By type		Total		
			Less than 3	3–5, inclusive	6–12, inclusive	More than 12	Power shovels	Drag-line excavators			
1941	769	55,071,609	1,009	153	95	64	(1)	(1)	1,321	(1)	(1)
1942	834	67,202,663	1,114	159	97	68	(1)	(1)	1,438	(1)	(1)
1943	1,004	79,685,175	1,488	173	106	72	(1)	(1)	1,839	(1)	(1)
1944	1,240	100,898,376	1,900	225	113	74	(1)	(1)	2,312	(1)	(1)
1945	1,370	109,986,865	2,004	243	117	75	(1)	(1)	2,439	(1)	(1)
1946	1,445	112,963,717	2,256	302	112	74	2,406	338	2,744	263	(1)
1947	1,750	139,395,011	2,685	362	123	84	2,822	432	3,254	275	(1)
1948	1,971	139,505,920	3,048	446	130	88	3,177	535	3,712	362	(1)
1949	1,761	106,045,299	2,931	367	168	110	3,011	565	3,576	320	(1)
1950	1,870	123,466,564	3,182	416	170	109	3,247	630	3,877	286	(1)
1951	1,784	117,617,676	3,088	420	187	115	3,164	646	3,810	220	(1)
1952	1,643	108,909,756	2,800	425	183	119	2,892	635	3,527	218	(1)
1953	1,554	105,448,569	2,692	413	193	111	2,793	616	3,409	244	1,954

[1] Data not available.

TABLE 26.—Number and production of bituminous-coal and lignite strip mines and units of stripping and loading equipment in use in the United States and Alaska, 1953, by States

State	Number of strip mines	Mined by stripping (net tons)	Number of power shovels and dragline excavators							Number of carryall scrapers	Number of bull-dozers
			By capacity (in cubic yards) of dipper or bucket				By type		Total		
			Less than 3	3–5, inclusive	6–12, inclusive	More than 12	Power shovels	Dragline excavators			
Alabama	35	1, 615, 132	71	14	4	1	73	17	90	13	45
Alaska	6	434, 630	9	1			10		10	6	22
Arkansas	11	379, 562	8	5	2	1	11	5	16		5
Colorado	7	368, 266	6	2	1		6	3	9	2	5
Illinois	60	16, 680, 687	51	34	33	36	102	52	154	4	40
Indiana	39	9, 630, 465	40	34	19	22	74	41	115	3	54
Iowa	35	974, 183	58	12	1		38	33	71	11	37
Kansas	21	1, 685, 299	19	9	8	7	31	12	43		10
Kentucky:											
Eastern	87	2, 007, 521	99	3	1	2	105		105	1	60
Western	38	8, 312, 085	60	21	23	7	76	35	111	5	34
Total Kentucky	125	10, 319, 606	159	24	24	9	181	35	216	6	94
Maryland	21	222, 335	26	1			24	3	27	1	8
Missouri	29	2, 242, 208	25	9	6	8	38	10	48	8	27
Montana:											
Bituminous	1	1, 421, 139	1	1	2	4	4	4	8		
Lignite	2	2, 655	1				1		1		2
Total Montana	3	1, 423, 794	2	1	2	4	5	4	9	1	2
New Mexico	2	16, 725	4				3	1	4		3
North Dakota (lignite)	40	2, 641, 120	32	7	9	1	41	8	49	21	18
Ohio	253	21, 612, 793	481	80	36	13	504	106	610	67	440
Oklahoma	21	1, 293, 428	21	5	4	2	22	10	32		20
Pennsylvania	569	20, 175, 310	1, 143	134	39	6	1, 065	257	1, 322	55	823
South Dakota (lignite)	2	23, 671	3				2	1	3	1	1
Tennessee	51	675, 276	65	2			66	1	67		20
Virginia	27	1, 303, 648	42	6	1		48	1	49	1	31
Washington	4	89, 573	5				5		5		2
West Virginia	184	9, 936, 129	408	27	4	1	429	11	440	40	245
Wyoming	9	1, 704, 729	14	6			15	5	20	4	2
Total	1, 554	105, 448, 569	2, 692	413	193	111	2, 793	616	3, 409	244	1, 954

TABLE 27.—Number of power shovels and dragline excavators at bituminous-coal and lignite strip mines in the United States, 1932–53, by type of power

Year	Steam	Electric	Diesel	Gasoline	Year	Steam	Electric	Diesel	Gasoline
1932	166	105	[1] 61	(2)	1943	172	234	[1] 1,433	(2)
1933	169	117	[1] 103	(2)	1944	166	244	[1] 1,902	(2)
1934	188	121	[1] 149	(2)	1945	141	256	[1] 2,042	(2)
1935	174	139	[1] 194	(2)	1946	111	261	1,619	753
1936	188	151	[1] 223	(2)	1947	83	301	2,279	591
1937	(3)	(3)	(3)	(3)	1948	54	337	2,675	646
1938	142	155	[1] 440	(2)	1949	51	352	2,646	527
1939	206	184	[1] 524	(2)	1950	42	348	2,880	607
1940	180	194	[1] 697	(2)	1951	26	346	2,905	533
1941	200	210	[1] 911	(2)	1952	19	321	2,642	545
1942	199	219	[1] 1,020	(2)	1953	17	317	2,629	446

[1] Includes gasoline shovels.
[2] Included with diesel shovels.
[3] Data not available.

TABLE 28.—Summary of operations at bituminous-coal and lignite strip mines using power drills in bank or overburden in the United States, 1946–53

Year	Number of mines	Production at mines using power drills: Quantity (net tons)	Production at mines using power drills: Percentage of total strip production	Number of power drills
1946	514	75,375,841	66.7	764
1947	598	95,915,346	68.8	875
1948	728	98,809,393	72.3	1,195
1949	756	78,146,655	73.7	1,256
1950	692	87,205,280	70.6	1,201
1951	650	85,331,204	72.5	1,125
1952	629	79,252,284	73.0	1,070
1953	603	80,259,365	76.1	1,048

TABLE 29.—Summary of operations at bituminous-coal and lignite strip mines using power drills in bank or overburden in the United States, 1952–53, by States and Alaska

State	Number of mines		Production at mines using power drills				Number of power drills					
			Quantity (net tons)		Percentage of total strip production		Horizontal		Vertical		Total	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
Alabama	21	20	1, 015, 560	1, 146, 989	61. 4	71. 0	27	25	11	11	38	36
Alaska	------	4	------	344, 278	------	79. 2	------	3	------	10	------	13
Arkansas	4	5	272, 625	303, 919	86. 5	80. 1	7	8	3	1	10	9
Colorado	4	4	381, 933	345, 905	99. 0	93. 9	3	3	3	3	6	6
Illinois	31	34	13, 417, 741	15, 057, 274	80. 3	90. 3	46	42	23	21	69	63
Indiana	33	33	8, 210, 308	9, 522, 885	84. 0	98. 9	55	47	28	34	83	81
Iowa	20	27	734, 211	899, 398	78. 5	92. 3	19	26	17	20	36	46
Kansas	10	9	1, 781, 971	1, 561, 985	89. 9	92. 7	15	10	7	6	22	16
Kentucky:												
Eastern	14	13	1, 228, 827	1, 264, 740	60. 7	63. 0	12	9	12	12	24	21
Western	25	26	8, 385, 398	7, 969, 546	94. 8	95. 9	32	36	30	36	62	72
Total Kentucky	39	39	9, 614, 225	9, 234, 286	88. 5	89. 5	44	45	42	48	86	93
Maryland	1	------	52, 259	------	24. 2	------	1	------	------	------	1	------
Missouri	15	15	2, 616, 447	2, 191, 266	95. 5	97. 7	17	16	8	7	25	23
Montana:												
Bituminous	1	1	1, 406, 321	1, 421, 139	100. 0	99. 8	2	------	------	2	2	2
Lignite	1	------	1, 432	------	20. 0	------	------	------	1	------	1	------
Total Montana	2	1	1, 407, 753	1, 421, 139	99. 6	99. 8	2	------	1	2	3	2
New Mexico	------	1	------	9, 000	------	53. 8	------	------	------	2	------	2
North Dakota (lignite)	6	3	950, 437	480, 909	33. 9	18. 2	3	2	3	1	6	3
Ohio	119	122	17, 563, 346	17, 925, 551	79. 3	82. 9	126	119	58	66	184	185
Oklahoma	9	8	1, 162, 124	1, 069, 167	88. 4	82. 7	13	12	5	2	18	14
Pennsylvania	198	172	10, 931, 451	10, 001, 963	53. 9	49. 6	175	158	103	90	278	248
South Dakota (lignite)	------	2	------	23, 671	------	100. 0	------	1	------	1	------	2
Tennessee	6	6	145, 337	173, 116	26. 6	25. 6	7	5	------	2	7	7
Virginia	11	6	866, 125	704, 629	38. 6	54. 1	13	6	4	5	17	11
Washington	2	1	43, 185	89, 573	39. 0	100. 0	------	------	2	5	2	5
West Virginia	92	86	6, 687, 919	6, 421, 314	65. 7	64. 6	105	105	62	67	167	172
Wyoming	6	5	1, 397, 327	1, 331, 148	71. 2	78. 1	7	6	5	5	12	11
Total	629	603	79, 252, 284	80, 259, 365	73. 0	76. 1	685	639	385	409	1, 070	1, 048

TABLE 30.—Summary of method of haulage from bituminous-coal and lignite strip mines to tipple or ramp, in the United States, 1948–53 [1]

Year	Strip mines reporting method of haulage: Strip mines using trucks: Production (net tons)	Strip mines using trucks: Number of trucks	Strip mines using trucks: Average capacity per truck (net tons)	Strip mines using trucks: Average distance hauled (miles)	Strip mines using rail, rail and truck, truck and tram, production (net tons)	Production of strip mines reporting: Quantity (net tons)	Production of strip mines reporting: Percentage of total strip production	Strip mines not reporting method of haulage, production (net tons)	Tota strip production (net tons)
1948	97, 450, 399	7, 214	9. 4	3. 7	6, 327, 989	103, 778, 388	74. 4	35, 727, 532	139,505,920
1949	73, 229, 556	6, 694	10. 1	3. 7	5, 365, 432	78, 594, 988	74. 1	27, 450, 311	106,045,299
1950	88, 666, 733	6, 564	10. 3	3. 8	4, 364, 333	93, 031, 066	75. 3	30, 435, 498	123,466,564
1951	87, 427, 029	6, 173	10. 6	4. 0	2, 424, 994	89, 852, 023	76. 4	27, 765, 653	117,617,676
1952	88, 589, 637	5, 799	11. 3	4. 0	2, 296, 744	90, 886, 381	83. 5	18, 023, 375	108,909,756
1953	84, 764, 694	5, 287	12. 2	4. 0	2, 104, 609	86, 869, 303	82. 4	18, 579, 266	105,448,569

[1] Excludes lignite in 1948 and 1949.

TABLE 31.—Summary of method of haulage from bituminous-coal and lignite strip mines to tipple or ramp, in the United States and Alaska, 1953, by States

State	Strip mines reporting method of haulage							Strip mines not reporting method of haulage, production (net tons)	Total strip production (net tons)
	Strip mines using trucks				Strip mines using rail, rail and truck, truck and tram, production (net tons)	Production of strip mines reporting			
	Production (net tons)	Number of trucks	Average capacity per truck (net tons)	Average distance hauled (miles)		Quantity net (tons)	Percentage of total strip production		
Alabama	1,278,362	141	8.6	3.9		1,278,362	79.1	336,770	1,615,132
Alaska	434,630	32	10.7	4.2		434,630	100.0		434,630
Arkansas	301,870	19	9.4	1.8		301,870	79.5	77,692	379,562
Colorado	345,905	15	15.6	2.1		345,905	93.9	22,361	368,266
Illinois	15,638,378	303	26.6	2.8		15,638,378	93.8	1,042,309	16,680,687
Indiana	8,702,903	213	25.6	3.7		8,702,903	90.4	927,562	9,630,465
Iowa	860,297	77	7.4	2.5		860,297	88.3	113,886	974,183
Kansas	1,319,928	50	24.9	2.5	295,364	1,615,292	95.8	70,007	1,685,299
Kentucky	7,224,283	219	14.8	2.3	388,106	7,612,389	73.8	2,707,217	10,319,606
Maryland	19,558	3	9.0	7.2		19,558	8.8	202,777	222,335
Missouri	2,191,092	75	26.8	2.6		2,191,092	97.7	51,116	2,242,208
Montana (bituminous and lignite)	1,616	3	4.0	.1	1,421,139	1,422,755	99.9	1,039	1,423,794
New Mexico	9,000	2	2.0	.2		9,000	53.8	7,725	16,725
North and South Dakota (lignite)	2,303,588	66	14.3	2.0		2,303,588	86.4	361,203	2,664,791
Ohio	19,113,319	1,171	11.2	4.8		19,113,319	88.4	2,499,474	21,612,793
Oklahoma	1,076,588	70	10.4	3.9		1,076,588	83.2	216,840	1,293,428
Pennsylvania	14,869,985	2,007	9.4	5.9		14,869,985	73.7	5,305,325	20,175,310
Tennessee	136,865	27	8.3	5.2		136,865	20.3	538,411	675,276
Virginia	739,524	40	10.0	2.0		739,524	56.7	564,124	1,303,648
Washington	89,573	16	8.8	2.4		89,573	100.0		89,573
West Virginia	6,776,282	709	9.7	5.4		6,776,282	68.2	3,159,847	9,936,129
Wyoming	1,331,148	29	11.9	2.0		1,331,148	78.1	373,581	1,704,729
Total	84,764,694	5,287	12.2	4.0	2,104,609	86,869,303	82.4	18,579,266	105,448,569

TABLE 32.—Stripping operations in the bituminous-coal and lignite fields of the United States and Alaska, 1953, by State and by county

State and county	Number of strip pits	Number of power shovels and dragline excavators				Mined by stripping (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Steam	Electric	Diesel	Gasoline		In strip pits	All others	Total			
Alabama:												
Bibb	1				1	7,910	8		8	96	768	10.30
Blount	4	1	2	5		139,997	43	8	51	210	10,718	13.06
Cullman	2	1		2		21,675	22	8	30	136	4,065	5.33
Jefferson	5			16		256,744	93	41	134	216	28,927	8.88
St. Clair	1				1	5,207	3		3	169	507	10.27
Tuscaloosa	9			25		439,798	148	26	174	196	34,104	12.90
Walker	13		3	31	2	743,801	305	67	372	170	63,157	11.78
Total Alabama	35	2	5	79	4	1,615,132	622	150	772	184	142,246	11.35
Alaska	6			10		434,630	105	47	152	208	31,655	13.73
Arkansas:												
Franklin	1	1		2		14,196	15	2	17	157	2,677	5.30
Johnson	5		1	8		301,389	99	25	124	175	21,671	13.91
Sebastian	5			1	3	63,977	39	3	42	205	8,620	7.42
Total Arkansas	11	1	1	11	3	379,562	153	30	183	180	32,968	11.51
Colorado:												
El Paso	1				1	4,287	2		2	233	466	9.20
Fremont	1				1	9,810	12		12	114	1,368	7.17
Jackson	1					2,833	3		3	277	831	3.41
Routt	3		1	3	1	338,518	38	41	79	175	13,862	24.42
Weld	1		1	1		12,818	12	4	16	33	528	24.28
Total Colorado	7		2	4	3	368,266	67	45	112	152	17,055	21.59
Illinois:												
Bureau	1			5		687,448	41	88	129	232	29,895	23.00
Fulton	14		19	13	4	5,253,695	346	565	911	229	208,404	25.21
Grundy	2		2	1	2	272,158	34	43	77	245	18,877	14.42
Hancock	1			1	2	11,133	8	6	14	69	966	11.52
Jackson	3	1	6	1		618,135	65	74	139	206	28,585	21.62
Kankakee	1		4			589,062	64	85	149	251	37,437	15.73
Knox	3		10	1		1,799,002	159	241	400	230	92,006	19.55
La Salle	3		1	1		5,013	8		8	134	1,071	4.68
Livingston	2				1	4,059	6		6	140	842	4.82
Peoria	3			5	1	306,693	33	27	60	223	13,396	22.89
Perry	5		11	3	1	2,366,595	195	374	569	196	111,808	21.17
Randolph	2		2	2	1	493,382	46	48	94	182	17,075	28.89

St. Clair	3		6	7		1, 527, 589	125	136	261	233	60, 846	25. 11
Saline	5		2	9		514, 808	131	133	264	150	39, 727	12. 96
Schuyler	1				2	8, 728	3	1	4	258	1, 031	8. 47
Vermilion	5		5		4	775, 790	49	78	127	194	24, 694	31. 42
Will	1		3	1		136, 083	20	17	37	239	8, 861	15. 36
Williamson	5		4	10		1, 311, 314	171	129	300	163	48, 855	26. 84
Total Illinois	60	1	75	60	18	16, 680, 687	1, 504	2, 045	3, 549	210	744, 376	22. 41
Indiana:												
Clay	13	1	9	18	11	1, 270, 489	248	145	393	193	75, 977	16. 72
Daviess	2		3	1		162, 953	45	42	87	58	5, 044	32. 31
Fountain	1		2	1		46, 678	9	15	24	248	5, 950	7. 85
Gibson	1		2		1	134, 451	27	20	47	210	9, 858	13. 64
Greene	4		3	3	1	629, 483	64	84	148	202	29, 926	21. 03
Knox	1		3	1		579, 714	67	43	110	242	26, 620	21. 78
Owen	1		2			28, 453	11	32	43	41	1, 772	16. 06
Pike	4		14	6		2, 478, 271	317	220	537	217	116, 435	21. 28
Spencer	1			1	1	25, 900	7	3	10	200	2, 000	12. 95
Sullivan	4		6	2		1, 134, 676	136	124	260	172	44, 679	25. 40
Vermillion	1		2			147, 187	21	28	49	127	6, 214	23. 69
Vigo	2		4	2	2	656, 445	73	69	142	265	37, 670	17. 43
Warrick	4		10	3		2, 335, 765	226	250	476	185	87, 908	26. 57
Total Indiana	39	1	60	38	16	9, 630, 465	1, 251	1, 075	2, 326	193	450, 053	21. 40
Iowa:												
Appanoose	1					3, 654	5	1	6	80	480	7. 61
Davis	2			6		145, 019	27	12	39	273	10, 661	13. 60
Jasper	1			1	1	2, 500	4	1	5	106	530	4. 72
Mahaska	10			17	2	124, 208	48	15	63	151	9, 505	13. 07
Marion	12		4	15	10	608, 543	119	58	177	222	39, 306	15. 48
Van Buren	3			5	2	31, 008	20	10	30	190	5, 694	5. 45
Wapello	6			4	4	59, 251	43	9	52	143	7, 450	7. 95
Total Iowa	35		4	48	19	974, 183	266	106	372	198	73, 626	13. 23
Kansas:												
Bourbon	3	2			1	15, 435	17		17	131	2, 225	6. 94
Cherokee	6		2	8	4	527, 958	80	38	118	218	25, 713	20. 53
Crawford	9	2	13	3	4	646, 870	186	115	301	164	49, 492	13. 07
Linn	1			2		485, 717	40	54	94	207	19, 494	24. 92
Osage	2			2		9, 319	13		13	162	2, 110	4. 42
Total Kansas	21	4	15	15	9	1, 685, 299	336	207	543	182	99, 034	17. 02
Eastern Kentucky:												
Bell	10			14	2	221, 607	122	14	136	89	12, 100	18. 31
Boyd	1			5		243, 006	44	11	55	225	12, 378	19. 63
Breathitt	1		1	2		288, 275	26	52	78	184	14, 388	20. 04
Clay	1			2		24, 984	7	2	9	265	2, 387	10. 47
Greenup	1			2		35, 000	35	9	44	60	2, 640	13. 26
Harlan	3			6		81, 494	36	4	40	198	7, 910	10. 30

TABLE 32.—Stripping operations in the bituminous-coal and lignite fields of the United States and Alaska, 1953, by State and by county—Continued

State and county	Number of strip pits	Number of power shovels and dragline excavators				Mined by stripping (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Steam	Electric	Diesel	Gasoline		In strip pits	All others	Total			
Eastern Kentucky—Continued												
Jackson	4				1	13,850	23	2	25	51	1,274	10.87
Knott	1					3,487	6		6	58	348	10.02
Knox	2			2		31,270	21	2	23	165	3,797	8.24
Laurel	8			5	4	79,876	50	3	53	200	10,611	7.53
Lawrence	2			2	1	21,340	12		12	125	1,500	14.23
Lee	2				1	9,150	12		12	71	852	10.74
Letcher	4			6	1	150,482	45	11	56	194	10,848	13.87
Magoffin	2			4		192,863	55	11	66	180	11,906	16.20
McCreary	4			7		69,132	55	9	64	111	7,104	9.73
Menifee	1					1,135	4		4	30	120	9.46
Morgan	6				1	17,264	24		24	92	2,210	7.81
Perry	2			2		27,932	16	2	18	140	2,512	11.12
Pike	1				1	3,528	6		6	55	330	10.69
Pulask	14			7	7	115,244	113	6	119	97	11,570	9.96
Rockcastle	9			4	4	40,940	61		61	82	4,980	8.22
Whitley	5			11		330,057	92	33	125	158	19,805	16.67
Wolfe	3					5,605	8		8	141	1,130	4.96
Total Eastern Kentucky	87		1	81	23	2,007,521	873	171	1,044	137	142,700	14.07
Western Kentucky:												
Butler	2			1	1	9,021	6		6	204	1,225	7.36
Daviess	2		1	5		524,733	48	33	81	264	21,403	24.52
Hancock	1			4		125,000	24	16	40	200	8,000	15.63
Hopkins	19		13	29	13	4,410,826	449	411	860	182	156,441	28.19
McLean	1					1,440	2		2	35	70	20.57
Muhlenberg	6		7	12	2	1,643,905	187	174	361	181	65,457	25.11
Ohio	6		8	10		1,261,712	132	159	291	188	54,679	23.07
Webster	1			5		335,448	30	18	48	249	11,952	28.07
Total Western Kentucky	38		29	66	16	8,312,085	878	811	1,689	189	319,227	26.04
Total Kentucky	125		30	147	39	10,319,606	1,751	982	2,733	169	461,927	22.34
Maryland:												
Allegany	6			5	1	49,820	41	1	42	148	6,204	8.03
Garrett	15			18	3	172,515	110	9	119	123	14,679	11.75
Total Maryland	21			23	4	222,335	151	10	161	130	20,883	10.65

Missouri:												
Barton	1	1				4,709	6		6	160	960	4.91
Bates	3		2		3	255,916	25	30	55	207	11,368	22.51
Boone	2			3	1	27,199	9	2	11	208	2,293	11.86
Callaway	1			3	1	130,543	30	13	43	288	12,378	10.55
Dade	1				1	9,990	6		6	280	1,680	5.95
Henry	9		9	5	1	812,562	130	86	216	189	40,889	19.87
Johnson	1					2,001	3		3	180	540	3.71
Macon	2		4	1		622,594	59	72	131	210	27,542	22.61
Ralls	1			1		3,740	6		6	197	1,183	3.16
Randolph	2		3			126,958	45	39	84	60	5,066	25.06
St. Clair	2		3	1		202,798	46	24	70	156	10,895	18.61
Vernon	4	2		2	1	43,198	31	8	39	154	6,023	7.17
Total Missouri	29	3	21	16	8	2,242,208	396	274	670	180	120,817	18.56
Montana:												
Bituminous coal: Rosebud	1		7	1		1,421,139	51	15	66	218	14,380	98.83
Lignite:												
Dawson	1					1,039	2		2	93	186	5.59
Sheridan	1				1	1,616	2	1	3	67	200	8.08
Total lignite	2				1	2,655	4	1	5	77	386	6.88
Total Montana	3		7	1	1	1,423,794	55	16	71	208	14,766	96.42
New Mexico:												
McKinley	1			1	1	9,000	7	3	10	205	2,050	4.39
Valencia	1			1	1	7,725	5		5	170	850	9.09
Total New Mexico	2			2	2	16,725	12	3	15	193	2,900	5.77
North Dakota (lignite):												
Adams	1			1		28,349	10		10	116	1,159	24.46
Bowman	1			1		163,704	11	6	17	222	3,773	43.39
Burke	2		3		2	426,880	28	35	63	204	12,876	33.15
Burleigh	1			1		16,661	3		3	200	600	27.77
Divide	1		2	1		242,481	16	22	38	175	6,650	36.46
Dunn	3				2	11,505	9		9	125	1,124	10.24
Grant	3			2		26,331	11		11	157	1,722	15.29
Hettinger	2				2	12,099	8	2	10	109	1,090	11.10
McKenzie	1					1,229	3		3	115	345	3.56
McLean	3		3		2	293,108	32	23	55	200	10,985	26.68
Mercer	7		5	4	1	831,131	67	59	126	196	24,663	33.70
Morton	6			3	2	28,020	18		18	152	2,727	10.28
Oliver	1			1		5,081	4		4	96	384	13.23
Stark	3			3		75,043	25	8	33	135	4,468	16.80
Ward	4		3	3	1	472,551	40	42	82	195	16,030	29.48
Williams	1				1	6,947	4		4	150	600	11.58
Total North Dakota	40		16	20	13	2,641,120	289	197	486	184	89,196	29.61

TABLE 32.—Stripping operations in the bituminous-coal and lignite fields of the United States and Alaska, 1953, by State and by county—Continued

State and county	Number of strip pits	Number of power shovels and dragline excavators				Mined by stripping (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Steam	Electric	Diesel	Gasoline		In strip pits	All others	Total			
Ohio:												
Athens	4			9		54, 903	26	5	31	93	2, 878	19. 08
Belmont	15			31	6	1, 016, 335	201	67	268	171	45, 827	22. 18
Carroll	8			20	3	397, 448	97	30	127	252	31, 944	12. 44
Columbiana	36			61	11	1, 171, 471	323	58	381	241	91, 812	12. 76
Coshocton	11		1	27	9	851, 314	165	55	220	242	53, 177	16. 01
Gallia	3			11		651, 547	98	46	144	265	38, 158	17. 07
Guernsey	6			10	1	317, 020	45	22	67	155	10, 415	30. 44
Harrison	18		18	32	4	5, 869, 616	496	581	1, 077	224	241, 002	24. 36
Hocking	4			3	1	18, 020	16	2	18	121	2, 169	8. 31
Holmes	1				1	1, 619	4		4	46	184	8. 80
Jackson	12		3	6	4	465, 981	81	43	124	203	25, 191	18. 50
Jefferson	24		5	52	1	2, 411, 229	378	198	576	223	128, 722	18. 73
Lawrence	5			11		254, 979	58	13	71	216	15, 338	16. 62
Mahoning	13		1	33	1	622, 338	132	26	158	252	39, 803	15. 64
Meigs	5			7	1	537, 185	97	19	116	211	24, 463	21. 96
Morgan	2			1	2	16, 583	6	1	7	234	1, 636	10. 14
Muskingum	11		3	16	5	1, 059, 867	132	43	175	250	43, 774	24. 21
Noble	8		3	20		1, 704, 360	195	122	317	233	73, 715	23. 12
Perry	12		5	21	5	1, 363, 504	308	156	464	162	75, 065	18. 16
Portage	3			4	2	142, 855	32	14	46	264	12, 148	11. 76
Stark	14		1	30	8	802, 239	179	47	226	238	53, 831	14. 90
Tuscarawas	26	1	2	55	17	1, 360, 515	323	112	435	254	110, 545	12. 31
Vinton	9			8	6	165, 539	76	27	103	213	21, 948	7. 54
Washington	2			5		239, 291	25	12	37	252	9, 322	25. 67
Wayne	1			6		117, 035	25	11	36	292	10, 512	11. 13
Total Ohio	253	1	42	479	88	21, 612, 793	3, 518	1, 710	5, 228	223	1, 163, 579	18. 57
Oklahoma:												
Coal	1			3		33, 120	14	5	19	257	4, 883	6. 78
Craig	2			2		8, 545	12		12	162	1, 947	4. 39
Haskell	5	1		8		426, 468	143	14	157	197	30, 928	13. 79
Latimer	3			4		80, 119	39	10	49	87	4, 273	18. 75
Le Flore	2		1	3	1	200, 798	70	16	86	204	17, 550	11. 44
McIntosh	2	1	1			162, 346	28	9	37	292	10, 792	15. 04
Muskogee	1					1, 446	3		3	68	204	7. 09
Okmulgee	1			1		10, 492	4		4	294	1, 176	8. 92

Rogers	2		2	1		347,119	69	44	113	243	27,511	12.62
Sequoyah	1			2		21,574	13	2	15	95	1,420	15.19
Wagoner	1			1		1,401	5	1	6	38	228	6.14
Total Oklahoma	21	2	4	25	1	1,293,428	400	101	501	201	100,912	12.82
Pennsylvania:												
Allegheny	45			69	17	830,436	328	79	407	194	78,808	10.54
Armstrong	41		2	74	11	1,619,872	490	134	624	177	110,398	14.67
Beaver	13			33	3	396,774	104	33	137	243	33,236	11.94
Bedford, Fulton, and Lycoming	3			12	1	185,193	80	29	109	124	13,475	13.74
Blair	3			6	3	115,394	38	7	45	255	11,474	10.06
Bradford	1			2	1	9,301	5		5	250	1,250	7.44
Butler	38			77	11	1,596,254	383	118	501	252	126,131	12.66
Cambria	21			47	6	594,326	239	35	274	216	59,100	10.06
Cameron	2			3		51,536	8	3	11	249	2,741	18.80
Centre	20			58	10	881,578	274	46	320	228	72,992	12.08
Clarion	28			78	8	1,957,934	386	209	595	254	150,948	12.97
Clearfield	89	1		222	12	3,650,920	1,234	302	1,536	200	307,531	11.87
Clinton	8			14	3	546,809	162	43	205	208	42,597	12.84
Elk	11			24	3	311,077	103	23	126	178	22,407	13.88
Fayette	27			29	7	702,149	351	44	395	130	51,241	13.70
Huntingdon	2			10		180,143	74	11	85	191	16,271	11.07
Indiana	34		1	69	9	1,013,164	394	101	495	166	82,202	12.33
Jefferson	29		1	49	14	943,299	271	80	351	199	69,912	13.49
Lawrence	15			30	4	677,344	142	17	159	261	41,452	16.34
McKean	3			8	2	79,001	27	2	29	228	6,612	11.95
Mercer	7		1	15	1	417,713	90	24	114	220	25,047	16.68
Somerset	42			100	12	1,037,923	420	75	495	177	87,388	11.88
Tioga	2			4		19,642	7		7	225	1,575	12.47
Venango	10			29	5	585,126	119	43	162	255	41,272	14.18
Washington	33		7	53	5	1,445,227	373	125	498	190	94,383	15.31
Westmoreland	42			34	12	327,175	216	30	246	108	26,632	12.29
Total Pennsylvania	569	1	12	1,149	160	20,175,310	6,318	1,613	7,931	199	1,577,075	12.79
South Dakota (lignite):												
Corson	1			1		3,147	3		3	120	360	8.74
Dewey	1			1	1	20,524	9	2	11	217	2,390	8.59
Total South Dakota	2			2	1	23,671	12	2	14	196	2,750	8.61
Tennessee:												
Anderson	4			2	1	29,560	26		26	111	2,874	10.29
Campbell	3			1	1	20,160	26	8	34	57	1,933	10.43
Claiborne	9			13	2	205,346	107	13	120	113	13,554	15.15
Cumberland	1			1		9,255	3		3	175	525	17.63
Fentress	1					4,000	7		7	53	371	10.78
Grundy	11			6	6	116,000	80	10	90	115	10,385	11.17
Marion	2				1	11,080	9		9	144	1,296	8.55
Morgan	4			4	2	45,000	34	2	36	105	3,792	11.87
Overton	3			3	2	29,410	19	6	25	139	3,475	8.46
Scott	8			10	4	109,065	63	6	69	149	10,290	10.60

TABLE 32.—Stripping operations in the bituminous-coal and lignite fields of the United States and Alaska, 1953, by State and by county—Continued

State and county	Number of strip pits	Number of power shovels and dragline excavators				Mined by stripping (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Steam	Electric	Diesel	Gasoline		In strip pits	All others	Total			
Tennessee—Continued												
Sequatchie	1				1	8,000	7		7	98	686	11.66
Van Buren	3			6		80,000	44	8	52	142	7,380	10.84
White	1				1	8,400	12	3	15	111	1,662	5.05
Total Tennessee	51			46	21	675,276	437	56	493	118	58,223	11.6)
Virginia:												
Buchanan	3		1	6		95,281	41	13	54	110	5,920	16.09
Dickenson	2		3	5		610,311	130	52	182	243	44,144	13.83
Lee	1			2		31,150	8	1	9	200	1,800	17.31
Russell	1			1		12,974	4		4	200	800	16.22
Wise	20			31		553,932	161	30	191	187	35,754	15.49
Total Virginia	27		4	45		1,303,648	344	96	440	201	88,418	14.74
Washington:												
King	2			2		28,080	20	5	25	136	3,389	8.29
Kittitas	1				2	51,097	23	4	27	169	4,551	11.23
Thurston	1				1	10,396	10		10	122	1,219	8.53
Total Washington	4			2	3	89,573	53	9	62	148	9,159	9.78
West Virginia:												
Barbour	12		2	28	1	1,226,294	276	111	387	164	63,519	19.31
Boone	2			5		184,922	33	10	43	202	8,686	21.29
Brooke	5			12		373,502	128	28	156	172	26,775	13.95
Fayette	17		2	34	1	637,850	404	80	484	89	42,954	14.85
Gilmer	1			2		29,765	8	2	10	197	1,965	15.15
Grant	1					2,265	8		8	52	416	5.44
Greenbrier	6		1	18	1	407,395	126	31	157	187	29,354	13.88
Hancock	3			3	2	132,328	29	4	33	218	7,186	18.41
Harrison	38		5	87	8	2,599,649	707	229	936	162	152,031	17.10
Kanawha	5			12		341,225	77	11	88	261	22,940	14.87
Lewis	6			8	5	228,298	77	24	101	118	11,880	19.22
Logan	3			6		128,927	38	5	43	154	6,620	19.48
Marion	2			1		10,110	14	4	18	59	1,067	9.48
McDowell	10			28	2	598,918	138	34	172	180	30,950	19.35
Mercer	14		4	26	2	658,408	234	40	274	169	46,436	14.18
Mineral	2			4		25,471	17	3	20	114	2,272	11.21
Mingo	1			3		23,610	11	5	16	169	2,705	8.73

Monongalia	4			11		148, 503	55	19	74	156	11, 549	12. 86
Nicholas	3			6	1	330, 779	69	18	87	234	20, 368	16. 24
Pocahontas	1			3		71, 344	31	5	36	272	9, 792	7. 29
Preston	12			21	2	474, 878	182	46	228	159	36, 186	13. 12
Raleigh	9			21	4	464, 891	172	24	196	124	24, 231	19. 19
Randolph	9			17	1	229, 131	129	27	156	120	18, 747	12. 22
Taylor	4		2	6		212, 657	51	14	65	214	13, 923	15. 27
Tucker	1			5		72, 008	35	8	43	145	6, 235	11. 55
Upshur	5			9	1	135, 528	52	12	64	117	7, 505	18. 06
Webster	2			4		43, 100	15	4	19	144	2, 729	15. 79
Wyoming	6			12	1	144, 373	67	17	84	105	8, 798	16. 41
Total West Virginia	184		16	392	32	9, 936, 129	3, 183	815	3, 998	155	617, 819	16. 08
Wyoming:												
Campbell	1		1			320, 654	16	21	37	285	10, 544	30. 41
Carbon	2	1		5		292, 340	42	25	67	253	16, 969	17. 23
Converse	1			1		6, 908	3		3	227	681	10. 14
Lincoln	1			3		508, 494	55	20	75	190	14, 250	35. 68
Sheridan	2		2	1	1	455, 633	36	28	64	248	15, 873	28. 70
Sweetwater	2			5		120, 700	20	10	30	235	7, 038	17. 15
Total Wyoming	9	1	3	15	1	1, 704, 729	172	104	276	237	65, 355	26. 08
Total United States	1, 554	17	317	2, 629	446	105, 448, 569	21, 395	9, 693	31, 088	193	5, 984, 792	17. 62

MECHANICAL LOADING

As mentioned above, 1 of the 4 major activities in underground mining was loading the coal onto underground haulage equipment. Before 1923 this tremendous task was done almost entirely by hand.

During the past 25 years underground mechanical loading of bituminous coal and lignite has increased from 5 to 80 percent of the total underground output. A similar increase in percentage of underground production "cut by machine" required 39 years (1891–1930). Many factors influenced this rapid rate of progress in mechanization of the soft-coal industry, but wage rates were probably the most important.

Extent of Mechanical Loading.—Bituminous coal and lignite mechanically loaded in underground mines in 1953 totaled 278 million tons, or approximately 4 times more than the tonnage hand loaded into mine cars (71 million tons).

Table 33 shows the growth of mechanical loading from 1923, when less than 1 percent of underground production was loaded mechanically, through 1953, when 80 percent was handled by some type of mechanical loading device.

Advantage of Mechanical Loading Compared With Hand Loading—Productivity.—As the percentage of underground coal mechanically loaded increased there was growing interest in use of the machine over the hand-loading process, when measured in terms of productivity. Since many mines load some coal by both machine and by hand and it is very difficult to allocate underground employment by functions, it is impossible to compile productivity statistics giving a complete separation between mechanical and hand loading; however, by classifying the underground mines into the three following groups much light can be thrown on the advantage of machine loading over hand loading. The groups are: (1) Underground mines with 90 percent or more of output mechanically loaded; (2) underground mines using loading devices but with less than 90 percent of output mechanically loaded; and (3) underground mines without loading devices—100 percent hand loaded. In compiling the figures, no mine was split, but all of the tonnage and men (surface and underground) were placed in 1 of the above 3 groups. The special compilation, as described above, is shown for 1943–53 in table 34, and the details are shown by States in table 35. In 1943 the mines with 90 percent or more of their output mechanically loaded averaged 6.62 tons per man per day while the mines without loading devices (100 percent hand loaded) averaged only 3.97 tons per man per day. By 1953 the relation had changed to 7.97 tons for machine loading against 5.24 tons for hand loading. During the same period (1943–53), the percentage of total underground production from machine-loading mines increased sharply, while the percentage from hand-loading mines declined. As shown in figure 11, in 1943 the mines with 90 percent or more of their output mechanically loaded supplied 36 percent of the total underground production, and by 1953 these mines furnished 74 percent of the total. During the same period (1943–53), the hand-loading mines dropped from 32 percent of total underground output to only 15 percent.

Trends in Loading Equipment.—Mechanical-loading equipment used in underground bituminous-coal and lignite mines is divided into three general types: Devices that mine and load the coal, known as continuous mining machines; devices that virtually eliminate hand shoveling, known as mobile loaders, scrapers, and duckbills or other self-loading conveyors; and devices that greatly reduce the labor in hand shoveling, known as hand-loaded conveyors and pit-car loaders. Scrapers and pit-car loaders reached their maximum number in use in 1930 and 1931, respectively, while mechanical loading was less than 15 percent of the total underground output. The canvass of pit-car loaders was made for the last time in 1950, when only 12 were reported in use. Duckbills or other self-loading conveyors reached their maximum number in use in 1948, hand-loaded conveyors in 1950, and mobile loading machines in 1951. As the number of pit-car loaders and scrapers decreased the number of duckbills or other self-loading conveyors, hand-loaded conveyors, and mobile loading machines increased until they reached their maximum. Continuous mining machines were first used in 1948, but the number was not shown separately until 1952, when 152 were reported in use. It required 20 years for mobile loading machines to replace pit-car loaders from their maximum of 3,428 in use in 1931. Mobile loading machines in use began to drop after 1951 and probably will continue to decline for several years while being replaced by continuous mining machines.

The percentage handled by each type of loading equipment in 1953 was as follows: Mobile loading machines 84, hand-loaded conveyors 9, continuous mining machines 4, and conveyors equipped with duckbills or other self-loading heads 3 percent. (See table 36.)

Mechanical Loading by States.—West Virginia was the leading producer of mechanically loaded coal in 1953, followed by Pennsylvania, Kentucky, Illinois, and Ohio. These 5 States produced 85 percent of the total output of underground mechanically loaded coal in the United States in 1953. The tonnage mechanically loaded, by State and type of loading devices, 1952–53, is shown in table 37, and similar data on number of mines using loading devices and number of loading devices in use are given in table 38.

Sales of Loading Equipment.—Shipments of mechanical loading equipment for underground use in soft-coal mines in the United States, in terms of capacity, were 14 percent greater in 1953 than in 1952.

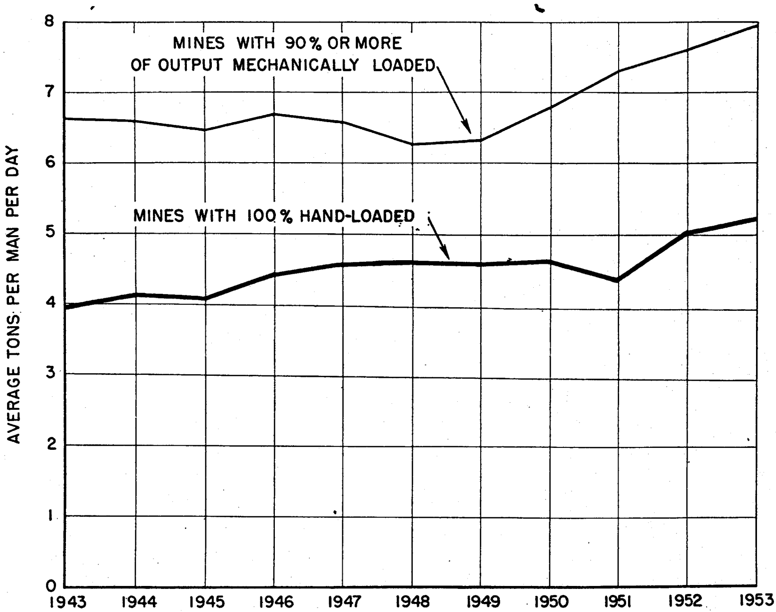

FIGURE 10.—Average tons per man per day at underground bituminous-coal and lignite mines in the United States, 1943–53, using mechanical loading devices and hand loading.

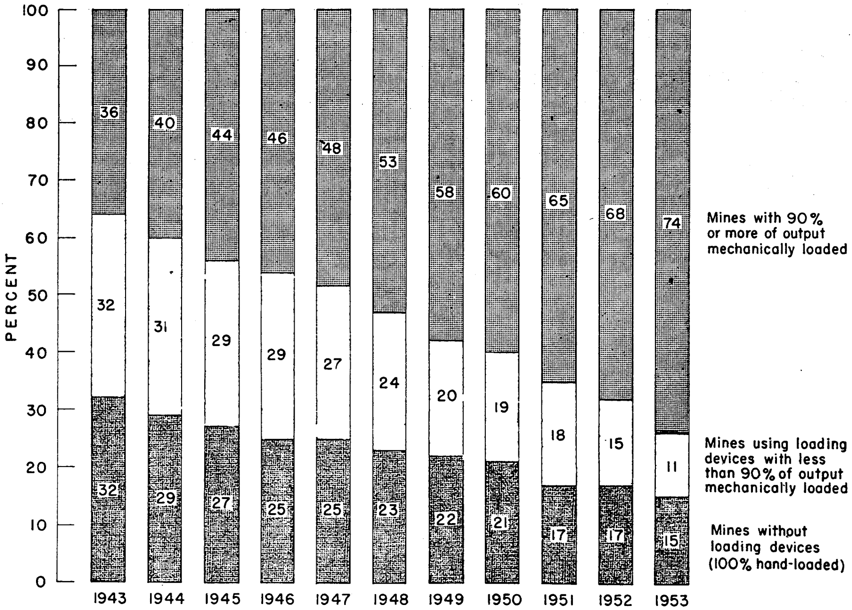

FIGURE 11.—Percentage of bituminous coal and lignite produced underground in the United States, 1943–53, by method of loading.

TABLE 33.—Growth of mechanical loading at underground bituminous-coal and lignite mines in the United States, 1923–53

[Production in thousand net tons]

Year	Underground production mechanically loaded									Percentage of underground production mechanically loaded	Number of mechanical loading units					
	Loaded by machines				Continuous-mining machines	Handled by conveyors			Total mechanically loaded		Mobile loading machines	Scrapers	Conveyors equipped with duckbills or other self-loading heads	Continuous-mining machines	Pit-car loaders	Hand-loaded conveyors
	Mobile loading machines	Scrapers	Conveyors equipped with duckbills or other self-loading heads	Total		Pit-car loaders	Hand-loaded conveyors	Total								
1923	[1]	[1]	[1]	[1]	....	[1]	[1]	[1]	[2] 1,880	[2] 0.3	[1]	[1]	[1]	....	[1]	[1]
1924	[1]	[1]	[1]	[1]	....	[1]	[1]	[1]	[2] 3,496	[2] .7	[1]	[1]	[1]	....	[1]	[1]
1925	[1]	[1]	[1]	[1]	....	[1]	[1]	[1]	[2] 6,243	[2] 1.2	[1]	[1]	[1]	....	[1]	[1]
1926	7,786	1,554	682	10,022	....	523	[1]	[1]	[2] 10,545	[2] 1.9	295	133	27	....	[1]	[1]
1927	[1]	[1]	[1]	[1]	....	[1]	[1]	[1]	16,500	3.3	[1]	[1]	[1]	....	[1]	[1]
1928	11,811	1,548	1,200	14,559	....	4,117	2,883	7,000	21,559	4.5	397	130	82	....	1,040	[1]
1929	16,432	1,550	1,309	19,291	....	14,979	3,592	18,571	37,862	7.4	488	126	99	....	2,521	[1]
1930	20,073	1,637	1,628	23,338	....	19,116	4,528	23,644	46,982	10.5	545	150	140	....	2,876	[1]
1931	19,407	1,471	1,811	22,689	....	19,172	5,701	24,873	47,562	13.1	583	146	165	....	3,428	[1]
1932	14,825	1,132	1,630	17,587	....	12,590	5,640	18,230	35,817	12.3	548	128	159	....	3,112	[1]
1933	17,865	991	1,656	20,512	....	11,413	5,896	17,309	37,821	12.0	523	93	132	....	2,453	525
1934	20,750	1,004	2,082	23,836	....	11,089	6,508	17,597	41,433	12.2	534	119	157	....	2,288	574
1935	24,675	1,118	2,595	28,388	....	11,098	7,691	18,789	47,177	13.5	657	78	179	....	2,098	670
1936	40,970	1,273	3,240	45,483	....	10,538	10,956	21,494	66,977	16.3	980	106	234	....	1,851	936
1937	[1]	[1]	[1]	[1]	....	[1]	[1]	[1]	83,500	20.2	[1]	[1]	[1]	....	[1]	[1]
1938	57,824	1,031	4,248	63,103	....	5,653	16,337	21,990	85,093	26.7	1,405	117	346	....	1,392	1,526
1939	76,442	1,007	6,759	84,208	....	5,038	21,466	26,504	110,712	31.0	1,573	131	559	....	873	1,834
1940	100,962	1,255	10,362	112,579	....	3,979	31,312	35,291	147,870	35.4	1,720	116	656	....	697	2,263
1941	126,478	1,290	14,918	142,686	....	3,447	40,534	43,981	186,667	40.7	1,985	109	788	....	607	2,807
1942	160,301	1,405	20,683	182,389	....	3,252	47,262	50,514	232,903	45.2	2,301	93	1,062	....	481	3,041
1943	179,008	1,349	22,917	203,274	....	2,669	43,862	46,531	249,805	48.9	2,525	83	1,226	....	321	3,191
1944	202,875	1,341	23,164	227,380	....	1,835	44,974	46,809	274,189	52.9	2,737	87	1,331	....	241	3,236
1945	198,668	1,252	21,506	221,426	....	986	40,100	41,086	262,512	56.1	2,950	87	1,383	....	142	3,385
1946	186,975	917	19,678	207,570	....	623	37,148	37,771	245,341	58.3	3,200	75	1,521	....	93	3,470
1947	229,836	854	21,921	252,611	....	353	45,193	45,546	298,157	60.7	3,569	67	1,531	....	71	3,979
1948	[3] 232,667	743	19,634	253,044	[4]	184	42,578	42,762	295,806	64.3	[3] 3,980	56	1,632	[4]	37	4,125
1949	[3] 177,239	339	13,994	191,572	[4]	54	30,750	30,804	222,376	67.0	[3] 4,205	46	1,483	[4]	17	4,312
1950	[3] 222,976	318	13,985	237,279	[4]	39	35,407	35,446	272,725	69.4	[3] 4,318	39	1,329	[4]	12	4,434
1951	[5] 252,663	126	13,884	266,673	[4]	[6]	37,583	37,583	304,256	73.1	[5] 4,410	22	1,242	[4]	[6]	3,904
1952	218,982	77	10,590	229,649	8,215	[6]	31,130	31,130	268,994	75.5	4,083	19	1,049	152	[6]	3,569
1953	232,585	239	8,531	241,355	11,830	[6]	25,144	25,144	278,329	79.6	3,985	29	849	219	[6]	2,994

[1] Data not available.
[2] Exclusive of tonnage "Handled by conveyors."
[3] Includes continuous mining machines.
[4] Included with mobile loading machines.
[5] Includes continuous mining machines and augers.
[6] Canvass of pit-car loaders discontinued in 1951.

TABLE 34.—Production and average tons per man per day at underground bituminous-coal and lignite mines in the United States, 1943–53, by method of loading

Year	Mines using mechanical loading devices						Mines without loading devices (100 percent hand-loaded)		Total underground mines	
	With 90 percent or more of output mechanically loaded		With less than 90 percent of output mechanically loaded		Total					
	Production (thousand net tons)	Average tons per man per day	Production (thousand net tons)	Average tons per man per day	Production (thousand net tons)	Average tons per man per day	Production (thousand net tons)	Average tons per man per day	Production (thousand net tons)	Average tons per man per day
1943	183,552	6.62	163,241	4.61	346,793	5.49	163,699	3.97	510,492	4.89
1944	208,345	6.60	157,551	4.56	365,896	5.53	152,782	4.15	518,678	5.04
1945	206,242	6.49	135,518	4.48	341,760	5.51	125,870	4.10	467,630	5.04
1946	193,271	6.72	120,696	4.92	313,967	5.89	106,991	4.42	420,958	5.43
1947	237,465	6.59	133,955	4.89	371,420	5.86	119,809	4.58	491,229	5.49
1948	242,545	6.26	113,006	4.50	355,551	5.57	104,461	4.60	460,012	5.31
1949	190,439	6.33	67,161	4.49	257,600	5.85	74,223	4.59	331,823	5.42
1950	235,887	6.79	74,708	4.74	310,595	6.15	82,249	4.61	392,844	5.75
1951	270,592	7.35	73,998	4.84	344,590	6.61	71,457	4.39	416,047	6.08
1952	244,044	7.62	52,937	4.90	296,981	6.77	60,950	5.01	357,931	6.39
1953	257,793	7.97	39,367	5.23	297,160	7.45	52,391	5.24	349,551	7.01

TABLE 35.—Production and average tons per man per day at underground bituminous-coal and lignite mines in the United States and Alaska in 1953, by method of loading and by State

State	Mines using mechanical loading devices						Mines without loading devices (100 percent hand-loaded)		Total underground mines	
	With 90 percent or more of output mechanically loaded		With less than 90 percent of output mechanically loaded		Total					
	Production (net tons)	Average tons per man per day	Production (net tons)	Average tons per man per day	Production (net tons)	Average tons per man per day	Production (net tons)	Average tons per man per day	Production (net tons)	Average tons per man per day
Alabama	9, 233, 566	6. 03	424, 199	5. 73	9, 657, 765	6. 02	1, 259, 164	3. 81	10, 916, 929	5. 64
Alaska			368, 245	6. 21	368, 245	6. 21	58, 596	4. 96	426, 841	6. 00
Arizona							5, 140	2. 72	5, 140	2. 72
Arkansas	343, 238	3. 53			343, 238	3. 53	52, 407	4. 41	395, 645	3. 63
Colorado	2, 114, 025	7. 31	624, 819	4. 09	2, 738, 844	6. 20	467, 740	4. 47	3, 206, 584	5. 87
Georgia							14, 100	3. 49	14, 100	3. 49
Illinois	28, 528, 803	11. 54	86, 243	4. 50	28, 615, 046	11. 49	714, 158	4. 36	29, 329, 204	11. 05
Indiana	6, 000, 043	10. 14			6, 000, 043	10. 14	181, 977	4. 85	6, 182, 020	9. 82
Iowa	6, 000	4. 08	88, 174	5. 17	94, 174	5. 08	319, 649	3. 84	413, 823	4. 07
Kansas							29, 705	2. 80	29, 705	2. 80
Kentucky	31, 919, 972	8. 85	7, 581, 790	5. 05	39, 501, 762	7. 74	15, 167, 114	5. 93	54, 668, 876	7. 13
Maryland	83, 455	5. 63			83, 455	5. 63	218, 462	3. 45	301, 917	3. 86
Missouri							151, 096	2. 80	151, 096	2. 80
Montana:										
Bituminous	418, 917	6. 73			418, 917	6. 73	8, 278	3. 20	427, 195	6. 59
Lignite	6, 973	8. 40			6, 973	8. 40	15, 175	7. 38	22, 148	7. 67
Total Montana	425, 890	6. 75			425, 890	6. 75	23, 453	5. 05	449, 343	6. 64
New Mexico	411, 450	6. 19	6, 146	3. 19	417, 596	6. 10	79, 460	3. 11	497, 056	5. 29
North Dakota (lignite)	152, 365	8. 58			152, 365	8. 58	9, 073	4. 33	161, 438	8. 13
Ohio	11, 331, 138	8. 86	6, 517	6. 09	11, 337, 655	8. 86	1, 647, 278	4. 65	12, 984, 933	7. 95
Oklahoma	802, 815	4. 53			802, 815	4. 53	71, 351	3. 50	874, 166	4. 43
Pennsylvania	50, 634, 073	6. 54	11, 886, 479	4. 73	62, 520, 552	6. 10	10, 534, 558	4. 85	73, 055, 110	5. 88
Tennessee	1, 666, 822	7. 60	374, 630	7. 45	2, 041, 452	7. 57	2, 681, 051	4. 07	4, 722, 503	5. 08
Utah	6, 453, 873	7. 50	16, 165	7. 40	6, 470, 038	7. 50	74, 107	5. 81	6, 544, 145	7. 48
Virginia	7, 995, 329	7. 85	3, 185, 315	6. 02	11, 180, 644	7. 23	6, 362, 876	5. 94	17, 543, 520	6. 70
Washington	507, 553	4. 28	2, 693	2. 99	510, 246	4. 27	90, 012	4. 14	600, 258	4. 25
West Virginia	95, 664, 254	8. 15	14, 712, 137	5. 63	110, 376, 391	7. 69	12, 160, 386	5. 50	122, 536, 777	7. 40
Wyoming	3, 518, 272	7. 94	3, 902	7. 03	3, 522, 174	7. 94	17, 669	3. 86	3, 539, 843	7. 90
Total	257, 792, 936	7. 97	39, 367, 454	5. 23	297, 160, 390	7. 45	52, 390, 582	5. 24	349, 550, 972	7. 01

TABLE 36.—Bituminous coal and lignite mechanically loaded underground in the United States, 1952–53, by type of loading equipment

Type of equipment	1952 Net tons	1952 Percentage of total	1953 Net tons	1953 Percentage of total
Mobile loading machines:				
Loading direct into mine cars	75,605,379	28.1	65,910,130	23.7
Loading onto conveyors	11,078,827	4.1	10,532,695	3.8
Loading into shuttle cars	132,297,476	49.2	156,142,324	56.1
Continuous mining machines	8,214,757	3.1	11,830,097	4.3
Scrapers	76,969	(1)	238,839	.1
Conveyors equipped with duckbills or other self-loading heads	10,590,076	3.9	8,530,949	3.0
Hand-loaded conveyors	31,130,505	11.6	25,143,948	9.0
Total mechanically loaded	268,993,989	100.0	278,328,982	100.0

[1] Less than 0.05 percent.

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TABLE 37.—Comparative changes in underground mechanical loading of bituminous coal and lignite by principal type of loading device in the United States and Alaska, 1952–53, by States

State	Net tons by— Loading machines [1] 1952	Loading machines [1] 1953	Continuous mining machines 1952	Continuous mining machines 1953	Hand-loaded conveyors 1952	Hand-loaded conveyors 1953	Total mechanically loaded (net tons) 1952	Total mechanically loaded (net tons) 1953	Total production at mines using mechanical loading devices (net tons) 1952	Total production at mines using mechanical loading devices (net tons) 1953	Handled by each class (percent) Loading machines [1] 1952	Loading machines [1] 1953	Continuous mining machines 1952	Continuous mining machines 1953	Hand-loaded conveyors 1952	Hand-loaded conveyors 1953
Alabama	6,376,139	7,605,058	604,382	679,625	1,450,807	1,169,280	8,431,328	9,453,963	8,534,865	9,657,765	75.6	80.4	7.2	7.2	17.2	12.4
Alaska	12,416	52,000	-----	-----	-----	15,000	12,416	67,000	346,372	368,245	100.0	77.6	-----	-----	-----	22.4
Arkansas	-----	-----	-----	-----	476,156	343,238	476,156	343,238	476,156	343,238	-----	-----	-----	-----	100.0	100.0
Colorado	1,080,595	2,072,488	91,053	110,391	188,639	117,955	2,260,287	2,300,834	2,726,489	2,738,844	87.6	90.1	4.0	4.8	8.4	5.1
Illinois	26,198,403	26,951,154	1,398,384	1,555,888	17,856	17,886	27,614,643	28,524,928	27,973,387	28,615,046	94.9	94.5	5.0	5.4	.1	.1
Indiana	6,353,002	5,999,143	-----	-----	6,053	-----	6,359,055	5,999,143	6,375,055	6,000,043	99.9	100.0	-----	-----	.1	-----
Iowa	30,698	8,250	-----	-----	-----	-----	30,698	8,250	41,753	94,174	100.0	100.0	-----	-----	-----	-----
Kentucky	29,427,764	31,823,182	289,224	494,054	4,214,100	4,165,805	33,931,088	36,483,041	38,125,447	39,501,762	86.7	87.2	.9	1.4	12.4	11.4
Maryland	57,484	49,928	-----	-----	36,050	33,527	93,534	83,455	93,534	83,455	61.5	59.8	-----	-----	38.5	40.2
Montana:																
Bituminous	616,933	418,917	-----	-----	-----	-----	616,933	418,917	616,933	418,917	100.0	100.0	-----	-----	-----	-----
Lignite	7,175	6,973	-----	-----	-----	-----	7,175	6,973	7,175	6,973	100.0	100.0	-----	-----	-----	-----
Total Montana	624,108	425,890	-----	-----	-----	-----	624,108	425,890	624,108	425,890	100.0	100.0	-----	-----	-----	-----
New Mexico	634,496	411,450	-----	-----	2,500	2,200	636,996	413,650	640,227	417,596	99.6	99.5	-----	-----	.4	.5
North Dakota (lignite)	168,281	152,365	-----	-----	-----	-----	168,281	152,365	168,281	152,365	100.0	100.0	-----	-----	-----	-----
Ohio	10,863,123	9,881,773	875,685	1,263,956	170,437	186,667	11,909,245	11,332,396	11,957,265	11,337,655	91.2	87.2	7.4	11.2	1.4	1.6
Oklahoma	93,154	72,202	-----	-----	703,331	730,613	796,485	802,815	796,485	802,815	11.7	9.0	-----	-----	88.3	91.0
Pennsylvania	40,947,594	47,572,923	3,293,638	5,601,520	5,484,732	4,390,283	49,725,964	57,564,726	55,756,709	62,520,552	82.4	82.7	6.6	9.7	11.0	7.6
Tennessee	1,211,469	1,509,785	-----	-----	480,881	370,111	1,692,350	1,879,896	2,264,474	2,041,452	71.6	80.3	-----	-----	28.4	19.7
Utah	5,930,218	6,292,666	96,727	134,946	60,963	32,770	6,087,908	6,460,382	6,094,013	6,470,038	97.4	97.4	1.6	2.1	1.0	.5
Virginia	8,075,758	8,443,539	-----	55,588	1,002,198	835,513	9,077,956	9,334,640	12,855,142	11,180,644	89.0	90.5	-----	.6	11.0	8.9
Washington	103,686	88,868	148,217	228,814	361,574	191,871	613,477	509,553	620,825	510,246	16.9	17.4	24.2	44.9	58.9	37.7
West Virginia	86,698,023	88,639,201	1,276,885	1,579,495	16,381,211	12,448,447	104,356,119	102,667,143	116,414,105	110,376,391	83.1	86.3	1.2	1.6	15.7	12.1
Wyoming	3,862,316	3,303,072	140,562	125,820	93,017	92,782	4,095,895	3,521,674	4,095,895	3,522,174	94.3	93.8	3.4	3.6	2.3	2.6
Total	229,648,727	241,354,937	8,214,757	11,830,097	31,130,505	25,143,948	268,993,989	278,328,982	296,980,587	297,160,390	85.3	86.7	3.1	4.3	11.6	9.0

[1] Includes mobile loading machines, scrapers, and conveyors equipped with duckbills or other self-loading heads.

TABLE 38.—Number of underground bituminous-coal and lignite mines using mechanical loading devices and number of units in use in the United States and Alaska, 1952–53, by States

State	Number of mines										Number of loading devices									
											Loading machines									
	Using loading machines only [1]		Using continuous mining machines only		Using hand-loaded conveyors only		Using more than one type of mechanical loading		Total		Mobile loading machines		Scrapers		Duckbills or other self-loading conveyors		Continuous mining machines		Hand-loaded conveyors (number of units)	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
Alabama	19	19	------	1	12	11	6	4	37	35	130	123	1	------	9	8	6	8	192	129
Alaska	2	1	------	------	------	------	------	1	2	2	1	3	------	10	2	------	------	------	------	3
Arkansas	------	------	------	------	15	13	------	------	15	13	------	------	------	------	------	------	------	------	68	64
Colorado	40	34	1	2	18	18	5	6	64	60	34	36	1	------	176	159	4	5	63	52
Illinois	79	70	1	1	2	2	3	3	85	76	367	309	------	------	12	8	18	20	10	5
Indiana	24	22	------	------	1	------	------	------	25	22	121	107	------	------	------	------	------	------	2	------
Iowa	3	3	------	------	------	------	------	------	3	3	1	2	------	------	3	1	------	------	------	------
Kentucky	125	109	1	1	36	33	26	25	188	168	483	471	------	------	100	77	10	13	437	449
Maryland	1	1	------	------	3	3	------	------	4	4	------	------	------	------	2	2	------	------	12	10
Montana:																				
Bituminous	8	10	------	------	------	------	------	------	8	10	24	29	------	------	11	6	------	------	------	------
Lignite	1	1	------	------	------	------	------	------	1	1	2	2	------	------	------	------	------	------	------	------
Total Montana	9	11	------	------	------	------	------	------	9	11	26	31	------	------	11	6	------	------	------	------
New Mexico	3	3	------	------	1	1	------	------	4	4	16	16	1	4	1	1	------	------	1	1
North Dakota (lignite)	2	2	------	------	------	------	------	------	2	2	4	4	------	------	------	------	------	------	------	------
Ohio	37	34	1	5	12	13	7	7	57	59	194	164	------	------	38	24	11	17	38	34
Oklahoma	------	------	------	------	6	6	1	1	7	7	5	5	------	------	------	------	------	------	145	127
Pennsylvania	103	103	3	3	94	94	54	47	254	247	938	927	8	9	86	85	71	112	729	581
Tennessee	8	8	------	------	6	4	5	3	19	15	28	28	------	------	17	13	------	------	59	41
Utah	32	38	------	------	6	5	3	1	41	44	124	123	------	------	57	35	2	2	19	10
Virginia	30	26	------	------	10	8	9	9	49	43	148	144	------	------	34	24	------	2	121	95
Washington	5	3	------	------	1	------	5	5	11	8	------	------	8	6	9	9	5	6	87	86
West Virginia	241	227	------	------	104	78	93	82	438	387	1,428	1,456	------	------	306	218	23	32	1,558	1,278
Wyoming	11	9	------	------	2	2	2	5	15	16	35	36	------	------	186	179	2	2	28	29
Total	774	723	7	13	329	291	219	199	1,329	1,226	4,083	3,985	19	29	1,049	849	152	219	3,569	2,994

[1] Includes mobile loading machines, scrapers, and conveyors equipped with duckbills or other self-loading heads.

TABLE 39.—Underground production at bituminous-coal and lignite mines in the United States and Alaska, 1952–53, by State and method of loading

State	Hand-loaded (net tons)		Mechanically loaded (net tons)		Total underground production (net tons)		Underground output hand-loaded (percent)		Underground output mechanically loaded (percent)	
	1952	1953	1952	1953	1952	1953	1953	1953	1952	1953
Alabama	1,298,064	1,462,966	8,431,328	9,453,963	9,729,392	10,916,929	13.3	13.4	86.7	86.6
Alaska	362,610	359,841	12,416	67,000	375,026	426,841	96.7	84.3	3.3	15.7
Arizona	5,003	5,140			5,003	5,140	100.0	100.0		
Arkansas	81,900	52,407	476,156	343,238	558,056	395,645	14.7	13.2	85.3	86.8
Colorado	977,064	905,750	2,260,287	2,300,834	3,237,351	3,206,584	30.2	28.2	69.8	71.8
Georgia	32,100	14,100			32,100	14,100	100.0	100.0		
Illinois	1,470,322	804,276	27,614,643	28,524,928	29,084,965	29,329,204	5.1	2.7	94.9	97.3
Indiana	218,377	182,877	6,359,055	5,999,143	6,577,432	6,182,020	3.3	3.0	96.7	97.0
Iowa	414,802	405,573	30,698	8,250	445,500	413,823	93.1	98.0	6.9	2.0
Kansas	47,400	29,705			47,400	29,705	100.0	100.0		
Kentucky	21,315,028	18,185,835	33,931,088	36,483,041	55,246,116	54,668,876	38.6	33.3	61.4	66.7
Maryland	263,323	218,462	93,534	83,455	356,857	301,917	73.8	72.4	26.2	27.6
Missouri	214,097	151,096			214,097	151,096	100.0	100.0		
Montana:										
Bituminous	15,554	8,278	616,933	418,917	632,487	427,195	2.5	1.9	97.5	98.1
Lignite	16,224	15,175	7,175	6,973	23,399	22,148	69.3	68.5	30.7	31.5
Total Montana	31,778	23,453	624,108	425,890	655,886	449,343	4.8	5.2	95.2	94.8
New Mexico	113,800	83,406	636,996	413,650	750,796	497,056	15.2	16.8	84.8	83.2
North Carolina	1,600				1,600		100.0			
North Dakota (lignite)	15,062	9,073	168,281	152,365	183,343	161,438	8.2	5.6	91.8	94.4
Ohio	2,038,072	1,652,537	11,909,245	11,332,396	13,947,317	12,984,933	14.6	12.7	85.4	87.3
Oklahoma	82,775	71,351	796,485	802,815	879,260	874,166	9.4	8.2	90.6	91.8
Oregon	1,179				1,179		100.0			
Pennsylvania	19,132,474	15,490,384	49,725,964	57,564,726	68,858,438	73,055,110	27.8	21.2	72.2	78.8
Tennessee	3,027,062	2,842,607	1,692,350	1,879,896	4,719,412	4,722,503	64.1	60.2	35.9	39.8
Utah	52,397	83,763	6,087,908	6,460,382	6,140,305	6,544,145	.9	1.3	99.1	98.7
Virginia	10,150,256	8,208,880	9,077,956	9,334,640	19,228,212	17,543,520	52.8	46.8	47.2	53.2
Washington	119,962	90,705	613,477	509,553	733,439	600,258	16.4	15.1	83.6	84.9
West Virginia	25,934,588	19,869,634	104,356,119	102,667,143	130,290,707	122,536,777	19.9	16.2	80.1	83.8
Wyoming	30,275	18,169	4,095,895	3,521,674	4,126,170	3,539,843	.7	.5	99.3	99.5
Total	87,431,370	71,221,990	268,993,989	278,328,982	356,425,359	349,550,972	24.5	20.4	75.5	79.6

TABLE 40.—Units of mechanical loading equipment sold to bituminous-coal and lignite mines for underground use in the United States, as reported by manufacturers, 1946–53

Type of equipment	1946	1947	1948	1949	1950	1951	1952	1953	Change from 1952 (percent)
Mobile loading machines	490	485	[1] 723	[1] 286	[1] 289	[1] 287	[1] 206	180	[1] +19.9
Continuous mining machines	-------	-------	(1)	(1)	(1)	(1)	(1)	67	(1)
Scrapers	3	12	17	8	1	4	8	11	+37.5
Conveyors [2]	838	846	1,025	394	316	297	155	87	−43.9
Total	1,331	1,343	1,765	688	606	588	369	345	−6.5
Number of manufacturers reporting	24	23	22	22	20	21	22	25	----------

[1] Continuous mining machines included with mobile loading machines.
[2] Includes hand loaded conveyors and those equipped with duckbills or other self-loading heads.

TABLE 41.—Units of mechanical loading and mining equipment sold for use in bituminous-coal and lignite mines in the United States and Alaska, as reported by manufacturers, 1952–53, by States

State	Mobile loading machines		Continuous mining machines		Augers		Scrapers		Room conveyors [1]	
	[2] 1952	1953	[2] 1952	1953	[3] 1952	1953	1952	1953	1952	1953
Alabama	7	8	-------	2	-------	-------	-------	-------	-------	1
Alaska	-------	-------	-------	-------	-------	-------	-------	6	-------	-------
Colorado	-------	1	-------	-------	-------	-------	6	-------	8	-------
Illinois	13	4	-------	-------	-------	-------	-------	-------	5	-------
Indiana	1	7	-------	3	-------	-------	-------	-------	1	-------
Kentucky	19	18	-------	2	-------	5	-------	-------	23	17
Maryland	-------	-------	-------	-------	-------	1	-------	-------	-------	-------
New Mexico	-------	-------	-------	-------	-------	-------	-------	-------	7	-------
North Dakota	1	-------	-------	-------	-------	-------	-------	-------	-------	-------
Ohio	5	-------	-------	3	-------	11	-------	-------	-------	6
Oklahoma	1	-------	-------	-------	-------	-------	1	-------	-------	-------
Pennsylvania	58	40	-------	40	-------	8	-------	4	18	7
Tennessee	1	2	-------	-------	-------	2	-------	-------	2	-------
Utah	6	8	-------	2	-------	-------	1	1	-------	-------
Virginia	7	22	-------	2	-------	2	-------	-------	-------	5
Washington	3	-------	-------	1	-------	-------	-------	-------	1	-------
West Virginia	82	65	-------	12	-------	28	-------	-------	90	51
Wyoming	2	5	-------	-------	-------	-------	-------	-------	-------	-------
Total	206	180	(2)	67	(3)	57	8	11	155	87

[1] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads.
[2] Sales of continuous mining machines are included with mobile loading machines in 1952.
[3] Data not available.

TABLE 42.—Units of conveying equipment sold for use in bituminous-coal and lignite mines in the United States, as reported by manufacturers, 1952–53, by States

State	Face conveyors [1]		Shuttle cars		"Mother" conveyors [2]	
	1952	1953	1952	1953	1952	1953
Alabama	-------	-------	35	27	-------	3
Colorado	3	-------	5	2	-------	1
Illinois	-------	-------	14	17	14	12
Indiana	-------	-------	-------	6	-------	-------
Kentucky	13	8	42	49	17	5
New Mexico	-------	-------	-------	-------	2	-------
Ohio	-------	-------	4	7	1	-------
Oklahoma	4	-------	2	-------	-------	3
Pennsylvania	10	1	127	140	6	14
Tennessee	-------	-------	2	2	-------	-------
Utah	-------	-------	7	10	1	1
Virginia	2	1	24	45	-------	1
West Virginia	44	39	166	118	26	18
Wyoming	-------	-------	-------	14	-------	-------
Total	76	49	428	437	67	58

[1] Includes "Bridge" conveyors and all other conveyors 10 to 100 feet long.
[2] Includes all haulage conveyors with capacity over 500 feet, except main-slope conveyors.

MECHANICAL CLEANING

Mechanical cleaning of bituminous coal in the United States was begun about 1875 at plants in western Pennsylvania and Illinois. The annual tonnage washed did not reach 10 million until 1907. Pneumatic cleaning was begun in 1919, but no statistics before 1927 are available. Data collected before 1927 include only the coal that was washed at the mines and do not include that cleaned by pneumatic methods at the mines and that cleaned at central washeries operated by consumers.[6] In 1927, the first year for which complete figures are available for all types of mechanical cleaning, 28 million net tons of bituminous coal were cleaned in the United States.

Since mechanical preparation includes screening as well as cleaning, the term "mechanical cleaning" refers only to cleaning with mechanical devices that effect separation of impurities from the raw coal by reason of differences in specific gravity. These mechanical devices are divided into two general classes, wet and pneumatic. The wet methods include jigs, concentrating tables, classifiers, launder washers, dense-medium processes, flotation, and miscellaneous processes. Pneumatic methods include pneumatic tables, pneumatic launders, pneumatic jigs, and the air-sand process. Although the air-sand process employs a dense medium of air and sand, it is not a wet process, and therefore the tonnage has been included with pneumatic methods. Where the words "clean," "cleaned," or "cleaning" are used without qualification, the implied meaning refers to results obtained by mechanical cleaning devices. Unless otherwise specified, tonnages given represent merchantable or usable coal after removal of impurities rather than the raw coal before treatment.

Growth of Mechanical Cleaning.—The quantity of bituminous coal mechanically cleaned in the United States increased from 28 million tons (5 percent of the total product) in 1927 to 242 million tons (53 percent of the total production) in 1953. (See table 43.)

[6] Plein, L. N., Statistical Analysis of the Progress in Mechanical Cleaning of Bituminous Coal from 1927 to 1934; Bureau of Mines Econ. Paper 18, 1936, p. 3.

Refuse handled at cleaning plants increased from 3 million tons in 1929 to 54 million in 1953. The ratio of refuse to raw coal increased from 9 percent in 1929 to 18 percent in 1953. Increased mechanical loading during this period was the major reason for additional refuse. Other important factors that tended to increase the percentage of refuse necessary to remove from the raw coal were: (1) Decreased demand for large lumps, (2) increased demand for stoker sizes, (3) increased practice of "full-seam mining," (4) depletion of some of the better coals, and (5) general demand for cleaner coal.

The number of mechanical cleaning plants increased from 236 in 1928 to 611 in 1953, and the average annual output per plant increased from 122,000 to 396,000 tons of cleaned coal per year during the same period.

Bituminous coal produced at mines with cleaning plants increased from 66 million tons (12 percent of the total production) in 1929 to 287 million tons (63 percent of the total production) in 1953.

Consumer-operated plants include plants owned by steel companies that receive coal from various mines (but usually from affiliated companies), clean it, and then consume it directly at the plant.

The ratio of tons cleaned at mines to total production at mines with cleaning plants increased from 49 percent in 1929 to 82 in 1953.

Figure 12 shows the relation of the output of bituminous coal mechanically cleaned to total production, by methods of mining and loading. The three lines "mechanically cleaned," "mechanically loaded," and "strip mined" follow approximately the same pattern. The gap between "mechanically loaded" and "mechanically cleaned" increased during the war years 1940–45, because of limited construction of new cleaning plants.

Types of Cleaning Equipment.—Table 44 shows the quantity of bituminous coal cleaned, by type of equipment, and percentage cleaned by each type, 1927–53. Many cleaning plants use more than one type of equipment. In 1953, 83 plants were using both wet and pneumatic methods, but separate data were reported for each. Separate tonnage figures by type of cleaning were not reported for 52 cleaning plants in 1953 that used a combination of wet methods and cleaned 42 million tons.

The oldest and most common type of coal-cleaning equipment is the jig. The first bituminous-coal washery in the United States was a piston jig built in 1869 near Pittsburgh, Pa., to clean slack.[7] There are three general types of jigs—basket, piston, and Baum. The basket jig was the first to be developed; it consists of a sieve that moves up and down in a tank of water. The piston jig was the next stage in the development of coal cleaning. It consists of a fixed sieve, and water is forced through the coal by use of a piston. The Baum-type jig is the most recent development and the most popular jig in use today. It is a fixed-screen jig with a sealed chamber in which pulsations are given to the water by compressed air. The first Baum-type jigs installed in the United States were built in 1928 in Indiana and Pennsylvania.

Wet-process coal-washing tables as we know them today have been in use in the United States approximately 40 years. A few table installations worthy of note before adoption of our present-day differential-motion tables are as follows: Six bumping tables were

[7] Coal Age, vol. 45, February 1940, p. 74.

operated in Western Kentucky in 1893; as late as 1923, 72 such tables were in operation in Pennsylvania.[8] Bumping tables were the forerunners of our present-day concentrating tables. Coal-washing tables are mainly advantageous in treating sizes from ¼-inch down to 48- or 65-mesh; however, a recent installation provided for the washing of 3-inch to 0 sizes.

The general theory of coal cleaning with classifiers or upward-current washers (also jigs) is that a particle sinks in an upward current of water if the speed of the current is less than the terminal velocity of fall of the particle in still water and rises if the speed of the current exceeds the terminal velocity of fall.[9] A Robinson washer installed in Alabama in 1892 was the first classifier used in the United States, and the Menzies hydroseparator was first used in bituminous-coal fields in 1926. The first Menzies cone separator installed to clean bituminous coal went into operation in 1936 to clean 2½- to ½-inch coal in West Virginia.[10] Most classifier-type equipment is restricted to cleaning coal from which the fine slack has been removed.

Although the most primitive methods used for concentrating ores were launders or trough washers, they were little used for cleaning coal until the Rheolaveur was developed. The first Rheolaveur used in the United States for cleaning bituminous coal was installed in Colorado in 1925, the trough washer was first used in conjunction with Baum jigs at mines in West Virginia in 1936, and the first *Koppers-Battelle* launder was installed in West Virginia in 1937.[11]

The dense-medium process of coal cleaning uses the familiar float-and-sink procedure on a commercial scale. Just as pieces of wood float on water and sand sinks, so coal floats and refuse sinks when placed in a medium intermediate in specific gravity between the coal and refuse. Liquids most widely used for cleaning coal are solutions of calcium chloride in water and a suspended sand or magnetite pseudoliquid. The Chance process, using a mixture of sand and water, was first installed for cleaning bituminous coal in Pennsylvania in 1925. The first Belknap-chloride washer was installed in West Virginia in 1935. The first installations employing dense-medium jigging and a magnetite dense-medium liquid for cleaning coal were made in 1942 and 1945, respectively. Generally, the minus-⅛-inch slack is removed before the coal is cleaned by dense-medium processes.

The air-sand process of coal cleaning was first installed in Pennsylvania in 1930. It employs a dense medium formed by bubbling air through a mass of dry sand. The air fluidizes the sand, the coal floats on the aerated sand mass, and the refuse sinks. Although the air sand is generally grouped with dense-medium processes, it is included with pneumatic processes in the following tables.

Froth flotation of coal in the United States began about 1918 with experiments at the Mellon Institute. Although it is applicable to the cleaning of fine sizes (minus-48-mesh), it may be employed on sizes as coarse as ⅛-inch.

Bituminous-coal cleaning by pneumatic methods includes air tables, air flow or air jigs, and air sand. The first commercial pneu-

[8] Gandrud, B. W., Coal Preparation: AIME, 1950, p. 435.
[9] Chapman, W. R. and Mott, R. A., The Cleaning of Coal: Chapman & Hall, Ltd., London, 1928, p. 181.
[10] Griffen, John, Coal Preparation: AIME, 1950, p. 275.
[11] Coal Age, vol. 45, February 1940, p. 75.

matic table used for coal cleaning was installed in 1919 and later became known as the American oscillating table. The Peale-Davis air table was introduced in 1923, the Stump air-flow in 1932 and the McNally-Brusset Vacuum air jig in 1950. American oscillating tables and Stump air-flow jigs are the predominant pneumatic coal cleaners in the United States today. Pneumatic methods are generally used for cleaning small sizes of bituminous coal and often are employed in conjunction with some type of wet cleaning.

Methods of Mining at Mines Served by Cleaning Plants.—Rapid progress has been made in mechanical loading of bituminous coal since 1927. The ratio of output of bituminous coal mechanically loaded at both strip and underground mines to the total production increased from 7 percent in 1927 to 84 percent in 1953. During the same period the ratio of output of mechanically cleaned coal to total production increased from 5 to 53 percent.

Table 45 gives the record of total bituminous-coal production and production from mines with cleaning plants, by mining methods, from 1933–53. With the rapid growth of strip mining and underground mechanical loading, the necessity for mechanical cleaning became more urgent. Mechanical cleaning paced strip mining from 1933 through 1938 and underground mechanical loading through 1939. The rapid growth of strip mining, especially the numerous hillside operations, and restrictions on new cleaning plants during World War II reversed the trend. The ratio of production from strip mines with cleaning plants to total strip production decreased from 50 percent in 1938 to 29 percent in 1946. Cleaning at underground mines with mechanical loading remained fairly constant throughout the war years (1941–45); about 50 percent of the output mechanically loaded was produced at mines with cleaning plants. In 1953 the ratio of production from mines with cleaning plants to the total output at strip mines and underground mines with mechanical loading was about 46 and 77 percent, respectively. There has been little change at underground mines with hand loading in the percentage of output from mines with cleaning plants to the total production, although the output hand loaded decreased from 278 million tons in 1933 to 71 million in 1953.

Figure 13 shows the percentage of bituminous coal produced at mines with cleaning plants, by methods of mining and loading. Production at strip mines with mechanical cleaning increased from 6 percent of the total in 1933 to 17 percent in 1953, and production at underground mines with mechanical loading and served by cleaning plants increased from 14 to 75 percent of the total during the same period. Production at underground mines with hand loading and served by cleaning plants decreased from 80 percent of the production at mines with cleaning plants in 1933 to 8 percent in 1953.

Bituminous-Coal Cleaning by States.—Table 46 gives the production mechanically cleaned by States and table 47 the percentage of State output cleaned mechanically by years, 1927–53. Certain States are grouped to prevent revealing data on individual operations. Alabama was the only State that cleaned more than half the total production in the State in 1927, while in 1953 eight States—Alabama, Illinois, Indiana, Kansas, Missouri, Pennsylvania, Washington, and West Virginia—mechanically cleaned over half of their total output.

Table 53 gives 1953 data on total production at mines with cleaning plants and the results of cleaning operations by States. For every

100 tons of raw coal cleaned during 1953 at the mines, 82 tons of clean merchantable coal were obtained on the average, and 18 tons were discarded.

Sales of Mechanical Cleaning Equipment.—Reports from 21 manufacturers of bituminous-coal-cleaning equipment show that the total capacity of 1953 sales was 7,000 net tons of clean coal per hour compared with 8,700 tons capacity sold in 1952. Sales in 1953, by type of equipment, in terms of capacity, show that dense-medium processes ranked first, followed by jigs and wet tables. The capacity of all types of equipment sold in 1953 for cleaning bituminous coal by wet methods was equivalent to 4 percent of the bituminous coal cleaned in 1953, while the capacity of pneumatic equipment sold in 1953 was 5 percent of the tonnage pneumatically cleaned in 1953. Approximately 60 percent of the total capacity of cleaning equipment sold in 1953 was for additions to present installations, and the remainder was new plants.

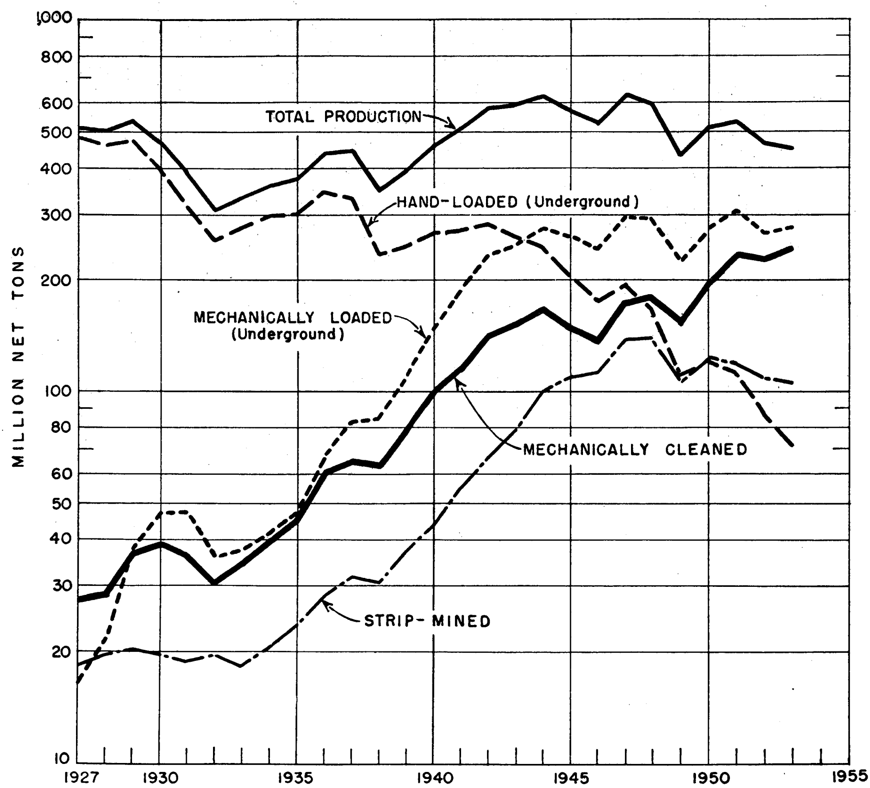

FIGURE 12.—Bituminous-coal and lignite production in the United States, 1927–53, by method of mining and loading and output mechanically cleaned.

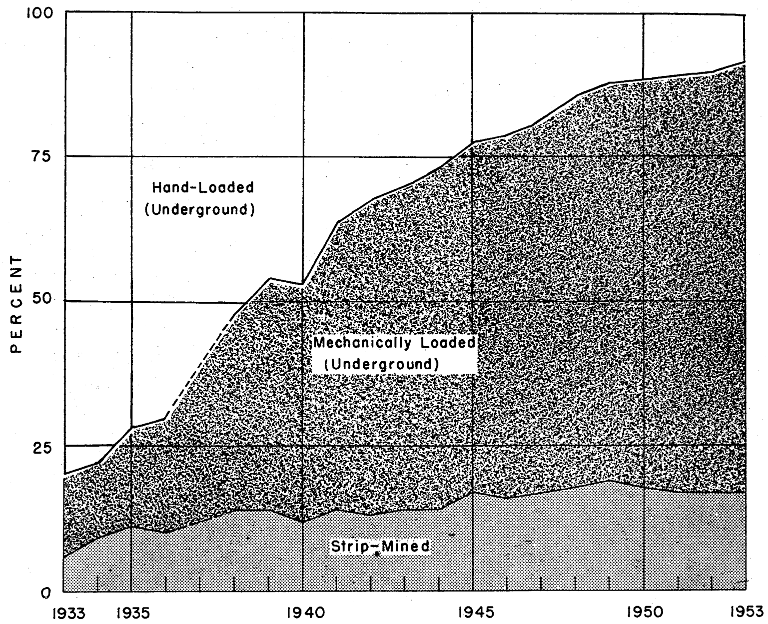

FIGURE 13.—Percentage of total output from bituminous-coal mines served by cleaning plants in the United States, 1933–53, by method of mining and loading.

TABLE 43.—Growth of mechanical cleaning at bituminous-coal mines in the United States and Alaska, 1927–53

Year	Total production (thousand tons)[1]	Production at mines with cleaning plants (thousand tons)	Number of cleaning plants[2]	Raw coal (thousand tons)[2]	Cleaned coal: At mines: Thousand tons	Cleaned coal: At mines: Percent[3]	Cleaned coal: At consumer-operated plants (thousand tons)	Cleaned coal: Total (thousand tons)	Refuse: Thousand tons	Refuse: Percentage of raw coal	Percentage of total production mechanically cleaned
1927	517,763	(4)	(4)	(4)	24,770	(4)	2,922	27,692	(4)	(4)	5.3
1928	500,745	(4)	236	(4)	24,975	(4)	3,808	28,783	(4)	(4)	5.7
1929	534,989	65,987	280	40,241	32,272	48.9	4,527	36,799	3,442	8.6	6.9
1930	467,526	66,510	297	42,645	35,690	53.7	3,110	38,800	3,845	9.0	8.3
1931	382,089	69,839	312	39,529	33,578	48.1	2,594	36,172	3,357	8.5	9.5
1932	309,710	56,872	309	32,903	27,357	48.1	2,921	30,278	2,625	8.0	9.8
1933	333,630	64,796	290	37,682	30,566	47.2	3,992	34,558	3,124	8.3	10.4
1934	359,368	76,309	293	43,556	35,854	47.0	3,973	39,827	3,729	8.6	11.1
1935	372,373	87,166	320	49,473	39,511	45.3	5,850	45,361	4,112	8.3	12.2
1936	439,088	115,402	342	67,162	53,386	46.3	7,709	61,095	6,067	9.0	13.9
1937	445,531	(4)	(4)	(4)	(4)	(4)	(4)	65,000	(4)	(4)	14.6
1938	348,545	108,238	374	71,207	57,999	53.6	5,456	63,455	7,752	10.9	18.2
1939	394,855	133,314	366	88,895	72,628	54.5	6,801	79,429	9,466	10.6	20.1
1940	460,771	161,736	387	115,692	93,520	57.8	8,750	102,270	13,422	11.6	22.2
1941	514,149	185,468	417	133,379	108,288	58.4	9,252	117,540	15,839	11.9	22.9
1942	582,693	218,074	438	162,598	131,397	60.3	10,790	142,187	20,411	12.6	24.4
1943	590,177	222,898	432	167,310	135,609	60.8	9,967	145,576	21,734	13.0	24.7
1944	619,576	232,936	439	182,071	148,455	63.7	10,272	158,727	23,344	12.8	25.6
1945	577,617	214,258	439	172,899	138,835	64.8	9,051	147,886	25,013	14.5	25.6
1946	533,922	200,274	445	163,633	131,732	65.8	6,938	138,670	24,963	15.3	26.0
1947	630,624	244,512	461	206,620	164,311	67.2	10,125	174,436	32,184	15.6	27.7
1948	599,518	251,712	502	215,217	170,478	67.7	10,402	180,880	34,337	16.0	30.2
1949	437,868	206,322	571	184,691	145,603	70.6	8,049	153,652	31,039	16.8	35.1
1950	516,311	266,689	612	238,391	190,305	71.4	8,394	198,699	39,692	16.7	38.5
1951	533,665	302,265	631	289,838	232,386	76.9	7,624	240,010	49,828	17.2	45.0
1952	466,841	276,133	625	274,246	221,243	80.1	6,022	227,265	46,981	17.1	48.7
1953	457,290	286,632	611	295,654	234,239	81.7	7,520	241,759	53,895	18.2	52.9

[1] Includes all coal produced (excluding refuse) in the United States and Alaska except Pennsylvania anthracite.
[2] Includes central washeries operated by consumer steel companies.
[3] Ratio of cleaned coal at mines to total production from mines with cleaning plants.
[4] Data not available.

TABLE 44.—Mechanical cleaning of bituminous coal in the United States, 1927–53, by type of equipment[1]

[Includes coal cleaned at plants operated by consumers at central washeries in Colorado and Pennsylvania]

Year	Wet methods								Pneumatic methods	Total
	Jigs	Concentrating tables	Classifiers	Launders	Dense-medium processes	Jigs and tables	Other combinations[2]	Total		
	THOUSAND NET TONS OF CLEAN COAL									
1927	18,741	3,200	(3)	[2] 1,000	(3)	300	800	24,041	3,651	27,692
1928	17,927	3,412	(3)	[2] 2,446	(3)	1,056	156	24,997	3,786	28,783
1929	18,915	3,532	(3)	[2] 7,103	(3)	1,214	191	30,955	5,844	36,799
1930	17,724	2,272	(3)	[2] 9,818	(3)	1,029	62	30,905	7,895	38,800
1931	13,957	1,551	(3)	[2] 11,213	(3)	926	11	27,658	8,514	36,172
1932	9,963	821	(3)	[2] 12,140	(3)	806	9	23,739	6,539	30,278
1933	11,895	1,119	(3)	[2] 13,272	(3)	693	5	26,984	7,574	34,558
1934	14,012	1,116	(3)	[2] 15,168	(3)	1,227	6	31,529	8,298	39,827
1935	15,735	1,118	(3)	[2] 18,454	(3)	1,549	---------	36,856	8,505	45,361
1936	23,417	1,843	(3)	[2] 22,631	(3)	2,613	---------	50,504	10,591	61,095
1937	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	65,000
1938	27,615	984	4,521	10,681	4,450	2,791	2,145	53,187	10,268	63,455
1939	37,056	1,402	5,917	12,809	4,683	3,256	2,611	67,734	11,695	79,429
1940	47,064	2,330	7,762	16,269	6,692	2,765	4,408	87,290	14,980	102,270
1941	53,287	2,510	8,177	16,954	9,344	4,364	5,742	100,378	17,162	117,540
1942	66,876	3,138	10,529	18,658	12,495	4,366	5,938	122,000	20,187	142,187
1943	66,092	2,929	11,854	17,424	13,388	4,322	8,366	124,375	21,201	145,576
1944	74,175	2,753	14,780	19,686	13,869	4,649	8,751	138,663	20,064	158,727
1945	68,609	2,594	14,203	18,980	12,875	4,754	8,455	130,470	17,416	147,886
1946	64,702	1,447	13,883	16,021	14,173	3,776	8,057	122,059	16,611	138,670
1947	85,931	2,980	14,648	17,902	17,702	4,303	12,617	156,083	18,353	174,436
1948	87,506	4,360	18,304	16,788	20,638	5,252	11,816	164,664	16,216	180,880
1949	72,423	4,040	14,865	11,238	17,821	3,288	17,033	140,708	12,944	153,652
1950	94,161	4,693	18,059	11,630	28,948	6,153	19,526	183,170	15,529	198,699
1951	101,746	5,811	23,174	10,362	33,840	7,613	38,884	221,430	18,580	240,010
1952	97,336	3,723	19,296	11,738	31,321	8,280	36,925	208,619	18,646	227,265
1953	101,001	4,002	18,312	11,988	36,805	8,647	41,739	222,494	19,265	241,759
	PERCENTAGE CLEANED BY EACH TYPE									
1927	67.6	11.6	(3)	[3] 3.6	(3)	1.1	2.9	86.8	13.2	100.0
1928	62.3	11.8	(3)	[3] 8.5	(3)	3.7	.5	86.8	13.2	100.0
1929	51.4	9.6	(3)	[3] 19.3	(3)	3.3	.5	84.1	15.9	100.0
1930	45.6	5.9	(3)	[3] 25.3	(3)	2.7	.2	79.7	20.3	100.0
1931	38.6	4.3	(3)	[3] 31.0	(3)	2.6	(5)	76.5	23.5	100.0
1932	32.8	2.7	(3)	[3] 40.2	(3)	2.7	(5)	78.4	21.6	100.0
1933	34.4	3.2	(3)	[3] 38.5	(3)	2.0	(5)	78.1	21.9	100.0
1934	35.2	2.8	(3)	[3] 38.1	(3)	3.1	(5)	79.2	20.8	100.0
1935	34.7	2.5	(3)	[3] 40.7	(3)	3.4	---------	81.3	18.7	100.0
1936	38.3	3.0	(3)	[3] 37.1	(3)	4.3	---------	82.7	17.3	100.0
1937	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	---------
1938	43.5	1.6	7.1	16.8	7.0	4.4	3.4	83.8	16.2	100.0
1939	46.6	1.8	7.5	16.1	5.9	4.1	3.3	85.3	14.7	100.0
1940	46.0	2.3	7.6	15.9	6.5	2.7	4.3	85.3	14.7	100.0
1941	45.3	2.2	7.0	14.4	7.9	3.7	4.9	85.4	14.6	100.0
1942	47.0	2.2	7.4	13.1	8.8	3.1	4.2	85.8	14.2	100.0
1943	45.4	2.0	8.1	12.0	9.2	3.0	5.7	85.4	14.6	100.0
1944	46.7	1.8	9.3	12.4	8.8	2.9	5.5	87.4	12.6	100.0
1945	46.4	1.8	9.6	12.8	8.7	3.2	5.7	88.2	11.8	100.0
1946	46.7	1.0	10.0	11.6	10.2	2.7	5.8	88.0	12.0	100.0
1947	49.3	1.7	8.4	10.3	10.1	2.5	7.2	89.5	10.5	100.0
1948	48.4	2.4	10.1	9.3	11.4	2.9	6.5	91.0	9.0	100.0
1949	47.1	2.6	9.7	7.3	11.6	2.2	11.1	91.6	8.4	100.0
1950	47.4	2.4	9.1	5.8	14.6	3.1	9.8	92.2	7.8	100.0
1951	42.4	2.4	9.7	4.3	14.1	3.2	16.2	92.3	7.7	100.0
1952	42.8	1.6	8.5	5.2	13.8	3.6	16.3	91.8	8.2	100.0
1953	41.8	1.6	7.6	4.9	15.2	3.6	17.3	92.0	8.0	100.0

[1] There are no mechanical cleaning plants at lignite mines.
[2] Includes all other wet methods.
[3] Launders include classifiers and dense-medium processes for 1927–36, inclusive.
[4] Data not available.
[5] Less than 0.05 percent.

TABLE 45.—Method of mining at bituminous-coal and lignite mines in the United States served by cleaning plants, 1933–53 [1]

Year	Strip mines			Auger mines			Underground mines: Mechanical loading			Underground mines: Hand loading			Total all mines		
	Production, thousand tons	Production from mines with cleaning plants: Thousand tons	Production from mines with cleaning plants: Percentage of total	Production, thousand tons	Production from mines with cleaning plants: Thousand tons	Production from mines with cleaning plants: Percentage of total	Production mechanically loaded, thousand tons	Production from mines with cleaning plants: Thousand tons	Production from mines with cleaning plants: Percentage of total	Production hand-loaded, thousand tons	Production from mines with cleaning plants: Thousand tons	Production from mines with cleaning plants: Percentage of total	Grand total production, thousand tons	Production from mines with cleaning plants: Thousand tons	Production from mines with cleaning plants: Percentage of total
1933	18,270	3,940	21.6				37,821	9,253	24.5	277,539	51,603	18.6	333,630	64,796	19.4
1934	20,790	7,128	34.3				41,433	10,129	24.4	297,145	59,052	19.9	359,368	76,309	21.2
1935	23,647	9,314	39.4				47,177	15,066	31.9	301,549	62,786	20.8	372,373	87,166	23.4
1936	28,126	10,953	38.9				66,977	23,462	35.0	343,985	80,987	23.5	439,088	115,402	26.3
1937	31,751	(2)	(2)				83,500	(2)	(2)	330,280	(2)	(2)	445,531	(2)	(2)
1938	30,407	15,214	50.0				85,093	37,195	43.7	233,045	55,829	24.0	348,545	108,238	31.1
1939	37,722	17,960	47.6				110,712	53,496	48.3	246,421	61,858	25.1	394,855	133,314	33.8
1940	43,167	20,030	46.4				147,870	66,148	44.7	269,734	75,558	28.0	460,771	161,736	35.1
1941	55,071	24,773	45.0				186,667	93,374	50.0	272,411	67,321	24.7	514,149	185,468	36.1
1942	67,203	28,597	42.6				232,903	118,917	51.1	282,587	70,560	25.0	582,693	218,074	37.4
1943	79,685	30,326	38.1				249,805	125,314	50.2	260,687	67,258	25.8	590,177	222,898	37.8
1944	100,898	32,444	32.2				274,189	137,927	50.3	244,489	62,565	25.6	619,576	232,936	37.6
1945	109,987	35,910	32.6				262,512	129,733	49.4	205,118	48,615	23.7	577,617	214,258	37.1
1946	112,964	33,222	29.4				245,341	125,521	51.2	175,617	41,531	23.6	533,922	200,274	37.5
1947	139,395	42,017	30.1				298,157	158,507	53.2	193,072	43,988	22.8	630,624	244,512	38.8
1948	139,506	44,305	31.8				295,806	171,346	57.9	164,206	36,061	22.0	599,518	251,712	42.0
1949	106,045	38,972	36.8				222,376	142,797	64.2	109,447	24,553	22.4	437,868	206,322	47.1
1950	123,466	47,701	38.6				272,725	188,732	69.2	120,120	30,256	25.2	516,311	266,689	51.7
1951	117,618	50,675	43.1	(2)	(2)	(2)	304,256	217,257	71.4	111,791	34,333	30.7	533,665	302,265	56.6
1952	108,910	48,193	44.3	1,506	260	17.3	268,994	200,853	74.7	87,431	26,827	30.7	466,841	276,133	59.1
1953	105,448	48,749	46.2	2,291	678	29.6	278,329	215,066	77.3	71,222	22,139	31.1	457,290	286,632	62.7

[1] Does not include any estimate for mines that may ship to consumer-operated plants.
[2] Data not available.

TABLE 46.—Bituminous coal mechanically cleaned by wet and pneumatic methods, in the United States and Alaska, by States, 1927–53, in net tons of clean coal

[Includes central washeries operated by consumers in Colorado and Pennsylvania]

Year	Alabama	Alaska	Arkansas	Colorado	Illinois	Indiana	Kansas	Kentucky	Maryland	Michigan	Missouri
1927	13, 153, 643	------------	9, 250	1, 362, 998	560, 642	250, 282	------------	309, 262	------------	155, 190	------------
1928	13, 064, 095	------------	6, 893	1, 276, 764	442, 054	245, 522	------------	541, 975	------------	111, 469	------------
1929	13, 585, 632	------------	9, 839	1, 270, 985	526, 551	498, 415	------------	457, 655	------------	157, 369	------------
1930	11, 760, 020	------------	(1)	888, 005	[2] 1, 152, 817	(3)	------------	290, 780	(1)	(4)	(1)
1931	9, 303, 386	------------	(1)	542, 265	[2] 1, 546, 459	(3)	------------	341, 954	(1)	(4)	(1)
1932	5, 842, 039	------------	(1)	284, 749	[2] 1, 640, 221	(3)	(1)	331, 416	(1)	(4)	(1)
1933	6, 729, 913	------------	(1)	361, 870	[2] 1, 756, 812	(3)	(5)	233, 238	(1)	(4)	[6] 454, 911
1934	7, 150, 888	------------	(1)	417, 295	[2] 2, 323, 242	(3)	(5)	308, 735	(1)	(4)	[6] 813, 488
1935	6, 841, 269	------------	(1)	492, 874	3, 154, 128	1, 283, 555	(5)	351, 568	(1)	(4)	[6] 1, 169, 351
1936	9, 922, 514	------------	(1)	713, 678	5, 613, 522	2, 198, 067	(5)	514, 647	(1)	(4)	[6] 1, 771, 870
1937	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)
1938	9, 072, 987	------------	(1)	458, 876	10, 160, 640	2, 564, 010	1, 053, 966	1, 270, 274	(1)	(1)	1, 289, 480
1939	9, 938, 993	52, 754	(1)	793, 271	14, 108, 576	3, 589, 173	1, 138, 039	2, 116, 523	(1)	(1)	1, 054, 664
1940	12, 923, 860	64, 567	(1)	1, 067, 856	18, 840, 805	5, 103, 522	1, 620, 407	2, 004, 360	------------	(1)	1, 236, 799
1941	12, 835, 169	69, 665	(1)	1, 216, 128	22, 126, 723	7, 205, 041	2, 283, 689	3, 005, 717	------------	(1)	1, 517, 861
1942	15, 697, 911	73, 417	(1)	1, 157, 313	27, 209, 284	9, 082, 500	2, 565, 936	4, 622, 553	------------	(1)	1, 487, 060
1943	13, 326, 372	100, 780	35, 638	1, 180, 248	30, 321, 306	9, 612, 008	1, 845, 362	6, 896, 774	------------	25, 290	2, 334, 203
1944	14, 453, 892	188, 558	41, 877	1, 131, 259	32, 965, 139	11, 667, 478	1, 672, 834	8, 374, 636	------------	17, 880	3, 525, 474
1945	13, 831, 185	158, 800	71, 951	1, 135, 679	30, 710, 862	11, 135, 525	1, 588, 125	8, 043, 420	------------	11, 949	2, 960, 031
1946	11, 608, 231	164, 623	98, 177	901, 069	28, 164, 779	10, 669, 696	1, 273, 764	8, 270, 196	------------	7, 554	2, 991, 932
1947	13, 923, 152	171, 799	250, 060	1, 373, 708	33, 363, 568	13, 865, 723	1, 349, 393	12, 195, 014	318, 498	------------	3, 071, 263
1948	13, 463, 049	147, 360	134, 569	1, 530, 318	34, 619, 845	13, 530, 612	1, 191, 344	11, 560, 556	216, 637	------------	3, 310, 227
1949	9, 360, 954	190, 384	55, 491	1, 223, 987	27, 428, 245	10, 548, 456	1, 101, 022	12, 894, 543	71, 914	------------	3, 004, 757
1950	11, 548, 036	175, 783	27, 600	1, 277, 747	35, 695, 520	14, 101, 094	1, 303, 614	21, 198, 829	30, 343	------------	2, 397, 442
1951	11, 069, 682	195, 241	17, 916	1, 649, 012	39, 606, 748	14, 060, 674	1, 189, 092	26, 923, 389	------------	------------	2, 865, 138
1952	9, 801, 444	265, 529	------------	1, 485, 290	36, 402, 615	12, 935, 513	1, 174, 053	27, 710, 824	------------	------------	2, 578, 768
1953	11, 110, 349	253, 570	------------	1, 618, 150	35, 456, 970	12, 650, 620	1, 238, 187	28, 144, 723	------------	------------	2, 156, 543

Year	Montana	New Mexico	Ohio	Oklahoma	Pennsylvania	Tennessee	Utah	Virginia	Washington	West Virginia	Other States	Total
1927	142, 802	----------	7, 278	5, 646	5, 625, 092	344, 562	----------	1, 289, 496	820, 481	3, 655, 423	----------	27, 692, 047
1928	101, 586	----------	----------	----------	6, 905, 546	326, 903	----------	269, 271	892, 498	4, 598, 463	----------	28, 783, 039
1929	73, 293	----------	204, 543	----------	11, 100, 193	308, 449	----------	(8)	967, 098	[9] 7, 639, 098	----------	36, 799, 120
1930	(1)	----------	[10] 719, 646	----------	13, 496, 934	297, 768	----------	(8)	819, 662	[9] 9, 227, 968	146, 019	38, 799, 619
1931	----------	----------	[10] 816, 906	(1)	12, 657, 958	249, 453	----------	(8)	603, 497	[9] 9, 715, 433	395, 062	36, 172, 373
1932	----------	----------	[10] 854, 123	(1)	10, 799, 082	247, 650	----------	(8)	485, 610	[9] 9, 323, 094	470, 385	30, 278, 369
1933	----------	(1)	[10] 1, 123, 115	(1)	12, 722, 812	308, 778	----------	(8)	519, 417	[9] 10, 267, 905	79, 440	34, 558, 211
1934	(1)	(1)	[10] 1, 260, 654	(1)	15, 652, 268	341, 530	----------	(8)	400, 336	[9] 11, 002, 766	155, 357	39, 826, 559
1935	(1)	(1)	[10] 1, 151, 546	----------	17, 844, 642	341, 117	----------	389, 548	614, 771	11, 613, 813	112, 839	45, 361, 021
1936	(1)	(1)	[10] 1, 331, 545	----------	21, 584, 403	257, 987	----------	473, 992	1, 203, 783	15, 360, 671	148, 297	61, 094, 976
1937	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	65, 000, 000
1938	(1)	(1)	2, 121, 344	----------	17, 047, 977	258, 089	(1)	814, 478	1, 197, 054	15, 888, 325	[11] 257, 088	63, 454, 588
1939	(1)	(1)	2, 800, 280	----------	21, 462, 135	320, 206	(1)	1, 272, 296	1, 366, 754	18, 812, 410	[11] 603, 352	79, 429, 426
1940	(1)	(1)	3, 533, 632	----------	27, 616, 594	314, 541	(1)	2, 315, 560	1, 362, 856	23, 384, 440	[12] 879, 954	102, 269, 753
1941	(1)	(1)	4, 626, 146	----------	29, 948, 020	337, 159	(1)	2, 733, 166	1, 632, 427	26, 724, 333	[12] 1, 278, 278	117, 539, 522
1942	(1)	90, 738	6, 022, 900	----------	35, 712, 262	455, 413	1, 413, 048	3, 062, 674	1, 726, 599	31, 607, 271	[12] 200, 467	142, 187, 346
1943	146, 503	53, 703	6, 611, 721	108, 942	35, 429, 650	438, 168	839, 111	3, 292, 751	1, 347, 160	31, 630, 159	----------	145, 575, 849
1944	211, 692	95, 856	6, 362, 939	244, 010	37, 349, 752	350, 229	2, 064, 798	3, 670, 435	1, 254, 605	33, 083, 786	----------	158, 727, 129
1945	302, 978	303, 470	6, 292, 400	239, 169	32, 880, 671	114, 695	1, 682, 138	3, 623, 548	1, 114, 360	31, 671, 908	[13] 13, 072	147, 885, 936
1946	171, 882	395, 347	6, 467, 864	90, 000	29, 807, 425	125, 276	1, 636, 201	3, 401, 629	816, 465	31, 592, 766	[13] 14, 961	138, 669, 837
1947	170, 522	477, 873	9, 366, 478	385, 442	36, 728, 026	188, 572	1, 679, 577	3, 375, 524	954, 734	41, 227, 011	----------	174, 435, 937
1948	182, 721	411, 325	10, 340, 972	706, 311	35, 602, 133	266, 900	2, 134, 386	4, 098, 567	1, 055, 749	46, 376, 742	----------	180, 880, 323
1949	182, 411	339, 672	9, 011, 617	738, 718	31, 984, 239	193, 884	2, 086, 754	3, 714, 188	802, 071	38, 718, 596	----------	153, 651, 903
1950	160, 550	74, 290	10, 708, 879	896, 344	38, 547, 253	353, 514	2, 312, 384	4, 796, 515	781, 346	52, 311, 435	----------	198, 698, 518
1951	126, 115	59, 635	13, 939, 962	692, 692	46, 325, 054	607, 392	2, 039, 335	7, 356, 766	809, 619	70, 476, 346	----------	240, 009, 808
1952	104, 150	143, 681	14, 771, 814	628, 083	40, 740, 414	406, 720	2, 497, 890	7, 786, 248	821, 788	67, 009, 806	----------	227, 264, 630
1953	45, 035	95, 410	13, 576, 190	623, 469	48, 776, 471	535, 462	2, 540, 571	7, 372, 207	671, 246	74, 893, 404	----------	241, 758, 577

1 Included with "Other States."
2 Includes Indiana.
3 Included with Illinois.
4 Included with Ohio.
5 Included with Missouri.
6 Includes Kansas.
7 Data not available.
8 Included with West Virginia.
9 Includes Virginia.
10 Includes Michigan.
11 Includes also Texas.
12 Includes also Georgia.
13 Oregon.

TABLE 47.—Percentage of State output of bituminous coal mechanically cleaned by wet and pneumatic methods, 1927–53

[Includes central washeries operated by consumers in Colorado and Pennsylvania]

Year	Alabama	Alaska	Arkansas	Colorado	Illinois	Indiana	Kansas	Kentucky	Maryland	Michigan	Missouri
1927	66.5	----	0.6	14.0	1.2	1.4	----	0.4	----	20.5	----
1928	74.1	----	.4	13.0	.6	1.5	----	.9	----	18.1	----
1929	75.7	----	.6	12.8	.9	2.7	----	.8	----	19.6	----
1930	75.5	----	(1)	10.8	[2] 1.6	(3)	----	.6	(1)	(4)	(1)
1931	77.5	----	(1)	8.2	[2] 2.6	(3)	----	.9	(1)	(4)	(1)
1932	74.4	----	(1)	5.1	[2] 3.5	(3)	(1)	.9	(1)	(4)	(1)
1933	76.8	----	(1)	6.9	[2] 3.4	(3)	(5)	.6	(1)	(4)	[6] 8.1
1934	78.2	----	(1)	8.0	[2] 4.1	(3)	(5)	.8	(1)	(4)	[6] 13.9
1935	80.4	----	(1)	8.3	7.1	8.2	(5)	.9	(1)	(4)	[6] 18.5
1936	81.1	----	(1)	10.5	11.0	12.3	(5)	1.1	(1)	(4)	[6] 25.5
1937	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)
1938	82.0	----	(1)	8.1	24.2	17.4	39.7	3.3	(1)	(1)	37.5
1939	82.5	35.5	(1)	13.4	30.2	21.2	42.5	5.0	(1)	(1)	32.2
1940	84.3	37.1	(1)	16.2	37.2	27.0	45.3	4.1	----	(1)	39.9
1941	83.0	29.2	(1)	17.5	40.4	32.0	57.0	5.6	----	(1)	48.3
1942	81.3	28.1	(1)	14.3	41.8	35.8	60.7	7.4	----	(1)	42.2
1943	77.7	34.8	2.1	14.2	41.7	38.3	53.7	10.9	----	15.0	54.2
1944	77.1	54.1	2.1	13.9	42.9	41.7	49.7	11.7	----	12.8	73.8
1945	75.8	53.4	3.9	15.0	42.1	44.2	49.2	11.6	----	9.5	74.3
1946	71.7	44.9	6.0	15.2	44.4	49.2	51.1	12.4	----	9.4	80.2
1947	73.1	47.6	13.4	21.6	49.2	54.5	49.2	14.5	15.5	----	72.5
1948	71.6	36.1	8.1	27.2	53.0	56.7	46.9	14.1	13.0	----	82.3
1949	72.4	43.9	5.8	26.4	58.1	63.7	54.2	20.6	10.8	----	82.4
1950	80.1	42.6	2.4	30.0	63.4	70.7	61.3	27.0	4.7	----	80.9
1951	81.4	39.5	1.6	40.2	73.1	72.3	60.6	35.9	----	----	87.6
1952	86.1	38.7	----	41.0	79.5	79.1	57.9	41.9	----	----	87.3
1953	88.7	29.4	----	45.3	77.1	80.0	72.2	43.3	----	----	90.1

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Year	Montana	New Mexico	Ohio	Oklahoma	Pennsylvania	Tennessee	Utah	Virginia	Washington	West Virginia	Other States	Total
1927	4.5	-----	0.1	0.1	4.2	6.0	-----	10.0	31.1	2.5	-----	5.3
1928	3.1	-----	-----	-----	5.3	5.8	-----	2.3	35.4	3.5	-----	5.7
1929	2.2	-----	.9	-----	7.7	5.7	-----	[8]	38.4	[9] 5.5	-----	6.9
1930	[1]	-----	[10] 3.1	-----	10.8	5.8	-----	[8]	35.6	[9] 7.0	1.4	8.3
1931	-----	-----	[10] 3.9	[1]	13.0	5.3	-----	[8]	32.7	[9] 8.7	4.5	9.5
1932	-----	-----	[10] 5.9	[1]	14.4	7.0	-----	[8]	30.5	[9] 10.0	4.8	9.8
1933	-----	[1]	[10] 5.6	[1]	16.0	8.2	-----	[8]	37.3	[9] 10.0	1.6	10.4
1934	[1]	[1]	[10] 5.9	[1]	17.4	8.3	-----	[8]	28.9	[9] 10.2	2.1	11.1
1935	[1]	[1]	[10] 5.3	-----	19.5	8.3	-----	4.0	39.4	11.7	1.6	12.2
1936	[1]	[1]	[10] 5.4	-----	19.6	5.1	-----	4.1	66.4	13.0	1.9	13.9
1937	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]	14.6
1938	[1]	[1]	11.4	-----	21.9	5.8	[1]	6.6	76.4	17.0	[11] 2.4	18.2
1939	[1]	[1]	13.8	-----	23.2	6.2	[1]	9.4	80.9	17.4	[11] 5.4	20.1
1940	[1]	[1]	15.5	-----	23.7	5.2	[1]	15.1	82.6	18.5	[12] 9.3	22.2
1941	[1]	[1]	15.8	-----	23.0	4.8	[1]	14.8	88.7	19.1	[12] 12.2	22.9
1942	[1]	5.4	18.4	-----	24.8	5.6	25.6	15.2	88.4	20.3	[12] 3.3	24.4
1943	3.1	2.9	20.5	3.8	25.1	6.1	12.6	16.2	88.2	19.9	-----	24.7
1944	4.4	5.5	18.8	7.6	25.6	4.8	29.0	18.8	82.3	20.1	-----	25.6
1945	6.8	20.5	19.2	8.2	24.7	1.8	25.2	21.0	82.1	20.8	[13] 79.2	25.6
1946	4.6	30.9	20.0	3.4	23.8	2.2	27.3	21.9	82.4	21.9	[13] 87.2	26.0
1947	5.4	33.1	24.9	11.3	25.0	3.0	22.6	16.7	85.4	23.4	-----	27.7
1948	6.3	30.2	26.7	20.4	26.5	4.1	31.3	22.8	86.5	27.5	-----	30.2
1949	6.6	33.8	29.1	24.4	35.9	4.6	33.9	25.5	89.2	31.6	-----	35.1
1950	6.4	10.2	28.4	33.5	36.4	7.0	34.7	27.2	89.4	36.3	-----	38.5
1951	5.4	7.6	36.7	31.2	42.8	11.2	33.2	34.4	94.5	43.2	-----	45.0
1952	5.0	18.9	40.8	28.6	45.7	7.7	40.7	36.1	97.3	47.3	-----	48.7
1953	2.4	18.6	39.1	28.8	52.3	9.8	38.8	38.6	97.3	55.8	-----	52.9

[1] Included with "Other States."
[2] Includes Indiana.
[3] Included with Illinois.
[4] Included with Ohio.
[5] Included with Missouri.
[6] Includes Kansas.
[7] Data not available.
[8] Included with West Virginia.
[9] Includes Virginia.
[10] Includes Michigan.
[11] Includes also Texas.
[12] Includes also Georgia.
[13] Oregon.

TABLE 48.—Bituminous coal mechanically cleaned by wet and pneumatic methods, in the United States, 1950–53, by method of cleaning, in net tons of clean coal

Method of cleaning	1950	1951	1952	1953	
				Quantity	Change from 1952 (percent)
Wet methods:					
At mines	174,776,675	213,806,870	202,597,163	214,974,289	+6.1
At consumer-operated plants	8,393,528	7,623,530	6,021,819	7,519,809	+24.9
Total wet methods	183,170,203	221,430,400	208,618,982	222,494,098	+6.7
Pneumatic methods	15,528,315	18,579,408	18,645,648	19,264,479	+3.3
Grand total	198,698,518	240,009,808	227,264,630	241,758,577	+6.4

TABLE 49.—Bituminous coal cleaned in the United States, 1952–53, by type of equipment

[Includes consumer-operated plants]

Type of equipment	Plants in operation [1]		Net tons of clean coal		Cleaned by each type (percent of total)	
	1952	1953	1952	1953	1952	1953
Wet methods:						
Jigs	300	296	97,336,578	101,000,574	42.8	41.8
Concentrating tables	17	15	3,723,076	4,002,100	1.6	1.6
Classifiers	80	82	19,295,679	18,312,573	8.5	7.6
Launders	11	10	11,737,760	11,987,575	5.2	4.9
Dense-medium processes	124	116	31,320,926	36,805,000	13.8	15.2
Jigs and concentrating tables	23	22	8,280,239	8,646,792	3.6	3.6
Other combinations and methods	49	52	36,924,724	41,739,484	16.3	17.3
Total wet methods	604	593	208,618,982	222,494,098	91.8	92.0
Pneumatic methods	96	101	18,645,648	19,264,479	8.2	8.0
Grand total	[2] 625	[2] 611	227,264,630	241,758,577	100.0	100.0

[1] Where a plant has more than 1 type of cleaning, it is credited to the type of cleaning with the largest percentage of the output.
[2] Total does not add. Number of plants using both wet and pneumatic methods was 75 in 1952 and 83 in 1953.

TABLE 50.—Total production from bituminous-coal mines served by cleaning plants in the United States, 1952–53, by type of equipment, in net tons

[Excludes consumer-operated plants]

Type of equipment	1952	1953	Change from 1952 (percent)
Wet methods:			
Jigs	123,977,777	126,785,419	+2.3
Concentrating tables	3,276,024	3,170,294	−3.2
Classifiers	32,590,301	32,378,030	−.7
Launders	9,289,757	8,192,920	−11.8
Dense-medium processes	51,590,475	54,724,892	+6.1
Jigs and concentrating tables	7,305,783	7,646,877	+4.7
Other combinations and methods	43,498,925	49,763,511	+14.4
Total wet methods	271,529,042	282,661,943	+4.1
Pneumatic methods	43,702,734	49,034,357	+12.2
Grand total	315,231,776	331,696,300	+5.2
Less duplications [1]	39,098,611	45,064,284	+15.3
Net total	276,133,165	286,632,016	+3.8
United States total production [2]	466,840,782	457,290,449	−2.0
Percent produced at mines having cleaning plants	59.1	62.7	

[1] Mines using both wet and pneumatic methods.
[2] Includes all coal except Pennsylvania anthracite. There are no mechanical cleaning plants at lignite mines.

TABLE 51.—Total production from bituminous-coal mines served by cleaning plants in the United States, 1950–53, by method of mining

[Excludes consumer-operated plants]

Method of mining	1950		1951		1952		1953	
	Thousand tons	Percent	Thousand tons	Percent	Thousand tons	Percent	Thousand tons	Percent
Hand-loaded underground	30, 256	11. 3	34, 333	11. 3	26, 827	9. 7	22, 139	7. 7
Mechanically loaded underground	188, 732	70. 8	217, 257	71. 9	200, 853	72. 7	215, 066	75. 0
Mined at auger mines	------	------	(1)	------	260	. 1	678	. 3
Mined by stripping	47, 701	17. 9	50, 675	16. 8	48, 193	17. 5	48, 749	17. 0
Total	266, 689	100. 0	302, 265	100. 0	276, 133	100. 0	286, 632	100. 0

[1] Data not available.

TABLE 52.—Bituminous coal mechanically cleaned by wet and pneumatic methods in the United States and Alaska, 1952–53, by States

[Includes consumer-operated plants]

State	Plants in operation		Net tons of clean coal		Output mechanically cleaned (percent)	
	1952	1953	1952	1953	1952	1953
Alabama	43	40	9, 801, 444	11, 110, 349	86. 1	88. 7
Alaska	2	1	265, 529	253, 570	38. 7	29. 4
Colorado	5	5	1, 485, 290	1, 618, 150	41. 0	45. 3
Illinois	69	69	36, 402, 615	35, 456, 970	79. 5	77. 1
Indiana	27	24	12, 935, 513	12, 650, 620	79. 1	80. 0
Kansas	3	4	1, 174, 053	1, 238, 187	57. 9	72. 2
Kentucky	76	77	27, 710, 824	28, 144, 723	41. 9	43. 3
Missouri	10	10	2, 578, 768	2, 156, 543	87. 3	90. 1
Montana	2	2	104, 150	45, 035	5. 0	2. 4
New Mexico	1	1	143, 681	95, 410	18. 9	18. 6
Ohio	27	25	14, 771, 814	13, 576, 190	40. 8	39. 1
Oklahoma	5	4	628, 083	623, 469	28. 6	28. 8
Pennsylvania [1]	89	89	40, 740, 414	48, 776, 471	45. 7	52. 3
Tennessee	6	9	406, 720	535, 462	7. 7	9. 8
Utah	6	6	2, 497, 890	2, 540, 571	40. 7	38. 8
Virginia	33	30	7, 786, 248	7, 372, 207	36. 1	38. 6
Washington	16	11	821, 788	671, 246	97. 3	97. 3
West Virginia [2]	205	204	67, 009, 806	74, 893, 404	47. 3	55. 8
Total	[3] 625	[4] 611	227, 264, 630	241, 758, 577	48. 7	52. 9

[1] Includes some coal mined in Pennsylvania and cleaned in Ohio and a small tonnage mined in other States and cleaned at a consumer-operated plant in Pennsylvania.
[2] Includes some coal mined in West Virginia and cleaned in Pennsylvania.
[3] Represents 75 plants using both wet and pneumatic methods of cleaning and 550 plants using only 1 cleaning method.
[4] Represents 83 plants using both wet and pneumatic methods of cleaning and 528 plants using only 1 cleaning method.

TABLE 53.—Operations at bituminous-coal-cleaning plants in the United States and Alaska, 1953, by States, in net tons

State	Total raw coal moved to cleaning plants	Coal obtained in cleaning process	Refuse resulting in cleaning process	Ratio of refuse to raw coal (percent) [1]	Total production from mines served by cleaning plants
Alabama	16,995,208	11,110,349	5,884,859	34.6	11,255,051
Alaska	342,185	253,570	88,615	25.9	253,570
Colorado	231,448	211,798	19,650	8.5	293,158
Illinois	42,386,515	35,456,970	6,929,545	16.3	41,057,746
Indiana	14,460,778	12,650,620	1,810,158	12.5	13,277,846
Kansas	1,646,727	1,238,187	408,540	24.8	1,238,187
Kentucky	33,278,057	28,144,723	5,133,334	15.4	32,653,848
Missouri	2,883,716	2,156,543	727,173	25.2	2,171,698
Montana	49,505	45,035	4,470	9.0	52,697
New Mexico	103,698	95,410	8,288	8.0	359,728
Ohio	17,216,136	13,576,190	3,639,946	21.1	17,264,843
Oklahoma	736,249	623,469	112,780	15.3	703,824
Pennsylvania [2]	54,219,387	42,663,014	11,556,373	21.3	49,736,539
Tennessee	624,087	535,462	88,625	14.2	1,327,043
Utah	3,002,780	2,540,571	462,209	15.4	3,303,560
Virginia	8,649,274	7,372,207	1,277,067	14.8	11,537,735
Washington	922,127	671,246	250,881	27.2	673,038
West Virginia [3]	89,452,610	74,893,404	14,559,206	16.3	99,471,905
Total at mines only [4]	287,200,487	234,238,768	52,961,719	18.4	286,632,016
Consumer plants [5]	8,453,040	7,519,809	933,231	11.0	------------
Grand total	295,653,527	241,758,577	53,894,950	18.2	------------

[1] In Alabama (for example) for every 100 tons of raw coal cleaned in 1953, an average of 34.6 tons of refuse was discarded and 65.4 tons of clean marketable coal was obtained.
[2] Includes some coal mined in Pennsylvania and cleaned in Ohio.
[3] Includes some coal mined in West Virginia and cleaned in Pennsylvania.
[4] Includes all mechanical cleaning other than washeries operated by consumer steel companies.
[5] Includes central washeries in Colorado and Pennsylvania operated by consumer steel companies.

MECHANICAL CRUSHING

Mechanical crushing is the process of running the coal through a heavy machine which crushes the large lumps into smaller ones. There are 2 prime objectives in crushing bituminous coal; 1 is to reduce lump to sizes that will facilitate handling and cleaning, and the other is to reduce to sizes according to market requirements. Since, before 1930, the larger sizes of lump were at a premium and there was only a small amount of mechanical cleaning, there was little incentive to crush soft coal other than to reduce the large lumps so that they would pass through the tipple. After about 1930 the steadily increasing percentage of soft coal mechanically loaded underground or loaded with power shovels at strip mines increased the proportion of large lumps and the amount of refuse that was loaded with the coal. To prepare a suitable product, often the coal must be crushed before it can be mechanically cleaned properly. The tonnage of soft coal loaded by machine and mined by stripping increased from 14 percent of the total output in 1930 to 84 percent in 1953. The increased use of mechanical stokers, which require specific sizes—usually the smaller sizes, greatly stimulated the necessity for crushing coal. Also, industrial consumers were constantly striving for greater fuel efficiency and demanding cleaner coal. As noted above, crushing facilitates the cleaning process. Therefore, it is not surprising that there has been a steady increase in the crushing of soft coal at mines in recent years.

The growth of mechanical crushing since 1940 is shown in table 54 and graphically in figure 14. The tonnage crushed has increased threefold from 1940 to 1953. The table also shows the growing close relationship among crushing, mechanical cleaning, and method of loading. Detailed figures on crushing by States are given in table 55. The variation of percentage of total production of coal crushed in different States may be affected by several factors, including physical character of the coal, mining method, amount and nature of impurities in the coal, and market demand.

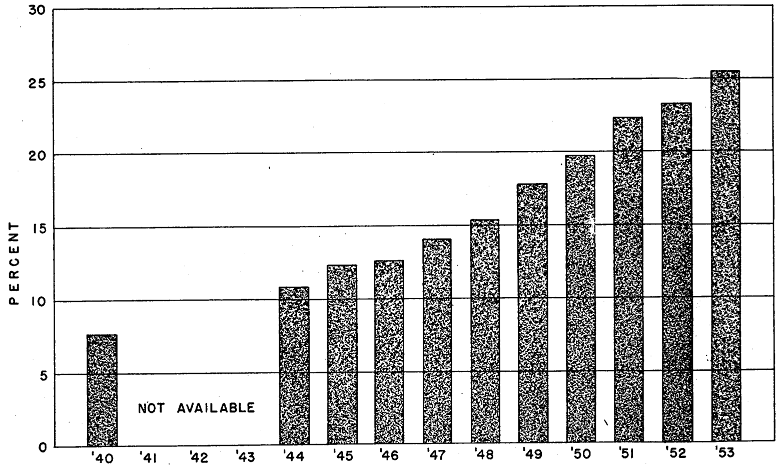

FIGURE 14.—Percentage of total production of bituminous coal and lignite crushed at mines in the United States, 1940 and 1944–53.

TABLE 54.—Mechanical crushing of bituminous coal and lignite at mines in the United States, 1940 and 1944–53 [1]

Year	Number of mines crushing coal	Coal crushed (net tons)	Percentage of production crushed at mines where crushing is done	Percentage of total production crushed	Percentage of production mechanically cleaned at mines where crushing is done	Percentage of total production of mines where crushing is done, by method of loading		
						Mechanically loaded	Hand-loaded	Strip mined
1940	716	35,251,061	19.3	7.7	(2)	(2)	(2)	(2)
1944	814	66,460,564	29.6	10.8	(2)	(2)	(2)	(2)
1945	830	70,936,898	32.4	12.3	(2)	(2)	(2)	(2)
1946	851	66,663,732	31.8	12.5	39.9	52.8	19.9	27.3
1947	904	88,985,858	35.7	14.1	41.4	56.0	16.5	27.5
1948	995	91,564,311	36.6	15.3	42.1	59.0	13.3	27.7
1949	1,120	77,327,691	39.0	17.7	47.3	61.4	11.5	27.1
1950	1,210	101,594,731	40.1	19.7	50.6	62.9	11.5	25.6
1951	1,374	118,663,712	39.6	22.2	54.8	65.5	10.2	24.3
1952	1,325	108,102,158	40.5	23.2	59.6	65.3	9.3	25.4
1953	1,239	116,493,415	42.5	25.5	62.7	68.8	7.9	23.3

[1] Data not available for 1941–43, inclusive. Lignite and Virginia semianthracite mines are not included in 1940–49, inclusive.
[2] Data not available.

TABLE 55.—Mechanical crushing of bituminous coal and lignite at mines in the United States and Alaska, 1952–53, by States

State	Number of mines crushing coal		Coal crushed (net tons)		Percentage of production crushed at mines where crushing is done		Percentage of total production crushed	
	1952	1953	1952	1953	1952	1953	1952	1953
Alabama	40	37	6,510,104	7,988,400	75.9	81.8	57.2	63.7
Alaska	3	3	127,493	168,332	85.8	46.8	18.6	19.5
Arizona	1	1	500	514	10.0	10.0	10.0	10.0
Arkansas	7	7	380,779	384,659	78.3	87.4	43.6	49.6
California (lignite)	1		2,998		100.0		100.0	
Colorado	45	39	1,192,909	1,537,001	45.3	56.2	32.9	43.0
Illinois	101	87	14,393,312	13,741,865	39.2	35.4	31.4	29.9
Indiana	31	34	4,067,592	4,490,324	40.3	38.9	24.9	28.4
Iowa	28	23	461,661	551,715	50.6	65.4	33.4	39.7
Kansas	5	5	1,006,606	644,579	81.6	58.7	49.6	37.6
Kentucky	158	138	13,138,575	11,722,471	34.5	32.5	19.9	18.0
Maryland	2	3	65,614	70,424	80.1	85.4	11.2	13.3
Missouri	13	15	993,624	1,125,381	40.9	50.7	33.6	47.0
Montana:								
Bituminous	7	7	58,100	72,958	9.5	31.5	2.8	3.9
Lignite	1	1	600	600	8.4	8.6	2.0	2.4
Total Montana	8	8	58,700	73,558	9.5	30.8	2.8	3.9
New Mexico	3	3	595,189	253,520	93.8	61.6	78.4	49.3
North Dakota (lignite)	14	13	2,393,619	2,254,404	87.1	87.7	80.2	80.4
Ohio	119	107	9,071,948	9,976,655	48.6	56.9	25.1	28.7
Oklahoma	13	13	1,078,376	1,133,519	66.6	70.6	49.2	52.3
Pennsylvania	335	316	26,149,028	31,242,011	52.2	55.7	29.3	33.5
Tennessee	19	15	587,676	658,101	36.6	41.0	11.2	12.0
Utah	32	34	3,175,093	3,744,133	55.0	60.5	51.7	57.2
Virginia	31	37	2,520,612	2,811,516	51.4	37.3	11.7	14.7
Washington	13	10	173,465	155,068	24.6	27.9	20.5	22.5
West Virginia	288	276	18,373,048	20,233,076	24.9	28.0	13.0	15.1
Wyoming	15	15	1,583,637	1,532,189	36.4	40.6	26.0	29.2
Total	1,325	1,239	108,102,158	116,493,415	40.5	42.5	23.2	25.5

TREATMENT FOR ALLAYING DUST

In recent years consumers have become more and more insistent that something be done about the dust from soft coal. The dust on coal may be negligible in comparison to the total weight; however, it is often carried where it is not wanted and may create a nuisance or a hazard from explosion. Thus, much experimentation has been carried on to develop processes for allaying coal dust. It should be noted that the following discussion pertains entirely to dust treatment at the tipple and has no reference to dust problems in underground coal mines. The main purpose of surface treatment of coal is to control the dust, but such treatment also serves a secondary purpose in helping to prevent freezing of wet coal. Other benefits are claimed as the result of treatment of soft coal with various agents or materials, such as reduced windage loss of fines in transit, improved burning performance, reduced tendency toward spontaneous heating during storage, and reduced air slackening and disintegration.

The materials used for surface treatment of coal to prevent dust are divided into three groups: (1) water in conjunction with wetting agents, (2) calcium chloride or calcium chloride with various admixtures, and (3) oil or other petroleum products.[12]

Wetting agents are organic chemical compounds that cause water to spread into a thin film and wet the coal surface readily. The quantity used depends on the concentration of the material and on its effectiveness; it may range from 1 to 10 gallons of agent to 1,000

[12] Young, W. H., and Anderson, R. L., Mechanical Crushing of Bituminous Coal and Treatment for Allaying Dust: Mechanization, vol. 15 April 1951, pp. 163–165.

gallons of water. Wetting agents do not retard evaporation of water and therefore do not make the coal permanently dustless; however, they do not evaporate at ordinary temperatures, and the coal is readily rewet for long intervals after water is applied.

Calcium chloride is a hygroscopic salt; that is, the dry salt will take up moisture from the atmosphere under normal conditions of relative humidity. It may be applied in solution, the usual concentration is 3 pounds of 77- to 80-percent flakes to 1 gallon of solution having a specific gravity of about 1.22. The amount of calcium chloride solution (specific gravity 1.22) required to treat 1 ton of bituminous coal of prepared sizes is 2¼ gallons. Coals having an inherent moisture content of over 8 percent cannot be effectively dust-proofed with calcium chloride.

When enough oil or other petroleum products are applied uniformly over the surface of coal, they form a sticky film, and fine particles of dust adhere to the larger pieces of coal or agglomerate into larger units that are too heavy to float in air currents. The rate of evaporation of oil is negligible, and no appreciable amount is washed off the coal by rain. From 1 to 6 quarts of oil per ton is required for dust treatment of coal, depending on the method used, the size and type of coal treated, and many other factors.

The historical trend in the growth of treatment of soft coal to allay dust, 1940–53, is shown in table 56. The tonnage treated increased from 8 percent of total production in 1940 to 11 percent in 1953. However, treatment was reduced sharply during World War II owing to Government restrictions on the use of oil for spraying. The percentage of soft coal treated, by types of agent used, is shown graphically in figure 15. The predominant treating agent has been oil, except during World War II when there were Government restrictions on its use. Detailed figures on treatment in 1953 by States are given in table 57.

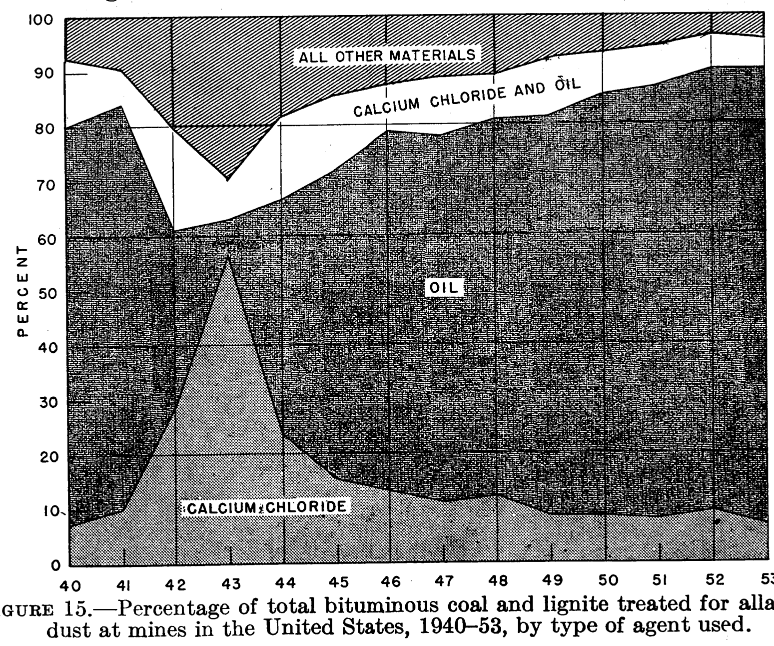

FIGURE 15.—Percentage of total bituminous coal and lignite treated for allaying dust at mines in the United States, 1940–53, by type of agent used.

TABLE 56.—Summary data on treatment of bituminous coal and lignite for allaying dust at mines in the United States, 1940–53 [1]

Year	Grand total production (net tons)	Total production at mines where coal was treated (net tons)	Percentage of production treated at mines where treating is done	Percentage of total production treated
1940	460,771,500	161,089,959	22.1	7.7
1941	514,149,245	197,476,343	20.0	7.7
1942	582,692,937	202,973,885	17.3	6.0
1943	590,177,069	153,863,052	17.3	4.5
1944	619,576,240	172,955,108	17.8	5.0
1945	577,617,327	166,935,955	20.1	5.8
1946	533,922,068	166,814,848	22.2	6.9
1947	630,623,722	195,840,059	26.4	8.2
1948	599,518,229	196,600,489	25.6	8.4
1949	437,868,036	160,978,742	26.0	9.5
1950	516,311,053	210,083,657	25.9	10.5
1951	533,664,732	228,802,637	25.6	11.0
1952	466,840,782	211,437,141	24.4	11.0
1953	457,290,449	206,374,498	23.7	10.7

Year	Net tons treated with—				
	Calcium chloride	Oil	Calcium chloride and oil	All other material	Total
1940	2,633,291	25,767,651	4,428,113	2,807,728	35,636,783
1941	3,957,459	29,258,462	2,482,899	3,844,476	39,543,296
1942	10,132,809	11,302,020	6,544,658	7,148,064	35,127,551
1943	15,049,176	1,720,176	1,947,219	7,966,484	26,683,055
1944	7,276,702	13,188,883	4,744,580	5,562,565	30,772,730
1945	5,115,090	18,875,674	4,647,872	4,910,602	33,549,238
1946	4,957,622	24,310,109	3,193,070	4,572,360	37,033,161
1947	5,822,483	34,667,571	5,571,953	5,732,101	51,794,108
1948	6,275,121	34,466,534	4,177,987	5,462,054	50,381,696
1949	3,670,120	30,448,670	4,380,961	3,275,151	41,774,902
1950	4,643,186	41,688,159	4,278,212	3,724,314	54,333,871
1951	4,694,938	46,142,726	4,587,940	3,172,205	58,597,809
1952	4,954,080	41,409,886	3,432,199	1,772,111	51,568,276
1953	3,362,552	40,671,431	2,769,833	2,154,985	48,958,801

Year	Number of mines treating with—				
	Calcium chloride	Oil	Calcium chloride and oil	All other materials	Total [2]
1940	51	486	22	62	614
1941	67	564	15	58	668
1942	167	334	73	117	603
1943	212	67	28	101	393
1944	145	192	47	83	434
1945	105	296	43	67	487
1946	79	380	41	51	546
1947	67	384	58	45	546
1948	68	474	48	46	629
1949	91	586	62	34	769
1950	106	688	32	45	838
1951	98	764	40	27	898
1952	101	723	30	20	865
1953	81	681	28	26	785

Year	Percentage of tonnage treated with—				
	Calcium chloride	Oil	Calcium chloride and oil	All other material	Total
1940	7.4	72.3	12.4	7.9	100.0
1941	10.0	74.0	6.3	9.7	100.0
1942	28.8	32.2	18.6	20.4	100.0
1943	56.4	6.4	7.3	29.9	100.0
1944	23.6	42.9	15.4	18.1	100.0
1945	15.2	56.3	13.9	14.6	100.0
1946	13.4	65.6	8.6	12.4	100.0
1947	11.2	66.9	10.8	11.1	100.0
1948	12.5	68.4	8.3	10.8	100.0
1949	8.8	72.9	10.5	7.8	100.0
1950	8.5	76.7	7.9	6.9	100.0
1951	8.0	78.8	7.8	5.4	100.0
1952	9.6	80.3	6.7	3.4	100.0
1953	6.8	83.1	5.7	4.4	100.0

[1] All items except "Grand total production" exclude lignite and semianthracite, 1940–49. Data for 1940–45 include mines with an average daily production of 50 tons and all mines with rail or river connections regardless of size. Data for 1946–53 include all mines producing 1,000 tons and over. The figures are reasonably comparable for all years.

[2] On account of some mines using more than 1 method of treatment, this total is not the sum of the individual items.

TABLE 57.—Treatment of bituminous coal and lignite at mines for allaying dust, in the United States, 1952–53 by States

State	Number of mines treating coal		Coal treated (net tons)		Percentage of production treated at mines where treating is done		Percentage of total production treated	
	1952	1953	1952	1953	1952	1953	1952	1953
Alabama	8	7	227,153	114,925	47.4	20.1	2.0	0.9
Arkansas	5	4	58,174	38,450	14.2	25.4	6.7	5.0
Colorado	47	40	267,412	265,430	14.7	17.3	7.4	7.4
Illinois	99	95	6,018,233	7,200,126	17.0	19.3	13.1	15.6
Indiana	29	28	1,443,282	1,695,636	13.1	14.8	8.8	10.7
Iowa	7	5	16,905	12,614	15.8	14.9	1.2	.9
Kansas	4	4	201,554	79,990	15.6	7.1	9.9	4.7
Kentucky	149	140	12,291,899	9,598,777	35.0	29.4	18.6	14.8
Maryland	1	-------	800	-----------	75.5	-------	.1	-------
Missouri	11	10	187,502	143,004	7.9	7.5	6.3	6.0
Montana:								
Bituminous	7	8	35,649	39,374	10.2	17.0	1.7	2.1
Lignite	-------	-------	-----------	-----------	-------	-------	-------	-------
Total Montana	7	8	35,649	39,374	10.2	17.0	1.7	2.1
North Dakota (lignite)	9	10	259,639	289,574	14.6	14.8	8.7	10.3
Ohio	26	23	1,391,004	1,886,843	15.6	22.7	3.8	5.4
Oklahoma	11	9	283,482	198,109	24.0	20.0	12.9	9.1
Pennsylvania	115	107	6,692,693	7,057,863	25.4	26.4	7.5	7.6
Tennessee	15	9	332,115	211,288	21.3	16.4	6.3	3.9
Utah	30	30	2,282,680	2,325,746	51.2	52.3	37.2	35.5
Virginia	47	42	3,875,645	2,963,693	31.1	25.6	18.0	15.5
Washington	-------	2	-----------	169	-------	.1	-------	-------
West Virginia	226	193	15,409,137	14,543,556	24.6	24.0	10.9	10.8
Wyoming	19	19	293,318	293,634	7.8	9.2	4.8	5.6
Total	865	785	51,568,276	48,958,801	24.4	23.7	11.0	10.7

PRODUCTION BY STATE AND COUNTY

Detailed production and employment statistics are given in table 58 for each coal-producing county in the United States from which three or more operators submitted reports for 1953. Statistics on counties with less than three reporting producers have been combined with data for other counties in the same State to avoid disclosing individual figures, unless the operators have granted permission to publish them separately. Production of mines on the border between two States has been credited to the State from which the coal was extracted rather than to that in which the tipple was situated. If the coal was mined from lands in both States, the tonnage was apportioned accordingly.

Bituminous coal and lignite were mined in 26 States and Alaska and in 353 counties in 1953. Since soft-coal composes a very large percentage of the economic activity in many counties, the key items pertaining to the industry are published by counties. These key items—(1) method of shipment of the coal, (2) value, (3) number of men working daily, (4) days worked, and (5) tons per man per day—are very helpful in making analyses of potential markets by counties.

The most striking thing about the following table is the wide variations between the different counties in the same State. Using Alabama as an illustration, production varied from 8.7 million tons in Jefferson County to only 2,210 tons in Winston County in 1953. Even average value and average tons per man per day indicated tremendous variations among the various counties. The differences in average value are the result of quality of coal, method of transportation, or market conditions. The differences in output per man per day are largely caused by physical conditions, method of mining, and the extent of mechanization.

TABLE 58.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and county

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton [3]	Average number of men working daily					Average number of days mines worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface: At auger mining	Surface: In strip pits	Surface: All others	Total			
ALABAMA													
Bibb	82,094	32,740	4,470	119,304	$6.21	200		8	34	242	150	36,272	3.29
Blount	106,600	61,691	30	168,321	6.61	49		43	15	107	191	20,430	8.24
Cullman	5,976	33,907		39,883	6.23	23		22	11	56	165	9,265	4.30
Jefferson	8,340,372	322,062	28,997	8,691,431	6.47	5,821		93	1,317	7,231	216	1,565,274	5.55
Marion	108,144	144,964	384	253,492	8.65	452			85	537	126	67,526	3.75
St. Clair		8,926		8,926	5.84	5		3	1	9	180	1,617	5.52
Shelby	7,450	80,298	115	87,863	6.93	137			16	153	183	28,073	3.13
Tuscaloosa	492,262	87,771	1,269	581,302	4.75	115		148	63	326	197	64,073	9.07
Walker	1,288,871	330,548	959,910	2,579,329	5.96	1,187		305	254	1,746	163	284,457	9.07
Winston	1,000	1,210		2,210	6.08	4				4	148	592	3.73
Total Alabama	10,432,769	1,104,117	995,175	12,532,061	6.33	7,993		622	1,796	10,411	200	2,077,579	6.03
ALASKA													
Total Alaska	819,737	38,200	3,534	861,471	$9.81	187		105	107	399	258	102,780	8.38
ARIZONA													
Navajo		5,140		5,140	$6.25	9			1	10	189	1,887	2.72

ARKANSAS

Franklin	10,242	3,954	----	14,196	$3.91	----	----	15	2	17	157	2,677	5.30
Johnson	350,472	5,481	30	355,983	7.80	136	----	99	65	300	119	35,707	9.97
Logan	64,142	618	805	65,565	10.89	313	----	----	54	367	59	21,506	3.05
Sebastian	318,233	21,230	----	339,463	7.66	384	----	39	62	485	169	82,205	4.13
Total Arkansas	743,089	31,283	835	775,207	7.93	833	----	153	183	1,169	122	142,095	5.46

COLORADO

Boulder	9,275	40,446	100	49,821	$5.82	64	----	----	14	78	133	10,351	4.81
Delta	34,562	21,726	1,357	57,645	5.66	41	----	----	15	56	184	10,296	5.60
El Paso	4,688	36,518	14,721	55,927	4.25	32	----	2	12	46	238	10,930	5.12
Fremont	45,486	129,586	235	175,307	4.32	94	----	12	30	136	196	26,628	6.58
Garfield	550	35,327	----	35,877	4.69	28	----	----	7	35	184	6,442	5.57
Gunnison	220,168	60,596	17,096	297,860	5.52	189	----	----	79	268	156	41,723	7.14
Huerfano	106,340	26,887	2,492	135,719	6.26	175	----	----	108	283	107	30,328	4.48
Jackson	----	2,833	----	2,833	5.61	----	----	3	----	3	277	831	3.41
LaPlata	21,288	22,481	31	43,800	4.17	43	----	----	4	47	202	9,484	4.62
Las Animas	1,127,560	26,306	18,905	1,172,771	6.69	662	----	----	541	1,203	214	257,731	4.55
Mesa	48,654	31,345	411	80,410	4.93	49	----	----	12	61	203	12,392	6.49
Moffat	77,392	12,548	----	89,940	5.39	30	----	----	13	43	175	7,529	11.95
Montrose	----	3,205	----	3,205	5.41	3	----	----	----	3	258	774	4.14
Pitkin	28,283	7,645	----	35,928	4.87	20	----	----	5	25	263	6,567	5.47
Rio Blanco	9,249	13,711	----	22,960	5.06	12	----	----	2	14	204	2,851	8.05
Routt	569,709	36,678	8,113	614,500	4.41	234	----	38	123	395	137	54,131	11.35
Weld	376,362	312,963	11,022	700,347	4.26	432	----	12	93	537	138	74,548	9.39
Total Colorado	2,679,566	820,801	74,483	3,574,850	5.37	2,108	----	67	1,058	3,233	174	563,536	6.34

GEORGIA

Dade	----	6,600	----	6,600	$5.00	11	----	----	----	11	166	1,825	3.62
Walker	----	7,500	----	7,500	5.00	12	----	----	2	14	158	2,210	3.39
Total Georgia	----	14,100	----	14,100	5.00	23	----	----	2	25	161	4,035	3.49

For footnotes, see end of table.

TABLE 58.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and county—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily					Average number of days mines worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface			Total			
							At auger mining	In strip pits	All others				
ILLINOIS													
Bureau	636,230	------	51,218	687,448	$4.08	------	------	41	88	129	232	29,895	23.00
Christian	6,530,263	160,461	31,401	6,722,125	3.42	1,680	------	------	393	2,073	212	439,925	15.28
Clinton	72,183	99,815	13,314	185,312	3.90	180	------	------	58	238	184	43,755	4.24
Douglas	161,709	66,295	1,350	229,354	4.33	58	------	------	16	74	222	16,425	13.96
Franklin	4,283,529	153,864	151,498	4,588,891	4.66	2,987	------	------	1,311	4,298	133	570,651	8.04
Fulton	4,894,153	447,888	7,195	5,349,236	3.82	108	------	346	586	1,040	217	225,949	23.67
Gallatin	143,460	14,208	2,499	160,167	3.74	100	------	------	25	125	207	25,817	6.20
Greene	------	1,045	350	1,395	4.07	3	------	------	------	3	131	393	3.55
Grundy	210,519	71,423	198	282,140	5.33	15	------	34	46	95	232	22,055	12.79
Hancock	------	11,041	92	11,133	6.17	------	------	8	6	14	69	966	11.52
Henry	38,729	19,986	719	59,434	4.66	54	------	------	17	71	111	7,910	7.51
Jackson	1,004,750	80,544	3,946	1,089,240	3.73	185	------	65	134	384	192	73,723	14.77
Jefferson	1,364,034	1,829	3,230	1,369,093	4.42	296	------	------	125	421	222	93,344	14.67
Kankakee	492,135	96,927	------	589,062	4.95	------	------	64	85	149	251	37,437	15.73
Knox	1,776,392	42,844	24,560	1,843,796	3.81	49	------	159	255	463	221	102,139	18.05
La Salle	------	9,136	2,505	11,641	4.73	10	------	8	2	20	126	2,513	4.63
Livingston	------	4,059	------	4,059	6.82	------	------	6	------	6	140	842	4.82
Logan	------	33,710	------	33,710	5.80	30	------	------	10	40	136	5,450	6.19
Macoupin	958,627	42,642	44,631	1,045,900	4.14	864	------	------	283	1,147	99	113,059	9.25
Madison	417,985	590,765	22,617	1,031,367	4.08	630	------	------	212	842	153	129,243	7.98
Marion	59,856	15,445	3,526	78,827	3.71	52	------	------	23	75	199	14,895	5.29
Menard	------	14,001	200	14,201	5.90	39	------	------	6	45	129	5,826	2.44
Montgomery	1,399,116	227,906	5,489	1,632,511	3.62	403	------	------	116	519	204	106,079	15.39
Peoria	55,815	308,706	1,302	365,823	4.65	89	------	33	38	160	168	26,803	13.65
Perry	4,119,214	139,460	46,827	4,305,501	3.57	701	------	195	657	1,553	182	283,167	15.20
Randolph	976,870	85,446	2,159	1,064,475	3.39	238	------	46	144	428	149	63,797	16.69
St. Clair	1,657,421	1,723,398	36,074	3,416,893	3.54	696	------	125	316	1,137	181	206,024	16.58
Saline	3,066,900	11,350	16,586	3,094,836	4.33	1,105	------	131	466	1,702	157	267,036	11.59
Sangamon	------	131,337	558	131,895	5.44	127	------	------	19	146	129	18,877	6.99
Schuyler	------	26,320	100	26,420	5.33	29	------	3	10	42	175	7,365	3.59
Tazewell	------	11,123	30	11,153	6.17	54	------	------	7	61	42	2,592	4.30
Vermilion	634,232	196,527	3,440	834,199	4.19	88	------	49	91	228	158	35,964	23.20
Washington	6,210	13,748	351	20,309	4.40	31	------	------	6	37	114	4,200	4.84
Will	77,258	58,825	------	136,083	5.17	------	------	20	17	37	239	8,861	15.36
Williamson	5,278,057	269,855	34,350	5,582,262	4.16	1,525	------	171	610	2,306	176	405,541	13.76
Total Illinois	40,315,647	5,181,929	512,315	46,009,891	3.95	12,426	------	1,504	6,178	20,108	169	3,398,518	13.54

INDIANA

Clay	1,074,090	190,984	5,415	1,270,489	$3.91			248	145	393	193	75,977	16.72
Daviess	136,896	23,755	2,302	162,953	4.12			45	42	87	58	5,044	32.31
Dubois		14,507		14,507	3.59	15			4	19	101	1,921	7.55
Fountain		46,678		46,678	5.93			9	15	24	248	5,950	7.85
Gibson	622,242	97,336	18,434	738,012	4.12	291		27	69	387	177	68,338	10.80
Greene	599,848	42,518	1,321	643,687	4.01	23		64	87	174	188	32,690	19.69
Knox	1,506,074	478,534	3,315	1,987,923	3.84	504		67	136	707	210	148,716	13.37
Owen	28,104	322	27	28,453	3.83			11	32	43	41	1,772	16.06
Parke		2,222		2,222	5.40	14			4	18	19	342	6.50
Pike	2,472,205	16,636	4,502	2,493,343	3.62	17		317	222	556	213	118,597	21.02
Spencer	25,900	3,903		29,803	4.57	2		7	4	13	206	2,672	11.15
Sullivan	1,798,916	94,352	17,814	1,911,082	4.08	408		136	224	768	170	130,755	14.62
Vermillion	128,172	49,421	1,039	178,632	4.06	46		21	36	103	111	11,465	15.58
Vigo	2,693,168	235,329	446,702	3,375,199	4.26	1,262		73	304	1,639	192	314,063	10.75
Warrick	2,690,293	235,560	3,649	2,929,502	3.74	375		226	397	998	161	161,097	18.18
Total Indiana	13,775,908	1,532,057	504,520	15,812,485	3.94	2,957		1,251	1,721	5,929	182	1,079,399	14.65

IOWA

Appanoose	44,985	74,716	2,403	122,104	$5.40	245		5	27	277	233	42,056	2.90
Boone		6,000		6,000	6.21	18			3	21	70	1,470	4.08
Davis	40,149	109,764	81	149,994	3.28	4		27	14	45	254	11,445	13.11
Jasper		2,500		2,500	4.60			4	1	5	106	530	4.72
Lucas	6,076	8,233	551	14,860	5.35	22			10	32	102	3,272	4.54
Mahaska	66,385	65,104		131,489	3.40	8		48	15	71	160	11,355	11.58
Marion	496,587	243,999	65	740,651	3.48	91		119	75	285	225	63,996	11.57
Monroe	66,929	44,377	52	111,358	4.38	92			17	109	198	21,620	5.15
Page		3,260		3,260	8.14	11			2	13	115	1,495	2.18
Van Buren	2,771	28,237		31,008	4.92			20	10	30	190	5,694	5.45
Wapello	12,096	54,832		66,928	3.79	24		43	12	79	124	9,804	6.83
Warren		7,854		7,854	4.76	11			2	13	205	2,665	2.95
Total Iowa	735,978	648,876	3,152	1,388,006	3.79	526		266	188	980	179	175,402	7.91

KANSAS

Bourbon		15,435		15,435	$4.21			17		17	131	2,225	6.94
Cherokee	439,700	87,873	385	527,958	4.05			80	38	118	218	25,713	20.53
Crawford	596,518	72,490	1,679	670,687	4.37	67		186	125	378	149	56,152	11.94
Linn	481,183	4,534		485,717	3.85			40	54	94	207	19,494	24.92
Osage		15,207		15,207	6.37	24		13	3	40	152	6,077	2.50
Total Kansas	1,517,401	195,539	2,064	1,715,004	4.14	91		336	220	647	169	109,661	15.64

For footnotes, see end of table.

TABLE 58.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and county—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily					Average number of days mines worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface			Total			
							At auger mining	In strip pits	All others				
KENTUCKY													
Eastern Kentucky:													
Bell	1,457,973	201,038	7,204	1,666,215	$5.04	1,748	----------	122	241	2,111	138	290,895	5.73
Boyd	151,427	180,583	----------	332,010	3.99	109	----------	44	25	178	195	34,774	9.55
Breathitt	977,336	31,897	481	1,009,714	5.29	619	----------	26	120	765	207	158,444	6.37
Carter	24,249	104,402	355	129,006	5.01	117	----------	----------	18	135	170	23,017	5.60
Clay	440,556	353,248	----------	793,804	4.57	943	----------	7	154	1,104	178	196,558	4.04
Clinton	----------	19,194	----------	19,194	4.16	26	----------	----------	4	30	132	3,960	4.85
Elliott	----------	17,945	----------	17,945	4.17	20	----------	----------	3	23	203	4,670	3.84
Floyd	5,166,116	416,440	3,987	5,586,543	5.85	3,743	----------	----------	788	4,531	197	892,919	6.26
Greenup	35,000	5,650	----------	40,650	4.09	18	----------	35	10	63	65	4,090	9.94
Harlan	9,707,188	297,626	85,188	10,090,002	5.85	7,867	----------	36	1,322	9,225	189	1,739,697	5.80
Jackson	----------	148,847	668	149,515	4.79	187	----------	23	34	244	150	36,504	4.10
Johnson	364,664	96,036	23	460,723	4.62	537	----------	----------	60	597	167	99,813	4.62
Knott	635,683	200,409	1,489	837,581	4.33	493	----------	6	62	561	141	78,929	10.61
Knox	61,600	116,189	----------	177,789	4.95	272	----------	21	25	318	114	36,404	4.88
Laurel	84,816	144,866	----------	229,682	4.57	231	----------	50	38	319	155	49,368	4.65
Lawrence	----------	55,473	----------	55,473	4.08	53	----------	12	3	68	142	9,683	5.73
Lee	120,383	58,709	----------	179,092	5.20	194	----------	12	45	251	183	45,932	3.90
Leslie	2,103,609	296,097	947	2,400,653	4.18	1,411	----------	----------	223	1,634	173	282,441	8.50
Letcher	4,495,840	523,492	18,886	5,038,218	5.77	3,171	----------	45	523	3,739	171	638,034	7.90
Magoffin	255,850	1,000	51	256,901	4.14	47	28	55	18	148	116	17,164	14.97
Martin	14,292	1,000	----------	15,292	4.94	11	----------	----------	1	12	146	1,752	8.73
McCreary	159,820	50,790	----------	210,610	4.61	340	----------	55	64	459	66	30,501	6.91
Menifee	----------	9,435	----------	9,435	4.67	10	----------	4	----------	14	114	1,595	5.92
Morgan	----------	48,909	----------	48,909	4.87	47	----------	24	----------	71	122	8,662	5.65
Owsley	----------	7,603	----------	7,603	5.67	14	----------	----------	----------	14	146	2,045	3.72
Perry	4,874,023	45,776	37,419	4,957,218	4.99	3,618	----------	16	794	4,428	146	648,494	7.64
Pike	7,283,219	913,187	21,935	8,218,341	4.97	6,217	6	6	1,024	7,253	181	1,310,513	6.27
Pulaski	6,150	222,759	----------	228,909	4.31	197	----------	113	31	341	108	36,974	6.19
Rockcastle	----------	109,315	----------	109,315	4.23	108	----------	61	14	183	114	20,815	5.25
Wayne	----------	32,137	----------	32,137	3.77	40	----------	----------	4	44	163	7,176	4.48
Whitley	338,586	86,507	398	425,491	4.17	260	----------	92	70	422	108	45,625	9.33
Wolfe	----------	13,105	----------	13,105	4.92	9	----------	8	1	18	154	2,780	4.71
Total Eastern Kentucky	38,758,380	4,809,664	179,031	43,747,075	5.29	32,677	34	873	5,719	39,303	172	6,760,228	6.47

Western Kentucky:													
Butler		95,192		95,192	$3.82	90		6	13	109	121	13,210	7.21
Daviess	393,452	218,902		612,354	2.60	91		48	46	185	188	34,732	17.63
Hancock	7,200	117,800		125,000	3.47			24	16	40	200	8,000	15.63
Henderson	1,200	263,976		265,176	3.63	213			36	249	169	42,191	5.85
Hopkins	12,004,492	471,462	1,367	12,477,321	3.41	2,359		449	1,012	3,820	195	745,721	16.73
McLean		7,733		7,733	3.90	15		2	2	19	99	1,150	6.72
Muhlenberg	4,657,660	156,019	16,381	4,830,060	3.18	1,161	8	-187	436	1,792	178	319,533	15.12
Ohio	1,254,814	78,917	2,264	1,335,995	3.41	92		132	173	397	177	70,120	19.05
Union	1,173,861	37,507	1,123	1,212,491	3.30	423			113	536	227	121,799	9.95
Webster	342,398	9,683		352,081	4.19	19		30	19	68	198	13,451	26.18
Total Western Kentucky	19,835,077	1,457,191	21,135	21,313,403	3.35	4,463	8	878	1,866	7,215	190	1,369,907	15.56
Total Kentucky	58,593,457	6,266,855	200,166	65,060,478	4.66	37,140	42	1,751	7,585	46,518	175	8,130,135	8.00

MARYLAND

Allegany	51,806	145,785	111	197,702	$4.85	194		44	22	260	185	48,057	4.11
Garrett	114,276	212,403	6,209	332,888	4.45	189		120	26	335	160	53,638	6.21
Total Maryland	166,082	358,188	6,320	530,590	4.60	383		164	48	595	171	101,695	5.22

MISSOURI

Adair		57,027	1,400	58,427	$4.95	69			18	87	149	12,978	4.50
Barton	578	4,061	70	4,709	3.55			6		6	160	960	4.91
Bates	247,055	8,861		255,916	3.87			25	30	55	207	11,368	22.51
Boone		27,199		27,199	3.79			9	2	11	208	2,293	11.86
Callaway		130,543		130,543	4.78			30	13	43	288	12,378	10.55
Clay		10,088	378	10,466	9.30	79			8	87	72	6,245	1.68
Dade		9,990		9,990	3.81			6		6	280	1,680	5.95
Harrison		4,107		4,107	7.04	12			2	14	150	2,100	1.96
Henry	764,485	47,854	223	812,562	3.89			130	86	216	189	40,889	19.87
Johnson		2,001		2,001	5.50			3		3	180	540	3.71
Lafayette		15,798	52	15,850	6.78	56			8	64	158	10,122	1.57
Linn		1,349		1,349	5.84	12			2	14	72	1,008	1.34
Macon	597,662	31,038	20	628,720	4.08	12		59	75	146	204	29,826	21.08
Putnam		10,850		10,850	4.96	30			4	34	123	4,198	2.58
Ralls		3,740		3,740	5.12			6		6	197	1,183	3.16
Randolph	127,606	42,185		169,791	4.41	95		45	53	193	100	19,250	8.82
Ray		1,088		1,088	8.07	10			2	12	64	768	1.42
St. Clair	201,772	1,026		202,798	3.94			46	24	70	156	10,895	18.61
Vernon	31,291	11,907		43,198	4.01			31	8	39	154	6,023	7.17
Total Missouri	1,970,449	420,712	2,143	2,393,304	4.12	375		396	335	1,106	158	174,704	13.70

For footnotes, see end of table.

TABLE 58.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and county—Continued

County	Production (net tons): Shipped by rail or water [1]	Production (net tons): Shipped by truck	Production (net tons): Used at mine [2]	Production (net tons): Total	Average value per ton [3]	Average number of men working daily: Underground	Average number of men working daily: Surface: At auger mining	Average number of men working daily: Surface: In strip pits	Average number of men working daily: Surface: All others	Average number of men working daily: Total	Average number of days mines worked	Number of man-days worked	Average tons per man per day [4]
MONTANA													
Bituminous coal:													
Blaine	--------	6,540	--------	6,540	$6.42	6	--------	--------	1	7	300	2,100	3.11
Carbon	47,498	6,297	715	54,510	5.29	60	--------	--------	28	88	97	8,577	6.36
Cascade	--------	1,738	--------	1,738	5.89	3	--------	--------	1	4	123	490	3.55
Musselshell	331,608	29,825	2,974	364,407	4.67	234	--------	--------	127	361	149	53,645	6.79
Rosebud	1,418,997	--------	2,142	1,421,139	2.00	--------	--------	51	15	66	218	14,380	98.83
Total bituminous coal	1,798,103	44,400	5,831	1,848,334	2.64	303	--------	51	172	526	151	79,192	23.34
Lignite:													
Custer	--------	5,999	--------	5,999	4.00	5	--------	--------	--------	5	120	600	10.00
Dawson	--------	1,039	--------	1,039	3.50	--------	--------	2	--------	2	93	186	5.59
Richland	--------	8,579	15	8,594	3.97	4	--------	--------	1	5	223	1,113	7.72
Sheridan	--------	9,071	100	9,171	3.47	5	--------	2	2	9	153	1,373	6.63
Total lignite	--------	24,688	115	24,803	3.77	14	--------	4	3	21	156	3,272	7.58
Total Montana	1,798,103	69,088	5,946	1,873,137	2.66	317	--------	55	175	547	151	82,464	22.71
NEW MEXICO													
Bernalillo	--------	1,020	10	1,030	$4.74	3	--------	--------	--------	3	76	228	4.52
Colfax	394,251	28,681	533	423,465	6.12	311	--------	--------	53	364	197	71,538	5.92
McKinley	5,000	35,377	273	40,650	5.55	50	--------	7	11	68	155	10,543	3.86
Rio Arriba	14,810	804		15,614	5.07	17	--------	--------	2	19	231	4,410	3.54
Sandoval	--------	2,415	--------	2,415	4.13	5	--------	--------	--------	5	219	1,095	2.21
San Juan	--------	3,162	--------	3,162	3.89	6	--------	--------	--------	6	215	1,290	2.45
Santa Fe	--------	16,688	--------	16,688	6.09	34	--------	--------	6	40	135	5,400	3.09
Socorro	--------	3,032	--------	3,032	6.08	8	--------	--------	2	10	150	1,500	2.02
Valencia	--------	7,725	--------	7,725	4.84	--------	--------	5	--------	5	170	850	9.09
Total New Mexico	414,061	98,904	816	513,781	6.00	434	--------	12	74	520	186	96,854	5.30

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NORTH DAKOTA (LIGNITE)

Adams	24, 167	4, 132	50	28, 349	$3. 36	-	-	10	-	10	116	1, 159	24. 46
Bowman	158, 155	5, 549	-	163, 704	1. 73	-	-	11	6	17	222	3, 773	43. 39
Burke	339, 791	29, 436	57, 653	426, 880	2. 29	-	-	28	35	63	204	12, 876	33. 15
Burleigh	-	16, 661	-	16, 661	3. 32	-	-	3	-	3	200	600	27. 77
Divide	217, 135	25, 124	222	242, 481	2. 59	-	-	16	22	38	175	6, 650	36. 46
Dunn	-	11, 505	-	11, 505	2. 85	-	-	9	-	9	125	1, 124	10. 24
Grant	-	28, 777	-	28, 777	2. 82	4	-	11	-	15	148	2, 222	12. 95
Hettinger	-	12, 084	15	12, 099	2. 97	-	-	8	2	10	109	1, 090	11. 10
McKenzie	-	1, 229	-	1, 229	4. 00	-	-	3	-	3	115	345	3. 56
McLean	254, 202	38, 906	-	293, 108	2. 37	-	-	32	23	55	200	10, 985	26. 68
Mercer	879, 039	21, 859	75. 240	976, 138	2. 31	60	-	67	74	201	203	40, 863	23. 89
Morton	-	29, 889	-	29, 889	2. 43	2	-	18	-	20	156	3, 127	9. 56
Oliver	-	5, 081	-	5, 081	2. 75	-	-	4	-	4	96	384	13. 23
Stark	-	21, 259	53, 784	75, 043	2. 75	-	-	25	8	33	135	4, 468	16. 80
Ward	296, 568	90, 098	93, 243	479, 909	2. 39	6	-	40	43	89	198	17, 591	27. 28
Williams	-	11, 705	-	11, 705	3. 24	7	-	4	-	11	163	1, 797	6. 51
Total North Dakota	2, 169, 057	353, 294	280, 207	2, 802, 558	2. 36	79	-	289	213	581	188	109, 054	25. 70

OHIO

Athens	334, 055	246, 735	4, 839	585, 629	$4. 38	403	12	26	90	531	152	80, 612	7. 26
Belmont	6, 718, 482	409, 749	23, 711	7, 151, 942	4. 04	2, 551	10	201	701	3, 463	215	743, 953	9. 61
Carroll	143, 200	356, 161	6, 001	505, 362	3. 59	93	9	97	45	244	218	53, 141	9. 51
Columbiana	35, 563	1, 204, 886	600	1, 241, 049	3. 39	74	2	323	69	468	228	106, 916	11. 61
Coshocton	548, 417	487, 092	10	1, 035, 519	3. 63	123	-	165	79	367	235	86, 166	12. 02
Gallia	749, 069	69, 067	-	818, 136	3. 60	143	-	98	63	304	239	72, 739	11. 25
Guernsey	328, 450	46, 320	186	374, 956	3. 33	60	-	45	34	139	198	27, 489	13. 64
Harrison	6, 791, 395	182, 799	13, 195	6, 987, 389	3. 84	520	-	496	708	1, 724	217	373, 370	18. 71
Hocking	7, 688	60, 969	-	68, 657	3. 84	57	-	16	9	82	154	12, 598	5. 45
Holmes	-	1, 619	-	1, 619	3. 26	-	-	4	-	4	46	184	8. 80
Jackson	407, 216	112, 729	2, 390	522, 335	3. 79	49	-	81	48	178	193	34, 287	15. 23
Jefferson	3, 611, 547	1, 147, 566	6, 132	4, 765, 245	4. 01	983	5	378	413	1, 779	218	388, 138	12. 28
Lawrence	-	292, 557	85	292, 642	3. 71	48	-	58	19	125	208	26, 028	11. 24
Mahoming	20, 966	596, 680	4, 692	622, 338	3. 93	-	-	132	26	158	252	39, 803	15. 64
Meigs	633, 742	44, 065	-	677, 807	3. 28	150	-	97	42	289	199	57, 595	11. 77
Morgan	32, 965	16, 583	-	49, 548	3. 40	12	-	6	4	22	223	4, 913	10. 09
Muskingum	717, 474	613, 361	3, 077	1, 333, 912	2. 74	176	-	132	70	378	221	83, 576	15. 96
Noble	1, 414, 021	301, 054	298	1, 715, 373	3. 01	8	-	195	123	326	233	75, 946	22. 59
Perry	1, 839, 346	303, 104	866	2, 143, 316	4. 25	520	-	308	285	1, 113	161	178, 788	11. 99
Portage	-	141, 180	1, 675	142, 855	4. 12	-	-	32	14	46	264	12, 148	11. 76
Stark	-	855, 006	8, 341	863, 347	3. 00	43	-	179	55	277	237	65, 519	13. 18
Tuscarawas	95, 444	2, 081, 235	107, 827	2, 284, 506	3. 82	507	4	323	164	998	234	233, 584	9. 78
Vinton	81, 332	115, 633	-	196, 965	4. 48	34	-	76	31	141	200	28, 181	6. 99
Washington	147, 684	91, 533	74	239, 291	3. 27	-	-	25	12	37	252	9, 322	25. 67
Wayne	-	116, 950	85	117, 035	4. 00	-	-	25	11	36	292	10, 512	11. 13
Total Ohio	24, 658, 056	9, 894, 633	184, 084	34, 736, 773	3. 78	6, 554	42	3, 518	3, 115	13, 229	212	2, 805, 508	12. 38

For footnotes, see end of table.

TABLE 58.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and county—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily					Average number of days mines worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface			Total			
							At auger mining	In strip pits	All others				
OKLAHOMA													
Coal	26,801	7,881		34,682	$6.80	5		14	5	24	236	5,668	6.12
Craig		8,545		8,545	4.68			12		12	162	1,947	4.39
Haskell	617,231	24,806		642,037	6.67	176		143	56	375	217	81,531	7.87
Latimer	66,358	13,761		80,119	2.66			39	10	49	87	4,273	18.75
Le Flore	287,145	3,094		290,239	7.34	147		70	42	259	164	42,456	6.84
McIntosh	160,220	2,126		162,346	3.35			28	9	37	292	10,792	15.04
Muskogee		1,446		1,446	4.40			3		3	68	204	7.09
Okmulgee	355,608	10,492	618	366,718	6.12	321		4	48	373	174	64,907	5.65
Pittsburg	207,847	914		208,761	7.41	199			43	242	233	56,276	3.71
Rogers	338,999	8,120		347,119	5.33			69	44	113	243	27,511	12.62
Sequoyah	21,574			21,574	5.14			13	2	15	95	1,420	15.19
Tulsa		2,607		2,607	7.19	7			1	8	144	1,152	2.26
Wagoner		1,401		1,401	3.49			5	1	6	38	228	6.14
Total Oklahoma	2,081,783	85,193	618	2,167,594	6.10	855		400	261	1,516	197	298,365	7.26
PENNSYLVANIA													
Allegheny	6,983,473	1,995,754	874,743	9,853,970	$5.63	5,459		328	1,032	6,819	212	1,445,553	6.82
Armstrong	2,801,809	363,878	1,710	3,167,397	4.02	1,090	12	490	357	1,949	162	316,271	10.01
Beaver	8,472	452,638	32	461,142	3.87	49		104	39	192	245	47,096	9.79
Bedford	112,495	30,489	1,667	144,651	6.25	228		15	20	263	122	32,035	4.52
Blair	28,535	120,644	6,705	155,884	4.22	77		38	16	131	162	21,232	7.34
Bradford		9,301	1,052	10,353	4.90	3		5		8	215	1,718	6.03
Butler	1,090,280	921,740	31,605	2,043,625	3.93	351	4	383	177	915	233	213,541	9.57
Cambria	10,347,413	472,993	1,161,945	11,982,351	6.44	9,352		239	1,991	11,582	201	2,323,484	5.16
Cameron	20,993	27,477	3,066	51,536	3.93			8	3	11	249	2,741	18.80
Centre	559,279	460,451	2,527	1,022,257	3.55	206		274	71	551	204	112,498	9.09
Clarion	1,483,319	717,421	1,019	2,201,759	3.59	201		386	235	822	242	198,612	11.09
Clearfield	4,977,037	535,478	12,743	5,525,258	4.35	1,758	6	1,234	559	3,557	187	663,566	8.33
Clinton	256,207	334,089	671	590,967	3.07	47		162	49	258	204	52,728	11.21
Elk	332,066	212,894		544,960	3.95	167	5	103	50	325	174	56,626	9.62

Fayette	5, 482, 292	1, 377, 960	2, 246, 358	9, 106, 610	6. 13	5, 854		351	890	7, 095	229	1, 624, 754	5. 60
Fulton and Lycoming	137, 668	31, 256	50	168, 974	6. 13	14		65	28	107	140	14, 935	11. 31
Greene	11, 575, 863	152, 263	14, 917	11, 743, 043	5. 91	6, 523	2		1, 354	7, 879	227	1, 787, 427	6. 57
Huntingdon	79, 080	152, 392	196	231, 668	5. 64	148		74	24	246	123	30, 225	7. 66
Indiana	4, 857, 981	748, 061	242, 661	5, 848, 703	5. 22	2, 984	8	394	760	4, 146	189	783, 333	7. 47
Jefferson	1, 510, 023	175, 862	1, 337	1, 687, 222	4. 02	647		271	177	1, 095	202	220, 972	7. 64
Lawrence		677, 031	313	677, 344	3. 90			142	17	159	261	41, 452	16. 34
McKean		79, 001		79, 001	3. 26			27	2	29	228	6, 612	11. 95
Mercer	263, 406	289, 466	1, 940	554, 812	4. 19	148		90	41	279	222	62, 045	8. 94
Somerset	3, 610, 589	400, 690	25, 029	4, 036, 308	5. 19	3, 070		420	579	4, 069	166	674, 537	5. 98
Tioga		70, 104	100	70, 204	5. 44	50		7	5	62	195	12, 067	5. 82
Venango	56, 897	530, 641	180	587, 718	3. 54	4		119	43	166	253	42, 056	13. 97
Washington	14, 424, 074	1, 232, 387	541, 690	16, 198, 151	6. 17	9, 415		373	1, 867	11, 655	213	2, 487, 181	6. 51
Westmoreland	2, 490, 691	1, 687, 555	406, 757	4, 585, 003	5. 79	2, 928		216	543	3, 687	200	736, 027	6. 23
Total Pennsylvania	73, 489, 942	14, 259, 916	5, 581, 013	93, 330, 871	5. 53	50, 773	37	6, 318	10, 929	68, 057	206	14, 011, 324	6. 66
SOUTH DAKOTA (LIGNITE)													
Corson		3, 147		3, 147	$3. 27			3		3	120	360	8. 74
Dewey		20, 524		20, 524	3. 50			9	2	11	217	2, 390	8. 59
Total South Dakota		23, 671		23, 671	3. 47			12	2	14	196	2, 750	8. 61
TENNESSEE													
Anderson	663, 848	60, 610	5, 929	730, 387	$4. 65	548		26	98	672	177	118, 718	6. 15
Bledsoe	31, 920	19, 927		51, 847	3. 50	94			10	104	178	18, 532	2. 80
Campbell	728, 463	117, 649	3, 860	849, 972	5. 77	1, 086		26	127	1, 239	159	196, 929	4. 32
Claiborne	545, 693	84, 609	2, 876	633, 178	4. 51	460	30	107	86	683	136	92, 569	6. 84
Cumberland		28, 908		28, 908	4. 25	38		3	1	42	146	6, 114	4. 73
Fentress	67, 870	66, 260	600	134, 730	4. 47	206		7	20	233	127	29, 528	4. 56
Grundy	213, 375	24, 480		237, 855	3. 84	154		80	22	256	113	29, 036	8. 19
Hamilton	3, 750	54, 228		57, 978	3. 47	99			12	111	135	15, 034	3. 86
Marion	787, 164	421, 365	337	1, 208, 866	5. 01	1, 103		9	127	1, 239	152	188, 018	6. 43
Morgan	213, 075	69, 750	22, 916	305, 741	5. 21	485		34	91	610	227	138, 749	2. 20
Overton	80, 390	61, 435		141, 825	3. 43	201		19	29	249	135	33, 536	4. 23
Pickett		6, 240		6, 240	4. 88	18				18	73	1, 320	4. 73
Putnam	439, 237	16, 301	775	456, 313	3. 68	162			25	187	215	40, 224	11. 34
Rhea		6, 840		6, 840	4. 63	19			2	21	70	1, 466	4. 67
Scott	315, 389	32, 330		347, 719	3. 54	235	4	63	41	343	116	39, 874	8. 72
Sequatchie		122, 680		122, 680	3. 02	168		7	16	191	114	21, 741	5. 64
Van Buren		121, 540		121, 540	3. 41	66		44	14	124	133	16, 443	7. 39
White	6, 000	17, 950		23, 950	3. 42	33		12	5	50	112	5, 615	4. 27
Total Tennessee	4, 096, 174	1, 333, 102	37, 293	5, 466, 569	4. 60	5, 175	34	437	726	6, 372	156	993, 446	5. 50

For footnotes, see end of table.

TABLE 58.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and county—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily					Average number of days mines worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface			Total			
							At auger mining	In strip pits	All others				
UTAH													
Carbon	4,401,538	174,743	172,842	4,749,123	$5.82	2,251			691	2,942	216	635,647	7.47
Emery	1,475,583	185,417	8,445	1,669,445	5.65	736			235	971	229	221,920	7.52
Garfield		1,418		1,418	4.75	2				2	166	332	4.27
Grand	1,983			1,983	5.00	4			2	6	115	690	2.87
Iron		31,241		31,241	4.49	17			2	19	266	5,062	6.17
Kane		1,905		1,905	6.58	2				2	150	300	6.35
Sevier	23,550	42,359	190	66,099	5.53	25			7	32	228	7,300	9.05
Summit		21,931		21,931	3.34	10			4	14	247	3,455	6.35
Uintah		1,000		1,000	6.87	2				2	140	280	3.57
Total Utah	5,902,654	460,014	181,477	6,544,145	5.76	3,049			941	3,990	219	874,986	7.48
VIRGINIA													
Buchanan	5,461,479	163,203	16,409	5,641,091	$5.29	3,551		41	677	4,269	192	768,993	6.89
Dickenson	4,180,696	134,116	15,285	4,330,097	5.24	1,791	7	130	448	2,376	204	484,749	8.93
Lee	567,910	148,315	6,463	722,688	6.19	771	17	8	127	923	160	147,949	4.88
Montgomery	65,531	6,419		71,950	6.33	88			24	112	175	19,600	3.67
Russell	716,032	202,793	1,377	920,202	5.10	660		4	84	748	151	112,760	8.16
Scott		27,663		27,663	5.33	30			5	35	200	7,000	3.95
Tazewell	2,394,490	40,552	19,155	2,454,197	6.11	1,838			410	2,248	203	455,420	5.39
Wise	4,223,454	520,424	207,284	4,951,162	5.00	3,335	4	161	541	4,041	178	721,117	6.87
Total Virginia	17,609,592	1,243,485	265,973	19,119,050	5.34	12,064	28	344	2,316	14,752	184	2,717,588	7.04

WASHINGTON

King	80,920	70,677	1,080	152,677	$7.21	97		20	35	152	210	31,984	4.77
Kittitas	389,738	11,788	9,926	411,452	7.45	359		23	156	538	175	94,198	4.37
Lewis		13,743		13,743	6.17	17			3	20	184	3,676	3.74
Pierce	50	1,738		1,788	7.38	2				2	249	498	3.59
Thurston	804	17,543		18,347	6.66	14		10	2	26	112	2,920	6.28
Whatcom	83,207	4,340	4,277	91,824	7.22	50			19	69	248	17,086	5.37
Total Washington	554,719	119,829	15,283	689,831	7.32	539		53	215	807	186	150,362	4.59

WEST VIRGINIA

Barbour	3,226,128	37,778	772	3,264,678	$4.23	865	23	276	321	1,485	174	258,109	12.65
Boone	5,601,392	2,546	16,870	5,620,808	5.07	2,633		33	774	3,440	200	689,234	8.16
Braxton	73,055	1,419		74,474	4.79	59			9	68	185	12,604	5.91
Brooke	275,941	166,158	912,978	1,355,077	4.30	488		128	98	714	223	159,050	8.52
Clay	760,896	14,924	12,125	787,945	5.47	488			156	644	211	135,866	5.80
Fayette	7,733,602	134,001	497,255	8,364,858	5.59	5,871	47	404	1,181	7,503	196	1,468,060	5.70
Gilmer	54,341	1,436		55,777	3.14	27		8	3	38	135	5,129	10.87
Grant		48,991		48,991	4.74	57		8	8	73	224	16,326	3.00
Greenbrier	1,466,908	67,607	2,017	1,536,532	4.90	895		126	146	1,167	186	216,948	7.08
Hancock	14,380	132,266	1,125	147,771	3.88	12		29	6	47	237	11,134	13.27
Harrison	8,371,775	189,191	740	8,561,706	4.00	1,964	87	707	724	3,482	169	588,463	14.55
Kanawha	8,748,321	364,141	25,035	9,137,497	5.35	4,326	52	77	742	5,197	210	1,090,595	8.38
Lewis	219,187	9,111	11,800	240,098	3.40	7		77	26	110	127	14,013	17.13
Logan	17,142,058	4,464	43,484	17,190,006	4.81	8,576	10	38	2,101	10,725	183	1,961,648	8.76
Marion	10,055,629	101,461	686,601	10,843,691	5.10	3,918		14	1,025	4,957	222	1,099,497	9.86
Marshall	397,738	35,265	3,341	436,344	4.56	313			53	366	169	61,949	7.04
Mason	106,103	11,407	296,164	413,674	5.12	390			52	442	125	55,456	7.46
McDowell	17,803,702	63,082	495,639	18,362,423	6.17	12,257	21	138	2,539	14,955	198	2,967,249	6.19
Mercer	2,344,211	32,239	15,824	2,392,274	5.88	1,430	19	234	375	2,058	182	375,563	6.37
Mineral	33,544	14,127	10	47,681	4.12	21		17	7	45	136	6,133	7.77
Mingo	7,031,035	77,874	21,932	7,130,841	4.77	3,515	30	11	880	4,436	193	857,175	8.32
Monongalia	8,100,414	134,765	15,230	8,250,409	4.45	3,374	5	55	686	4,120	175	722,475	11.42
Nicholas	3,801,944	28,367	41,270	3,871,581	4.99	2,045	3	69	354	2,471	206	510,205	7.59
Ohio	1,019,554	78,635	3,243	1,101,432	4.37	764			100	864	151	130,455	8.44
Pocahontas	394,763			394,763	6.69	182		31	35	248	248	61,520	6.42
Preston	1,418,742	438,336	151,421	2,008,499	3.90	1,373	3	182	254	1,812	184	332,890	6.03
Putnam		25,156		25,156	4.78	22			4	26	176	4,565	5.51
Raleigh	9,446,518	38,287	63,640	9,548,445	5.88	6,734	39	172	1,466	8,411	186	1,567,570	6.09
Randolph	1,356,527	61,802	10,403	1,428,732	5.89	919	7	129	206	1,261	199	250,747	5.70
Taylor	341,974	9,639		351,613	3.46	84		51	28	163	177	28,822	12.20
Tucker	184,207		33	184,240	5.49	96		35	26	157	165	25,983	7.09
Upshur	906,491	42,709	912	950,112	3.97	414	9	52	89	564	185	104,563	9.10
Wayne	184,695	2,221	246	187,162	4.16	146			22	168	167	28,109	6.66
Webster	1,007,253	17,504	2,741	1,027,498	5.96	637		15	130	782	201	157,032	6.54
Wyoming	8,641,505	13,562	107,455	8,762,522	5.57	4,796	13	67	1,110	5,986	210	1,254,508	6.98
Total West Virginia	128,264,533	2,400,471	3,440,306	134,105,310	5.17	69,698	368	3,183	15,736	88,985	194	17,229,645	7.78

For footnotes, see end of table.

TABLE 58.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States and Alaska, 1953, by State and County—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily					Average number of days mines worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface			Total			
							At auger mining	In strip pits	All others				
WYOMING													
Campbell	275, 867	23, 575	21, 212	320, 654	$1. 36	--------	--------	16	21	37	285	10, 544	30. 41
Carbon	680, 230	50, 547	5, 701	736, 478	5. 57	165	--------	42	85	292	224	65, 306	11. 28
Converse	--------	6, 850	58	6, 908	3. 13	--------	--------	3	--------	3	227	681	10. 14
Fremont	--------	3, 032	10	3, 042	6. 48	4	--------	--------	2	6	245	1, 470	2. 06
Hot Springs	6, 007	6, 523	12	12, 542	7. 71	10	--------	--------	2	12	173	2, 075	6. 04
Johnson	--------	1, 253	200	1, 453	4. 00	2	--------	--------	--------	2	211	422	3. 44
Lincoln	603, 547	4, 940	9, 387	617, 874	2. 97	84	--------	55	49	188	174	32, 669	18. 91
Sheridan	494, 941	39, 905	600	535, 446	3. 21	92	--------	36	55	183	118	21, 556	24. 84
Sublette	--------	1, 000	--------	1, 000	6. 21	3	--------	--------	--------	3	120	360	2. 78
Sweetwater	2, 931, 596	4, 975	72, 604	3, 009, 175	5. 15	1, 487	--------	20	373	1, 880	201	378, 368	7. 95
Total Wyoming	4, 992, 188	142, 600	109, 784	5, 244, 572	4. 53	1, 847	--------	172	587	2, 606	197	513, 451	10. 21
UNITED STATES													
Total United States	397, 780, 945	47, 101, 997	12, 407, 507	457, 290, 449	$4. 92	216, 435	564	21, 395	54, 712	293, 106	191	55, 947, 223	8. 17

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by truck to railroad siding, and hauled by truck to waterway.
[2] Includes coal used by mine employees, taken by locomotive senders at tipple, used at mine for power and heat, transported to point of use by conveyor or tram, made into beehive coke at mine, and all other uses.
[3] 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.)
[4] In certain counties the average tons per man per day is large due to auger mining, strip mining, or mechanical loading underground.

TRANSPORTATION

The method of shipment of bituminous coal and lignite from the mines not only has an important bearing upon the opening of the mine in the first instance but also upon the cost of the transportation and ultimately upon the final price of the coal to consumers at the destination. Before the advent of the railroads coal was transported to consumers by wagons or by water. Thus, the opening of new mines was limited by nearness to market by wagon haulage or easy access to water transportation. By about 1850 the railroads had become the principal method of transporting coal, but here again the opening of new mines and new coal fields awaited arrival of the railroads. Motor trucks were not used until after World War I and not significantly so until the late 1920's. By the middle 1930's, trucks had become not only an important method of transporting coal from mines to the final destination but also were used in hauling coal from mines to tipples and railroad sidings or waterways for further shipment. This latter use made possible the opening of many small mines and even larger strip mines. The introduction of an alternative, and usually cheaper, form of transportation tended to intensify competition among the coal producers and also among certain markets. The historical trend in methods of shipment of soft coal from mines for 1933–53 is shown in table 59 and graphically in figure 16.

Shipments by Railroad.—Rail shipments have been the principal method of moving soft coal from mines since the early advent of the railroads. Before about 1933 approximately 90 percent of the total production was shipped by railroad. Since 1933 the quantity shipped by rail, including the tonnage trucked to rail sidings, declined steadily to 79 percent by 1953. This decline in percentage has been due largely to increased shipments by water and shipments by truck from mines to the final destination.

Detailed statistics on shipments of soft coal, by individual railroads and rivers, are shown in table 60. Data include coal loaded at mines directly into railroad cars or river barges, hauled by truck to railroad sidings and hauled by trucks to waterways. In general, the data show the quantity of bituminous coal and lignite originated for each railroad and waterway as reported by mine operators. It must be noted that in 1 year an operator may report coal loaded on the subsidiary railroad and in another year the same operator may report coal loaded on the parent railroad system.

A very large proportion of the soft coal originating at mines by railroad does not travel to its final destination by rail. Approximately 40 to 50 million tons per year is dumped at Atlantic coast tidewater piers and transported by water coastwise to ports in the United States or exported overseas. In addition, 40 to 50 million tons per year is dumped at lower Lake Erie, Lake Ontario, and Lake Michigan ports, and transported by water to the Northwestern States and to Canada. Some of this coal is again transshipped by rail or trucks to final destination. Weekly and monthly statistics of the tidewater and Lake dumpings are published currently in Weekly Coal Reports of the Bureau of Mines.

Shipments by Waterways.—As mentioned above, some of the earliest shipments of soft coal were by water. However, the major movement by water awaited growth of large consumers located on water, particularly the steel industry on the Monongahela River near

Pittsburgh. Even in 1953 by far the largest movement of soft coal by water was on the Monongahela River. Since 1933 the proportion shipped by water, including the tonnage trucked to water, has been growing and has increased from 4 percent of total production in 1933 to 8 percent in 1953. Part of this growth is accounted for by increased shipments on rivers other than the Monongahela. In 1953 soft coal was being shipped from mines via nine rivers. All of the coal shipped from the mines by river does not travel by river to its final destination. There is a considerable tonnage, moving particularly to the Cincinnati area, that is transshipped from the Ohio River to final destination by railroad or truck.

Trucked to Railroads or Waterways.—The most recent development in the shipment of soft coal is the trucking of coal from mines to railroad sidings or to waterways for further shipment. Table 61 gives the historical trend of this development since 1940, indicating an increase from 1 percent in 1940 to 6 percent of total production in 1953. During the same period the average distance trucked doubled, increasing from 4 miles to 8. Since the producers of approximately two thirds of the tonnage trucked to railroads or waterways gave the distance the coal was trucked, the above figures on distance appear to be representative.

Trucked to Final Destination.—As indicated above, for many years motor trucks have been gradually gaining in importance as a means of transporting coal from mines to final destination. The development of larger and more efficient trucks and of more improved highways has stimulated this growth. The fact that the freight rate per ton-mile for short hauls is characteristically higher than for long hauls has encouraged the use of trucks where it is easiest for them to compete, namely, in short-haul traffic. Since soft coal is produced in some 26 States, many markets are now within trucking distance.

Detailed statistics on shipments of soft coal from mines to the final destination by trucks for 1933–53 are shown in table 59. For 1933–36 producers were asked to report "Commercial sales by truck or wagon, excluding coal used by employees." For 1938–46 producers were asked to report "Shipped by truck or wagon, excluding coal used by mine employees." Beginning with 1947 each producer was asked to report "Shipped by truck or wagon from mine to final destination, excluding coal used by mine employees." It is believed that the figures for the years mentioned above are reasonably comparable. This method of shipping coal from mines to the final destination, as a percentage of total production, doubled in the past 20 years, increasing from 5 percent in 1933 to 10 percent of the total output in 1953.

Used at Mines.—The remaining production of soft coal that is not shipped, has been classified as "Used at Mine." This tonnage includes such categories as coal used by mine employees, taken by locomotive tenders at tipple, used at mines for power and heat, transported from mines to point of use by conveyors or trams, made into beehive coke at mines, and all other uses at mines. Particularly since 1933, there has been little change in the percentage of tonnage used at mines. (See table 59.) However, there have been very substantial changes in the different categories mentioned above. During World War I approximately half of all the coke produced was beehive coke, made at mines. As byproduct ovens replaced beehive ovens in later years, the making of beehive coke at the mines almost ceased. During World War II beehive coke made at mines expanded sharply but dropped steadily after the close of the war and was insignificant in 1953. For many years the tonnages in each of the remaining categories have been decreasing except "Shipped by conveyors or trams to point of consumption," which has been increasing.

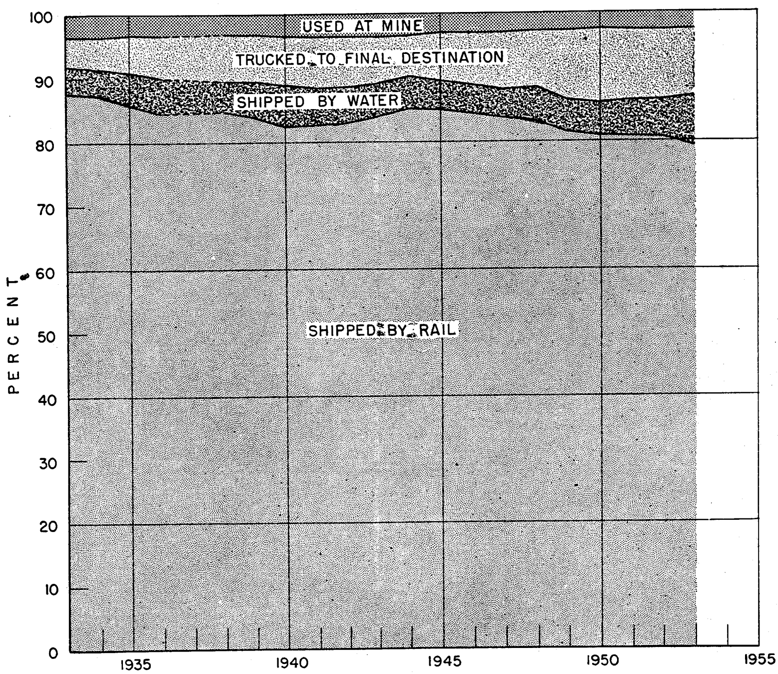

FIGURE 16.—Percentage of total production of bituminous coal and lignite, 1933–53, by method of shipment from mines and used at mines.

TABLE 59.—Method of shipment of bituminous coal and lignite from mines, and used at mines, in the United States, 1933–53

Year	Method of shipment from mines							Used at mines [1]	Total production
	Shipped by rail and trucked to rail			Shipped by water and trucked to water			Trucked to final destination		
	Rail	Trucked to rail	Total	Water	Trucked to water	Total			
	THOUSAND NET TONS								
1933	(2)	(2)	293,258	(2)	(2)	13,021	15,463	11,888	333,630
1934	(2)	(2)	313,304	(2)	(2)	15,128	18,739	12,197	359,368
1935	(2)	(2)	319,742	(2)	(2)	18,327	21,960	12,344	372,373
1936	(2)	(2)	370,763	(2)	(2)	24,868	27,929	15,528	439,088
1937	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	445,531
1938	(2)	(2)	295,336	(2)	(2)	16,903	25,592	10,714	348,545
1939	327,145	4,045	331,190	21,148	1,081	22,229	29,534	11,902	394,855
1940	375,364	5,024	380,388	28,390	1,103	29,493	35,540	15,350	460,771
1941	414,040	11,144	425,184	28,898	1,342	30,240	40,056	18,669	514,149
1942	464,693	18,121	482,814	33,297	721	34,018	45,154	20,707	582,693
1943	464,668	31,195	495,863	29,291	897	30,188	42,433	21,693	590,177
1944	476,455	50,681	527,136	30,328	1,190	31,518	40,123	20,799	619,576
1945	443,332	47,140	490,472	26,152	1,396	27,548	41,477	18,120	577,617
1946	403,111	47,504	450,615	23,493	1,149	24,642	42,731	15,934	533,922
1947	468,554	58,728	527,282	27,911	1,892	29,803	55,859	17,680	630,624
1948	438,746	59,448	498,194	25,250	1,485	26,735	58,260	16,329	599,518
1949	316,182	40,420	356,602	20,760	1,069	21,829	47,786	11,651	437,868
1950	375,578	41,647	417,225	26,299	1,284	27,583	58,286	13,217	516,311
1951	396,308	34,079	430,387	29,019	965	29,984	58,132	15,162	533,665
1952	346,525	29,386	375,911	26,027	1,719	27,746	50,231	12,953	466,841
1953	335,892	26,241	362,133	33,025	2,623	35,648	47,102	12,407	457,290
	PERCENTAGE OF TOTAL								
1933	(2)	(2)	87.9	(2)	(2)	3.9	4.6	3.6	100.0
1934	(2)	(2)	87.2	(2)	(2)	4.2	5.2	3.4	100.0
1935	(2)	(2)	85.9	(2)	(2)	4.9	5.9	3.3	100.0
1936	(2)	(2)	84.4	(2)	(2)	5.7	6.4	3.5	100.0
1937	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	100.0
1938	(2)	(2)	84.7	(2)	(2)	4.9	7.3	3.1	100.0
1939	82.9	1.0	83.9	5.3	0.3	5.6	7.5	3.0	100.0
1940	81.5	1.1	82.6	6.2	.2	6.4	7.7	3.3	100.0
1941	80.5	2.2	82.7	5.6	.3	5.9	7.8	3.6	100.0
1942	79.8	3.1	82.9	5.7	.1	5.8	7.7	3.6	100.0
1943	78.7	5.3	84.0	5.0	.1	5.1	7.2	3.7	100.0
1944	76.9	8.2	85.1	4.9	.2	5.1	6.5	3.3	100.0
1945	76.7	8.2	84.9	4.5	.3	4.8	7.2	3.1	100.0
1946	75.5	8.9	84.4	4.4	.2	4.6	8.0	3.0	100.0
1947	74.3	9.3	83.6	4.4	.3	4.7	8.9	2.8	100.0
1948	73.2	9.9	83.1	4.2	.3	4.5	9.7	2.7	100.0
1949	72.2	9.2	81.4	4.7	.3	5.0	10.9	2.7	100.0
1950	72.7	8.1	80.8	5.1	.2	5.3	11.3	2.6	100.0
1951	74.3	6.4	80.7	5.4	.2	5.6	10.9	2.8	100.0
1952	74.2	6.3	80.5	5.6	.3	5.9	10.8	2.8	100.0
1953	73.5	5.7	79.2	7.2	.6	7.8	10.3	2.7	100.0

[1] Includes coal used by mine employees, taken by locomotive tenders at tipples, used at mines for power and heat, transported from mines to point of use by conveyors or trams, made into beehive coke at mines, and all other uses at mines.
[2] Data not available.

TABLE 60.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States and Alaska, 1953, as reported by mine operators

Route	State	Net tons: By State	Net tons: Total for route
RAILROAD			
Alabama Central	Alabama	84,500	84,500
Alaska	Alaska	819,737	819,737
Algers, Winslow & Western	Indiana	1,773,255	1,773,255
Artemis-Jellico	Kentucky	6,600	6,600
Atchison, Topeka & Santa Fe	Colorado	224,053	985,016
	Illinois	361,712	
	New Mexico	399,251	
Baltimore & Ohio	Illinois	191,673	34,722,033
	Indiana	129,893	
	Maryland	39,018	
	Ohio	3,844,844	
	Pennsylvania	6,429,880	
	West Virginia	24,086,725	
Bessemer & Lake Erie	Pennsylvania	2,129,006	2,129,006
Brimstone	Tennessee	100,059	100,059
Buffalo Creek & Gauley	West Virginia	685,982	685,982
Cambria & Indiana	Pennsylvania	2,768,312	2,768,312
Campbell's Creek	West Virginia	474,587	474,587
Carbon County	Utah	1,780,496	1,780,496
Castlemen River R. R	Maryland	6,234	6,234
Central of Georgia	Alabama	16,063	16,063
Chesapeake & Ohio	Kentucky	11,174,627	53,685,560
	Ohio	283,268	
	Virginia	967,391	
	West Virginia	41,260,274	
Cheswick & Harmar	Pennsylvania	631,599	631,599
Chicago, Burlington & Quincy	Colorado	10,325	8,397,126
	Illinois	6,757,095	
	Iowa	255,229	
	Missouri	597,662	
	Wyoming	776,815	
Chicago & Eastern Illinois	Illinois	807,330	1,603,221
	Indiana	795,891	
Chicago & Illinois Midland	Illinois	4,319,814	4,319,814
Chicago, Indianapolis & Louisville	Indiana	352,618	352,618
Chicago, Milwaukee, St. Paul & Pacific	Indiana	2,790,560	3,303,908
	Montana (bituminous)	331,026	
	North Dakota (lignite)	182,322	
Chicago & North Western	Illinois	1,314,325	1,314,325
Chicago, Rock Island & Pacific	Arkansas	28,079	942,013
	Illinois	636,230	
	Iowa	77,771	
	Missouri	130,818	
	Oklahoma	69,115	
Clinchfield	Kentucky	8,248	5,078,945
	Virginia	5,070,697	
Colorado & Southeastern	Colorado	14,424	14,424
Colorado & Southern	Colorado	30,611	30,611
Colorado & Wyoming	Colorado	916,111	916,111
Conemaugh & Black Lick	Pennsylvania	495,809	495,809
Cumberland & Pennsylvania	Maryland	22,931	22,931
Denver & Rio Grande Western	Colorado	1,107,680	4,171,030
	New Mexcio	14,810	
	Utah	3,048,540	
Detroit, Toledo & Ironton	Ohio	465	465
East Broad Top R. R. & Coal Co	Pennsylvania	281,441	281,441
Emory River R. R	Tennessee	114,675	114,675
Erie	Ohio	35,272	458,037
	Pennsylvania	422,765	
Fort Smith & Van Buren	Oklahoma	376,459	376,459
Galesburg & Great Eastern	Illinois	461,414	461,414
Great Northern	North Dakota (lignite)	556,926	643,070
	Washington	86,144	
Gulf, Mobile & Ohio	Alabama	158,422	1,194,318
	Illinois	1,035,896	
Huntingdon & Broad Top Mountain R. R. & Coal Co	Pennsylvania	47,802	47,802
Illinois Central	Alabama	108,144	26,607,442
	Illinois	11,986,855	
	Indiana	85,390	
	Kentucky	14,427,053	
Illinois Terminal	Illinois	410,167	410,167
Interstate	Kentucky	274,165	2,195,636
	Virginia	1,921,471	
Johnstown & Stoney Creek	Pennsylvania	223,483	223,483
Joplin-Pittsburg	Kansas	21,306	21,306

TABLE 60.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States and Alaska, 1953, as reported by mine operators—Continued

Route	State	Net tons: By State	Net tons: Total for route
RAILROAD—continued			
Kanawha Central	West Virginia	10,449	10,449
Kansas City Southern	Kansas	481,183	897,373
	Missouri	247,055	
	Oklahoma	169,135	
Kelley's Creek & Northwestern	West Virginia	1,242,931	1,242,931
Kentucky & Tennessee	Kentucky	128,431	128,431
Lake Erie, Franklin & Clarion	Pennsylvania	606,591	606,591
Litchfield & Madison	Illinois	317,315	317,315
Louisville & Nashville	Alabama	2,296,959	28,949,310
	Kentucky	25,728,690	
	Tennessee	763,976	
	Virginia	159,685	
Mary Lee	Alabama	529,821	529,821
Midland Valley	Arkansas	150,209	428,952
	Oklahoma	278,743	
Minneapolis & St. Louis	Illinois	1,057,907	1,080,140
	Iowa	22,233	
Minneapolis, St. Paul & Sault Ste. Marie	North Dakota (lignite)	550,770	550,770
Missouri-Illinois	Illinous	214,436	214,436
Missouri-Kansas-Texas	Kansas	418,658	1,266,869
	Missouri	482,901	
	Oklahoma	365,310	
Missouri Pacific	Arkansas	424,856	3,670,369
	Illinois	2,928,065	
	Kansas	286,157	
	Missouri	31,291	
Monongahela	Pennsylvania	1,163,382	10,417,897
	West Virginia	9,254,515	
Montana, Wyoming & Southern	Montana (bituminous)	47,498	47,498
Montour	Pennsylvania	3,162,597	3,162,597
Nashville, Chattanogga & St. Louis	Tennessee	998,788	998,788
New York Central (includes coal shipped over Kanawha & Michigan, Kelley's Creek, Toledo & Ohio Central, and Zanesville & Western)	Illinois	5,802,331	18,425,525
	Indiana	2,787,878	
	Ohio	4,156,038	
	Pennsylvania	3,989,684	
	West Virginia	1,689,594	
New York, Chicago & St. Louis	Ohio	8,205,328	8,205,328
Nicholas, Fayette, & Greenbrier	West Virginia	402,795	402,795
Norfolk & Western	Kentucky	4,857,393	40,136,292
	Virginia	8,667,148	
	West Virginia	26,611,751	
Northeast Oklahoma	Kansas	2,400	2,400
Northern Pacific	Montana (bituminous)	1,419,579	2,706,449
	North Dakota (lignite)	879,039	
	Washington	407,831	
Oklahoma City-Ada-Atoka	Oklahoma	26,801	26,801
Pacific Coast	Washington	60,744	60,744
Pennsylvania (includes Pittsburgh, Cincinnati, Chicago, & St. Louis)	Illinois	7,564	31,052,208
	Indiana	4,240,967	
	Ohio	5,173,290	
	Pennsylvania	21,438,102	
	West Virginia	192,285	
Pittsburgh & Lake Erie	Pennsylvania	1,546,481	1,546,481
Pittsburg & Shawmut	do	1,723,937	1,723,937
Pittsburgh, Chartiers & Youghiogheny	do	5,031	5,031
Pittsburgh & West Virginia	Ohio	521,302	718,722
	Pennsylvania	171,465	
	West Virginia	25,955	
Preston	do	51,479	51,479
St. Louis & O'Fallon	Illinois	132,762	132,762
St. Louis-San Francisco	Alabama	912,377	2,513,917
	Arkansas	139,945	
	Kansas	307,697	
	Missouri	357,678	
	Oklahoma	796,220	
Southern	Alabama	618,154	3,583,954
	Indiana	819,456	
	Kentucky	442,046	
	Tennessee	946,629	
	Virginia	757,669	
Southern Iowa	Iowa	41,190	41,190
Tennessee	Tennessee	581,229	581,229
Tennessee Central	do	551,147	551,147
Tennessee Coal, Iron & Railroad Co	Alabama	3,426,684	3,426,684
Thomas & Sayreton	do	383,844	383,844
Toledo, Peoria, & Western	Illinois	72,109	72,109

TABLE 60.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States and Alaska, 1953, as reported by mine operators—Continued

Route	State	Net tons: By State	Net tons: Total for route
RAILROAD—continued			
Union	Pennsylvania	18,640	18,640
Union Pacific	Colorado	376,362	4,591,735
	Wyoming	4,215,373	
Unity	Pennsylvania	763,528	763,528
Utah	Utah	1,073,618	1,073,618
Virginian	Virginia	65,531	12,630,808
	West Virginia	12,565,277	
Wabash	Illinois	12,983	475,582
	Iowa	339,555	
	Missouri	123,044	
West Virginia Northern	West Virginia	513,119	513,119
Western Allegheny	Pennsylvania	240,701	240,701
Western Maryland	Maryland	97,899	4,919,574
	Pennsylvania	399,864	
	West Virginia	4,421,811	
Winifrede	do	239,798	239,798
Woodward Iron Co	Alabama	1,105,168	1,105,168
Youngstown & Southern	Ohio	21,257	21,257
Total railroad shipments		362,132,733	362,132,733
WATERWAY			
Allegheny River	Pennsylvania	1,520,724	1,520,724
Black Warrior River	Alabama	88,517	88,517
Illinois River	Illinois	1,225,966	1,225,966
Inland Water Way	Alabama	704,116	704,116
Kanawha River	West Virginia	2,996,500	2,996,500
Monongahela River	Pennsylvania	23,197,398	24,311,357
	West Virginia	1,113,959	
Ohio River	Illinois	261,698	4,649,641
	Kentucky	1,546,204	
	Ohio	2,416,992	
	West Virginia	424,747	
Tennessee River	Tennessee	39,671	39,671
Youghiogheny River	Pennsylvania	111,720	111,720
Total waterway shipments		35,648,212	35,648,212
Total loaded at mines for shipment by railroads and waterways.		397,780,945	397,780,945
Shipped by truck from mine to final destination		47,101,997	47,101,997
Used at mine [1]		12,407,507	12,407,507
Total production, 1953		457,290,449	457,290,449

[1] Includes coal used by mine employees, taken by locomotive tenders at tipple, used at mine for power and heat, transported from mine to point of use by conveyor or tram, made into beehive coke at mine, and all other uses at mine.

TABLE 61.—Truck shipments from bituminous-coal and lignite mines in the United States, 1940–53, to railroad siding or waterway

Year	Thousand net tons	Percentage of total production	Average distance trucked (miles)
1940	6,127	1.3	3.6
1941	12,486	2.4	3.7
1942	18,843	3.2	3.9
1943	32,092	5.4	3.8
1944	51,871	8.4	3.8
1945	48,536	8.4	3.8
1946	44,070	8.2	4.0
1947	48,778	7.7	4.6
1948	60,933	10.2	5.3
1949	41,489	9.5	5.4
1950	42,931	8.3	5.9
1951	35,044	6.6	5.7
1952	31,105	6.7	7.5
1953	28,864	6.3	7.7

CONSUMPTION

The statistics on consumption of bituminous coal and lignite, by major consumer class, for 1933–53, as shown in table 62, are based upon complete coverage of all consumers in each class with the exception of "Other industrials" and "Retail deliveries." The figures for each of these 2 categories are based upon a monthly sample approximating 35 percent coverage. In each instance a benchmark was established in 1943 based upon 95-percent coverage. Since 1943 data for each month have been determined by matching of identicals for the last 2 months, calculating the percentage change of these identicals for the last month from the month previous, and applying this percentage change to the published figure for the month previous. The results obtained by this procedure have been reasonably reliable over a period of years. As indicated in footnote 7 of table 62, the total of classes shown approximates total consumption and is a much more reliable figure than "calculated" consumption based on production, imports, exports, and changes in stocks, because certain significant items of stocks are not included in year-end stocks.

There have been a number of major changes in consumption of bituminous coal and lignite during the past 20 years. From a depression level of slightly over 300 million tons in 1933, consumption expanded to a war level of almost 600 million tons in 1943. Since 1943 consumption of soft coal has been generally downward reaching 427 million tons in 1953. An analysis of the different consumer classes reveals wide variations in trends. Since the close of World War II consumption by electric power utilities has almost doubled, coke plants and cement mills have remained steady consumers, and railroads in 1953 used only about one-fourth of their wartime level.

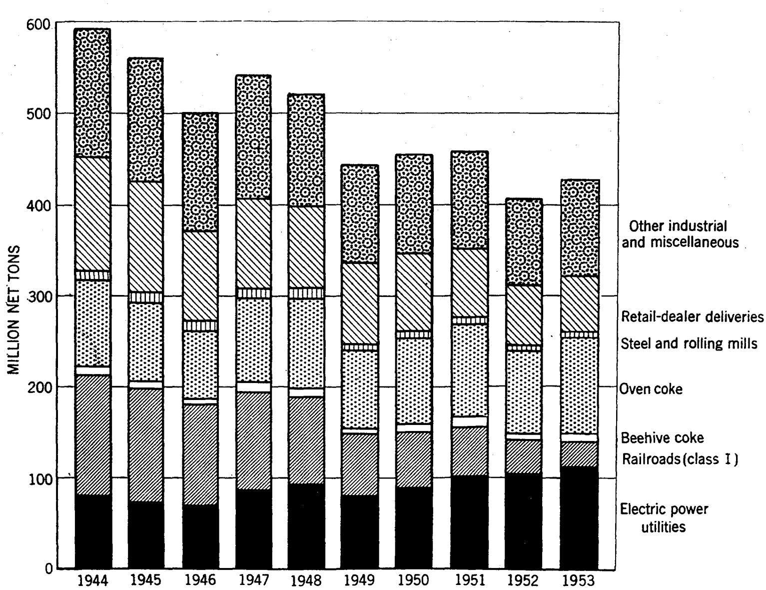

FIGURE 17.—Consumption of bituminous coal and lignite, by consumer class, and retail deliveries in the United States, 1944–53.

Diesel-electric locomotives have rapidly replaced coal-burning steam locomotives. Present experiments on coal-gas turbine locomotives are in process in an effort to recover the lost railroad market for coal. The other consumer classes all declined in coal consumed since World War II, including Retail deliveries.

TABLE 62.—Consumption of bituminous coal and lignite, by consumer class, and retail deliveries in the United States, 1933–53, in thousand net tons

Year and month	Electric power utilities [1]	Bunker foreign trade [2]	Railroads [3] (class I)	Coke plants		Steel and rolling mills	Cement mills [4]	Other industrials [5]	Retail deliveries [6]	Total of classes shown [7]
				Beehive	Ovens					
1933	27,088	1,316	72,548	1,408	38,681	10,009	2,832	83,321	80,482	317,685
1934	29,707	1,321	76,037	1,635	44,343	10,898	3,500	89,448	86,925	343,814
1935	30,936	1,576	77,109	1,469	49,046	11,747	3,516	96,937	83,990	356,326
1936	38,104	1,622	86,391	2,698	63,244	13,471	4,771	113,792	84,200	408,293
1937	41,045	1,832	88,080	4,927	69,575	12,853	5,247	127,142	80,076	430,777
1938	36,440	1,352	73,921	1,360	45,266	8,412	4,483	96,527	68,520	336,281
1939	42,304	1,477	79,072	2,298	61,216	9,808	5,274	103,079	71,570	376,098
1940	49,126	1,426	85,130	4,803	76,583	10,040	5,633	110,469	87,700	430,910
1941	59,888	1,643	97,384	10,529	82,609	10,902	6,832	124,868	97,460	492,115
1942	63,472	1,585	115,410	12,876	87,974	10,434	7,570	135,979	104,750	540,050
1943	74,036	1,647	130,283	12,441	90,019	11,238	5,851	145,518	122,764	593,797
1944	76,656	1,559	132,049	10,858	94,438	10,734	3,789	134,610	124,906	589,599
1945	71,603	1,785	125,120	8,135	87,214	10,084	4,215	129,606	121,805	559,567
1946	68,743	1,381	110,166	7,167	76,121	8,603	7,009	120,610	100,586	500,386
1947	86,009	1,689	109,296	10,475	94,325	10,048	7,938	126,948	99,163	545,891
1948	95,620	1,057	94,838	10,322	96,984	10,046	8,554	112,741	89,747	519,909
1949	80,610	874	68,123	5,354	85,882	7,451	7,988	98,957	90,299	445,538
1950	88,262	717	60,969	9,088	94,757	7,698	7,943	98,164	86,604	454,202
1951	101,898	890	54,005	11,418	102,030	7,973	8,525	105,634	76,531	468,904
1952:										
January	9,537	19	4,301	980	8,796	775	740	9,783	9,389	44,320
February	8,427	19	3,877	904	8,207	743	673	8,932	7,830	39,612
March	8,498	16	3,698	879	8,845	677	665	8,914	7,070	39,262
April	7,749	76	3,321	648	7,661	582	608	7,818	4,214	32,677
May	7,719	92	3,075	627	7,895	562	637	7,208	3,017	30,832
June	7,367	83	2,569	182	3,344	208	582	6,444	2,978	23,757
July	7,605	78	2,342	99	3,302	229	603	6,102	3,219	23,579
August	8,262	76	2,722	344	8,295	532	681	6,602	5,212	32,726
September	8,506	75	2,852	562	8,265	538	679	6,919	6,176	34,572
October	9,602	77	3,128	471	8,677	623	699	8,746	6,936	38,959
November	9,623	75	3,031	540	8,481	653	725	8,895	5,056	37,079
December	10,414	37	3,046	676	8,934	698	781	9,500	7,296	41,382
Total	103,309	723	37,962	6,912	90,702	6,820	8,073	95,863	68,393	418,757
1953:										
January	10,182	11	2,833	760	8,960	679	764	9,300	7,996	41,485
February	8,863	9	2,448	733	8,102	617	687	8,705	6,893	37,057
March	9,104	9	2,560	867	8,994	625	709	9,027	5,756	37,651
April	8,616	73	2,413	820	8,620	559	664	8,422	4,317	34,504
May	8,298	79	2,334	866	9,031	474	692	7,597	2,724	32,095
June	8,764	73	2,168	791	8,763	454	668	7,164	2,841	31,686
July	9,286	73	2,191	650	9,074	449	686	6,985	3,202	32,596
August	9,395	73	2,227	661	8,985	424	682	7,160	4,019	33,626
September	9,379	66	2,134	587	8,591	421	668	7,203	5,325	34,374
October	9,918	66	2,239	567	8,802	469	702	8,262	5,708	36,733
November	9,893	54	2,096	478	8,387	481	686	8,427	5,371	35,873
December	10,585	19	2,092	446	8,339	555	754	9,185	7,143	39,118
Total	112,283	605	27,735	8,226	104,648	6,207	8,362	97,437	61,295	426,798

[1] Federal Power Commission. Represents latest available revised figures for bituminous coal and lignite consumed by public-utility power plants in power generation, including a small quantity of coke amounting to approximately 100,000 tons annually.

[2] Bureau of Census, U. S. Department of Commerce.

[3] Association of American Railroads. Represents consumption of bituminous coal and lignite by class I railways for all uses, including locomotive, powerhouse, shop, and station fuel.. The Interstate Commerce Commission reports that in 1953 consumption for all uses by class I line-haul railways, plus purchases for class II and class III railways, plus purchases by all switching terminal companies combined was 29,211,854 tons of bituminous coal and lignite.

[4] Includes a small amount of anthracite.

[5] Estimates based upon reports collected from a selected list of representative manufacturing plants.

[6] Estimates based upon reports collected from a selected list of representative retailers. Include some coal shipped by truck from mine to final destination.

[7] The total of classes shown approximates total consumption. It is not possible to calculate consumption closely from production, imports, exports and changes in stocks because certain significant items of stocks are not included in year-end stocks. These items are: Stocks on lake and tidewater docks, stocks at other intermediate storage piles between mine and consumer, and coal in transit.

TABLE 63.—Fuel economy in consumption of coal at electric-utility power plants in the United States, 1919–53

Year	Coal consumed per kilowatt-hour (pounds)	Economy gain over 1919 (percent)	Year	Coal consumed per kilowatt-hour (pounds)	Economy gain over 1919 (percent)	Year	Coal consumed per kilowatt-hour (pounds)	Economy gain over 1919 (percent)
1919	3.20	----------	1931	1.52	52.5	1943	1.30	59.4
1920	3.00	6.2	1932	1.49	53.4	1944	1.29	59.7
1921	2.70	15.6	1933	1.46	54.4	1945	1.30	59.4
1922	2.50	21.9	1934	1.45	54.7	1946	1.29	59.7
1923	2.40	25.0	1935	1.44	55.0	1947	1.31	59.1
1924	2.20	31.3	1936	1.44	55.0	1948	1.30	59.4
1925	2.00	37.5	1937	1.44	55.0	1949	1.24	61.2
1926	1.90	40.6	1938	1.40	56.2	1950	1.19	62.8
1927	1.82	43.1	1039	1.38	56.9	1951	1.14	64.4
1928	1.73	45.9	1940	1.34	58.1	1952	1.10	65.6
1929	1.66	48.1	1941	1.34	58.1	1953	1.06	66.9
1930	1.60	50.0	1942	1.30	59.4			

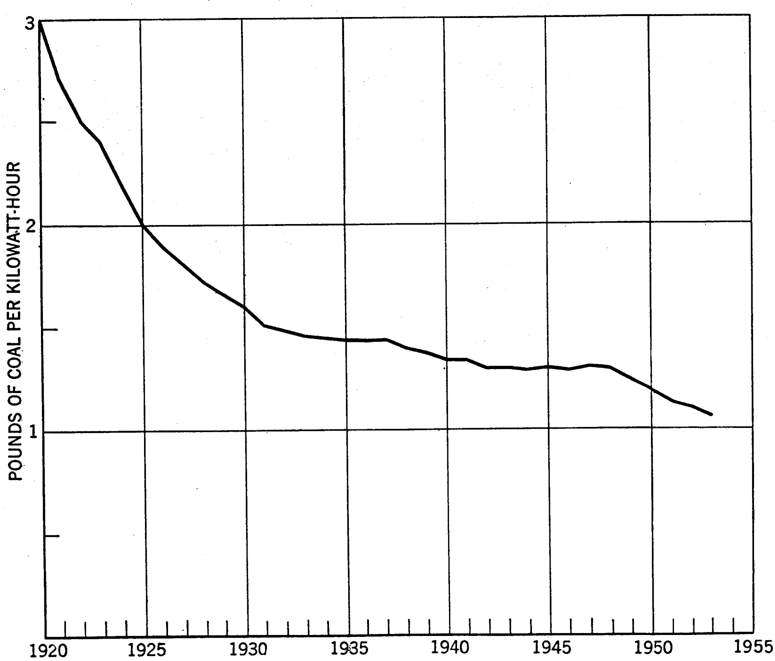

FIGURE 18.—Trend in fuel economy at electric-utility power plants in the United States, 1920–53.

RELATIVE RATE OF GROWTH OF COAL, PETROLEUM, NATURAL GAS, AND WATERPOWER, 1889–1953

The total supply of available energy in the form of coal, oil, natural gas, and waterpower in 1953 was 39,256 trillion B. t. u., a 1.2-percent increase over 1952.

The figures are expressed in British thermal units because some common denominator is necessary for such unlike quantities as tons of coal, barrels of oil, and cubic feet of gas. Table 64 summarizes the equivalent of each of the fuels in British thermal units. Waterpower is represented by the equivalent fuel required to perform the same work.

In converting waterpower to its equivalent of fuel required to perform the same work, the *prevailing* or average performance of all fuel-burning central electric stations for each year in question has been used. This average has declined from about 7.05 pounds of coal consumed per kilowatt-hour in 1899 to 1.06 in 1953, which shows the influence of improving fuel efficiency. The *prevailing* fuel equivalent closely approximates the quantity of fuel that would have been needed in any one year to generate the same power in a steam-electric station. It should be noted, however, that the ultimate use of the waterpower generated often displaces fuel burned much less efficiently than in central stations and that no other important branch of fuel consumption has made advances in fuel efficiency approaching that of the central stations. As these tables attempt to determine the total energy from all fuels and from waterpower, the ideal factor for converting waterpower into fuel equivalent would be the average efficiency of all forms of fuel consumption in each year.

The figures for oil represent production of crude petroleum and imports; the figures for natural gas represent marketed production. Most of this production does not come into direct competition with coal. Much of the supply of both oil and gas is used in regions of the country, such as California and portions of the Southwest, where coal is available only at unusually high cost because of heavy transportation charges. Nearly half of the natural gas is used in the field for drilling or operating oil and gas wells and pipelines or for the manufacture of carbon black. More than half of the oil is used in the form of gasoline, kerosine, and lubricants, purposes for which coal cannot well compete, except at very much higher levels of oil prices. Even these refined products, however, involve a certain measure of indirect competition with coal, for the energy market of the country is becoming more fluid and competitive, and a demand that cannot be met by one source of supply tends to fall back on the others.

The subject of interfuel competition is exceedingly complex, and an elaborate analysis and the accumulation of data not now available would be required to determine even approximately how much of any one fuel actually has been displaced either by other fuels or by waterpower. The present tables do not permit determination of such displacement; their purpose is rather to measure the long-time trends in the total demand for energy.

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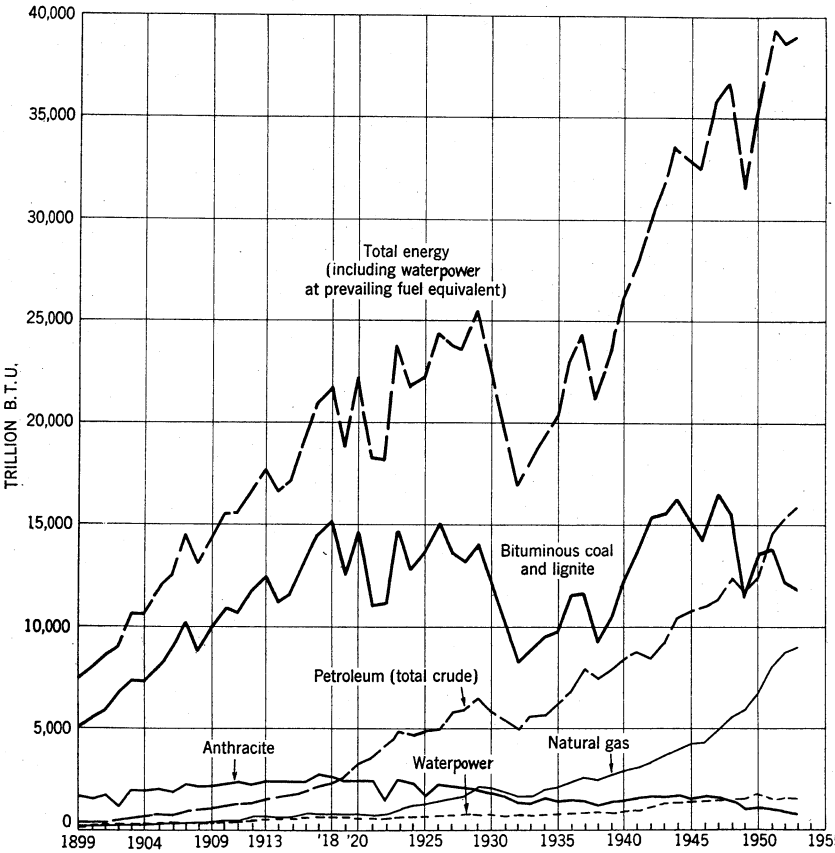

FIGURE 19.—Annual supply of energy from mineral fuels and waterpower in the United States, 1899–1953.

TABLE 64.—Annual supply of energy from mineral fuels and waterpower in the United States, 1889 and 1899–1953, in trillion British thermal units [1]

Year	Pennsylvania anthracite	Bituminous coal and lignite	Total coal	Petroleum (crude)		Natural gas (marketed production)	Total petroleum and natural gas	Total mineral fuels	Waterpower [2]	Grand total
				Domestic production	Imports					
1889	1,157	2,507	3,664	204	----------	268	472	4,136	(3)	(3)
1899	1,535	5,065	6,600	331	----------	240	571	7,171	238	7,409
1900	1,457	5,563	7,020	369	----------	254	623	7,643	250	7,893
1901	1,714	5,917	7,631	402	----------	283	685	8,316	264	8,580
1902	1,051	6,818	7,869	515	----------	301	816	8,685	289	8,974
1903	1,895	7,408	9,303	583	----------	319	902	10,205	321	10,526
1904	1,858	7,301	9,159	679	----------	333	1,012	10,171	354	10,525
1905	1,973	8,255	10,228	781	----------	377	1,158	11,386	386	11,772
1906	1,811	8,983	10,794	734	----------	418	1,152	11,946	414	12,360
1907	2,174	10,343	12,517	963	----------	437	1,400	13,917	441	14,358
1908	2,115	8,713	10,828	1,035	----------	432	1,467	12,295	476	12,771
1909	2,059	9,949	12,008	1,062	----------	517	1,579	13,587	513	14,100
1910	2,146	10,928	13,074	1,215	3	547	1,765	14,839	539	15,378
1911	2,298	10,635	12,933	1,279	8	551	1,838	14,771	565	15,336
1912	2,143	11,793	13,936	1,293	40	604	1,937	15,873	585	16,458
1913	2,325	12,535	14,860	1,441	98	626	2,165	17,025	609	17,634
1914	2,307	11,075	13,382	1,541	98	636	2,275	15,657	636	16,293
1915	2,260	11,597	13,857	1,630	105	676	2,411	16,268	659	16,927
1916	2,224	13,166	15,390	1,744	121	810	2,675	18,065	681	18,746
1917	2,530	14,457	16,987	1,945	175	855	2,975	19,962	700	20,662
1918	2,510	15,180	17,690	2,064	219	775	3,058	20,748	701	21,449
1919	2,238	12,206	14,444	2,195	306	802	3,303	17,747	718	18,465
1920	2,276	14,899	17,175	2,569	616	858	4,043	21,218	738	21,956
1921	2,298	10,897	13,195	2,739	727	712	4,178	17,373	620	17,993
1922	1,389	11,063	12,452	3,234	738	820	4,792	17,244	643	17,887
1923	2,371	14,792	17,163	4,248	476	1,083	5,807	22,970	685	23,655
1924	2,233	12,672	14,905	4,141	451	1,228	5,820	20,725	648	21,373
1925	1,570	13,625	15,195	4,430	359	1,278	6,067	21,262	668	21,930
1926	2,145	15,022	17,167	4,471	350	1,411	6,232	23,399	728	24,127
1927	2,034	13,565	15,599	5,227	339	1,553	7,119	22,718	776	23,494
1928	1,914	13,120	15,034	5,229	463	1,686	7,378	22,412	854	23,266
1929	1,875	14,017	15,892	5,842	458	2,062	8,362	24,254	816	25,070
1930	1,762	12,249	14,011	5,208	360	2,089	7,657	21,668	752	22,420
1931	1,515	10,011	11,526	4,936	274	1,813	7,023	18,549	668	19,217
1932	1,266	8,114	9,380	4,554	259	1,673	6,486	15,866	713	16,579
1933	1,258	8,741	9,999	5,253	185	1,672	7,110	17,109	711	17,820
1934	1,452	9,415	10,867	5,267	206	1,904	7,377	18,244	698	18,942
1935	1,325	9,756	11,081	5,780	187	2,060	8,027	19,108	806	19,914
1936	1,386	11,504	12,890	6,378	187	2,330	8,895	21,785	812	22,597
1937	1,317	11,673	12,990	7,419	159	2,588	10,166	23,156	871	24,027
1938	1,171	9,132	10,303	7,043	153	2,468	9,664	19,967	866	20,833
1939	1,308	10,345	11,653	7,337	192	2,663	10,192	21,845	838	22,683
1940	1,308	12,072	13,380	7,849	247	2,860	10,956	24,336	880	25,216
1941	1,432	13,471	14,903	8,133	294	3,024	11,451	26,354	934	27,288
1942	1,532	15,267	16,799	8,043	71	3,282	11,396	28,195	1,136	29,331
1943	1,540	15,463	17,003	8,733	80	3,671	12,484	29,487	1,304	30,791
1944	1,618	16,233	17,851	9,732	260	3,989	13,981	31,832	1,344	33,176
1945	1,395	15,134	16,529	9,939	429	4,213	14,581	31,110	1,442	32,552
1946	1,537	13,989	15,526	10,057	517	4,333	14,907	30,433	1,406	31,839
1947	1,453	16,522	17,975	10,771	576	4,926	16,273	34,248	1,426	35,674
1948	1,451	15,707	17,158	11,717	[4] 1,099	5,534	18,350	35,508	1,481	36,989
1949	1,085	11,472	12,557	10,683	[4] 1,376	5,827	17,886	30,443	1,539	31,982
1950	1,120	13,527	14,647	11,449	[4] 1,803	6,753	20,005	34,652	1,573	36,225
1951	1,084	13,982	15,066	13,037	[4] 1,800	8,016	22,853	37,919	1,559	39,478
1952	1,031	12,231	13,262	13,282	[4] 2,041	8,614	23,937	37,199	1,581	38,780
1953 [5]	786	11,981	12,767	13,688	[4] 2,254	9,025	24,967	37,734	1,522	39,256

[1] The unit heat values employed are: Anthracite, 12,700 B. t. u. per pound; bituminous coal and lignite, 13,100 B. t. u. per pound; petroleum, 5,800,000 B. t. u. per barrel; residual oil, 6,300,000 B. t. u. per barrel; natural gas, 1,075 B. t. u. per cubic foot. Waterpower includes installations owned by manufacturing plants and mines, as well as Government and privately owned public utilities. The fuel equivalent of waterpower is calculated from the kilowatt-hours of power produced wherever available, as it is true of all public-utility plants since 1919. Otherwise, the fuel equivalent is calculated from the reported horsepower of installed water wheels, assuming a capacity factor of 20 percent for factories and mines and 40 percent for public utilities.

[2] Fuel equivalent calculated by assuming the average central-station practice for each of the years for which data are available.

[3] Data not available.

[4] Includes crude, residual, and distillate

[5] Preliminary.

TABLE 65.—Index number for relative rate of growth of coal, oil, and waterpower in the United States, 1889 and 1899–1953

[1918=100]

Year	Pennsylvania anthracite	Bituminous coal and lignite	Total coal	Petroleum (crude)		Natural gas (marketed production)	Total petroleum and natural gas	Total mineral fuels	Waterpower	Grand total
				Domestic production	Imports					
1889	46	17	21	10	---------	35	15	20	(1)	(1)
1899	61	33	37	16	---------	31	19	35	34	35
1900	58	37	40	18	---------	33	20	37	36	37
1901	68	39	43	19	---------	37	22	40	38	40
1902	42	45	44	25	---------	39	27	42	41	42
1903	75	49	53	28	---------	41	29	49	46	49
1904	74	48	52	33	---------	43	33	49	50	49
1905	79	54	58	38	---------	49	38	55	55	55
1906	72	59	61	36	---------	54	38	58	59	58
1907	87	68	71	47	---------	56	46	67	63	67
1908	84	57	61	50	---------	56	48	59	68	60
1909	82	66	68	51	---------	67	52	65	73	66
1910	85	72	74	59	1	71	58	72	77	72
1911	92	70	73	62	4	71	60	71	81	71
1912	85	78	79	63	18	78	63	77	83	77
1913	93	83	84	70	45	81	71	82	87	82
1914	92	73	76	75	45	82	74	75	91	76
1915	90	76	78	79	48	87	79	78	94	79
1916	89	87	87	84	55	105	87	87	97	87
1917	101	95	96	94	80	110	97	96	100	96
1918	100	100	100	100	100	100	100	100	100	100
1919	89	80	82	106	140	103	108	86	102	86
1920	91	98	97	124	281	111	132	102	105	102
1921	92	72	75	133	332	92	137	84	88	84
1922	55	73	70	157	337	106	157	83	92	83
1923	94	97	97	206	217	140	190	111	98	110
1924	89	83	84	201	206	158	190	100	92	100
1925	63	90	86	215	164	165	198	102	95	102
1926	85	99	97	217	160	182	204	113	104	112
1927	81	89	88	253	155	201	233	109	111	110
1928	76	86	85	253	211	218	241	108	122	108
1929	75	92	90	283	209	266	273	117	116	117
1930	70	81	79	252	164	270	250	104	107	105
1931	60	66	65	239	125	234	230	89	95	90
1932	50	53	53	221	118	216	212	77	102	77
1933	50	57	57	255	84	216	233	82	101	83
1934	58	62	61	255	94	246	241	88	100	88
1935	53	64	63	280	85	266	262	92	115	93
1936	55	76	73	309	85	301	291	105	116	105
1937	52	77	73	359	73	334	332	112	124	112
1938	47	60	58	341	70	318	316	96	124	97
1939	52	68	66	355	88	344	333	105	120	106
1940	52	80	76	380	113	369	358	117	126	118
1941	57	89	84	394	134	390	374	127	133	127
1942	61	101	95	390	32	423	373	136	162	137
1943	61	102	96	423	37	474	408	142	186	144
1944	64	107	101	472	119	515	457	153	192	155
1945	56	100	93	482	196	544	477	150	206	152
1946	61	92	88	487	236	559	487	147	201	148
1947	58	109	102	522	263	636	532	165	203	166
1948	58	103	97	568	[2] 502	714	600	171	211	172
1949	43	76	71	518	[2] 628	752	585	147	220	149
1950	45	89	83	555	[2] 823	871	654	167	224	169
1951	43	92	85	632	[2] 822	1,034	747	183	222	184
1952	41	81	75	644	[2] 932	1,111	783	179	226	181
1953 [3]	31	79	72	663	[2] 1,029	1,165	816	182	217	183

[1] Data not available.
[2] Includes crude, residual, and distillate.
[3] Preliminary.

TABLE 66.—Percentage of total British thermal unit equivalent contributed by the several mineral fuels and waterpower in the United States, 1899–1953 [1]

Year	Pennsylvania anthracite	Bituminous coal and lignite	Total coal	Petroleum (crude)		Natural gas (marketed production)	Total petroleum and natural gas	Total mineral fuels	Waterpower	Grand total
				Domestic production	Imports					
1899	20.7	68.4	89.1	4.5	---------	3.2	7.7	96.8	3.2	100.0
1900	18.4	70.5	88.9	4.7	---------	3.2	7.9	96.8	3.2	100.0
1901	20.0	68.9	88.9	4.7	---------	3.3	8.0	96.9	3.1	100.0
1902	11.7	76.0	87.7	5.7	---------	3.4	9.1	96.8	3.2	100.0
1903	18.0	70.4	88.4	5.6	---------	3.0	8.6	97.0	3.0	100.0
1904	17.6	69.4	87.0	6.4	---------	3.2	9.6	96.6	3.4	100.0
1905	16.8	70.1	86.9	6.6	---------	3.2	9.8	96.7	3.3	100.0
1906	14.7	72.7	87.4	5.9	---------	3.4	9.3	96.7	3.3	100.0
1907	15.2	72.0	87.2	6.7	---------	3.0	9.7	96.9	3.1	100.0
1908	16.6	68.2	84.8	8.1	---------	3.4	11.5	96.3	3.7	100.0
1909	14.6	70.6	85.2	7.5	---------	3.7	11.2	96.4	3.6	100.0
1910	13.9	71.1	85.0	7.9	---------	3.6	11.5	96.5	3.5	100.0
1911	15.0	69.3	84.3	8.3	0.1	3.6	12.0	96.3	3.7	100.0
1912	13.0	71.7	84.7	7.8	.2	3.7	11.7	96.4	3.6	100.0
1913	13.2	71.0	84.2	8.2	.6	3.5	12.3	96.5	3.5	100.0
1914	14.1	68.0	82.1	9.5	.6	3.9	14.0	96.1	3.9	100.0
1915	13.4	68.5	81.9	9.6	.6	4.0	14.2	96.1	3.9	100.0
1916	11.9	70.2	82.1	9.3	.7	4.3	14.3	96.4	3.6	100.0
1917	12.2	70.0	82.2	9.4	.9	4.1	14.4	96.6	3.4	100.0
1918	11.7	70.8	82.5	9.6	1.0	3.6	14.2	96.7	3.3	100.0
1919	12.1	66.1	78.2	11.9	1.7	4.3	17.9	96.1	3.9	100.0
1920	10.4	67.8	78.2	11.7	2.8	3.9	18.4	96.6	3.4	100.0
1921	12.8	60.6	73.4	15.2	4.0	4.0	23.2	96.6	3.4	100.0
1922	7.8	61.8	69.6	18.1	4.1	4.6	26.8	96.4	3.6	100.0
1923	10.0	62.6	72.6	17.9	2.0	4.6	24.5	97.1	2.9	100.0
1924	10.5	59.3	69.8	19.4	2.1	5.7	27.2	97.0	3.0	100.0
1925	7.2	62.1	69.3	20.2	1.7	5.8	27.7	97.0	3.0	100.0
1926	8.9	62.3	71.2	18.5	1.5	5.8	25.8	97.0	3.0	100.0
1927	8.7	57.7	66.4	22.3	1.4	6.6	30.3	96.7	3.3	100.0
1928	8.2	56.4	64.6	22.5	2.0	7.2	31.7	96.3	3.7	100.0
1929	7.5	55.9	63.4	23.3	1.8	8.2	33.3	96.7	3.3	100.0
1930	7.9	54.6	62.5	23.2	1.6	9.3	34.1	96.6	3.4	100.0
1931	7.9	52.1	60.0	25.7	1.4	9.4	36.5	96.5	3.5	100.0
1932	7.6	49.0	56.6	27.5	1.5	10.1	39.1	95.7	4.3	100.0
1933	7.1	49.0	56.1	29.5	1.0	9.4	39.9	96.0	4.0	100.0
1934	7.7	49.7	57.4	27.8	1.1	10.0	38.9	96.3	3.7	100.0
1935	6.7	49.0	55.7	29.0	.9	10.4	40.3	96.0	4.0	100.0
1936	6.1	50.9	57.0	28.2	.9	10.3	38.4	96.4	3.6	100.0
1937	5.5	48.6	54.1	30.9	.6	10.8	42.3	96.4	3.6	100.0
1938	5.6	43.8	49.4	33.8	.7	11.9	46.4	95.8	4.2	100.0
1939	5.8	45.6	51.4	32.3	.9	11.7	44.9	96.3	3.7	100.0
1940	5.2	47.9	53.1	31.1	1.0	11.3	43.4	96.5	3.5	100.0
1941	5.2	49.4	54.6	29.8	1.1	11.1	42.0	96.6	3.4	100.0
1942	5.2	52.1	57.3	27.4	.2	11.2	38.8	96.1	3.9	100.0
1943	5.0	50.2	55.2	28.4	.3	11.9	40.6	95.8	4.2	100.0
1944	4.9	48.9	53.8	29.3	.8	12.0	42.1	95.9	4.1	100.0
1945	4.3	46.5	50.8	30.5	1.3	13.0	44.8	95.6	4.4	100.0
1946	4.8	44.0	48.8	31.6	1.6	13.6	46.8	95.6	4.4	100.0
1947	4.1	46.3	50.4	30.2	1.6	13.8	45.6	96.0	4.0	100.0
1948	3.9	42.5	46.4	31.7	[2] 3.0	14.9	49.6	96.0	4.0	100.0
1949	3.4	35.9	39.3	33.4	[2] 4.3	18.2	55.9	95.2	4.8	100.0
1950	3.1	37.4	40.5	31.6	[2] 5.0	18.6	55.2	95.7	4.3	100.0
1951	2.8	35.4	38.2	33.0	[2] 4.6	20.3	57.9	96.1	3.9	100.0
1952	2.7	31.5	34.2	34.2	[2] 5.3	22.2	61.7	95.9	4.1	100.0
1953 [3]	2.0	30.5	32.5	34.9	[2] 5.7	23.0	63.6	96.1	3.9	100.0

[1] Percentages based upon figures in table.
[2] Includes crude, residual, and distillate.
[3] Preliminary.

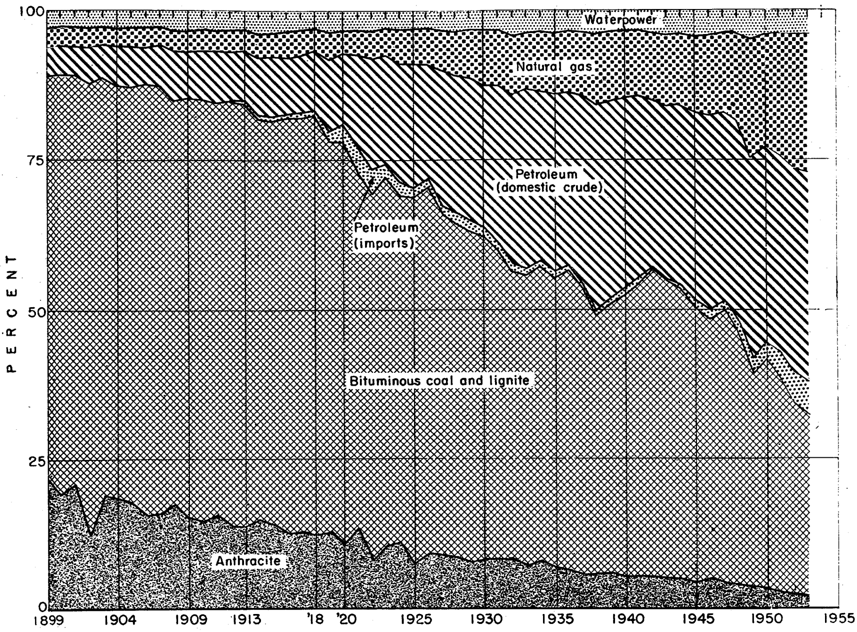

FIGURE 20.—Percentage of total British thermal units equivalent contributed by the several sources of energy in the United States, counting waterpower at the prevailing fuel equivalent of central stations in each year, 1899–1953.

STOCKS

Little or no stocks are accumulated at the mines. Some stocks are built up at intermediate storage piles between mine and consumer, the largest being at river lifting points, such as Cincinnati. Also, there are considerable stocks at Atlantic coast tidewater receiving ports, principally in the New York Harbor area and in New England. Currently, there are approximately 7 to 9 million tons of soft coal in railroad cars in transit and this "backlog" is very helpful in times of emergency and sudden strikes. Year-end stocks on upper Lake docks are listed in table 1.

Stocks of bituminous coal and lignite in the hands of industrial consumers and in retail yards in 1944–53 are shown graphically in figure 2; the wide variations from month to month are caused almost entirely by prolonged strikes. Detailed figures on tonnage of stocks and on days' supply are shown in table 67. All these figures on stocks are based on complete coverage except "Other industrials" and "Retail yards." Stocks for these two categories are based on samples, and the statistical procedure followed is the same as for calculating total consumption, as described above.

There are wide variations in stocks of soft coal held by the different classes of consumers, as expressed in terms of days supply. Traditionally, the largest industrial stocks—over 100 days supply—are held by the electric utilities, and the smallest stocks—approximately 30 days supply—by the railroads. The retail yards have a decided seasonal variation in the size of their stockpiles, increasing in summer and decreasing in winter.

TABLE 67.—Stocks of bituminous coal and lignite in hands of commercial consumers and in retail dealers' yards in the United States, 1952–53

Date	Total stocks (net tons)	Days' supply at current rate of consumption on date of stock taking							
		Coke ovens	Steel plants	Other industrials	Electric utilities	Retail yards	Railroads	Cement mills	Total
1952									
Jan. 1	76,636,000	55	48	62	112	7	29	58	56
Feb. 1	75,423,000	52	49	62	106	5	30	57	53
Mar. 1	76,474,000	56	50	64	112	6	32	58	56
Apr. 1	77,293,000	59	61	68	119	5	36	59	61
May 1	78,141,000	65	70	76	130	9	38	61	72
June 1	79,496,000	67	74	85	139	15	41	61	80
July 1	80,744,000	65	70	94	146	16	47	73	84
Aug. 1	79,359,000	64	66	99	146	16	47	75	85
Sept. 1	81,238,000	60	67	96	138	10	39	74	77
Oct. 1	83,298,000	57	69	94	133	9	37	77	72
Nov. 1	77,951,000	52	58	70	118	7	30	72	62
Dec. 1	75,978,000	48	50	63	113	10	29	66	62
Dec. 31	76,745,000	50	48	62	107	7	31	61	58
1953									
Jan. 1	76,745,000	50	48	62	107	7	31	61	58
Feb. 1	73,346,000	47	45	61	106	6	33	55	55
Mar. 1	71,385,000	46	43	57	107	5	33	51	54
Apr. 1	70,235,000	46	47	59	115	6	33	48	58
May 1	70,531,000	47	49	60	121	7	32	48	62
June 1	72,912,000	48	61	70	134	14	34	50	71
July 1	76,026,000	50	64	75	127	16	38	55	72
Aug. 1	74,752,000	45	63	78	126	15	36	54	71
Sept. 1	77,997,000	51	67	79	128	12	35	61	72
Oct. 1	81,005,000	56	68	78	127	9	37	65	71
Nov. 1	82,719,000	59	68	71	127	9	36	66	70
Dec. 1	82,381,000	60	63	65	123	10	37	67	69
Dec. 31	80,614,000	62	55	60	117	7	38	61	64

PRICES

The prices of bituminous coal and lignite are the most important indicator of the condition of the soft-coal industry and of its position in the competitive market. Current statistics on soft-coal prices are very sketchy, although they do throw some light on the market situation. The coal-trade journals publish current wholesale prices, f. o. b. mine, usually in terms of range, that is, high and low quotations. For many years the Bureau of Labor Statistics, United States Department of Labor, has published monthly average wholesale and retail prices of soft coal, based on a small sampling. The Interstate Commerce Commission publishes monthly data on the average cost of railroad fuel purchased f. o. b. mine. The Bureau of Mines collects and publishes the annual average cost of bituminous coal at merchant coke ovens. Annual averages, 1952–53, for the items mentioned above are shown in table 1. The cost of railroad fuel for 1944–53 is charted in figure 2.

The most valuable single index of the trend of prices at the mines has been the familiar annual figure of "average value per ton, f. o. b. mines." Since 1890 the coal producers have been asked to report annually the total sales value received for coal f. o. b. mines, including an estimate for coal not sold. Although there have been slight variations in requests for selling-cost discounts, the average value figures are reasonably comparable throughout 1890 to 1953, as shown in table 5. For many years total dollars received was reported for over 95 percent of the total output. Estimates, based on reports from adjacent mines, have been made for the remaining 5 percent of production.

The figures on average value per ton have been published in the annual Coal chapter, by State and by county, for 1890 to 1953. The averages for the United States for 1905–53 are plotted in figure 3. The average values, classified according to method of mining, in 1914–53 are shown in table 24 and classified by States in table 68. Separate data by counties are shown in table 58, and lignite values are given in table 69.

The average value, too, has fluctuated widely from year to year, although it has remained remarkably constant for the past 6 years. However, wide variations remain in the average value among States, counties, and methods of mining. Variations resulting from method of mining are discussed in that section of the chapter. The quality of the coal, nearness to market and method of transportation, and competition in the market largely explain the variations in average value among the counties.

TABLE 68.–Average value per ton, f.o.b. mines, of bituminous coal and lignite produced in the United States and Alaska, 1952–53, by States [1]

State	1952				1953			
	Underground mines	Auger mines	Strip mines	Total, all mines	Underground mines	Auger mines	Strip mines	Total, all mines
Alabama	$6.35		$5.44	$6.22	$6.44		$5.63	$6.33
Alaska	9.52		7.09	8.42	11.00		8.64	9.81
Arizona	6.60			6.60	6.25			6.25
Arkansas	8.36		6.90	7.83	8.43		7.40	7.93
California (lignite)			10.24	10.24				
Colorado	5.40		4.46	5.30	5.50		4.23	5.37
Georgia	5.00			5.00	5.00			5.00
Illinois	4.24		3.86	4.10	4.02		3.82	3.95
Indiana	4.15		3.86	3.97	4.23		3.76	3.94
Iowa	4.53		3.50	3.84	4.55		3.47	3.79
Kansas	4.91		3.87	3.90	4.35		4.12	4.14
Kentucky	5.04		3.58	4.80	4.93	$3.75	3.19	4.66
Maryland	[2] 4.84	$4.49	4.16	4.58	4.88	4.53	4.22	4.60
Missouri	5.57		3.96	4.08	5.48		4.02	4.12
Montana:								
Bituminous	4.59		1.99	2.80	4.78		2.00	2.64
Lignite	3.79		3.40	3.70	3.80		3.53	3.77
Total, Montana	4.56		1.99	2.81	4.73		2.00	2.66
New Mexico	5.79		4.50	5.77	6.08		3.67	6.00
North Carolina	7.93			7.93				
North Dakota (lignite)	2.45		2.36	2.37	2.40		2.36	2.36
Ohio	[2] 4.36	3.93	3.47	3.81	4.26	3.28	3.50	3.78
Oklahoma	6.96		5.00	5.78	6.97		5.52	6.10
Oregon	7.34			7.34				
Pennsylvania	[2] 5.71	4.37	3.96	5.31	6.01	3.50	3.84	5.53
South Dakota (lignite)							3.47	3.47
Tennessee	4.95		4.00	4.85	4.77	3.43	3.57	4.60
Utah	5.28			5.28	5.76			5.76
Virginia	5.40	5.12	4.70	5.32	5.38	5.46	4.71	5.34
Washington	7.12		6.91	7.09	7.31		7.39	7.32
West Virginia	[2] 5.32	4.27	4.27	5.23	5.27	4.16	4.14	5.17
Wyoming	4.99		2.99	4.34	5.28		2.97	4.53
Total	5.24	4.31	3.81	4.90	5.27	4.20	3.75	4.92

[1] Average gross realization; selling cost not deducted.
[2] Revised.

LIGNITE [13]

TABLE 69.—Summary of number of mines, production, value, men working daily, days operated, man-days of labor, output per man per day, and detailed operations at underground and strip lignite mines in the United States, 1953, by States [1]

	Montana [2]	North Dakota	South Dakota	Total
OPERATIONS AT UNDERGROUND AND STRIP MINES				
Number of mines	6	46	2	54
Production (net tons):				
Shipped by rail [3]	----------	2,169,057	----------	2,169,057
Shipped by truck or wagon	24,688	353,294	23,671	401,653
Used at mines [4]	115	280,207	----------	280,322
Total	24,803	2,802,558	23,671	2,851,032
Average value per ton	$3.77	$2.36	$3.47	$2.38
Average number of men working daily:				
Underground	14	79	----------	93
Surface: In strip pits	4	289	12	305
All others	3	213	2	218
Total	21	581	14	616
Average number of days worked	156	188	196	187
Number of man-days worked	3,272	109,054	2,750	115,076
Average tons per man per day	7.58	25.70	8.61	24.78
OPERATIONS AT UNDERGROUND MINES				
Number of mines	4	6	----------	10
Shot off the solid ... net tons	22,148	6,627	----------	28,775
Cut by machines ... do	----------	154,811	----------	154,811
Total ... do	22,148	161,438	----------	183,586
Number of cutting machines	----------	5	----------	5
Average output per machine ... net tons	----------	30,962	----------	30,962
Percentage of total underground production cut by machines	----------	95.9	----------	84.3
Average value per ton	$3.80	$2.40	----------	$2.57
Average number of men working daily:				
Underground	14	79	----------	93
All other	2	16	----------	18
Total	16	95	----------	111
Average number of days worked	180	209	----------	205
Man-days of labor	2,886	19,858	----------	22,744
Average tons per man per day	7.67	8.13	----------	8.07
OPERATIONS AT STRIP MINES				
Number of strip pits	2	40	2	44
Production at strip pits ... net tons	2,655	2,641,120	23,671	2,667,446
Average value per ton	$3.53	$2.36	$3.47	$2.37
Number of shovels and dragline excavators	1	49	3	53
Average number of men working daily:				
In strip pits	4	289	12	305
All other	1	197	2	200
Total	5	486	14	505
Average number of days worked	77	184	196	183
Number of man-days worked	386	89,196	2,750	92,332
Average tons per man per day	6.88	29.61	8.61	28.89

[1] Exclusive of small mines producing less than 1,000 tons.
[2] Includes output from Custer, Dawson, Richland, and Sheridan Counties.
[3] Includes coal loaded at mine directly into railroad cars and hauled by truck to railroad siding.
[4] Includes coal used by mine employees, taken by locomotive tenders at tipple, used at mine for power and heat, made into briquets, and other uses.

[13] Detailed data by counties shown in table 58.

FOREIGN TRADE[14]

The United States is both an importer and exporter of bituminous coal and lignite. The historical record of exports and imports for 1890 to 1953, inclusive, is presented in table 5. The exports to Canada and Mexico and "Overseas" for 1910–53 are shown graphically in figure 21. Shipments to Mexico have been only a few thousand tons for many years. "Overseas" includes all shipments overseas other than to Canada and Mexico. Although exports have fluctuated widely over a period of years imports remained reasonably constant from 1890 to 1923, then declined almost steadily from about 2 million tons in 1923 to only 227,000 in 1953.

Imports.—Although this country has a large exportable surplus, a few States get some bituminous coal from Canada. Imports of bituminous coal come from the Crow's Nest Pass field in British Columbia and are received in Washington, Montana, and Idaho; those from Nova Scotia go to Maine and New Hampshire.

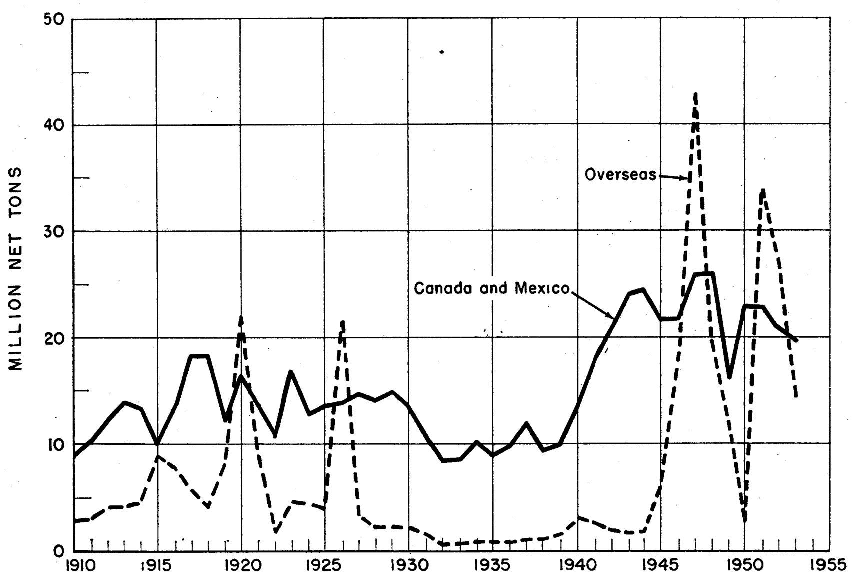

FIGURE 21.—Exports of bituminous coal and lignite from the United States to Canada and Mexico and overseas, 1910–53.

Exports.—Canada has been the principal customer for exports of bituminous coal from the United States. For the past 10 years exports to Canada have been approximately 20 million tons per year.

The overseas exports of bituminous coal, chiefly to Europe, have fluctuated widely since 1913 and have been influenced primarily by war, the aftereffects of war or prolonged strikes. Substantial shipments were made to Europe during and after World War I and during the British coal-mine strike in 1926. From 1927–44, inclusive, shipments to Europe were insignificant. Because of the shortage of coal

[14] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

in Europe after the close of World War II, there were tremendous shipments of bituminous coal from the United States, largely with Federal aid. Since 1945 exports to Europe have fluctuated between 36 million net tons in 1947 to less than 1 million net tons in 1950, depending primarily upon the amount of Federal aid available. Heavy exports to Europe continued and were 8 million tons in 1953. In recent years a considerable amount of bituminous coal has been exported to South America and to Asia.

TABLE 70.—Bituminous coal[1] imported for consumption in the United States, 1951–53, by country and customs district, in net tons

[U. S. Department of Commerce]

Country	1951	1952	1953
North America: Canada	291,774	262,264	226,900
South America: Brazil	441	--------	--------
Europe:			
France	--------	4	--------
Germany	18	--------	--------
Greece	145	--------	--------
Total	292,378	262,268	226,900

Customs district	1951	1952	1953
Alaska	2,506	777	414
Buffalo	--------	772	--------
Chicago	52	--------	48
Dakota	1,185	541	563
Duluth and Superior	221	147	42
Hawaii	310	--------	--------
Los Angeles	441	--------	--------
Maine and New Hampshire	127,816	128,909	116,909
Maryland	18	--------	--------
Michigan	74	--------	58
Minnesota	--------	50	--------
Montana and Idaho	157,500	129,876	106,658
New York	612	4	--------
Ohio	--------	--------	(2)
Philadelphia	--------	15	--------
St. Lawrence	--------	50	--------
Vermont	49	--------	--------
Washington	1,594	1,127	2,208
Total	292,378	262,268	226,900

1 Includes slack, culm, and lignite.
2 Less than 1 ton.

TABLE 71.—Exports of bituminous coal, by country groups, 1944–48 (average) and 1949–53, in thousand net tons

U. S. Department of Commerce]

Year	Canada (including Newfoundland) and Mexico	West Indies and Central America[1]	Overseas (all other countries)							Grand total
			Miquelon, Bermuda, and Greenland	South America	Europe	Asia	Africa	Oceania	Total overseas	
1944–48 (average)	24,033	297	77	1,623	14,613	255	1,023	35	17,626	41,956
1949	16,100	140	6	819	8,682	1,395	612	88	11,602	27,842
1950	23,010	108	1	1,303	794	147	105	--------	2,350	25,468
1951	22,823	125	13	3,016	27,926	1,889	919	11	33,774	56,722
1952	20,984	77	7	2,280	20,672	3,053	541	29	26,582	47,643
1953	19,626	69	2	1,747	8,312	3,915	89	--------	14,065	33,760

1 Includes Bahamas and Panama.

TABLE 72.—Bituminous coal exported from the United States, 1950–53, by countries, in net tons [1]

[U. S. Department of Commerce]

Country	1950	1951	1952	1953
North America:				
Bermuda		612	2,460	1,779
Canada	23,009,089	22,823,044	20,956,569	19,584,135
Central America:				
British Honduras	50	20	20	15
Canal Zone	10,632			
Costa Rica	41	100	55	20
El Salvador	110	75	187	95
Guatemala	337	190	130	181
Honduras	372	248	287	253
Nicaragua	6	16	6	12
Panama	50	30	40	
Greenland		11,461	4,627	
Mexico	767	907	27,496	42,278
Miquelon and St. Pierre	508	444		315
West Indies:				
British:				
Jamaica	3,360	30,274	12,584	12,528
Leeward and Windward Islands		11,060		
Trinidad and Tobago	11,184	11,974	18,774	15,325
Other British	20		5	5
Cuba	73,021	64,808	38,339	36,626
Dominican Republic	99	177	75	55
French	8,940	5,467	6,526	4,259
Haiti	15	15	15	15
Netherland Antilles	80	176	50	
Total North America	23,118,681	22,961,098	21,068,245	19,697,896
South America:				
Argentina	97,343	1,632,480	1,073,938	553,693
Bolivia	11,101	2,810	3,763	14,123
Brazil	1,055,305	1,026,952	875,507	812,804
Chile	97,101	219,496	230,943	271,053
Surinam	3,008	2,590	3,615	1,969
Uruguay	39,168	128,370	92,286	93,278
Other South America	47	3,505	60	62
Total South America	1,303,073	3,016,203	2,280,112	1,746,982
Europe:				
Austria		929,356	720,804	67,069
Belgium-Luxembourg	50,352	1,495,110	711,519	644,303
Denmark		1,075,809	953,273	6,399
Finland	48,107	191,218	204,693	
France	10,944	4,305,301	3,169,758	373,946
Germany	31,333	6,047,167	[2] 7,182,086	[2] 3,141,014
Gibraltar	21,743	170,587	46,025	
Iceland		4,865		3,980
Ireland	10,827	681,679	220,228	
Italy	114,578	5,085,519	3,158,088	1,884,241
Netherlands	33,629	3,368,526	2,077,716	1,232,267
Norway	5,643	991,523	173,480	99,980
Portugal	26,378	139,286	27,265	10,336
Spain		14,800	209,164	46,417
Sweden	140,882	942,039	798,476	53,479
Switzerland	195,975	1,062,053	647,952	196,152
Trieste		118,395	49,027	105,767
United Kingdom	103,579	1,302,260	216,366	
Yugoslavia			106,301	446,270
Total Europe	793,970	27,925,493	20,672,221	8,311,620
Asia:				
Indonesia		13,803	8,255	32,683
Japan	147,218	1,564,472	2,785,313	3,873,888
Pakistan		310,945	255,740	6,273
Other Asia	25	20	3,076	2,229
Total Asia	147,243	1,889,240	3,052,384	3,915,073

For footnotes, see end of table.

TABLE 72.—Bituminous coal exported from the United States, 1950–53, by countries, in net tons [1]—Continued

[U. S. Department of Commerce]

Country	1950	1951	1952	1953
Africa:				
Algeria	68,211	401,592	192,942	10,916
Belgian Congo	-----------	32,242	105,245	22,276
Canary Islands	6,193	66,452	16,271	-----------
Egypt	3,557	106,212	21,870	44,525
French Morocco	-----------	76,574	18,369	-----------
French West Africa	-----------	80,217	33,525	-----------
Gold Coast	-----------	10,362	74,859	-----------
Madeira Islands	-----------	8,886	4,046	-----------
Tunisia	27,470	107,823	49,383	-----------
Other Africa	5	27,956	24,551	10,975
Total Africa	105,436	918,316	541,061	88,692
Oceania	-----------	11,197	29,127	-----------
Grand total	25,468,403	56,721,547	47,643,150	33,760,263

[1] Amounts stated do not include fuel or bunker coal loaded on vessels engaged in foreign trade, which aggregated 874,029 tons in 1949, 717,488 tons in 1950, 908,269 tons in 1951, 723,372 tons in 1952, and 605,019 tons in 1953.
[2] West Germany.

TABLE 73.—Bituminous coal exported from the United States, 1950–53, by customs districts, in net tons

[U. S. Department of Commerce]

Customs district	1950	1951	1952	1953
North Atlantic:				
Maine and New Hampshire	4,208	3,629	6,456	3,843
Massachusetts	30	-----------	-----------	-----------
New York	1,294	4,169	59	98
Philadelphia	22,217	356,978	390,073	24,636
Rhode Island	-----------	-----------	723	-----------
South Atlantic:				
Georgia	49	-----------	176	-----------
Maryland	337,153	3,861,883	2,981,228	1,553,475
South Carolina	-----------	646,454	344,351	-----------
Virginia	2,104,393	28,742,863	22,563,456	12,452,500
Gulf Coast:				
Florida	4,618	562	588	17
Laredo	-----------	-----------	-----------	408
Mobile	66,874	193,143	126,975	147,701
New Orleans	1,545	1,462	3,382	1,020
Sabine	-----------	10	377	-----------
Mexican border:				
Arizona	399	308	164	119
El Paso	211	488	27,266	27,131
Pacific Coast:				
Los Angeles	-----------	10,065	20,496	10,251
Oregon	325	15,552	58,228	-----------
San Diego	157	77	53	25
San Francisco	62	830	5	-----------
Washington	6,112	118,800	224,670	23,283
Northern border:				
Buffalo	979,624	1,036,728	853,663	850,784
Chicago	442,569	925,479	1,192,503	759,546
Dakota	36,728	36,559	43,283	44,705
Duluth and Superior	207,212	350,332	354,055	47,854
Michigan	3,662,662	3,572,549	3,033,863	2,676,464
Montana and Idaho	614	1,637	2,793	1,255
Ohio	12,456,669	11,551,859	11,057,815	11,629,093
Rochester	3,068,678	3,160,056	2,394,845	2,018,576
St. Lawrence	2,062,946	2,126,249	1,959,833	1,451,990
Vermont	1,044	1,388	1,762	1,835
Wisconsin	-----------	200	-----------	-----------
Miscellaneous:				
Alaska	-----------	5	9	4
Hawaii	-----------	40	-----------	-----------
Pittsburgh	-----------	1,193	-----------	-----------
Puerto Rico	10	-----------	-----------	-----------
Total	25,468,403	56,721,547	47,643,150	[1] 33,760,263

[1] Includes 33,650 tons representing estimated data for which district breakdown not available.

TABLE 74.—Shipments of bituminous coal to possessions and other areas administered by the United States, 1951–53 [1]

[U. S. Department of Commerce]

Territory	1951		1952		1953	
	Net tons	Value	Net tons	Value	Net tons	Value
Guam			2	$400		
Puerto Rico	8,577	$93,767	11,459	153,138	3,311	$39,291
Virgin Islands	4,224	40,538	10,515	101,272		

[1] Effective August 1951 shipments of bituminous coal to possessions and other areas administered by the United States not separately classified; data for 1951, 1952, and 1953 cover "coal and related fuels."

WORLD PRODUCTION

World production of anthracite and bituminous coal amounted to 1,512 million metric tons in 1953 and lignite to 452 million tons, a total of 1,964 million tons. Total coal output in 1953, including lignite, was 29 million metric tons over that of 1952. Of the total world coal output, 71 percent was produced in 4 countries—the United States, Russia, Germany, and the United Kingdom. The United States supplied 443 million metric tons of bituminous coal, anthracite, and lignite or 23 percent of the world output in 1953.

Most coal-producing countries in Europe enjoyed increased production during 1953; however, consumption requirements of the principal coal-producing countries on the European Continent exceeded available supplies.

Although world production of anthracite, bituminous coal, and lignite increased in 1953, the European output was not adequate to satisfy requirements, and production from the United States made up a large part of the deficit.

TABLE 75.—World production of bituminous coal, anthracite, and lignite, by countries, 1949–53, in thousand metric tons [1]

[Compiled by Pauline Roberts and Berenice B. Mitchell]

Country	1949	1950	1951	1952	1953
North America:					
Canada:					
Bituminous	15,648	15,364	14,845	14,057	12,587
Lignite	1,697	1,999	2,017	1,890	1,834
Greenland: Bituminous	9	7	8	7	[2] 7
Mexico: Bituminous	1,075	912	1,119	1,317	1,432
United States:					
Anthracite (Pennsylvania)	38,738	39,986	38,709	36,816	28,076
Bituminous	394,420	465,330	481,144	420,771	412,258
Lignite	2,805	3,057	2,986	2,737	2,586
South America:					
Argentina: Bituminous	18	26	37	109	[2] 120
Brazil: Bituminous (including lignite)	2,129	1,959	1,963	1,961	2,030
Chile: Bituminous	2,141	2,217	2,211	2,417	2,336
Colombia: Bituminous [2]	1,015	1,200	1,350	1,300	1,225
Peru: Bituminous and anthracite	170	196	186	225	[2] 223
Venezuela: Bituminous	24	25	28	25	29
Europe:					
Albania: Lignite [2]	16	16	16	16	40
Austria:					
Bituminous	183	183	196	190	162
Lignite	3,816	4,308	5,005	5,179	5,574
Belgium: Bituminous and anthracite	27,854	27,321	29,651	30,384	30,060
Bulgaria:					
Anthracite [2]	27	30	35	35	40
Bituminous, Lignite	4,695	5,682	6,365	7,365	[2] 8,660

For footnotes, see end of table.

TABLE 75.—World production of bituminous coal, anthracite, and lignite, by countries, 1949–53, in thousand metric tons [1]—Continued

Country	1949	1950	1951	1952	1953	
Europe—Continued						
Czechoslovakia:						
Bituminous	17,003	18,456	18,300	20,100	20,200	
Lignite	26,526	27,506	31,000	32,500	34,300	
Denmark: Lignite	1,600	770	1,582	1,275	744	
France:						
Bituminous and anthracite	51,204	50,835	52,968	55,365	52,577	8
Lignite	1,843	1,686	2,004	1,990	1,949	
Germany:						
Bituminous and anthracite:						
East Germany	3,019	2,807	3,417	3,525	[2] 3,900	
West Germany (including pech coal)	104,787	112,299	120,593	125,000	126,155	5
Lignite:						
East Germany	124,000	137,300	158,700	172,900	[2] 186,300	
West Germany	72,264	75,840	83,124	83,366	83,554	4
Greece: Lignite	176	163	191	253	444	
Hungary:						
Bituminous	1,390	1,500	1,630	1,850	[2] 2,400	
Lignite	10,440	11,840	13,620	16,870	[2] 18,900	
Ireland: Bituminous and anthracite	129	172	179	182	184	
Italy:						
Bituminous and anthracite	1,104	1,031	1,167	1,089	1,131	
Lignite	863	781	879	842	771	
Netherlands:						
Bituminous	11,705	12,247	12,424	12,532	12,297	
Lignite	205	194	283	235	252	
Poland:						
Bituminous	74,081	78,001	81,992	84,437	88,596	6
Lignite	4,621	4,837	4,591	4,770	5,295	
Portugal:						
Bituminous and anthracite	443	426	418	442	478	
Lignite	111	95	83	77	71	
Rumania:						
Bituminous and anthracite	230	[2] 300	[2] 400	[2] 420	[2] 420	
Lignite	2,576	[2] 2,900	[2] 3,440	[2] 3,480	[2] 4,100	
Saar	14,262	15,091	16,279	16,235	16,418	
Spain:						
Bituminous and anthracite	10,832	11,118	11,553	12,264	12,395	
Lignite	1,332	1,316	1,497	1,600	1,791	
Svalbard (Spitsbergen): Bituminous [3]	581	551	719	706	687	
Sweden, Bituminous	317	309	279	347	282	
Switzerland:						
Bituminous and anthracite	25	30	20	[2] 10	[2] 10	
Lignite				(4)	(4)	
U. S. S. R.:						
Bituminous and anthracite [2]	191,000	205,000	221,000	230,000	240,000	2
Lignite [2]	45,000	55,000	60,000	71,000	80,000	
United Kingdom:						
Great Britain: Bituminous and anthracite	218,582	219,796	226,464	230,121	227,806	3
Northern Ireland: Bituminous	1	1	1	1	2	
Yugoslavia:						
Bituminous	1,275	1,154	992	1,011	925	
Lignite	10,833	11,712	11,050	11,087	10,321	
Asia:						
Afghanistan: Bituminous	5	9	13	12	16	
China: Bituminous, anthracite, and lignite	[2] 16,000	37,000	43,250	[2] 52,000	[2] 57,000	7
India: Bituminous	32,204	32,826	34,985	36,885	36,422	
Indochina: Bituminous and anthracite	376	494	638	857	833	
Indonesia: Bituminous	662	804	868	969	897	
Iran: Bituminous	[5] 170	[2 5] 200	[2 5] 200	170	150	
Japan:						
Bituminous and anthracite	37,968	38,461	43,320	43,356	46,524	
Lignite	2,088	1,284	1,403	1,536	1,488	
Korea:						
Anthracite:						
Korea, Republic of	1,066	568	129	576	867	
North Korea [2]	1,500	1,500	1,000	750	1,000	
Lignite:						
Korea, Republic of	63	28	6	2	(4)	
North Korea [2]	1,600	500	500	400	400	
Malaya: Bituminous	393	422	389	320	291	
Pakistan: Bituminous	337	444	513	609	593	
Philippines: Bituminous	123	159	151	139	155	
Taiwan (Formosa): Bituminous	1,614	1,405	1,657	2,286	2,393	
Turkey:						
Bituminous	4,182	4,361	4,730	4,846	5,654	
Lignite	1,272	1,214	1,255	1,375	1,531	
U. S. S. R., including Sakhalin, southern: Bituminous	(6)	(6)	(6)	(6)	(6)	

For footnotes, see end of table.

TABLE 75.—World production of bituminous coal, anthracite, and lignite, by countries, 1949–53, in thousand metric tons [1]—Continued

Country	1949	1950	1951	1952	1953
Africa:					
Algeria: Bituminous and anthracite	265	258	247	269	295
Belgian Congo: Bituminous	152	160	218	253	315
French Morocco: Anthracite	341	368	394	460	565
Madagascar: Bituminous	(4)	2	5	4	5
Mozambique: Bituminous	13	56	78	115	162
Nigeria: Bituminous	559	593	559	590	712
Southern Rhodesia: Bituminous	1, 918	2, 128	2, 300	2, 559	2, 619
Tunisia: Lignite	47	41	8	----------	----------
Union of South Africa: Bituminous	25, 496	26, 473	26, 632	28, 064	28, 459
Oceania:					
Australia:					
Bituminous	14, 332	16, 795	17, 891	19, 717	18, 708
Lignite	7, 494	7, 445	7, 962	8, 234	8, 390
New Zealand:					
Bituminous and anthracite	952	936	689	876	787
Lignite	1, 907	1, 777	1, 786	1, 918	1, 773
Other countries (estimate)	100	100	100	100	100
Total all grades	1, 656, 000	1, 812, 000	1, 925, 000	1, 935, 000	1, 964, 000
Lignite (total of item shown above)	325, 000	354, 000	395, 000	426, 000	452, 000
Bituminous and anthracite (by subtraction)	1, 331, 000	1, 458, 000	1, 530, 000	1, 509, 000	1, 512, 000

1 This table incorporates a number of revisions of data published in previous Coal chapters.
2 Estimate.
3 Includes the following quantities, in thousands of metric tons, produced in U. S. S. R.-controlled mines: 1949, 125; 1950, 187; 1951, 249; 1952, 253; and 1953, 260 (estimate).
4 Negligible.
5 Year ended March 20 of year following that stated.
6 Output from U. S. S. R. in Asia included with U. S. S. R. in Europe.

COAL TECHNOLOGY [15]

Significant developments during 1953 in the coal and related industries making products from coal are briefly described. More detailed information regarding these developments may be found in the references cited in footnotes.

The importance of research in coal technology was emphasized by the construction of a new laboratory for the industry-supported Bituminous Coal Research, Inc., and by the many studies of fundamental coal properties, mining methods, coal preparation, and coal combustion, carbonization, gasification, and production of synthetic liquid fuels and chemical products by the Bureau of Mines, and by State and industrial organizations. The year was marked by a significant increase in the amount of mechanical mining equipment sold and an increase in the amount of coal mechanically cleaned, although there was a marked decrease in coal production. Significant also were the improved safety in coal mining and the increased productivity per man-day, steady increases in thermal efficiency (particularly in new, large, utility-type power plants), and the further development of specialized utilization techniques, such as the fluidized-bed lignite drying and carbonizing plant at Rockdale, Tex.

Exploration, Geology, and Reserves.—A reappraisal of the coal reserves of the United States, as of January 1, 1953,[16] by the Federal Geological Survey showed substantial declines from the previous estimates of the total remaining reserves for all ranks of coal except anthracitic. More detailed investigations, such as the State estimates

15 Prepared by E. P. Carman.
16 Averitt, Paul, Berryhill, L. R., and Taylor, D. A., Coal Resources of the United States (a Progress Report, October 1, 1953): Geol. Survey Circ. 293, 1953, 49 pp.

of coal and lignite reserves in Colorado [17] and North Dakota [18] by the Survey and the Bureau of Mines county reports of known recoverable reserves of coking coal, have indicated that earlier coal reserves estimates were in many instances overoptimistic. The Bureau published coking-coal reserve estimates for 2 Pennsylvania counties [19] [20] and for 1 each in West Virginia,[21] Maryland,[22] and Kentucky,[23] while studies were continued in these States and in Tennessee. The Federal Geological Survey published detailed reports or maps describing the geology and coal resources of 8 coal-bearing areas; the Tennessee Division of Geology published 2 charts covering exploratory drilling in that State; and the Division of Geological Survey of Ohio was completing a study of the Lower Kittanning bed in that State.

Constitution, Petrography, Properties, and Analysis.—Bureau of Mines equipment and procedure for determining volatile matter in coal was demonstrated in London to the International Standards Organization Working Group as part of the continued cooperation for establishing international standards for coal analysis and classification, and two Bureau reports on determining bed moisture in low-rank coals were published.[24] [25] The Classification Working Party, Coal Committee, Economic Commission for Europe, tentatively adopted a classification system for anthracitic, bituminous, and subbituminous coals that provided 10 classes, with further subdivision into groups and subgroups according to caking and coking properties.[26]

Growing interest in coal constitution and petrography was evident both in this country and in Europe, with work at Pennsylvania State University and in Europe seeking to relate petrographic constituents with coking properties. Bureau of Mines petrographic studies were largely concerned with studies on lignites, in part relating to the international standards classification work; [27] and the Ohio and Illinois Geological Surveys and the University of Alabama [28] applied various methods of analysis, including petrographic and paleobotanic, to local coals.

The Coal Research Laboratory, Carnegie Institute of Technology, studied coal oxidation and degradation techniques and products [29] [30]

[17] Spencer, F. D., and Erwin, M. I., Coal Resources of Colorado, a Progress Report, January 1, 1953: Geol. Survey Circ. 258, 1953, 17 pp.

[18] Brant, R. A., Lignite Resources of North Dakota: Geol. Survey Circ. 226, 1953, 78 pp., 1 pl.

[19] Wallace, J. J., Dowd, J. J., Bowsher, J. A., Abernethy, R. F., and Reynolds, D. A., Estimate of Known Recoverable Reserves of Coking Coal in Somerset County, Pa.: Bureau of Mines Rept. of Investigations 4998, 1953, 20 pp.

[20] Wallace, J. J., Dowd, J. J., Provost, J. M., Abernethy, R. F., and Reynolds, D. A., Estimate of Known Recoverable Reserves of Coking Coal in Allegheny County, Pa.: Bureau of Mines Rept. of Investigations 5003, 1953, 16 pp.

[21] Wallace, J. J., Dowd, J. J., Tavenner, W. H., Provost, J. M., Abernethy, R. F., and Reynolds, D. A., Estimate of Known Recoverable Reserves of Coking Coal in Wyoming County, W. Va.: Bureau of Mines Rept. of Investigations 4966, 1953, 39 pp.

[22] Wallace, J. J., Dowd, J. J., Williams, L., Abernethy, R. F., and Reynolds, D. A., Estimate of Known Recoverable Reserves of Coking Coal in Allegany County, Md.: Bureau of Mines Rept. of Investigations 4970, 1953, 18 pp.

[23] Wallace, J. J., Dowd, J. J., Travis, R. G., Abernethy, R. F., and Reynolds, D. A., Estimate of known Recoverable Reserves of Coking Coal in Letcher County, Ky.: Bureau of Mines Rept. of Investigations 5016, 1953, 26 pp.

[24] Selvig, W. A., and Ode, W. H., Determination of Moisture-Holding Capacity (Bed Moisture) of Coal for Classification by Rank: Bureau of Mines Rept. of Investigations 4968, 1953, 10 pp.

[25] Goodman J. B., Gomez, Manuel, and Parry, V. F., Determination of Moisture in Low-Rank Coals: Bureau of Mines Rept. of Investigations 4969, 1953, 20 pp.

[26] Brown, R. L., and Carman, E. P., Report of Research and Technologic Work on Coal and Related Investigations, July 1, 1952–December 31, 1953: Bureau of Mines Inf. Circ. 7699, 1954, pp. 8–9.

[27] Selvig, W. A., Properties of Lignites of the United States: Fuel (British), vol. 32, No. 1, January 1953, pp. 28–35.

[28] Shotts, Reynold Q., Quantitative Petrographic Composition of Three Alabama Coals. Min. Eng., vol. 5, May 1953, pp. 522–526.

[29] Entel, J. Ruof, C. H., and Howard, H. C., Separation of Oxygenated Compounds and Hydrocarbons by Adsorption—Compounds Typical of Certain Coal-Degredation Products: Anal. Chem., vol. 25, April 1953, pp. 616–618.

[30] Entel, J., Ruof, C. H., and Howard, H. C., Possible Significance of Lactones as Intermediates in Oxidation of Carbonaceous Materials: Jour. Am. Chem. Soc., vol. 75 No. 12, June 1953, pp. 3038–3039.

and methods of determining macroporosity of porous materials, such as coke.[31] The Bureau of Mines issued three publications giving analyses of tipple and delivered samples of coals of the United States taken during the fiscal years 1948–50,[32] 1951,[33] and 1952.[34] Netherlands and British scientists published studies of coal structure,[35] true density,[36] analytical tolerances,[37] and a shorter method of sulfur determination.[38] The Bureau of Mines, and the Federal and West Virginia Geological Surveys made extensive surveys of the concentration of germanium in various coal beds. The Eagle-Picher Co. cooperated in these surveys by furnishing direct or confirmatory analyses of samples of coal and ash for germanium. The Bureau concentrated largely on the coal supplies to various large public-utility power plants and analyzed the stoker and fly ash from these plants for germanium. It is generally conceded that the recovery of germanium directly from coal would not be economical, but there is substantial evidence that the ash from certain large power plants is a potential source of commercial germanium. Bureau of Mines distillation assays of eastern [39] [40] and Missouri Basin coals [41] gave low-temperature carbonization yields of coke, coal chemicals, and gas; and the assay apparatus as used for low-rank coals was described.[42]

Mining and Mine Transportation.—Increased sales of mechanical mining equipment indicated the increased interest in mechanization as a means of reducing coal-mining costs and meeting the more highly competitive conditions faced by the coal industry in 1953. The Bureau of Mines and the University of Kentucky made studies of continuous mining machines in commercial mines to evaluate the use of these machines under various mining conditions. The Bureau continued cooperation with three companies using German coal planers in relatively thin coal beds, while another plowing-type thin-bed mechanical-mining machine with a walking mechanism for maneuvering was used; both types were used with longwall mining methods. The Le Roi Co. was granted a license to manufacture the continuous mining machine developed by Bituminous Coal Research, Inc. An interesting application of a remotely controlled continuous miner with attached conveyor units to highwall mining was reported from a mine in Pennsylvania,[43] and additional data on another remotely controlled

[31] Ergun, Sabri, and Owen, Jack, Determination of Size Distribution of Macropores in Porous Materials—Macroporosity of Coke by Gas-Flow Method: Anal. Chem., vol. 25, August 1953, pp. 1222–1226.

[32] Snyder, N. H., and Aresco, S. J., Analyses of Tipple and Delivered Samples of Coal (Collected During the Fiscal Years 1948–50, Inclusive): Bureau of Mines Bull. 516, 1953, 133 pp.

[33] Aresco, S. J., and Haller, C. P., Analyses of Tipple and Delivered Samples of Coal (Collected During the Fiscal Year 1951): Bureau of Mines Rept. of Investigations 4934, 1953, 93 pp.

[34] Aresco, S. J., and Haller, C. P., Analyses of Tipple and Delivered Samples of Coal (Collected During the Fiscal Year 1952): Bureau of Mines Rept. of Investigations 4972, 1953, 84 pp.

[35] Van Krevelen, D. W., Physikalische Eigenschaften und chemische Struktur der Steinkohle: Brennstoff-Chem., vol. 34, Nos. 11–12, June 17, 1953, pp. 167–82.

[36] Dryden, I. G. C., Chemical Significance of True Density of Coals: Fuel (British), vol. 32, No. 1, January 1953, pp. 82–88.

[37] Tomlinson, R. C., and Hall, D. A., Analytical Tolerances and the Detection of Mistaken Results, With Particular Reference to Coal Analysis: Fuel (British), vol. 32, No. 1, January 1953, pp. 77–81.

[38] Mott, R. A., and Wilkinson, H. C., The Use of the Eschka Method for Determination of High Sulfur Contents: Jour. App. Chem., vol. 3, part 5, May 1953, pp. 218–223.

[39] Reynolds, D. A., Davis, J. D., Wolfson, D. E., Naugle, B. W., Brewer, R. E., Birge, G. W., and Frederic, W. H., Carbonizing Properties; West Virginia Coals From the Beckley Bed, Caretta No. 5 Mine, McDowell County, and Glen Rogers No. 2 Mine, Wyoming County: Bureau of Mines Bull. 522, 1953, 27 pp.

[40] Reynolds, D. A., Davis, J. D., Birge, G. W., Brewer, R. E., Wolfson, D. E., Ode, W. H., and Naugle, B. W., Carbonizing Properties; Tennessee Coals From the Jellico Bed in Campbell County and the Sewanee Bed in Marion County: Bureau of Mines Bull. 523, 1953, 35 pp.

[41] Gomez, Manuel, and Goodman, J. B., Distillation Assays of Missouri River Basin Coals: Bureau of Mines Rept. of Investigations 5009, 1953, 9 pp.

[42] Goodman, John B., Gomez, Manuel, Parry, V. F., and Landers, W. S., Low-Temperature Carbonization Assay of Coal in a Precision Laboratory Apparatus: Bureau of Mines Bull. 530, 1953, 24 pp.

[43] Coal Age, Remotely Controlled Miner Works 350 Feet Beyond Highwall: Vol. 59, No. 1, January 1954, pp. 64–67.

miner were reported.[44] The British reported experiences with 6 continuous-mining methods,[45] 3 of which used plow- or stripper-type machines.

Attention was directed to concentrating production into fewer working places and operating with fewer men and to developing mining plans to permit continuous production from face to preparation plant or tipple. Toward this end progress was made in developing extensible belt conveyors of various types for use behind continuous mining machines and in improving the machines themselves to permit greater flexibility and adaptability.

A decided trend to mobile mechanical mining equipment of all types was in evidence, with increased use of high-capacity intermediate- and low-bed mobile loaders and shuttle cars. There was also more use of mobile cutters and mobile coal and roof-bolting drills and an increase in belt haulage, particularly in new developments.

Improvements in construction materials permitting faster and more continuous operation included development of harder cutting elements with better wearing qualities and the introduction of aluminum troughs and carrier frames for shaking conveyors. The introduction of two types of tractor-treaded shuttle cars provided equipment for use with bad bottoms or steep grades.

There were many references in the technical literature to articles on stowing in Great Britain, the Soviet Union, India, Germany, France, and Belgium. Study of roof pressures and design of roof-support members was continued by the Bureau, and one anthracite mine installed compressible ring supports in a particularly bad section of an important haulage tunnel. The British and Germans conducted studies of pressures developed in mines, and the British introduced a movable, steel, roof-supporting device.[46]

Roof bolting continued to receive the active attention of both research and operating personnel and equipment manufacturers, as the Bureau of Mines reported on the use of torque wrenches.[47] Experiences under varying roof conditions were reported from bituminous-coal mines [48] and improved roof-bolt drilling and dust-collecting apparatus was introduced. In some instances roof-bolt drills have been mounted on continuous-mining machines. Interest in roof bolting in other countries was indicated by reports from Great Britain, France, and Germany.

Field tests at an unused mine confirmed laboratory results at Johns Hopkins University indicating that practical methods of abating water pollution from coal-mine acid wastes may be possible by a chemical spraying or dusting treatment, which may last 6 to 8 years.

In strip mining the attention of operators and equipment manufacturers continued to be directed toward improvements in earth-moving, drilling, and haulage equipment. High-speed, rotary over-

[44] Alspaugh, P. L., Remotely Controlled Bore Mining: Coal-Mine Modernization, 1953, pp. 134–140.

[45] Harley, P. L., Experience Gained from Continuous Mining Schemes: Trans. Inst. Min. Eng. (British) vol. 112, part 11, August 1953, pp. 911–932.

[46] Colliery Engineering (British), Gedling Gatehead Safety Canopy: Vol. 30, No. 347, January 1953, pp. 34–36.

[47] Barry, A. J., Panek, L. A., and McCormick, John A., Use of Torque Wrench to Determine Load in Roof Bolts; Part 1. Slotted-Type Bolts: Bureau of Mines Rept. of Investigations 4967, 1953, 7 pp.

[48] Cooper, E. R., Increasing Reserves Through Roof Bolting: Coal Mine Modernization, 1953, pp. 16–20; Hunter, J. C., Roof-Bolting Experiences and Results: Pp. 21–24; Knight, Herman E., Development of Roof-Bolting Equipment: Pp. 25–35.

burden drills with pneumatic removal of cuttings and trucks, capable of carrying up to 70 tons and with engines up to 400 hp., have speeded stripping operations, while the design of larger and improved shovels and draglines continues to meet the need for removing increasing heights of overburden. Augers for recovering coal from strip-mine highwalls had rather wide application in recovering coal beyond the economical limits of overburden removal, the maximum depth of boring remaining around 200 feet from the highwall.

Health and Safety in Mining.—A striking drop in coal-mining fatalities, from 548 in 1952 to 460 in 1953, to again record the lowest number of deaths in the history of the coal-mining industry, and a greatly improved nonfatal-accident record, both in number and frequency, featured the health and safety record of coal mining in 1953. There was only 1 major disaster (that is, an accident in which 5 or more men lose their lives) in coal mining in 1953; here 2 men were killed by a coal-dust explosion, while 3 of 5 men who entered the mine later to investigate died of carbon monoxide poisoning. There were 396 fatalities in bituminous-coal and lignite mines in 1953, a drop of 53 from the previous low in 1952. Despite the 13-percent decrease in total man-hours of exposure there was also a decrease in the rate per million man-hours, or 0.84 for 1953 as compared to 0.90 for 1952. However the nonfatal-injury experience decreased 3 percent in 1953.

The Bureau of Mines and the British Safety in Mines Research Establishment investigated coal-dust explosions and means of suppressing them, and there was substantial interest here and abroad in the development of fireproof conveyor belting. Bureau studies of dust exposure during rock drilling [49] and methods of improving coal-mine ventilation [50] were published, as were analytical studies of injury experience in coal mining [51] and of coal-mining explosions and fires,[52] as well as suggestions for selection and care of fire-fighting equipment for coal mines.[53] The Bureau of Mines continued its research and test work to improve health and safety in mining and its coal-mine inspection work, making 8,231 regular inspections and analyzing thousands of samples of mine air and coal and rock dusts. As provided for under sec. 202 (b) of Title II, Federal Coal Mine Safety Act, State-participation plans for joint State-Federal coal-mine inspections have been approved and are in effect in Alaska, North Carolina, North Dakota, Oklahoma, Washington, and Wyoming.

The Bureau of Mines tested various types of coal mining equipment and accessories for permissibility, issuing approvals where schedule requirements were met. It also conducted training courses in mine safety and first aid, and it took an active part in sponsoring and promoting safety organizations and meetings at the national, regional, and local levels.[54]

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[49] Owings, C. W., and Johnson, L., A Study to Determine Potential Dust Exposure in Connection With Intermittent Rock Drilling in Coal Mines: Bureau of Mines Rept. of Investigations 5004, 1953, 7 pp.

[50] Herbert, C. A., Some Factors Affecting and Suggested Ways for Improving Coal-Mine Ventilation, With Particular Reference to Mines in Illinois, Indiana, and Western Kentucky: Bureau of Mines Inf. Circ. 7656, 1953, 15 pp.

[51] Reese, Seth T., Wrenn, Virginia E., and Reid, Elizabeth J., Injury Experience in Coal Mining, 1949: Bureau of Mines Bull. 525, 1953, 131 pp.

[52] Fene, W. J., and Humphrey, H. B., Coal-Mine Explosions and Coal- and Metal-Mine Fires in the United States in 1950, 1951, and 1952: Bureau of Mines Inf. Circ. 7661, 1953, 13 pp.

[53] Walker, W. D., Jr., Eathorne, William, Polack, S. P., and Keenan, C. M., Fire-Fighting Equipment in Coal Mines—Selection, Pleacment, and Care: Bureau of Mines Inf. Circ. 7662, 1953, 20 pp.

[54] Tomlinson, W. H., National First-Aid and Mine-Rescue Contest, Columbus, Ohio, Oct. 2, 3 and 4, 1951: Bureau of Mines Inf. Circ. 7658, 1953, 71 pp.

A report of experiments conducted by the School of Mines, University of West Virginia, on degasifying coal beds [55] indicated that appreciable quantities of methane could be withdrawn for a considerable time from some coal beds where geologic conditions were particularly favorable, but further experimental work was desirable to determine optimum drilling patterns and their correlation with mining layouts. Another report by Belgian authors, but published by the Federal Bureau of Mines,[56] described firedamp-draining techniques and experimental and operating installations in Germany, Great Britain, France, Netherlands, and Belgium.

Coal Preparation, Transportation, and Briquetting.—The 242 million tons of bituminous coal mechanically cleaned in 1953—an increase of more than 14 million tons over 1952—gave a new high in percentage and tonnage of coal mined that was mechanically cleaned (52.9 percent) and 2 million tons over the previous tonnage record in 1951. New coal-cleaning equipment sold in 1953, in terms of capacity, showed a preference for dense-medium systems, followed by jigs, and wet tables, about 60 percent of the total capacity of both wet and pneumatic new equipment being installed as additions to present plants; the remainder went into new plants. Some of the more complex coal-cleaning systems, such as double gravity separation with crushing of middling product for re-treatment, have been applied in plants supplying metallurgical coal where adherence to close specifications and scarcity of coking coals that can readily be cleaned to give a low-sulfur washed product created difficult preparation problems. The Bureau of Mines published data on preparation characteristics of coking coals [57] [58] and on problems involved in preparing special-purpose coals.[59]

Fine-coal cleaning, dewatering, and drying attracted increased attion.[60] The Bureau of Mines studied a fine-coal cleaning problem in the production of metallurgical coal,[61] described a European coal-slurry treating process,[62] and published results of an investigation of problems of cleaning Korean anthracites, many of which are predominantly fines.[63] The Bureau continued its studies of fine-coal cleaning with experiments on the use of compressed air to improve kerosine-flotation-cell capacity and with tests of an artificial bed (feldspar) jig and a heavy-medium cyclone. Froth flotation of fine coals also received the attention of equipment manufacturers and coal operators in this country and of research groups in Great Britain and the Soviet Union, while dense-medium process studies were made in several countries, including the United States, Great Britain, and the Netherlands.

The cyclone was used more extensively for the cleaning and partial dewatering of fine coal. Pennsylvania State University, cooperating

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[55] Spindler, G. R , Degasification of Coal Seams: Coal-Mine Modernization, 1953, pp. 206–220.

[56] Venter, J. and Stassen, P., Drainage and Utilization of Firedamp: Bureau of Mines Inf. Circ. 7670, 1953, 22 pp.

[57] Crentz, W. L., and Miller, J. W., Preparation Characteristics of Coal From Jefferson County, Pa.: Bureau of Mines Rept. of Investigations 4941, 1953, 21 pp.

[58] Crentz, W. L., and Miller, J. W., Preparation Characteristics of Coal From Knott County, Ky.: Bureau of Mines Rept. of Investigations 4993, 1953, 30 pp.

[59] Campbell, Robert J., Jr., Boyd, Clarence L., and Hilton, R. John, Coal for Electrodes; What the Market Is in the Aluminum Industry and What Can Be Done to Make Coal Suitable for It: Coal Age, vol. 58, No. 8, August 1953, pp. 86–7.

[60] Vissac, G. A., Fine-Coal Drying: Min. Eng., vol. 5, October 1953, pp. 1004–11.

[61] Gandrud, B. W., and Riley, H. L., Washability Study of the Upper Hartshorne Bed at the Quality Mine, Hackett, Ark.: Bureau of Mines Rept. of Investigations 4964, 1953, 17 pp.

[62] Fraser, Thomas, Convertol Process of Coal-Slurry Treatment: Bureau of Mines Inf. Circ. 7660, 1953, 4 pp.

[63] Crentz, W. L., Preparation Characteristics of Anthracites in South Korea: Bureau of Mines Rept. of Investigations 5010, 1953, 17 pp.

with the Coal Operators Associations of Central and Western Pennsylvania, studied the possibilities of obtaining a salable pyrite from coal refuse, using cyclones as concentrating units. Special applications of the cyclone were also investigated at Northwestern University as part of its coal research program, which also included studies of mechanical separation of coal, sizing, and methods of dewatering and drying. Several companies introduced or installed new or refined equipment for fine-coal cleaning and drying. Several new heavy-medium processes were introduced, including a simplified method for recovering magnetite in heavy-medium circuits. A horizontal filter was used in an endeavor to improve centrifugal drying of coal and combine this with filtering into a single operation.

Heat drying of coal that found numerous applications as mounting use of coal for power generation placed greater emphasis on stable quality and delivered B. t. u. values included use of various systems, such as the McNally Pulso drier, the Raymond flash drier, the Multi-Louvre and the Baughman driers, and the new Dorr Co. fluidized-type drier. Using data from the first prototype drier built and tested during 1952, the Texas Power & Light Co. began construction of nine 50-ton-per-hour lignite driers to supply fuel for the power-plant boilers of the Sandow Works of the Aluminum Co. of America, at Rockdale, Tex. As they were completed, these driers, which utilize the entrained-drying process developed by V. F. Parry at the Denver station of the Bureau of Mines,[64] were put on the line, using pneumatic transportation of the dried lignite from the drying units directly to the pulverized-coal burners. The commercial application of this method to drying of Canadian coals before briquetting [65] was described at the Third Biennial Briquetting Conference, held at Banff, Alberta, on August 31 and September 1. A number of papers on briquetting in this country and abroad, including one on briquetting chars from the Parry process [66] were given at this Conference.

Pittsburgh Consolidation Coal Co. completed operation of its demonstration plant at Cadiz, Ohio, which showed the technical feasibility of transporting coal hydraulically in pipelines for considerable distances. One of the longest permanent belt-conveyor systems in use was a 4½-mile system of transporting 800 tons of coal an hour from a strip mine near Beverly, Ohio, to a storage area of an Ohio Power Co. plant on the Muskingum River.

COAL UTILIZATION

For many years, the trend in large utility-type power-generating stations has been toward the use of higher steam pressures and temperatures; and as the new larger and more efficient plants have come on the line to supplement or replace older units the average coal used per kilowatt-hour has continued to decline, reaching a new low of 1.06 pounds in 1953. A significant development in 1953 was the decision to break through the critical steam pressure and to design a plant to

[64] Parry, V. F., Landers, W. S., Wagner, E. O,. Goodman, J. B., and Lammers, G. C., Drying and Carbonizing Fine Coal in Entrained and Fluidized State: Bureau of Mines Rept. of Investigations 4954, 1953, 43 pp.

[65] Morrison, R. L., and Grant, P. S., The Parry Dryer: Proc. 3d Biennial Briquetting Conf., Inf. Circ. 6, Univ. of Wyoming Natural Resources Research Inst. November 1953, pp. 30–37.

[66] Landers, W. S., and Parry, V. F., Briquetting Properties of Fluidized Chars: Proc. 3d Biennial Briquetting Conf., Univ. of Wyoming, Natural Resources Research Inst., Inf. Circ. 6, November 1953, pp. 37–47.

operate at 4,500 p. s. i. and 1,150° F. This new unit, of 120,000-kilowatt capacity, was being designed for the Philo plant of American Gas & Electric Co. It will have 2 stages of reheat, is expected to operate at about 8,500 B. t. u. per kilowatt-hour (or about 500 B. t. u. per kilowatt-hour less than the best of present installations), and will be of the once-through type, using crushed-coal firing in cyclone burners.

Pulverized-coal firing is used for most large utility boilers, but many units are adaptable to two or more fuels, and when oil or gas become available at competitive prices, such as cheap residual oil along the eastern seaboard, changeover is made to the cheaper fuel. Cyclone burner units utilizing crushed rather than pulverized coal are coming into wider use. Refinements and improvements in furnace design, including slag screens, divided furnaces, and partition walls or tube curtains extending into the furnace to receive heat from both sides, are being incorporated in coal-burning furnaces to improve boiler and furnace performance. A special pellet gun was developed for cleaning high-capacity furnaces and those using low-grade fuels. Studies were made by the Bureau of Mines and others of corrosion-resistant materials for air preheaters [67] and of furnace heat-absorption efficiencies [68] in large power boilers.

In the industrial steam- and power-plant field "package-type" boilers and standardized types of larger units—up to 100,000 pounds per hour capacity—are finding wide acceptance, with major emphasis on modernization rather than expansion. Coal, fired principally on spreader stokers, maintained its lead in most new industrial units, although use of oil and gas is on the increase, particularly where new pipelines are bringing gas into areas not previously served. A new-type spreader stoker with reciprocating grates discharging to the front like the traveling-grate type attracted considerable attention.

In the small industrial-commercial and domestic coal-burning field, Bituminous Coal Research sponsored development of a packaged automatic, coal-fired, steam generator with completely integrated components. Based on an extensive study of the causes of self-heating and ignition in coal mine dumps and washery refuse piles, the Bureau developed a method of extinguishing and preventing fires in such dumps by covering them with a layer of ¼-inch by 0 waste material from coal washeries. The Bureau also studied combustion of waste materials in incinerators to reduce air pollution and to develop suitable incinerators to meet the waste-disposal problems of the Atomic Energy Commission. Pennsylvania State University continued its studies of refractory materials for stoker arches, and the Coal Research Laboratory of Carnegie Institute of Technology conducted fundamental studies relating to reactivity of fuels.[69] [70]

The Locomotive Development Committee of Bituminous Coal Research and the American Locomotive Co. worked on improvements in coal-handling and ash-separation equipment for use with their open cycle locomotive-size coal-burning gas turbine, while the

[67] Barkley, J. F., Karlsson, Hilmer, Berk, A. A., Stark, C. F., and Burdick, L. R., Corrosion and Deposits in Regenerative Air Preheaters: Bureau of Mines Rept. of Investigations 4996, 1953, 23 pp.

[68] Myers, J. W., and Corey, R. C., Furnace Heat Absorption in a Spreader-Stoker-Fired Steam Generator; I.—Furnace Heat-Absorption Efficiency as Shown by Anthalpy of Gases Leaving the Furnace: Trans. ASME vol. 75, No. 5, July 1953, p. 909.

[69] Weisz, H. L., and Orning, A. A., Reactivity of Solid Fuels—Influence of Oxygen Partial Pressure: Fuel (British), vol. 32, October 1953, pp. 435–40; Carnegie Inst. Technol., Coal Res. Lab. Contrib. 204.

[70] Hou, H. L., and Orning, A. A., Reactivity of Cokes to Carbon Dioxide as Measured by Adiabatic Cooling: Fuel (British), vol. 33, January 1954, pp. 42–50; Carnegie Inst. Technol. Coal Res. Lab. Contrib. 206.

Canadian group at McGill University continued its studies of an exhaust-heated coal-burning turbine, with railroad use in view. A large, coal-burning, steam-turbine-electric locomotive was built for the Norfolk & Western Railroad.

Carbonization.—During the year 1,027 new slot-type coke ovens were completed, and 646 old ovens were dismantled, giving a net gain of 381. Although the new ovens have an annual coke capacity of 5.3 million tons, the net gain in capacity was only 1.8 million tons because of the number of ovens withdrawn. This raised the annual capacity of all slot-type ovens to about 78.3 million tons.

Research on coal carbonization by the Bureau of Mines and by various State, university, and industry groups included fundamental and applied research at both low and high temperatures and in fixed and fluidized beds. The Bureau continued its tests of carbonizing properties of coals,[71] its studies of coal expansion, and its analysis of test methods.[72] The Illinois State Geological Survey completed a new test oven similar in some respects to the Bureau's Tuscaloosa oven, and the Koppers Co. reported on the development of instruments and techniques for measuring gas pressures in full-scale slot ovens. A study at the University of Maryland on thermal changes involved in coal carbonization and the effects of pretreatment on these changes indicated that, with certain coals, mild oxidation increased the quality of the coke produced, but further oxidation destroyed coking properties. At the University of Wyoming, solvent extraction of coals and determination of the relation between molecular weight of extract and coking property of the coals was undertaken, while at Montana State College studies were made to produce satisfactory coke from local coals by washing or other treatments. The full report of the coke evaluation study, covering tests on coke properties from a number of commercial coke plants by a committee from the American Iron and Steel Institute and from the American Coke and Coal Chemicals Institute was issued in December 1953.[73]

Low-temperature carbonization continued to attract the interest of research and industrial organizations. Designs were completed and approved for construction of the first industrial-size (35-ton-per-hour) low-temperature, fluidized-bed carbonizer at the Alcoa plant at Rockdale, Tex., to carbonize lignite dried in the Bureau-developed fluidized-bed drying system described in the Coal Preparation section (p. 133). This plant is significant in that it is making economical the use of low-rank solid fuel for power generation in an oil- and gas-producing area. The only commercial low-temperature carbonizing plants operating in this country during the year were those of the Pittsburgh Coal Carbonizing Co. and the Dakota Briquets & Tar Products, Inc., both producing primarily domestic fuels; but research on low-temperature carbonization was carried on by several groups, including the University of Kentucky, the Southern Research Institute, Pittsburgh Consolidation Coal Co., Northwestern University, and the University of Illinois. Much of this research was done with fluidized beds, and one of the major objectives was the separation, identification, and

[71] See footnotes 49 and 50.

[72] Gayle, John B., and Auvil, H. Stuart, A Study of the Precision of the Shatter Test on Coke: Bureau of Mines Rept. of Investigations 4987, 1953, 13 pp.

[73] American Iron and Steel Institute, Contributions to the Metallurgy of Steel No. 43—Coke Evaluation Project: Am. Iron and Steel Inst., 1952, 159 pp.

evaluation of the tar and other liquid products obtained by low-temperature carbonization of various ranks of coal. In other laboratory and pilot-plant work the production of chars or cokes suitable for blending with western coals for production of metallurgical coke was sought. The Kemmerer Coal Co., in cooperation with the Bureau of Mines, operated a pilot carbonizer. Chars from the Wyoming coal carbonized in this plant were tested in a phosphate reduction furnace in Idaho.

Chemical and Miscellaneous Uses.—Development of a coal-chemicals industry has been one of the major objectives of the previously mentioned low-temperature carbonization research in the large pilot plant of the Pittsburgh Consolidation Coal Co., as well as of several other organizations working along this line. More details and a flowsheet were given for the Carbide & Carbon Chemical Co.'s coal-hydrogenation plant to produce synthetic coal chemicals at Institute, W. Va.[74]

Shaped carbon forms for various uses, such as blast-furnace and chemical vessel linings have found increasing use, as have anthracite and low-ash chars as electrode materials in the electrometallurgical and electrochemical industries and as filtering, decolorizing, and deodorizing mediums. The Midwest Research Institute continued its cooperation with companies seeking to produce lightweight aggregate by sintering clays with coal, and the Bureau of Mines cooperated with a coal company in West Virginia in research with the same objective, utilizing a process for burning of washery waste material on a traveling grate.

Gasification.—Displacement of manufactured gas by natural gas continued in 1953, particularly in the Northeastern States, despite higher average values for natural gas both at the wellhead and at points of consumption. However, a number of research groups recognized the need for improving coal-gasification methods to meet specific objectives. The Bureau of Mines published three reports on gasification tests of lignite in a commerical-scale annular-retort gasifier,[75] [76] [77] and the University of Rhode Island published results of a cooperative investigation with the Bureau that showed the technical feasibility of gasifying high-ash meta-anthracite to produce mineral wool.[78] The American Institute of Mining and Metallurgical Engineers published as a book on coal gasification and liquefaction papers presented at a 1952 gasification symposium,[79] and the American Gas Association published a critical review of methods of producing high-B. t. u. gas from coal.

Although reductions in appropriations made it necessary for the Bureau of Mines to discontinue its demonstration-scale gasification work at Louisiana, Mo., and suspend the underground gasification

[74] Chemical Engineering, Aromatics From Coal: Vol. 60, No. 12, December 1953, pp. 250–253.
[75] Burr, A. C., Holtz, J. C., Koth, A. W., and Oppelt, W. H., Gasification of Lignite in a Commercial-Scale Pilot Plant; Progress Report for 1947–48: Bureau of Mines Rept. of Investigations 4940, 1953, 28 pp.
[76] Chetrick, M. H., Thermal Requirements for the Gasification of Lignite in an Externally-Heated Retort: Bureau of Mines Rept. of Investigations 4957, 1953, 7 pp.
[77] Burr, A. C., Ellman, R. C., Hoeppner, J. J., Holtz, J. C., Kamps, T. W., Kube, W. R., Ongstad, O. C., and Oppelt, W. H., Gasification of Lignite in a Commerical-Scale Pilot Plant; Progress Report Jan. 1, 1949, to June 30, 1950: Bureau of Mines Rept. of Investigations 4997, 1953, 48 pp.
[78] Crawford, T. Stephen, Corey, R. C., Schwartz, C. H., Spano, L. A., and Carpenter, E. L., A Slagging Gas Producer for the Production of Mineral Wool From Rhode Island Meta-Anthracite: University of Rhode Island Eng. Exp. Sta., Bull. 3, 1953, 35 pp.
[79] American Institute of Mining and Metallurgical Engineers, Gasification and Liquefaction of Coal: Res. Bull. 6, 1953, 221 pp.

tests at Gorgas, Ala.,[80] gasification tests with coking coals and with noncoking subbituminous coal and an anthracite were run in the atmospheric pressure gasification pilot plant at Morgantown, W. Va. Many design features developed by the Bureau, in cooperation with the Babcock & Wilcox Co., were incorporated by a chemical company in a pilot-scale pulverized-coal-fired gasifier to manufacture gas from coal for synthesis of ammonia. Tests with a downflow pressure gasifier gave large capacities per volume of reaction space and improved design.[81] Other Bureau research on coal gasification included gas-purification studies at atmospheric and elevated pressures, investigations of catalysts for the catalytic conversion of synthesis gas to liquid fuels and to methane, and tests of anthracite in producers for ceramic-kiln firing.

The Institute of Gas Technology developed a process for complete gasification of coal under pressure involving partial combustion of coal in suspension to give synthesis gas and catalytic upgrading of this gas to methane. The Coal Research Laboratory of the Carnegie Institute of Technology continued gasification studies in both fixed and fluidized beds. Battelle Memorial Institute continued its investigation of producers, both downdraft and updraft types, and demonstrated operation of a small diesel engine on producer gas, with pilot-oil ignition. Companies interested in coal-gasification research included the Pittsburgh Consolidation Coal Co., investigating carbon-steam reactions, and the Sinclair Coal Co., which continued basic laboratory research on underground-gasification problems.

Synthetic Liquid Fuels.—The Bureau of Mines investigations on the production and purification of synthesis gas for synthetic fuels production by the synthesis-gas process were mentioned in the previous section. Coal-hydrogenation runs were made in the Bureau's demonstration plant at Louisiana, Mo., on Pittsburgh and Illinois No. 6 bed coals before this plant was closed in June 1953, and reports of operations and operating problems were published.[82 83 84 85] Research was continued at the Bureau's Bruceton and Pittsburgh, Pa., laboratories where laboratory and batch-autoclave studies brought closer to realization a one-step high-temperature hydrogenation process. An existing pilot plant was modified for studies of this process. Other studies involved acid treatment of coal and hydrogenation as treated and with various catalysts, development of catalysts and of methods of separating polynuclear hydrocarbons in coal-hydrogenation oils, and design and development of new research instruments and equipment.

The Coal Research Laboratory, Carnegie Institute of Technology, utilized solvent fractionation and molecular distillation techniques to

[80] Elder, J. L., and Fies, M. H., Underground Gasification of Coal—The Gorgas Experiments: Consulting Eng., vol. 2, No. 6, August 1953, pp. 22–25, 62–64.

[81] Strimbeck, G. R., Cordiner, J. B., Jr., Taylor, H. G., Plants, K. D., and Schmidt, L. D., Progress Report on Operation of Pressure-Gasification Pilot Plant Utilizing Pulverized Coal and Oxygen: Bureau of Mines Rept. of Investigations 4971, 1953, 27 pp.

[82] Bureau of Mines, Synthetic Liquid Fuels, Annual Report of the Secretary of the Interior for 1952. Part I. Oil From Coal: Rept. of Investigations 4942, 1953, 85 pp.

[83] Clarke, Edwin A., Chaffee, C. C., and Hirst, L. L., Early Operations of the Hydrogenation Demonstration Plant, Using Rock Springs, Wyo., Coal: Bureau of Mines Rept. of Investigations 4944, 1953, 80 pp.

[84] Chaffee, C. C., and Hirst, L. L., Liquid Fuel From Coal: Ind. Eng. Chem., vol. 45, No. 4, April 1953, pp. 822–838.

[85] Gardner, G. D., and Donovan, J. T., Corrosion and Erosion in the Synthetic-Fuels Demonstration Plant: Trans. ASME, vol. 75, No. 4, May 1953, pp. 525–533.

determine the chemical nature of coal hydrogenation products [86] in a continuation of its coal-hydrogenation and products-evaluation studies.

Except for the Carbide & Carbon Chemicals Co. plant at Institute, W. Va., producing coal chemicals by mild hydrogenation of coal, no commercial synthetic liquid fuels plants were in operation in this country in 1953, and studies by the Bureau of Mines and other organizations had indicated that economic synthetic liquid fuels in this country would probably first be derived from oil shale. Progress made in combining German and American processes to suit South African conditions in a commercial plant to produce gasoline and diesel oil, using the gas-synthesis process, was described.[87]

[86] Glenn, R. A., and DeWalt, C. W., Jr., Chemical Nature of Coal Hydrogenation Products. V. Solvent Fractionation and Molecular Distillation of the Soluble Residue from a Restricted Hydrogenolysis and a Louisiana, Mo., Continuous Liquid-Phase Hydrogenation: Fuel (British), vol. 32, April 1953, pp. 157-168; Carnegie Inst. Technol. Coal Res. Lab. Contrib. 198.

[87] Engineer (staff article), Oil From Coal in South Africa: Vol. 195, No. 5061, Jan. 23, 1953, p. 123.

Coal—Pennsylvania Anthracite

By J. A. Corgan, Marian I. Cooke, and J. A. Vaughan

GENERAL SUMMARY

TOTAL production of Pennsylvania anthracite in 1953 was 31 million net tons, a 24-percent decline from 1952. The quantity produced in 1953 was smaller than in any year since 1881, and the percentage decrease was one of the most drastic in the recent history of the industry. Factors responsible for the sharp decline in production included continued strong competition from petroleum and natural gas in the space-heating field, the virtual disappearance of export shipments to the western European countries, and a decline of approximately 28 percent in exports to Canada. The fact that winter temperatures were again substantially above normal in the principal anthracite markets also exerted a serious adverse effect upon the demand for the space-heating sizes.

As the demand for the domestic sizes (Pea and larger), which are used largely for heating homes and apartments, decreased, the smaller sizes, principally consumed in commercial and industrial installations, have assumed a relatively stronger market position. This trend has been apparent for a number of years but has gained impetus since the close of World War II because competitive fuels have invaded the space-heating market. For instance, as recently as 1951 the steam sizes composed 42 percent of breaker shipments but in 1953 were 47 percent of total breaker shipments.

The average number of men working daily in the industry fell abruptly in 1953, aggravating an already major unemployment problem in the anthracite region. In 1953, the average number of men working daily in the industry was approximately 12 percent less than in 1952, and the number of days worked fell to 163, the lowest since 1932. The seriousness of the situation prompted concerted efforts by State and privately formed bodies to devise feasible methods for relieving the severe stresses placed upon the economy of the region by the decline in anthracite production and employment.

Despite abandonment and consolidation of many mining operations and accompanying retrenchments in the labor force, relations between management and labor were marked by a high degree of mutual cooperation in 1953. No serious disruptions occurred in the work schedule during the year because of strikes or suspensions. The contract signed by the anthracite producers and the United Mine

Workers of America, effective November 16, 1952, continued in effect during 1953 without change, as neither party signatory thereto exercised the right to terminate by giving 60 days written notice.

To integrate the Bureau's research program on the mining, preparation, and utilization of anthracite more effectively with industry, the Secretary of the Interior appointed an Anthracite Advisory Committee for consultative and advisory purposes. The committee, composed of six members equally representing mine owners, mine workers, and the public, held two meetings in 1953. For further details, see the Technology section of this chapter.

Month-end stocks of anthracite in retail yards in 1953 were considerably lower than in 1952, except for January and February, apparently reflecting the belief of merchandisers that the curtailed demand for anthracite at the retail level could be met adequately with reduced stocks. However, stocks held by producing companies climbed steadily throughout the year as a result of many producers following the customary industry practice of stockpiling during the summer and early fall months as a protection to ultimate consumers, and of the effort of many companies to keep mines operating to avoid costly shutdowns.

The depressed market conditions of 1953 intensified competition at the producer level and, by the last quarter of the year, f. o. b. mine price quotations, in some instances, were considerably lower than published circular prices. To minimize, as far as possible, the effect of declining production upon costs, many concerns instituted programs aimed at reducing fixed costs and increasing operating efficiency. One phase of the programs called for suspension of work at some high-cost deep operations and a shift of emphasis to the production of relatively larger quantities of coal from lower cost operations and complete abandonment of other mines. In other instances, smaller mines or operating units were consolidated into larger and more efficient integrated operations. By the close of the year, these procedures had materially reduced the number of individual units in operation and the productive capacity of the industry.

Coal produced underground in 1953 declined from 61 percent of total production in 1952 to 58 percent. And, although the actual tonnage declined, the output from strip pits increased from 26 percent in 1952 to 28 percent in 1953, and production from culm banks increased from 12 percent of the 1952 total to 13 percent. Output from dredges operating in the Lehigh, Schuylkill, and Susquehanna Rivers and their tributaries remained at about the 1952 level—1 percent of total production.

TABLE 1.—Salient statistics of the Pennsylvania anthracite industry, 1949–53

	1949	1950	1951 [1]	1952 [1]	1953 [1]
Production:					
Loaded at mines for shipment outside producing region:					
Breakers ... net tons	35,653,628	37,658,864	36,204,268	33,807,596	25,074,456
Washeries ... do	1,380,115	882,541	923,610	1,309,061	1,242,306
Dredges ... do	655,753	488,739	379,460	310,964	299,799
Sold to local trade and used by employees ... net tons	3,848,420	3,930,889	4,125,495	4,228,430	3,711,235
Used at collieries for power and heat net tons	1,163,808	1,115,670	1,037,164	926,507	621,356
Total production ... do	42,701,724	44,076,703	42,669,997	40,582,558	30,949,152
Value at breaker, washery, or dredge	$358,008,451	$392,398,006	$405,817,963	$379,714,076	$299,139,687
Average sales realization per net ton on breaker shipments to points outside producing region:					
Domestic	$11.39	$11.94	$13.19	$13.07	$13.31
Steam	$5.05	$5.25	$5.48	$5.78	$6.60
Total all sizes	$8.90	$9.34	$9.94	$9.81	$10.15
Percent of total breaker shipments to points outside producing region:					
Domestic	60.6	61.1	57.8	55.3	52.9
Steam	39.4	38.9	42.2	44.7	47.1
Producers' stocks at end of year [2] net tons	975,457	1,268,300	982,396	1,708,887	1,915,919
Exports [3] ... do	4,942,670	3,891,569	5,955,535	4,592,060	2,724,270
Imports [3] ... do	------------	18,289	26,812	29,370	31,443
Consumption (apparent) ... do	37,700,000	39,900,000	37,000,000	35,300,000	28,000,000
Average number of days worked	195	211	208	201	163
Average number of men working daily	75,377	72,624	68,995	65,923	57,862
Output per man per day ... net tons	2.87	2.83	2.97	3.06	3.28
Output per man per year ... do	560	597	618	615	535
Quantity cut by machines ... do	557,599	611,734	496,085	386,128	318,699
Quantity mined by stripping ... do	10,376,808	11,833,934	11,135,990	10,696,705	8,606,482
Quantity loaded by machines underground ... net tons	11,858,088	12,335,650	10,847,787	10,034,464	6,838,769
Distribution:					
Total receipts in New England [4] do	3,445,543	3,677,738	3,174,473	2,887,640	2,106,343
Exports to Canada [3] ... do	3,583,297	3,798,285	3,484,800	3,606,618	2,601,818
Loaded into vessels at Lake Erie [5] net tons	611,888	611,409	460,776	478,534	263,705
Receipts at Duluth-Superior [6] ... do	271,854	297,814	156,917	226,956	81,678

[1] Figures for 1951–53 are not strictly comparable with those for previous years. See Production and Employment sections, Minerals Yearbook, 1951.
[2] Anthracite Committee. [3] U. S. Department of Commerce.
[4] Commonwealth of Massachusetts, Division on the Necessaries of Life; and Association of American Railroads.
[5] Ore and Coal Exchange, Cleveland, Ohio. [6] U. S. Engineer Office, Duluth, Minn

Output per man per day again established a new record, reaching 3.28 tons in 1953 to exceed the previous record of 3.06 tons set in 1952. The gain in productivity rate was due largely to the relative increases at strip pits and culm banks, where output per man-day is considerably higher than at underground operations. The Schuylkill region again had the largest production because of its large output of strip-pit and culm-bank coal, and the Wyoming region again led in underground production and in the tonnage of coal loaded mechanically underground.

TABLE 2.—Statistical summary of monthly developments in the Pennsylvania anthracite industry in 1953

[All tonnage figures represent net tons]

	January	February	March	April	May	June	July	August	September	October	November	December	Year 1953	Change from 1952 (percent)	Year 1952
Production (including mine fuel, local sales, and dredge coal)	2,707,000	2,438,000	2,354,000	2,048,000	2,869,000	2,975,000	2,551,000	2,452,000	2,732,000	2,994,000	2,386,000	2,443,000	30,949,000	−23.7	40,583,000
Shipments (breakers and washeries only, all sizes):															
By rail [1]	1,949,795	1,572,089	1,560,601	1,466,026	2,245,059	2,382,566	2,012,952	1,974,001	2,252,549	2,310,184	1,779,214	1,785,580	23,290,616	−24.9	31,010,175
By truck [2]	629,049	588,480	525,894	520,765	553,854	510,173	422,244	458,765	552,786	627,641	612,263	731,998	6,733,912	+8.3	6,216,436
Carloadings [3]	39,963	32,840	32,554	29,923	44,157	46,800	41,919	40,836	45,788	46,005	36,664	36,823	474,272	−22.8	614,662
Distribution:															
Lake Erie loadings [4]	--------	--------	--------	17,955	16,624	50,309	27,396	31,249	6,874	69,456	43,842	--------	263,705	−44.9	478,534
Lake Ontario loadings [5]	--------	--------	--------	9,690	--------	--------	2,598	--------	2,634	2,984	--------	--------	17,906	−57.3	41,902
Receipts at Duluth-Superior [6]	--------	--------	--------	9,440	14,673	6,951	--------	1,839	5,507	31,550	11,718	--------	81,678	−64.0	226,956
Upper Lake dock trade: [7]															
Receipts:															
Lake Superior	--------	--------	--------	9,404	14,718	7,159	--------	8,776	5,507	22,377	5,965	--------	73,906	−64.6	208,552
Lake Michigan	1,744	1,697	2,572	18,936	3,756	34,865	31,089	19,950	1,652	20,651	17,185	2,688	156,785	−45.2	286,061
Deliveries (reloadings):															
Lake Superior	6,409	6,931	2,909	4,114	12,195	14,241	5,200	5,907	14,381	13,114	12,228	9,151	106,780	−32.3	157,790
Lake Michigan	23,188	18,673	13,843	8,667	14,923	23,759	13,442	14,188	19,425	21,749	15,306	16,091	203,254	−27.4	280,127
New England receipts:															
Tidewater [3]	--------	1,681	1,652	1,512	2,149	2,504	3,045	2,004	--------	462	1,608	1.407	18,024	−56.3	41,262
Rail [8]	154,238	143,869	115,048	101,489	197,850	249,860	198,452	181,312	199,727	209,712	189,004	147,758	2,088,319	−26.6	2,846,378
Exports [9]	179,704	149,239	140,293	91,389	271,256	323,425	220,099	254,074	324,027	364,889	247,206	158,669	2,724,270	−40.7	4,592,060
Imports [9]	6,005	--------	34	3,625	--------	--------	--------	--------	2,895	9,402	--------	9,482	31,443	+7.1	29,370
Industrial consumption and stocks:															
Railroads (class 1 only): [3]															
Consumption	64,139	56,168	57,753	46,260	36,704	32,040	31,248	31,868	32,550	40,207	46,860	56,141	531,938	−15.1	626,620
Stocks	42,446	40,298	32,911	28,177	41,819	52,512	62,039	63,252	71,301	72,431	64,046	60,390	60,390	+35.3	44,649
Electric utilities: [10]															
Consumption	320,821	278,932	319,671	291,878	293,276	300,822	302,510	310,821	289,175	306,217	299,783	300,043	3,613,949	−3.9	3,761,902
Stocks	5,571.269	5,528,338	5,450,606	5,410,293	5,469,392	5,558,931	5,653,930	5,749,157	5,833,779	5,922,567	5,963,037	5,869,932	5,869,932	+4.8	5,601,500

TABLE 2.—Statistical summary of monthly developments in the Pennsylvania anthracite industry in 1953—Continued

[All tonnage figures represent net tons]

	January	February	March	April	May	June	July	August	September	October	November	December	Year 1953	Change from 1952 (percent)	Year 1952
Stocks on Upper Lake docks: [7]															
Lake Superior	114,433	107,440	104,350	108,544	111,067	103,965	98,788	101,275	92,241	101,494	95,149	85,923	85,923	−28.9	120,842
Lake Michigan	116,657	99,700	88,703	93,673	82,006	93,112	110,761	116,523	98,750	97,652	99,531	86,128	86,128	−37.6	138,101
Stocks in retail dealer yards [11]	2,550,000	2,080,000	1,709,000	1,676,000	2,004,000	2,255,000	2,417,000	2,449,000	2,543,000	2,633,000	2,566,000	2,265,000	2,265,000	−23.7	2,967,000
Producers' stocks [12]	1,674,307	1,622,632	1,635,388	1,610,706	1,607,911	1,654,354	1,725,972	1,758,603	1,785,780	1,870,402	1,928,699	1,915,919	1,915,919	+12.1	1,708,887
Wholesale price indexes (1947–49=100): [13]															
F. o. b. mines:															
Chestnut	141.5	141.5	141.5	129.2	129.2	132.1	135.4	137.5	139.3	137.1	137.3	137.3	136.6	+8.1	126.4
Pea	132.9	132.9	132.9	118.4	118.4	121.1	125.1	127.2	129.6	126.8	126.8	126.8	126.6	+8.3	116.9
Employee wages and hours: [13]															
Average weekly earnings	\$70.75	\$86.75	\$65.70	\$61.99	\$77.19	\$91.63	\$83.89	\$61.49	\$70.40	\$73.41	\$63.49	\$64.71	\$72.91	+2.4	\$71.19
Average hourly earnings	\$2.50	\$2.50	\$2.47	\$2.45	\$2.49	\$2.49	\$2.46	\$2.44	\$2.47	\$2.48	\$2.48	\$2.47	\$2.48	+9.7	\$2.26
Average number hours worked per week	28.3	34.7	26.6	25.3	31.0	36.8	34.1	25.2	28.5	29.6	25.6	26.2	29.4	−6.7	31.5

[1] Furnished by Anthracite Institute.
[2] Pennsylvania Department of Mines.
[3] Association of American Railroads.
[4] Ore and Coal Exchange, Cleveland, Ohio.
[5] Buffalo Branch, Ore and Coal Exchange, Cleveland, Ohio.
[6] U. S. Engineer Office, Duluth, Minn.
[7] Includes all commercial docks on Lake Superior and west shore of Lake Michigan as far south as Kenosha. Based on data courteously supplied by Maher Coal Bureau and direct reports to the Bureau of Mines.
[8] Furnished by Commonwealth of Massachusetts, Division on the Necessaries of Life.
[9] U. S. Department of Commerce.
[10] Federal Power Commission.
[11] Estimated from reports submitted by a selected list of retail dealers.
[12] Anthracite Committee. Represents coal in storage nearest available date to the end of the month.
[13] Bureau of Labor Statistics, U. S. Department of Labor.

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TABLE 3.—Historical statistics of the Pennsylvania anthracite industry, 1890–1953

Year	Production (net tons)	Value of production	Average value per net ton	Exports [1] (net tons)	Imports [1] (net tons)	Apparent consumption [2] (net tons)	Average number of employees	Average number of days worked	Average tons per man per day	Average tons per man per year	Quantity cut by machines [3] (net tons)	Quantity produced by stripping [4] (net tons)	Quantity loaded mechanically underground [5] (net tons)
1890	46,468,641	$66,383,772	$1.43	889,655	16,962	45,596,000	126,000	200	1.85	369	----	----	----
1891	50,665,431	73,944,735	1.46	964,601	42,120	49,743,000	126,350	203	1.98	401	----	----	----
1892	52,472,504	82,442,000	1.57	953,836	72,865	51,592,000	129,050	198	2.06	407	----	----	----
1893	53,967,543	85,687,078	1.59	1,493,281	60,220	52,534,000	132,944	197	2.06	406	----	----	----
1894	51,921,121	78,488,063	1.51	1,613,500	100,876	50,408,000	131,603	190	2.08	395	----	----	----
1895	57,999,337	82,019,272	1.41	1,647,195	158,297	56,510,000	142,917	196	2.07	406	----	----	----
1896	54,346,081	81,748,651	1.50	1,512,000	113,892	52,948,000	148,991	174	2.10	365	----	----	----
1897	52,611,681	79,301,954	1.51	1,454,620	27,478	51,185,000	149,884	150	2.34	351	----	----	----
1898	53,382,645	75,414,537	1.41	1,513,062	3,527	51,873,000	145,504	152	2.41	367	----	----	----
1899	60,418,005	88,142,130	1.46	1,912,732	68	58,505,000	139,608	173	2.50	433	----	----	----
1900	57,367,915	85,757,851	1.49	1,853,163	132	55,515,000	144,206	166	2.40	398	----	----	----
1901	67,471,667	112,504,020	1.67	2,232,504	320	65,239,000	145,309	196	2.37	464	----	----	----
1902	41,373,595	76,173,586	1.84	1,016,934	190,636	40,547,000	148,141	116	2.40	279	----	----	----
1903	74,607,068	152,036,448	2.04	2,249,920	196,837	72,554,000	150,483	206	2.41	496	----	----	----
1904	73,156,709	138,974,020	1.90	2,495,799	81,232	70,742,000	155,861	200	2.35	469	----	----	----
1905	77,659,850	141,879,000	1.83	2,497,581	38,350	75,201,000	165,406	215	2.18	470	----	----	----
1906	71,282,411	131,917,694	1.85	2,483,005	36,236	68,836,000	162,355	195	2.25	439	----	----	----
1907	85,604,312	163,584,056	1.91	3,021,841	11,085	82,594,000	167,234	220	2.33	512	----	----	----
1908	83,268,754	158,178,849	1.90	3,082,641	18,462	80,205,000	174,174	200	2.39	478	----	----	----
1909	81,070,359	149,181,587	1.84	3,183,840	3,574	77,890,000	[6] 171,195	205	[7] 2.31	[7] 474	----	----	----
1910	84,485,236	160,275,302	1.90	3,384,222	9,180	81,110,000	169,497	229	2.17	498	----	----	----
1911	90,464,067	175,189,392	1.94	3,980,479	2,759	86,486,000	172,585	246	2.13	524	69,907	----	----
1912	84,361,598	177,622,626	2.11	4,131,444	1,870	80,232,000	174,030	231	2.10	485	246,216	----	----
1913	91,524,922	195,181,127	2.13	4,652,912	1,004	85,474,000	175,745	257	2.02	520	555,776	----	----
1914	90,821,507	188,181,399	2.07	4,289,873	17,696	84,041,000	179,679	245	2.06	505	916,596	----	----
1915	88,995,061	184,653,498	2.07	3,965,255	814	88,144,000	176,552	230	2.19	504	1,307,756	1,121,603	----
1916	87,578,493	202,009,561	2.31	4,665,530	6,000	87,118,000	159,869	253	2.16	548	1,839,506	1,987,800	----
1917	99,611,811	283,650,723	2.85	6,007,306	13,000	94,068,000	154,174	285	2.27	646	1,955,223	2,301,588	----
1918	98,826,084	336,480,347	3.40	4,967,808	37,272	92,775,000	147,121	293	2.29	672	1,857,514	2,360,183	----
1919	88,092,201	364,926,950	4.14	4,976,598	82,818	81,518,000	154,571	266	2.14	570	1,575,205	2,006,879	----
1920	89,598,249	434,252,198	4.85	5,403,749	31,748	85,786,000	145,074	271	2.28	618	938,073	2,054,441	----
1921	90,473,451	452,304,903	5.00	4,677,368	8,894	81,950,000	159,499	271	2.09	567	979,145	2,027,790	----
1922	54,683,022	273,700,125	5.01	2,649,457	233,528	56,799,000	156,849	151	2.31	349	502,793	949,745	----
1923	93,339,009	506,786,768	5.43	5,090,138	300,360	86,914,000	157,743	268	2.21	592	1,208,542	2,263,098	----
1924	87,926,862	477,230,852	5.43	4,017,785	117,951	80,717,000	160,009	274	2.00	550	1,423,884	1,865,677	----
1925	61,817,149	327,664,512	5.30	3,179,006	382,894	64,061,000	160,312	182	2.12	386	941,189	1,578,478	----
1926	84,437,452	474,164,252	5.62	4,029,683	813,956	77,221,000	165,386	244	2.09	511	931,650	2,401,356	----
1927	80,095,564	420,941,726	5.26	3,325,507	119,030	74,672,000	165,259	225	2.15	485	1,171,888	2,153,156	[6] 2,223,281
1928	75,348,069	393,637,690	5.22	3,336,272	384,707	73,650,000	160,681	217	2.17	469	1,289,809	2,422,924	[6] 2,351,074
1929	73,828,195	385,642,751	5.22	3,406,369	487,172	71,457,000	151,501	225	2.16	487	1,159,910	1,911,766	3,470,158
1930	69,384,837	354,574,191	5.11	2,551,659	674,812	67,628,000	150,804	208	2.21	460	1,410,123	2,536,288	4,467,750

TABLE 3.—Historical statistics of the Pennsylvania anthracite industry, 1890–1953—Continued

Year	Production (net tons)	Value of production	Average value per net ton	Exports [1] (net tons)	Imports [1] (net tons)	Apparent consumption [2] (net tons)	Average number of employees	Average number of days worked	Average tons per man per day	Average tons per man per year	Quantity cut by machines [3] (net tons)	Quantity produced by stripping [4] (net tons)	Quantity loaded mechanically underground [5] (net tons)
1931	59,645,652	$296,354,586	$4.97	1,778,308	637,951	58,408,000	139,431	181	2.37	428	1,587,265	3,813,237	4,384,780
1932	49,855,221	222,375,129	4.46	1,303,355	607,097	50,500,000	121,243	162	2.54	411	1,674,223	3,980,973	5,433,340
1933	49,541,344	206,718,405	4.17	1,034,562	456,252	49,600,000	104,633	182	2.60	473	1,648,249	4,932,069	6,557,267
1934	57,168,291	244,152,245	4.27	1,297,610	478,118	55,500,000	109,050	207	2.53	524	1,981,088	5,798,138	9,284,486
1935	52,158,783	210,130,565	4.03	1,608,549	571,439	51,100,000	103,269	189	2.68	505	1,848,095	5,187,072	9,279,057
1936	54,579,535	227,003,538	4.16	1,678,024	614,639	53,200,000	102,081	192	2.79	535	2,162,744	6,203,267	10,827,946
1937	51,856,433	197,598,849	3.81	1,914,173	395,737	50,400,000	99,085	189	2.77	523	1,984,512	5,696,018	10,683,837
1938	46,099,027	180,600,167	3.92	1,908,911	362,895	45,200,000	96,417	171	2.79	478	1,588,407	5,095,341	10,151,669
1939	51,487,377	187,175,324	3.64	2,590,000	298,153	49,700,000	93,138	183	3.02	553	1,881,884	5,486,479	11,773,833
1940	51,484,640	205,489,814	3.99	2,667,632	135,436	49,000,000	91,313	186	3.02	562	1,816,483	6,352,700	12,326,000
1941	[8] 56,368,267	240,275,126	4.26	3,380,189	74,669	52,700,000	88,054	203	[9] 3.04	617	1,855,422	7,316,574	13,441,987
1942	[8] 60,327,729	271,673,380	4.50	4,438,588	140,115	56,500,000	82,121	239	[9] 2.95	705	2,285,640	9,070,933	14,741,459
1943	[8] 60,643,620	306,816,018	5.06	4,138,680	166,020	57,100,000	79,153	270	[9] 2.78	751	1,624,883	8,989,387	14,745,793
1944	[8] 63,701,363	354,582,884	5.57	4,185,933	11,847	59,400,000	77,591	292	[9] 2.79	815	1,336,082	10,953,030	14,975,146
1945	[8] 54,933,909	323,944,435	5.90	3,691,247	149	51,600,000	72,842	269	[9] 2.79	751	1,210,171	10,056,325	13,927,955
1946	[8] 60,506,873	413,417,070	6.83	6,497,245	9,556	53,900,000	78,145	271	[9] 2.84	770	1,232,828	12,858,930	15,619,162
1947	[8] 57,190,009	413,019,486	7.22	8,509,995	10,350	48,200,000	78,600	259	[9] 2.78	720	1,209,983	12,603,545	16,054,011
1948	[8] 57,139,948	467,051,800	8.17	6,675,914	945	50,200,000	76,215	265	[9] 2.81	745	1,016,757	13,352,874	15,742,368
1949	[8] 42,701,724	358,008,451	8.38	4,942,670	---------	37,700,000	75,377	195	[9] 2.87	560	557,599	10,376,808	11,858,088
1950	[8] 44,076,703	392,398,006	8.90	3,891,569	18,289	39,900,000	72,624	211	[9] 2.83	597	611,734	11,833,934	12,335,650
1951 [10]	42,669,997	405,817,963	9.51	5,955,535	26,812	37,000,000	68,995	208	2.97	618	496,085	11,135,990	10,847,787
1952 [10]	40,582,558	379,714,076	9.36	4,592,060	29,370	35,300,000	65,923	201	3.06	615	386,128	10,696,705	10,034,464
1953 [10]	30,949,152	299,139,687	9.67	2,724,270	31,443	28,000,000	57,862	163	3.28	535	318,699	8,606,482	6,838,769

[1] U. S. Department of Commerce.
[2] Before 1913 the figures of consumption take no account of producers' stocks, there being no data available for this item.
[3] Data first collected in 1911.
[4] Data first collected in 1915.
[5] Data first collected in 1929.
[6] As reported by the Commonwealth of Pennsylvania, Department of Mines.
[7] Calculated on basis of Pennsylvania Department of Mines employment data.
[8] Includes some "bootleg" coal purchased by authorized operators and prepared at their breakers.
[9] Output per man calculated on authorized tonnages only; bootleg purchases excluded.
[10] See footnote 1, table 1.

SCOPE OF REPORT

Pennsylvania anthracite, commonly referred to as "hard" coal, was produced only in the following counties of Pennsylvania in 1953: Carbon, Columbia, Dauphin, Lackawanna, Luzerne, Northumberland, and Schuylkill. In Lancaster, Lebanon, Northampton, and Snyder Counties, small quantities of dredge coal were recovered in 1953. Although coal produced at mines in Sullivan County is classified as semianthracite according to the American Society for Testing Materials Tentative Standard, data relative thereto are included in this chapter.

The anthracite deposits of Pennsylvania underlie a surface area of approximately 484 square miles. About 181 square miles is in the Southern field, 176 in the Northern, 94 in the Western Middle, and 33 in the Eastern Middle. The anthracite fields are also divided by trade usage into three regions: The Wyoming, which is coextensive with the Northern field; the Lehigh, which is comprised of the Eastern Middle field and that part of the Southern field lying east of Tamaqua; and the Schuylkill, which includes the Western Middle field plus that part of the Southern field west of Tamaqua. Therefore, to satisfy requirements of individual readers, most of the data in this chapter are presented by counties, regions, and fields.

Anthracite is produced by companies operating underground mines, strip pits, culm banks, and dredges. Each operator is contacted by mail on a calendar-year basis. As anthracite is marketed as a cleaned, sized, and, in some instances, specially prepared product, data on commercial output are obtained only from companies operating preparation plants. A large part of the raw material prepared in breakers and washeries is produced by contractors working strip pits and culm banks, and these contractors are also canvassed. Mines that do not have preparation facilities and whose coal is processed at another company's plant also report. Because dredging operations are not integrated with other producing units of the industry, production and employment data are obtained directly from the dredge operators.

All schedules received are edited for completeness and accuracy. Reports submitted by companies operating preparation plants are checked against schedules filed by contractors, run-of-mine suppliers, and affiliated producing companies to determine whether complete data have been obtained on the production of run-of-mine material, source of coal, and labor. Inconsistencies in the data are resolved by correspondence. The final nonresponse rate seldom exceeds 1 or 2 percent of the total production. For this group from which no response is received, the Bureau of Mines estimates data based upon industry statistics prepared by the Anthracite Committee and the Pennsylvania Department of Mines.

As the method employed to collect and process data on the distribution of Pennsylvania anthracite differs greatly from that outlined above, a detailed discussion of the procedure used will be found in the Distribution section of this chapter.

PRODUCTION, MINING METHODS, AND EQUIPMENT

Pennsylvania anthracite produced in 1953 totaled 31 million tons from all sources, including deep mines, strip pits, culm banks, and dredges operating in the Lehigh, Schuylkill, and Susquehanna Rivers and their tributaries. Also included is a small tonnage (17,227 tons) of semianthracite mined in the Bernice Basin of Sullivan County. For detailed data on production and shipments by type of preparation plant, fields, regions, and counties, see tables 4 to 9. Tables 10 and 11 present data on shipments by sizes and regions, in percent of total shipments.

Shipments of anthracite from the Lehigh, Schuylkill, and Wyoming regions for 1890–1953 are shown graphically in figure 1.

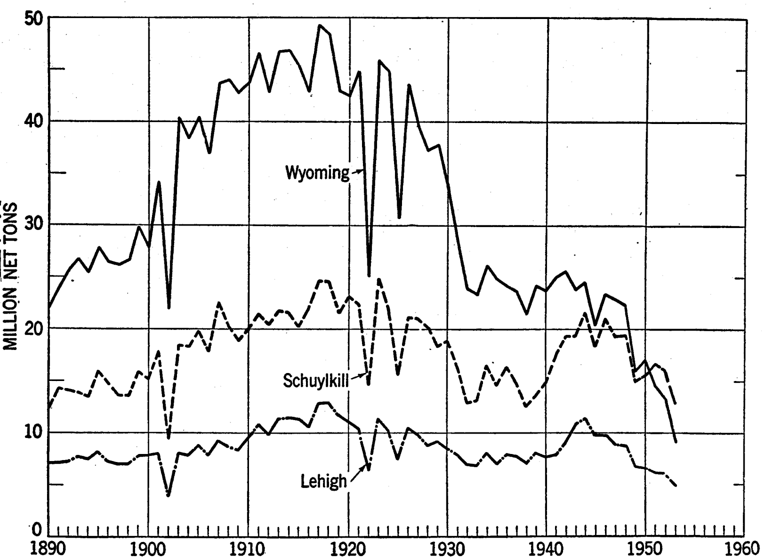

FIGURE 1.—Anthracite shipped from the Lehigh, Schuylkill, and Wyoming regions, 1890–1953.

TABLE 4.—Pennsylvania anthracite produced, 1949–53, by field and type of plant, in net tons

[The figures of breaker product include a certain quantity of culm-bank coal, which amounted to 2,728,598 tons in 1953]

Field and type of plant	1949	1950	1951 [1]	1952 [1]	1953 [1]
Eastern Middle:					
Breakers	3,379,672	3,094,587	3,063,131	2,615,151	2,182,139
Washeries	238,532	195,387	243,744	330,354	359,236
Total Eastern Middle	3,618,204	3,289,974	3,306,875	2,945,505	2,541,375
Western Middle:					
Breakers	9,636,954	10,755,416	12,371,387	11,720,646	8,876,979
Washeries	135,670		11,709	62,447	5,150
Dredges	246,905	197,812	122,732	62,696	46,884
Total Western Middle	10,019,529	10,953,228	12,505,828	11,845,789	8,929,013
Southern:					
Breakers	8,776,671	8,660,440	8,245,800	8,102,147	6,562,386
Washeries	484,595	439,934	556,142	876,982	790,584
Dredges	603,217	406,002	431,836	304,243	380,339
Total Southern	9,864,483	9,506,376	9,233,778	9,283,372	7,733,309
Northern:					
Breakers	18,579,955	19,930,556	17,366,517	16,318,695	11,589,838
Washeries	584,463	354,129	221,237	160,027	127,432
Dredges	15,000	15,750	7,000	5,115	10,958
Total Northern	19,179,418	20,300,435	17,594,754	16,483,837	11,728,228
Total, excluding Sullivan County:					
Breakers	40,373,252	42,440,999	41,046,835	38,756,639	29,211,342
Washeries	1,443,260	989,450	1,032,832	1,429,810	1,282,402
Dredges	865,122	619,564	561,568	372,054	438,181
Total, excluding Sullivan County	42,681,634	44,050,013	42,641,235	40,558,503	30,931,925
Sullivan County: [2] Breakers	20,090	26,690	28,762	24,055	17,227
Grand total	42,701,724	44,076,703	42,669,997	40,582,558	30,949,152

[1] See footnote 1, table 1.
[2] For purposes of historical comparison and statistical convenience, the mines of Sullivan County are grouped with the Pennsylvania anthracite region, although the product is classified as semianthracite according to the American Society for Testing Materials Tentative Standard.

TABLE 5.—Pennsylvania anthracite shipped outside producing region, sold locally, and used as colliery fuel in 1953, by region and type of plant

Region and type of plant	Shipments outside region		Local sales		Colliery fuel		Total	
	Net tons	Value [1]	Net tons	Value	Net tons	Value	Net tons	Value [1]
Lehigh:								
Breakers	4, 426, 566	$45, 003, 777	341, 915	$3, 857, 790	100, 999	$774, 977	4, 869, 480	$49, 636, 544
Washeries	381, 587	1, 638, 869			120	720	381, 707	1, 639, 589
Dredges	31, 391	121, 773					31, 391	121, 773
Total Lehigh	4, 839, 544	46, 764, 419	341, 915	3, 857, 790	101, 119	775, 697	5, 282, 578	51, 397, 906
Schuylkill:								
Breakers	11, 647, 957	105, 609, 204	990, 942	8, 789, 563	113, 125	437, 935	12, 752, 024	114, 836, 702
Washeries	741, 757	3, 147, 335	30, 486	124, 729	1, 020	2, 061	773, 263	3, 274, 125
Dredges	257, 450	765, 277	137, 682	514, 655	700	1, 400	395, 832	1, 281, 332
Total Schuylkill	12, 647, 164	109, 521, 816	1, 159, 110	9, 428, 947	114, 845	441, 396	13, 921, 119	119, 392, 159
Wyoming:								
Breakers	8, 987, 656	103, 659, 639	2, 196, 790	22, 198, 882	405, 392	1, 796, 945	11, 589, 838	127, 655, 466
Washeries	118, 962	457, 367	8, 470	34, 075			127, 432	491, 442
Dredges	10, 958	46, 044					10, 958	46, 044
Total Wyoming	9, 117, 576	104, 163, 050	2, 205, 260	22, 232, 957	405, 392	1, 796, 945	11, 728, 228	128, 192, 952
Total, excluding Sullivan County:								
Breakers	25, 062, 179	254, 272, 620	3, 529, 647	34, 846, 235	619, 516	3, 009, 857	29, 211, 342	292, 128, 712
Washeries	1, 242, 306	5, 243, 571	38, 956	158, 804	1, 140	2, 781	1, 282, 402	5, 405, 156
Dredges	299, 799	933, 094	137, 682	514, 655	700	1, 400	438, 181	1, 449, 149
Total	26, 604, 284	260, 449, 285	3, 706, 285	35, 519, 694	621, 356	3, 014, 038	30, 931, 925	298, 983, 017
Sullivan County:								
Breakers	12, 277	112, 804	4, 950	43, 866			17, 227	156, 670
Grand total:								
1953	26, 616, 561	260, 562, 089	3, 711, 235	35, 563, 560	621, 356	3, 014, 038	30, 949, 152	299, 139, 687
1952	35, 427, 621	337, 241, 167	4, 228, 430	38, 271, 412	926, 507	4, 201, 497	40, 582, 558	379, 714, 076
Percent change	−24.9	−22.7	−12.2	−7.1	−32.9	−28.3	−23.7	−21.2

[1] Value given for shipments is value at which coal left possession of producing company and does not include margins of separately incorporated sales companies.

TABLE 6.—Pennsylvania anthracite produced in 1953, classified as fresh-mined, culm-bank, and river coal and as breaker, washery, and dredge product, by region and type of plant, in net tons

Region and type of plant	From mines			From culm banks	From river dredging	Total
	Underground		Strip pits			
	Mechanically loaded	Hand loaded				
Lehigh:						
Breakers	277,657	2,525,708	1,733,176	332,939		4,869,480
Washeries				381,707		381,707
Dredges					31,391	31,391
Total Lehigh	277,657	2,525,708	1,733,176	714,646	31,391	5,282,578
Schuylkill:						
Breakers	787,997	5,033,195	4,911,772	2,019,060		12,752,024
Washeries				773,263		773,263
Dredges					395,832	395,832
Total Schuylkill	787,997	5,033,195	4,911,772	2,792,323	395,832	13,921,119
Wyoming:						
Breakers	5,773,115	3,478,590	1,961,534	376,599		11,589,838
Washeries				127,432		127,432
Dredges					10,958	10,958
Total Wyoming	5,773,115	3,478,590	1,961,534	504,031	10,958	11,728,228
Total, excluding Sullivan County:						
Breakers	6,838,769	11,037,493	8,606,482	2,728,598		29,211,342
Washeries				1,282,402		1,282,402
Dredges					438,181	438,181
Total	6,838,769	11,037,493	8,606,482	4,011,000	438,181	30,931,925
Sullivan County: Breakers		17,227				17,227
Grand total	6,838,769	11,054,720	8,606,482	4,011,000	438,181	30,949,152

TABLE 7.—Pennsylvania anthracite produced in 1953, classified as fresh-mined, culm-bank, and river coal and as breaker, washery, and dredge product, by field and type of plant, in net tons

Field and type of plant	From mines			From culm banks	From river dredging	Total
	Underground		Strip pits			
	Mechanically loaded	Hand loaded				
Eastern Middle:						
Breakers	277, 657	772, 529	985, 069	146, 884	----------	2, 182, 139
Washeries	----------	----------	----------	359, 236	----------	359, 236
Total Eastern Middle	277, 657	772, 529	985, 069	506, 120	----------	2, 541, 375
Western Middle:						
Breakers	471, 094	3, 295, 439	3, 404, 673	1, 705, 773	----------	8, 876, 979
Washeries	----------	----------	----------	5, 150	----------	5, 150
Dredges	----------	----------	----------	----------	46, 884	46, 884
Total Western Middle	471, 094	3, 295, 439	3, 404, 673	1, 710, 923	46, 884	8, 929, 013
Southern:						
Breakers	316, 903	3, 490, 935	2, 255, 206	499, 342	----------	6, 562, 386
Washeries	----------	----------	----------	790, 584	----------	790, 584
Dredges	----------	----------	----------	----------	380, 339	380, 339
Total Southern	316, 903	3, 490, 935	2, 255, 206	1, 289, 926	380, 339	7, 733, 309
Northern:						
Breakers	5, 773, 115	3, 478, 590	1, 961, 534	376, 599	----------	11, 589, 838
Washeries	----------	----------	----------	127, 432	----------	127, 432
Dredges	----------	----------	----------	----------	10, 958	10, 958
Total Northern	5, 773, 115	3, 478, 590	1, 961, 534	504, 031	10, 958	11, 728, 228
Total, excluding Sullivan County:						
Breakers	6, 838, 769	11, 037, 493	8, 606, 482	2, 728, 598	----------	29, 211, 342
Washeries	----------	----------	----------	1, 282, 402	----------	1, 282, 402
Dredges	----------	----------	----------	----------	438, 181	438, 181
Total	6, 838, 769	11, 037, 493	8, 606, 482	4, 011, 000	438, 181	30, 931, 925
Sullivan County: Breakers	----------	17, 227	----------	----------	----------	17, 227
Grand total	6, 838, 769	11, 054, 720	8, 606, 482	4, 011, 000	438, 181	30, 949, 152

TABLE 8.—Pennsylvania anthracite shipped in 1953, by region and size

Size	Breaker shipments [1]								
	Lehigh region			Schuylkill region			Wyoming region		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
NET TONS									
Lump [2] and Broken	16,053	3	16,056	15,916	1,435	17,351	25,595	29,058	54,653
Egg	58,700	418	59,118	173,937	1,456	175,393	184,131	4,514	188,645
Stove	885,682	4,731	890,413	1,815,974	98,684	1,914,658	2,467,528	59,459	2,526,987
Chestnut	957,084	63,431	1,020,515	2,069,795	198,090	2,267,885	2,550,651	288,193	2,838,844
Pea	351,969	120,924	472,893	988,857	204,914	1,193,771	691,564	699,414	1,390,978
Total domestic	2,269,488	189,507	2,458,995	5,064,479	504,579	5,569,058	5,919,469	1,080,638	7,000,107
Buckwheat No. 1	586,764	57,227	643,991	1,797,105	136,865	1,933,970	1,271,226	373,201	1,644,427
Buckwheat No. 2 (Rice)	356,525	74,410	430,935	1,122,830	104,763	1,227,593	674,757	261,127	935,884
Buckwheat No. 3 (Barley)	429,366	19,167	448,533	1,660,347	116,114	1,776,461	753,665	293,562	1,047,227
Buckwheat No. 4	384,082	1,604	385,686	945,917	99,240	1,045,157	229,810	42,630	272,440
Other (including silt)	400,341		400,341	1,057,279	29,381	1,086,660	138,729	145,632	284,361
Total steam	2,157,078	152,408	2,309,486	6,583,478	486,363	7,069,841	3,068,187	1,116,152	4,184,339
Grand total	4,426,566	341,915	4,768,481	11,647,957	990,942	12,638,899	8,987,656	2,196,790	11,184,446
VALUE									
Lump [2] and Broken	$233,015	$40	$233,055	$224,682	$20,878	$245,560	$360,338	$399,018	$759,356
Egg	827,978	6,565	834,543	2,353,096	20,522	2,373,618	2,507,356	61,385	2,568,741
Stove	12,670,486	70,750	12,741,236	24,474,306	1,206,711	25,681,017	34,707,947	878,501	35,586,448
Chestnut	13,662,561	975,421	14,637,982	27,669,798	2,528,972	30,198,770	35,491,430	4,290,896	39,782,326
Pea	3,796,642	1,450,024	5,246,666	10,002,521	2,120,471	12,122,992	7,393,358	8,317,773	15,711,131
Total domestic	31,190,682	2,502,800	33,693,482	64,724,403	5,897,554	70,621,957	80,460,429	13,947,573	94,408,002
Buckwheat No. 1	5,558,713	585,639	6,144,352	16,445,560	1,182,952	17,628,512	12,100,343	3,725,749	15,826,092
Buckwheat No. 2 (Rice)	2,770,860	639,231	3,410,091	8,214,253	689,233	8,903,486	5,237,374	2,124,308	7,361,682
Buckwheat No. 3 (Barley)	2,389,304	121,679	2,510,983	8,713,028	564,597	9,277,625	4,270,835	1,739,948	6,010,783
Buckwheat No. 4	1,617,514	8,441	1,625,955	3,514,554	355,406	3,869,960	1,092,786	163,632	1,256,418
Other (including silt)	1,476,704		1,476,704	3,997,406	99,821	4,097,227	497,872	497,672	995,544
Total steam	13,813,095	1,354,990	15,168,085	40,884,801	2,892,009	43,776,810	23,199,210	8,251,309	31,450,519
Grand total	45,003,777	3,857,790	48,861,567	105,609,204	8,789,563	114,398,767	103,659,639	22,198,882	125,858,521

For footnotes, see end of table.

TABLE 8.—Pennsylvania anthracite shipped in 1953, by region and size—Continued

Size	Breaker shipments [1]—Continued								
	Lehigh region			Schuylkill region			Wyoming region		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
AVERAGE VALUE PER TON									
Lump [2] and Broken	$14.52	$13.33	$14.52	$14.12	$14.55	$14.15	$14.08	$13.73	$13.89
Egg	14.11	15.71	14.12	13.53	14.09	13.53	13.62	13.60	13.62
Stove	14.31	14.95	14.31	13.48	12.23	13.41	14.07	14.77	14.08
Chestnut	14.28	15.38	14.34	13.37	12.77	13.32	13.91	14.89	14.01
Pea	10.79	11.99	11.09	10.12	10.35	10.16	10.69	11.89	11.30
Total domestic	13.74	13.21	13.70	12.78	11.69	12.68	13.59	12.91	13.49
Buckwheat No. 1	9.47	10.23	9.54	9.15	8.64	9.12	9.52	9.98	9.62
Buckwheat No. 2 (Rice)	7.77	8.59	7.91	7.32	6.58	7.25	7.76	8.14	7.87
Buckwheat No. 3 (Barley)	5.56	6.35	5.60	5.25	4.86	5.22	5.67	5.93	5.74
Buckwheat No. 4	4.21	5.26	4.22	3.72	3.58	3.70	4.76	3.84	4.61
Other (including silt)	3.69	----------	3.69	3.78	3.40	3.77	3.59	3.42	3.50
Total steam	6.40	8.89	6.57	6.21	5.95	6.19	7.56	7.39	7.52
Grand total	10.17	11.28	10.25	9.07	8.87	9.05	11.53	10.11	11.25

Size	Sullivan County			Total					
				Excluding Sullivan County			Including Sullivan County		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
NET TONS									
Lump [2] and Broken	----------	----------	----------	57,564	30,496	88,060	57,564	30,496	88,060
Egg	----------	----------	----------	416,768	6,388	423,156	416,768	6,388	423,156
Stove	510	198	708	5,169,184	162,874	5,332,058	5,169,694	163,072	5,332,766
Chestnut	3,059	1,190	4,249	5,577,530	549,714	6,127,244	5,580,589	550,904	6,131,493
Pea	2,616	1,017	3,633	2,032,390	1,025,252	3,057,642	2,035,006	1,026,269	3,061,275
Total domestic	6,185	2,405	8,590	13,253,436	1,774,724	15,028,160	13,259,621	1,777,129	15,036,750
Buckwheat No. 1	1,414	725	2,139	3,655,095	567,293	4,222,388	3,656,509	568,018	4,224,527
Buckwheat No. 2 (Rice)	----------	----------	----------	2,154,112	440,300	2,594,412	2,154,112	440,300	2,594,412
Buckwheat No. 3 (Barley)	----------	----------	----------	2,843,378	428,843	3,272,221	2,843,378	428,843	3,272,221
Buckwheat No. 4	----------	----------	----------	1,559,809	143,474	1,703,283	1,559,809	143,474	1,703,283
Other (including silt)	4,678	1,820	6,498	1,596,349	175,013	1,771,362	1,601,027	176,833	1,777,860
Total steam	6,092	2,545	8,637	11,808,743	1,754,923	13,563,666	11,814,835	1,757,468	13,572,303
Grand total	12,277	4,950	17,227	25,062,179	3,529,647	28,591,826	25,074,456	3,534,597	28,609,053
VALUE									
Lump [2] and Broken	----------	----------	----------	$818,035	$419,936	$1,237,971	$818,035	$419,936	$1,237,971
Egg	----------	----------	----------	5,688,430	88,472	5,776,902	5,688,430	88,472	5,776,902
Stove	$7,276	$2,829	$10,105	71,852,739	2,155,962	74,008,701	71,860,015	2,158,791	74,018,806
Chestnut	43,383	16,871	60,254	76,823,789	7,795,289	84,619,078	76,867,172	7,812,160	84,679,332
Pea	29,394	11,431	40,825	21,192,521	11,888,268	33,080,789	21,221,915	11,899,699	33,121,614
Total domestic	80,053	31,131	111,184	176,375,514	22,347,927	198,723,441	176,455,567	22,379,058	198,834,625
Buckwheat No. 1	12,762	4,960	17,722	34,104,616	5,494,340	39,598,956	34,117,378	5,499,300	39,616,678
Buckwheat No. 2 (Rice)	----------	----------	----------	16,222,487	3,452,772	19,675,259	16,222,487	3,452,772	19,675,259
Buckwheat No. 3 (Barley)	----------	----------	----------	15,373,167	2,426,224	17,799,391	15,373,167	2,426,224	17,799,391
Buckwheat No. 4	----------	----------	----------	6,224,854	527,479	6,752,333	6,224,854	527,479	6,752,333

For footnotes, see end of table.

TABLE 8.—Pennsylvania anthracite shipped in 1953, by region and size—Continued

Size	Breaker shipments [1]—continued								
	Sullivan County			Total					
				Excluding Sullivan County			Including Sullivan County		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
Other (including silt)	19,989	7,775	27,764	5,971,982	597,493	6,569,475	5,991,971	605,268	6,597,239
Total steam	32,751	12,735	45,486	77,897,106	12,498,308	90,395,414	77,929,857	12,511,043	90,440,900
Grand total	112,804	43,866	156,670	254,272,620	34,846,235	289,118,855	254,385,424	34,890,101	289,275,525
AVERAGE VALUE PER TON									
Lump [2] and Broken				$14.21	$13.77	$14.06	$14.21	$13.77	$14.06
Egg				13.65	13.85	13.65	13.65	13.85	13.65
Stove	$14.27	$14.29	$14.27	13.90	13.24	13.88	13.90	13.24	13.88
Chestnut	14.18	14.18	14.18	13.77	14.18	13.81	13.77	14.18	13.81
Pea	11.24	11.24	11.24	10.43	11.60	10.82	10.43	11.60	10.82
Total domestic	12.94	12.94	12.94	13.31	12.59	13.22	13.31	12.59	13.22
Buckwheat No. 1	9.03	6.84	8.29	9.33	9.69	9.38	9.33	9.68	9.38
Buckwheat No. 2 (Rice)				7.53	7.84	7.58	7.53	7.84	7.58
Buckwheat No. 3 (Barley)				5.41	5.66	5.44	5.41	5.66	5.44
Buckwheat No. 4				3.99	3.68	3.96	3.99	3.68	3.96
Other (including silt)	4.27	4.27	4.27	3.74	3.41	3.71	3.74	3.42	3.71
Total steam	5.38	5.00	5.27	6.60	7.12	6.66	6.60	7.12	6.66
Grand total	9.19	8.86	9.09	10.15	9.87	10.11	10.15	9.87	10.11

Size	Washery shipments			Dredge shipments			Grand total		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
NET TONS									
Lump [2] and Broken	----	----	----	----	----	----	57, 564	30, 496	88, 060
Egg	----	----	----	----	----	----	416, 768	6, 388	423, 156
Stove	----	----	----	----	----	----	5, 169, 694	163, 072	5, 332, 766
Chestnut	1, 188	1, 006	2, 194	----	----	----	5, 581, 777	551, 910	6, 133, 687
Pea	531	649	1, 180	----	510	510	2, 035, 537	1, 027, 428	3, 062, 965
Total domestic	1, 719	1, 655	3, 374	----	510	510	13, 261, 340	1, 779, 294	15, 040, 634
Buckwheat No. 1	15, 980	417	16, 397	823	378	1, 201	3, 673, 312	568, 813	4, 242, 125
Buckwheat No. 2 (Rice)	36, 052	486	36, 538	7, 510	888	8, 398	2, 197, 674	441, 674	2, 639, 348
Buckwheat No. 3 (Barley)	183, 900	5, 043	188, 943	46, 534	4, 675	51, 209	3, 073, 812	438, 561	3, 512, 373
Buckwheat No. 4	393, 775	----	393, 775	25, 711	56, 403	82, 114	1, 979, 295	199, 877	2, 179, 172
Other (including silt)	610, 880	31, 355	642, 235	219, 221	74, 828	294, 049	2, 431, 128	283, 016	2, 714, 144
Total steam	1, 240, 587	37, 301	1, 277, 888	299, 799	137, 172	436, 971	13, 355, 221	1, 931, 941	15, 287, 162
Grand total	1, 242, 306	38, 956	1, 281, 262	299, 799	137, 682	437, 481	26, 616, 561	3, 711, 235	30, 327, 796
VALUE									
Lump [2] and Broken	----	----	----	----	----	----	$818, 035	$419, 936	$1, 237, 971
Egg	----	----	----	----	----	----	5, 688, 430	88, 472	5, 776, 902
Stove	----	----	----	----	----	----	71, 860, 015	2, 158, 791	74, 018, 806
Chestnut	$15, 266	$12, 927	$28, 193	----	----	----	76, 882, 438	7, 825, 087	84, 707, 525
Pea	5, 788	7, 074	12, 862	----	$2, 730	$2, 730	21, 227, 703	11, 909, 503	33, 137, 206
Total domestic	21, 054	20, 001	41, 055	----	2, 730	2, 730	176, 476, 621	22, 401, 789	198, 878, 410
Buckwheat No. 1	126, 345	3, 524	129, 869	$5, 604	2, 077	7, 681	34, 249, 327	5, 504, 901	39, 754, 228
Buckwheat No. 2 (Rice)	272, 859	3, 402	276, 261	39, 018	4, 318	43, 336	16, 534, 364	3, 460, 492	19, 994, 856
Buckwheat No. 3 (Barley)	955, 464	21, 822	977, 286	186, 721	21, 275	207, 996	16, 515, 352	2, 469, 321	18, 984, 673
Buckwheat No. 4	1, 611, 399	----	1, 611, 399	97, 892	183, 335	281, 227	7, 934, 145	710, 814	8, 644, 959
Other (including silt)	2, 256, 450	110, 055	2, 366, 505	603, 859	300, 920	904, 779	8, 852, 280	1, 016, 243	9, 868, 523
Total steam	5, 222, 517	138, 803	5, 361, 320	933, 094	511, 925	1, 445, 019	84, 085, 468	13, 161, 771	97, 247, 239
Grand total	5, 243, 571	158, 804	5, 402, 375	933, 094	514, 655	1, 447, 749	260, 562, 089	35, 563, 560	296, 125, 649

For footnotes, see end of table.

TABLE 8.—Pennsylvania anthracite shipped in 1953, by region and size—Continued

Size	Washery shipments			Dredge shipments			Grand total		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
AVERAGE VALUE PER TON									
Lump [2] and Broken	----------	----------	----------	----------	----------	----------	$14.21	$13.77	$14.06
Egg	----------	----------	----------	----------	----------	----------	13.65	13.85	13.65
Stove	----------	----------	----------	----------	----------	----------	13.90	13.24	13.88
Chestnut	$12.85	$12.85	$12.85	----------	----------	----------	13.77	14.18	13.81
Pea	10.90	10.90	10.90	----------	$5.35	$5.35	10.43	11.59	10.82
Total domestic	12.25	12.09	12.17	----------	5.35	5.35	13.31	12.59	13.22
Buckwheat No. 1	7.91	8.45	7.92	$6.81	5.49	6.40	9.32	9.68	9.37
Buckwheat No. 2 (Rice)	7.57	7.00	7.56	5.20	4.86	5.16	7.52	7.83	7.58
Buckwheat No. 3 (Barley)	5.20	4.33	5.17	4.01	4.55	4.06	5.37	5.63	5.41
Buckwheat No. 4	4.09	----------	4.09	3.81	3.25	3.42	4.01	3.56	3.97
Other (including silt)	3.69	3.51	3.68	2.75	4.02	3.08	3.64	3.59	3.64
Total steam	4.21	3.72	4.20	3.11	3.73	3.31	6.30	6.81	6.36
Grand total	4.22	4.08	4.22	3.11	3.74	3.31	9.79	9.58	9.76

[1] Figures of shipments from breakers include some culm-bank coal handled in breakers.
[2] Quantity of Lump included is insignificant.

TABLE 9.—Pennsylvania anthracite produced in 1953, by counties

County	Shipments outside producing regions		Sold to local trade		Colliery fuel		Total production	
	Net tons	Value [1]	Net tons	Value	Net tons	Value	Net tons	Value [1]
Carbon	1,600,087	$14,663,643	35,954	$400,021	22,067	$234,892	1,658,108	$15,298,556
Columbia	608,956	6,711,105	15,890	198,721	13,143	42,203	637,989	6,952,029
Dauphin	138,392	986,986	157,576	744,455	---------	---------	295,968	1,731,441
Lackawanna	2,890,580	31,617,105	723,217	8,272,942	185,534	771,149	3,799,331	40,661,196
Lancaster, Lebanon, Northampton, and Snyder [2]	224,373	625,716	9,440	39,557	---------	---------	233,813	665,273
Luzerne	7,909,838	90,158,806	1,699,634	16,485,516	282,575	1,390,803	9,892,047	108,035,125
Northumberland	3,860,413	32,654,615	395,880	3,142.033	12,843	42,573	4,269,136	35,839,221
Schuylkill	9,371,645	83,031,309	668,694	6,236,449	105,194	532,418	10,145,533	89,800,176
Sullivan	12,277	112,804	4,950	43,866	---------	---------	17,227	156,670
Total	26,616,561	260,562,089	3,711,235	35,563,560	621,356	3,014,038	30,949,152	299,139,687

[1] Value given for shipments is value at which coal left possession of producing company and does not include margins of separately incorporated sales companies.
[2] Counties producing dredge coal only.

Underground Operations.—The "pitch" (angle at which coal seams lie in relation to the horizontal) and other geological and physical conditions, such as seam thickness, faults, fissures, roof, and outcrop not only greatly influence mining methods and mine transportation but determine, to a large degree, the manner by which access is gained to the coal seams. Generally, underground anthracite mining is conducted from 1 of 3 types of openings—shafts, slopes, or drifts. The greater part of the anthracite produced underground is brought to the surface by means of shafts, vertical openings from the surface that may penetrate several workable coal seams. A typical shaft usually has two compartments through which mine cars, men, and supplies are hoisted to or lowered from the surface. A slope entry is an opening driven downward from the surface at an angle calculated to intersect one or several coal seams and provide a means of haulage. A drift entry, on the other hand, is usually driven into the coal outcrop and follows the course of the coal seam.

The room-and-pillar method of mining, by which nearly all underground output was produced in the early years of the industry, is still used quite generally in the Wyoming region, where the coal beds are comparatively flat. In this system, main gangways are driven from the shaft or slope to provide transportation roads for the mine; from the main gangways, miners' chambers or rooms are driven at specified intervals with pillars of solid coal left standing to support the roof. Subsequently, many of these pillars are recovered through pillar "robbing" operations.

Because of exhaustion of virgin reserves in many areas, much of the current underground production is obtained by second mining (pillar robbing) or third mining. Underground mining has become increasingly costly, particularly since the beginning of World War II, because of sharply increased costs for materials and labor. In recent years, also, the expense of pumping water from underground workings per ton of output has mounted steadily with declines in production. Therefore, to attain a better competitive status, efforts have been made to curtail production at high-cost deep mines and obtain a larger production from lower cost sources. In 1953, for example, 58 percent of the total output was produced underground compared with 61 percent in 1952. Of the total underground production in 1953, 52 percent was mined in the Wyoming region, 32 percent in the Schuylkill, and 16 percent in the Lehigh.

TABLE 10.—Sizes of Pennsylvania anthracite shipped from breakers to points outside producing region, 1949–53, by regions, in percent of total

[Does not include shipments of dredge and washery coal]

Size	Percent of total shipments									
	Lehigh region					Schuylkill region				
	1949	1950	1951	1952	1953	1949	1950	1951 [1]	1952 [1]	1953 [1]
Lump [2] and Broken	0.4	0.4	1.0	0.3	0.4	0.3	0.2	0.4	0.2	0.1
Egg	2.9	3.6	3.7	1.9	1.3	3.1	3.5	3.6	1.9	1.5
Stove	20.6	22.0	20.1	19.9	20.0	17.5	18.1	16.2	16.6	15.6
Chestnut	22.8	22.7	22.4	21.3	21.6	22.3	22.4	19.6	19.6	17.8
Pea	7.7	7.9	7.7	7.0	8.0	8.3	7.9	8.0	7.7	8.5
Total domestic	54.4	56.6	54.9	50.4	51.3	51.5	52.1	47.8	46.0	43.5
Buckwheat No. 1	13.1	13.5	13.2	13.3	13.3	14.2	14.6	14.1	14.7	15.4
Buckwheat No. 2 (Rice)	8.1	7.9	8.0	7.5	8.0	8.9	8.6	8.9	9.2	9.6
Buckwheat No. 3 (Barley)	9.7	9.8	9.3	8.9	9.7	12.6	11.9	13.2	14.1	14.3
Buckwheat No. 4	7.9	6.1	7.3	8.2	8.7	6.3	6.2	7.5	7.9	8.1
Other (including silt)	6.8	6.1	7.3	11.7	9.0	6.5	6.6	8.5	8.1	9.1
Total steam	45.6	43.4	45.1	49.6	48.7	48.5	47.9	52.2	54.0	56.5

Size	Wyoming region					Sullivan County				
Lump [2] and Broken	0.2	0.3	0.9	0.3	0.3	-----	-----	-----	-----	-----
Egg	3.4	3.3	3.9	2.4	2.0	-----	-----	-----	-----	-----
Stove	29.4	29.3	27.8	28.3	27.5	32.0	15.1	9.9	4.7	4.2
Chestnut	31.7	31.2	30.7	29.8	28.4	38.0	25.5	20.0	21.1	24.9
Pea	6.7	6.6	6.6	7.2	7.7	10.0	20.5	15.4	16.2	21.3
Total domestic	71.4	70.7	69.9	68.0	65.9	80.0	61.1	45.3	42.0	50.4
Buckwheat No. 1	13.4	13.3	13.0	14.5	14.1	2.1	16.4	12.5	11.6	11.5
Buckwheat No. 2 (Rice)	7.0	7.0	6.6	7.3	7.5	-----	-----	42.2	-----	-----
Buckwheat No. 3 (Barley)	6.0	6.7	7.7	7.5	8.4	-----	-----	-----	-----	-----
Buckwheat No. 4	1.1	1.2	1.6	1.4	2.6	-----	-----	-----	-----	-----
Other (including silt)	1.1	1.1	1.2	1.3	1.5	17.9	22.5	-----	46.4	38.1
Total steam	28.6	29.3	30.1	32.0	34.1	20.0	38.9	54.7	58.0	49.6

Size	Total									
	Excluding Sullivan County					Including Sullivan County				
Lump [2] and Broken	0.2	0.3	0.7	0.3	0.2	0.2	0.3	0.7	0.3	0.2
Egg	3.2	3.4	3.7	2.1	1.7	3.2	3.4	3.7	2.1	1.7
Stove	23.2	23.7	21.5	21.7	20.6	23.2	23.7	21.5	21.7	20.6
Chestnut	26.5	26.4	24.5	23.8	22.3	26.5	26.4	24.5	23.8	22.3
Pea	7.5	7.3	7.4	7.4	8.1	7.5	7.3	7.4	7.4	8.1
Total domestic	60.6	61.1	57.8	55.3	52.9	60.6	61.1	57.8	55.3	52.9
Buckwheat No. 1	13.7	13.8	13.5	14.4	14.6	13.7	13.8	13.5	14.4	14.6
Buckwheat No. 2 (Rice)	7.9	7.8	7.9	8.2	8.6	7.9	7.8	7.9	8.2	8.6
Buckwheat No. 3 (Barley)	9.2	9.3	10.3	10.7	11.3	9.2	9.3	10.3	10.7	11.3
Buckwheat No. 4	4.4	3.9	5.1	5.4	6.2	4.4	3.9	5.1	5.4	6.2
Other (including silt)	4.2	4.1	5.4	6.0	6.4	4.2	4.1	5.4	6.0	6.4
Total steam	39.4	38.9	42.2	44.7	47.1	39.4	38.9	42.2	44.7	47.1

[1] See footnote 1, table 1. [2] Quantity of Lump included is insignificant.

TABLE 11.—Sizes of Pennsylvania anthracite shipped from breakers to points outside and inside producing region in 1953, by regions, in percent of total

[Does not include shipments of dredge and washery coal]

Size	Percent of total shipments								
	Lehigh region			Schuylkill region			Wyoming region		
	Shipped outside region	Local sales	Total	Shipped outside region	Local sales	Total	Shipped outside region	Local sales	Total
Lump [1] and Broken	0.4	(2)	0.3	0.1	0.1	0.1	0.3	1.3	0.5
Egg	1.3	0.1	1.3	1.5	0.1	1.4	2.0	0.2	1.7
Stove	20.0	1.4	18.7	15.6	10.0	15.2	27.5	2.7	22.6
Chestnut	21.6	18.5	21.4	17.8	20.0	17.9	28.4	13.1	25.4
Pea	8.0	35.4	9.9	8.5	20.7	9.5	7.7	31.9	12.4
Total domestic	51.3	55.4	51.6	43.5	50.9	44.1	65.9	49.2	62.6
Buckwheat No. 1	13.3	16.7	13.5	15.4	13.8	15.3	14.1	17.0	14.7
Buckwheat No. 2 (Rice)	8.0	21.8	9.0	9.6	10.6	9.7	7.5	11.9	8.4
Buckwheat No. 3 (Barley)	9.7	5.6	9.4	14.3	11.7	14.0	8.4	13.4	9.4
Buckwheat No. 4	8.7	0.5	8.1	8.1	10.0	8.3	2.6	1.9	2.4
Other (including silt)	9.0	—	8.4	9.1	3.0	8.6	1.5	6.6	2.5
Total steam	48.7	44.6	48.4	56.5	49.1	55.9	34.1	50.8	37.4

Size	Sullivan County			Total					
				Excluding Sullivan County			Including Sullivan County		
Lump [1] and Broken	—	—	—	0.2	0.9	0.3	0.2	0.9	0.3
Egg	—	—	—	1.7	0.2	1.5	1.7	0.2	1.5
Stove	4.2	4.0	4.1	20.6	4.6	18.7	20.6	4.6	18.7
Chestnut	24.9	24.0	24.7	22.3	15.6	21.4	22.3	15.6	21.4
Pea	21.3	20.6	21.1	8.1	29.0	10.7	8.1	29.0	10.7
Total domestic	50.4	48.6	49.9	52.9	50.3	52.6	52.9	50.3	52.6
Buckwheat No. 1	11.5	14.6	12.4	14.6	16.1	14.8	14.6	16.1	14.8
Buckwheat No. 2 (Rice)	—	—	—	8.6	12.5	9.1	8.6	12.4	9.1
Buckwheat No. 3 (Barley)	—	—	—	11.3	12.1	11.4	11.3	12.1	11.4
Buckwheat No. 4	—	—	—	6.2	4.1	5.9	6.2	4.1	5.9
Other (including silt)	38.1	36.8	37.7	6.4	4.9	6.2	6.4	5.0	6.2
Total steam	49.6	51.4	50.1	47.1	49.7	47.4	47.1	49.7	47.4

[1] Quantity of Lump included is insignificant. [2] Less than 0.05 percent.

Strip-Pit Coal.—When a seam of coal lies near enough to the surface, it may be recovered by stripping, a method similar in some respects to quarrying. The more important factors considered in determining the feasibility of stripping a particular seam are (1) the ratio of overburden (soil, clay, and rock) to recoverable coal, (2) physical characteristics and costs of removing the overburden, (3) capacities of available machinery, (4) the market price of coal, and (5) availability of transportation.

In strip-mining coal, surface soil generally is removed by power shovels or bulldozers to expose the shale or rock strata. The exposed strata are drilled and blasted, and large-capacity shovels and draglines are employed to cast the material to one side into spoil banks, usually into the pit formed by removing coal from a previous cut, or into trucks for disposal. The coal seam thus exposed is then cleaned, drilled, and blasted for loading. In the Wyoming region, conditions are not conducive to the stripping of large tonnages. However, in the Lehigh and Schuylkill regions, especially the latter, the thick, highly pitched seams are more adaptable to strip mining, and it is in those regions that stripping has been carried on most extensively.

In recent years a definite trend has developed toward the production of a relatively larger proportion of annual output from surface sources. For example, although the quantity produced at strip pits in 1953 was substantially less than in 1952, the amount produced represented 28 percent of the total output and approximately 33 percent of the fresh-mined output—each a new high. In contrast, the record strip tonnage of 13,352,874 tons produced in 1948 represented only 23 percent of total output and 27 percent of the fresh-mined total. Of the total stripped in 1953, 57 percent was produced in the Schuylkill region, 20 percent in the Lehigh, and 23 percent in the Wyoming.

On the basis of fresh-mined tonnage only, strip coal represented 46 percent of the 1953 production in the Schuylkill region, 38 percent in the Lehigh, and 18 percent in the Wyoming, compared with 45, 33, and 16 percent, respectively, in 1951. These changes reflect a steady increase in the level of stripping operations in the Schuylkill region, with its thick outcropping beds, and the result of efforts by operators in the other regions to obtain more production from open pits. Table 12 presents data on stripping operations for selected years in the period 1915–53, and figure 2 delineates the growth of strip-pit production, by regions, 1928–53.

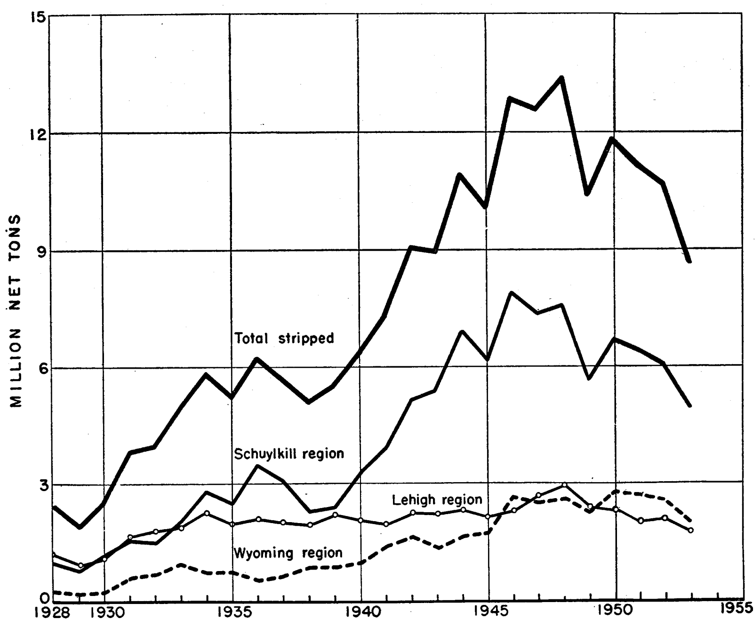

FIGURE 2.—Pennsylvania anthracite mined from strip pits, by regions, 1928–53.

Culm-Bank Coal.—In the early days of the anthracite industry, only the large sizes of coal were in demand; and such sizes as Steamboat and Grate, which are no longer produced, formed an important part of production. Inasmuch as preparation appliances were not then de-

TABLE 12.—Production of Pennsylvania anthracite from strip pits, 1915, 1920, 1925, 1930, and 1947–53

	Mined by stripping (net tons)	Percent of fresh-mined total that was stripped	Number of men employed	Average number of days worked
1915	1,121,603	(1)	(1)	(1)
1920	2,054,441	2.5	(1)	(1)
1925	1,578,478	2.7	(1)	(1)
1930	2,536,288	3.7	(1)	(1)
1947	12,603,545	25.4	7,264	242
1948	13,352,874	26.5	7,005	260
1949	10,376,808	27.7	7,386	198
1950	11,833,934	29.6	7,949	212
1951	11,135,990	29.7	7,647	220
1952	10,696,705	30.2	7,100	212
1953:				
Lehigh region	1,733,176	38.2	1,368	184
Schuylkill region	4,911,772	45.8	3,428	194
Wyoming region	1,961,534	17.5	1,372	201
Total [2]	8,606,482	32.5	6,168	193

[1] Data not available.
[2] No production by stripping in Sullivan County in 1953.

veloped to the present state of efficiency, vast additional quantities of the smaller sizes were also discarded.

The first efforts at recovering coal from the banks were generally confined to reclaiming Chestnut and larger sizes. This material was loaded by machine and moved to breakers, where it was crushed, screened, and otherwise prepared to remove adhering pieces of rock or slate from the coal. However, over the years, combustion equipment was gradually developed to burn progressively smaller coal. To meet the growing demand for small coal, the industry evolved more effective methods of preparing the smaller sizes for market. Under these circumstances, the culm and silt banks scattered throughout the region became extremely valuable. However, as most of the older banks have been processed and, in some instances, reprocessed, little large coal remains.

Due to the strong demand for coal during World War II, output from culm and silt banks reached an alltime peak of 9.6 million tons in 1944. In the following years, production gradually declined, falling to about 3.5 million tons by 1950. Despite decreases in total production in 1951 and 1952, however, the tonnage recovered from banks increased in both years because of the relatively strong demand for the smaller sizes for public-utility and industrial use. Output from the banks will probably decline slowly during the next few years and eventually cease as the banks are exhausted. Recovery of coal from waste material may be limited in future to silt from old settling ponds and basins and anthrafines from breaker wastes, as the efficiency of modern coal-preparation equipment permits little coal to reach spoil banks.

Anthracite recovered from culm and silt banks slightly exceeded the 4-million-ton mark in 1953—16 percent less than in 1952; however, the total represented 13 percent of total production in 1953 compared with 12 percent in 1952. Of the total recovered from banks in 1953, approximately 70 percent was obtained in the Schuylkill region, 18 percent in the Lehigh, and 12 percent in the Wyoming, indicating that only slight relative changes occurred in production from banks in the 3 regions. Details on the production of culm-bank coal are presented, by region and field, in tables 13 and 14.

TABLE 13.—Production of Pennsylvania anthracite from culm banks, by regions, 1935–53, in net tons

Year	Lehigh	Schuylkill	Wyoming	Sullivan County	Total
1935	192, 790	1, 748, 960	760, 718		2, 702, 468
1936	136, 058	2, 532, 116	525, 798		3, 193, 972
1937	101, 239	2, 178, 482	442, 878		2, 722, 599
1938	53, 037	1, 941, 896	345, 511		2, 340, 444
1939	64, 180	2, 159, 548	360, 086		2, 583, 814
1940	192, 878	2, 109, 557	480, 603		2, 783, 038
1941	326, 755	2, 881, 049	449, 062		3, 656, 866
1942	745, 934	3, 529, 757	459, 373		4, 735, 064
1943	1, 944, 047	4, 577, 917	1, 041, 841	19, 893	7, 583, 698
1944	2, 125, 317	5, 787, 036	1, 673, 994	13, 833	9, 600, 180
1945	2, 086, 864	4, 936, 907	1, 728, 440	34, 448	8, 786, 659
1946	1, 875, 590	4, 752, 141	1, 780, 874	22, 487	8, 431, 092
1947	1, 044, 501	3, 947, 016	1, 409, 217	2, 912	6, 403, 646
1948	796, 114	3, 729, 542	1, 098, 123		5, 623, 779
1949	694, 763	2, 778, 131	956, 250		4, 429, 144
1950	366, 069	2, 533, 535	565, 829	1, 877	3, 467, 310
1951	566, 613	3, 578, 795	484, 792		4, 630, 200
1952	791, 445	3, 407, 974	566, 097		4, 765, 516
1953	714, 646	2, 792, 323	504, 031		4, 011, 000

TABLE 14.—Culm-bank coal put through breakers, 1948–53, by fields, in net tons

Year	Northern	Eastern Middle	Western Middle	Southern	Total
1948	393, 787	152, 827	1, 871, 847	1, 571, 119	3, 989, 580
1949	371, 787	193, 565	1, 366, 775	1, 081, 585	3, 013, 712
1950	[1] 213, 577	35, 270	1, 388, 760	840, 253	2, 477, 860
1951	263, 555	107, 064	2, 526, 144	700, 605	3, 597, 368
1952	406, 070	93, 543	2, 158, 009	679, 932	3, 337, 554
1953	376, 599	146, 884	1, 705, 773	499, 342	2, 728, 598

[1] A small quantity of culm-bank coal was put through breakers in Sullivan County.

Dredge Coal.—During the early history of the industry, tremendous quantities of anthracite were deposited into the rivers and creeks traversing the coal fields, either through the erosive action of natural forces upon the vast culm banks or as the result of dumping breaker wastes directly into the surface streams. With the advent of improved combustion equipment, the use of river, or dredge, coal became economically attractive to many electric-power and industrial consumers. By 1890, dredging had become an important auxiliary source of low-cost fuel. From 1909 to 1953, inclusive, dredge operators reported the recovery of about 31 million tons from the Susquehanna, Lehigh, and Schuylkill Rivers and from such creeks as the Mahanoy, Shamokin, Swatara, and Wiconisco. As in the case of culm-bank coal, however, the output from dredges will eventually cease because of more efficient preparation methods and the Pennsylvania State laws that prohibit the deposition of untreated breaker wastes into surface streams.

Production of dredge coal totaled about 438,000 tons in 1953, an increase of 18 percent over 1952. The Susquehanna River, which, with its tributaries, has provided the bulk of the dredge coal produced, contributed 88 percent of the 1953 output. Details on the production of dredge coal, by rivers, are shown in tables 15 and 16.

TABLE 15.—Pennsylvania anthracite produced by dredges in 1953, by rivers (including tributaries)

River	Production (net tons)	Value	
		Total	Average
Lehigh	31,391	$121,773	$3.88
Schuylkill	20,643	71,605	3.47
Susquehanna	386,147	1,255,771	3.25
Total	438,181	1,449,149	3.31

TABLE 16.—Pennsylvania anthracite produced by dredges, 1909–53, by rivers (including tributaries)

Year	Net tons				Value	
	Lehigh River	Schuylkill River	Susquehanna River	Total	Total	Average per ton
1909	(1)	(1)	(1)	107,788	(1)	(1)
1910				102,853		
1911				106,005		
1912				96,009		
1913				150,064		
1914				115,257		
1915				138,421	$100,744	$0.73
1916				160,507	110,831	.69
1917				170,672	206,754	1.21
1918				282,930	366,565	1.30
1919				693,093	868,746	1.25
1920				740,453	862,296	1.16
1921				623,329	650,654	1.04
1922				904,108	989,709	1.09
Total, 1909–22 [2]	(1)	(1)	(1)	4,391,489	[2] 4,156,299	1.12
1923	106,092	97,254	753,022	956,368	811,065	0.85
1924	80,301	74,359	670,734	825,394	681,181	.83
1925	99,614	173,639	742,455	1,015,708	929,292	.91
1926	58,544	131,654	724,566	914,764	828,398	.91
1927	85,177	127,705	758,935	971,817	794,807	.82
1928	89,304	157,449	696,648	943,401	821,530	.87
1929	87,241	133,720	495,983	716,944	626,187	.87
1930	60,219	138,236	444,836	643,291	538,268	.84
1931	33,014	90,855	334,881	458,750	379,682	.83
1932	42,091	105,990	331,969	480,050	445,799	.93
1933	51,083	106,004	381,837	538,924	452,153	.84
1934	91,346	100,873	459,961	652,180	636,038	.98
1935	78,578	73,326	438,563	590,467	517,304	.88
1936	63,327	31,669	451,688	546,684	581,679	1.06
1937	[3] 95,065	(3)	665,409	760,474	842,052	1.11
1938	[3] 123,452	(3)	447,572	571,024	570,579	1.00
1939	62,134	67,539	574,187	703,860	746,000	1.06
1940	[3] 78,947	(3)	863,997	942,944	1,097,000	1.16
1941	47,838	396,522	1,073,203	1,517,563	1,839,784	1.21
1942	9,385	268,919	1,006,729	1,285,033	1,478,719	1.15
1943	37,452	342,815	954,470	1,334,737	1,972,777	1.48
1944	40,894	494,371	837,472	1,372,737	2,084,431	1.52
1945	41,409	366,161	797,656	1,205,226	1,924,148	1.60
1946	37,441	247,757	847,196	1,132,394	2,091,324	1.85
1947	46,478	158,102	1,015,126	1,219,706	2,480,068	2.03
1948	54,284	67,871	865,849	988,004	2,291,752	2.32
1949	22,131	52,012	790,979	865,122	2,131,096	2.46
1950	21,877	34,222	563,465	619,564	1,677,508	2.71
1951	25,344	27,454	508,770	561,568	1,576,576	2.81
1952	17,402	30,407	324,245	372,054	1,109,778	2.98
1953	31,391	20,643	386,147	438,181	1,449,149	3.31
Total, 1923–53	1,818,855	4,117,528	20,208,550	26,144,933	36,406,124	1.39
Grand total	(1)	(1)	(1)	30,536,422	(1)	(1)

[1] Data not available.
[2] Figures for value cover 1915–22.
[3] Schuylkill included with Lehigh in 1937, 1938, and 1940.

Breakers and Washeries.—The modern anthracite breaker, or preparation plant, may be compared with a large industrial plant in size, initial cost, value of annual product, and complexity of the machinery with which it is equipped. The typical large breaker is capable of handling and processing daily thousands of tons of a wide variety of raw carbonaceous material. Many breakers process the output of deep mines and strip pits as well as low-grade culm-bank material into a finished product meeting fully the rigid specifications for "standard anthracite" (see table 17).

TABLE 17.—Standard anthracite specifications approved and adopted by the Anthracite Committee, effective July 28, 1947

Size	Round test mesh (inches)	Percent					
		Oversize, maximum	Undersize		Maximum impurities [1]		
			Maximum	Minimum	Slate	Bone or ash [2]	
Broken	Through 4⅜				1½	2	11
	Over 3¼ to 3		15	7½			
Egg	Through 3¼ to 3	5			1½	2	11
	Over 2 7/16		15	7½			
Stove	Through 2 7/16	7½			2	3	11
	Over 1⅝		15	7½			
Chestnut	Through 1⅝	7½			3	4	11
	Over 13/16		15	7½			
Pea	Through 13/16	10			4	5	12
	Over 9/16		15	7½			
Buckwheat No. 1	Through 9/16	10					13
	Over 5/16		15	7½			
Buckwheat No. 2 (Rice)	Through 5/16	10					13
	Over 3/16		17	7½			
Buckwheat No. 3 (Barley)	Through 3/16	10					15
	Over 3/32		20	10			
Buckwheat No. 4	Through 3/32	20					15
	Over 3/64		30	10			
Buckwheat No. 5	Through 3/64	30	No limit				16

[1] When slate content in the sizes from Broken to Chestnut, inclusive, is less than above standards, bone content may be increased by 1½ times the decrease in the slate content under the allowable limits, but slate content specified above shall not be exceeded in any event.

A tolerance of 1 percent is allowed on the maximum percentage of undersize and the maximum percentage of ash content.

The maximum percentage of undersize is applicable only to anthracite as it is produced at the preparation plant. Slate is defined as any material that has less than 40 percent fixed carbon.

Bone is defined as any material that has 40 percent or more, but less than 75 percent, fixed carbon.

[2] Ash determinations are on a dry basis.

The primary function of the breaker is to break down the large masses of coal and to remove the extraneous foreign material, rock, slate, and bone to limit impurities of the cleaned and sized coal to the specified standard. In addition, the breakers are equipped with a system of multiple screening devices to produce a wide variety of sizes. Impurities generally are removed in breakers by cleaning devices such as jigs, tables, and dense- or heavy-medium separators operating on the differences in specific gravity between anthracite and its impurities. Froth-flotation equipment has been installed at several plants to clean and recover the extremely fine mesh particles formerly lost in the breaker wastes. Of the approximate 31 million tons of anthracite produced in 1953, 29.2 million tons was prepared at breakers or preparation plants and the remainder at washeries and dredges.

Although the major part of the culm-bank material processed in recent years has been put through breakers, a substantial amount is prepared at washeries. These plants process straight culm-bank material, which requires little or no crushing. Consequently, most of the washeries are equipped only with washing and screening facilities and, at most, one set of primary rolls. As indicated in the discussion of culm-bank coal, most of the older culm banks have already been processed for the recovery of large-size coal. Therefore, the current output of washeries is predominantly small coal. Of the 1.3 million tons shipped from washeries in 1953, over 99 percent was Buckwheat No. 1 and smaller sizes.

Weekly and Monthly Data.—Weekly and monthly production data are published regularly by the Bureau of Mines in the Weekly Anthracite Report. The weekly data in this report are estimated on the basis of carloading figures courteously furnished by the Association of American Railroads and include estimates of truck shipments and colliery fuel. The data in tables 18 and 19 have been adjusted to the total production figure obtained from a direct mail canvass of the anthracite-producing companies.

TABLE 18.—Estimated weekly production of Pennsylvania anthracite in 1953 [1]

Week ended—	Thousand net tons	Week ended—	Thousand net tons	Week ended—	Thousand net tons	Week ended—	Thousand net tons
Jan. 3	[2] 80	Apr. 11	462	July 18	690	Oct. 24	703
10	688	18	452	25	622	31	623
17	725	25	527	Aug. 1	607	Nov. 7	553
24	567	May 2	605	8	552	14	615
31	647	9	625	15	575	21	606
Feb. 7	672	16	633	22	567	28	490
14	543	23	708	29	618	Dec. 5	574
21	652	30	780	Sept. 5	575	12	530
28	571	June 6	697	12	495	19	532
Mar. 7	601	13	698	19	628	26	514
14	682	20	710	26	703	31	[2] 415
21	540	27	829	Oct. 3	699		
28	335	July 4	87	10	721	Total	30,949
Apr. 4	321	11	608	17	697		

[1] Estimated from weekly carloadings as reported by the Association of American Railroads. Adjusted to annual production total from Bureau of Mines canvass.
[2] Figures represent output of working days in that part of week included in the calendar year 1953. Preliminary production for week of Jan. 2, 1954, was 422,000 tons. Revised total for week of Jan. 3, 1953, was 516,000 tons.

TABLE 19.—Estimated monthly production of Pennsylvania anthracite, 1946–53, in thousand net tons [1]

Month	1946	1947	1948	1949	1950	1951 [2]	1952 [2]	1953 [2]
January	4,968	5,172	4,929	3,725	2,893	4,316	4,221	2,707
February	4,774	4,254	4,682	2,930	2,563	3,621	3,362	2,438
March	5,476	4,984	4,935	2,375	4,847	2,244	3,140	2,354
April	5,069	4,293	4,445	3,725	3,331	2,675	3,384	2,048
May	5,453	4,564	4,874	4,407	4,228	3,723	3,400	2,869
June	3,625	4,624	4,597	3,406	4,166	3,848	3,293	2,975
July	5,248	4,098	4,372	3,925	2,855	2,847	2,522	2,551
August	5,428	5,011	5,129	3,710	4,386	3,612	2,704	2,452
September	5,033	5,158	5,015	2,114	3,835	3,267	3,761	2,732
October	5,393	5,524	4,969	4,979	4,282	4,675	4,213	2,994
November	4,975	4,629	4,687	4,657	3,355	4,129	3,405	2,386
December	5,065	4,879	4,506	2,749	3,336	3,713	3,178	2,443
Total	60,507	57,190	57,140	42,702	44,077	42,670	40,583	30,949

[1] Production is estimated from weekly carloadings as reported by the Association of American Railroads and includes mine fuel, coal sold locally, and dredge coal.
[2] See footnote 1, table 1.

Mechanical Loading.—Of the 17.9 million tons of Pennsylvania anthracite produced at underground workings in 1953, 38 percent was loaded by mechanical means, indicating a significant drop both in the volume of coal produced underground and in mechanical loading. The Northern field, which is coextensive with the Wyoming region, again led in mechanical loading with 84 percent of the total, followed by the Western Middle field with 7 percent, the Southern with 5 percent, and the Eastern Middle field with 4 percent. On a percentage basis, the quantity mechanically loaded underground declined 33 percent in 1953 in the Northern, 34 percent in the Southern, 28 percent in the Western Middle, and 12 percent in the Eastern Middle field. Data are presented on underground mechanical loading in tables 20 to 22. Historical trends in mechanical loading, hand loading, and stripping are shown graphically in figure 3.

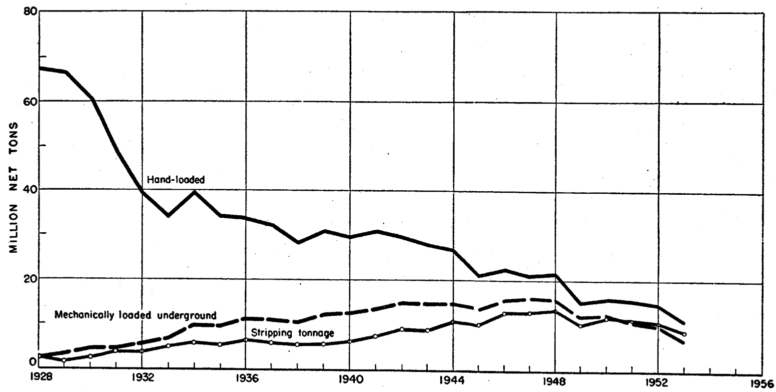

FIGURE 3.—Trends in mechanical loading, hand loading, and stripping of Pennsylvania anthracite, 1928–53.

Cutting Machines.—Only a small part of the underground production of anthracite is cut by machine before blasting. The quantity cut has declined steadily since 1946, and the total of 318,699 tons for 1953 was about 17 percent less than in 1952. All of the 135 cutting machines used in 1953 were of the "permissible" type which conformed to safety standards established by the Bureau of Mines.

TABLE 20.—Pennsylvania anthracite loaded mechanically underground, 1952–53, by fields, in net tons

Field	Scraper loaders [1]		Pit-car loaders		Hand-loaded face conveyors, all types [2]		Total mechanically loaded	
	1952	1953	1952	1953	1952	1953	1952	1953
Northern	1,206,136	1,062,007	42,162	47,422	7,339,669	4,663,686	8,587,967	5,773,115
Eastern Middle	34,011	34,032			280,121	243,625	314,132	277,657
Western Middle	106,058	76,377	12,070	5,030	534,696	389,687	652,824	471,094
Southern	61,568	56,077			417,973	260,826	479,541	316,903
Total	1,407,773	1,228,493	54,232	52,452	8,572,459	5,557,824	10,034,464	6,838,769

[1] Includes mobile loaders.
[2] Shaker chutes, etc., including those equipped with duckbills.

TABLE 21.—Pennsylvania anthracite loaded mechanically underground, 1949–53

Year	Scrapers		Mobile loaders		Conveyors [1] and pit-car loaders		Total loaded mechanically	
	Number of units	Net tons loaded	Number of units	Net tons loaded	Number of units	Net tons loaded	Number of units	Net tons loaded
1949	589	1,950,503	27	80,104	3,618	9,827,481	4,234	11,858,088
1950	556	1,900,185	30	89,191	3,460	10,346,274	4,046	12,335,650
1951	528	1,693,656	43	79,032	3,282	9,075,099	3,853	10,847,787
1952	456	1,321,930	54	85,843	3,232	8,626,691	3,742	10,034,464
1953	489	1,206,241	39	22,252	2,784	5,610,276	3,312	6,838,769

[1] Includes duckbills and other self-loading conveyors.

TABLE 22.—Relative growth of mechanical loading, hand loading, and stripping in Pennsylvania anthracite mines, 1927–53

[Mechanical loading includes coal handled on pit-car loaders and hand-loaded face conveyors]

Year	Net tons			Index numbers: 1937=100		
	Underground		Stripping	Underground		Stripping
	Mechanical loading	Hand loading		Mechanical loading	Hand loading	
1927	[1] 2,223,281	71,434,537	2,153,156	20	224	38
1928	[1] 2,351,074	67,373,788	2,422,924	22	211	43
1929	3,470,158	66,493,690	1,911,766	32	209	34
1930	4,467,750	60,458,344	2,536,288	42	190	45
1931	4,384,780	49,074,722	3,813,237	41	154	67
1932	5,433,340	38,400,820	3,980,973	51	120	70
1933	6,557,267	34,474,844	4,932,069	61	108	87
1934	9,284,486	39,290,255	5,798,138	87	123	102
1935	9,279,057	34,503,819	5,187,072	87	108	91
1936	10,827,946	33,898,560	6,203,267	101	106	109
1937	10,683,837	31,882,514	5,696,018	100	100	100
1938	10,151,669	27,990,628	5,095,341	95	88	89
1939	11,773,833	30,797,715	5,486,479	110	97	96
1940	12,326,000	29,190,837	6,352,700	115	92	112
1941	13,441,987	30,435,277	7,316,574	126	95	128
1942	14,741,459	30,495,240	9,070,933	138	96	159
1943	14,745,793	27,990,005	8,989,387	138	88	158
1944	14,975,146	26,800,270	10,953,030	140	84	192
1945	13,927,955	20,957,744	10,056,325	130	66	177
1946	15,619,162	22,465,295	12,858,930	146	70	226
1947	16,054,011	20,909,101	12,603,545	150	66	221
1948	15,742,368	21,432,923	13,352,874	147	67	234
1949	11,858,088	15,172,562	10,376,808	111	48	182
1950	12,335,650	15,820,245	11,833,934	115	50	208
1951	10,847,787	15,494,452	11,135,990	102	49	196
1952	10,034,464	14,713,819	10,696,705	94	46	188
1953	6,838,769	11,054,720	8,606,482	64	35	151

[1] As reported by Commonwealth of Pennsylvania, Department of Mines.

Stripping Equipment.—The number of power shovels and draglines used in 1953 in stripping Pennsylvania anthracite increased slightly over 1952, and the largest gain was reported for diesel-powered shovels. Details on the number of stripping machines in 1951–53, by type of power, are shown in table 23.

TABLE 23.—Power shovels and draglines used in stripping Pennsylvania anthracite, 1951–53, by type of power

Type of power	1951			1952			1953		
	Number of power shovels	Number of draglines	Total	Number of power shovels	Number of draglines	Total	Number of power shovels	Number of draglines	Total
Gasoline	47	7	54	51	7	58	45	7	52
Electric	55	50	105	53	57	110	54	56	110
Diesel	195	241	436	158	226	384	180	232	412
Total	297	298	595	262	290	552	279	295	574

PRICES AND VALUES OF SALES

Effective February 18, 1953, the Office of Price Stabilization suspended Ceiling Price Regulation 4, under which ceiling prices of anthracite, other solid fuels, and related commodities had been controlled since February 1, 1951. However, as f. o. b. mine prices had been in a disturbed state during much of the winter of 1952–53 because of decreased demand and intense competition within the industry, this action by the OPS was not followed by immediate advances in quoted prices. In fact, the industry announced rather substantial discounts on the larger domestic sizes of coal with the release of spring prices in mid-April 1953. In some instances, list prices were given as of October 1, 1953, with earlier prices established by subtracting stated discounts from the list price, the amount of the discount decreasing with the advance of the season. However, soon after termination of spring and summer discounts on October 1, circular prices of the domestic sizes were lower, in most instances, than they were before issuance of spring prices. With the release of spring prices, almost all producing companies simultaneously announced small increases in prices of the steam sizes.

According to Saward's Journal, f. o. b. mine prices quoted by the industry in the latter part of October 1953, which generally remained unchanged during the remainder of the year, were within the following limits: Broken, \$15.30–\$15.60; Egg, \$14.95–\$16.25; Stove, \$15.35–\$16.50; Chestnut, \$15.15–\$16.30; Pea, \$11.55–\$12.60; Buckwheat No. 1, \$9.95–\$10.50; Rice, \$8.10–\$8.50; and Barley, \$5.95–\$6.25. Monthly data compiled from reports published by the Bureau of Labor Statistics, United States Department of Labor, on retail prices of Pennsylvania anthracite and other fuels in certain cities are shown in table 24.

During the summer and fall months of 1953, companies representing the preponderant part of the industry's annual output made strenuous efforts to hold the line against drastic price cutting. As a result, the average value received f. o. b. mine based on production from all sources increased from \$9.36 per net ton in 1952 to \$9.67 in 1953. Calculated on the basis of total breaker shipments only, the average realization increased from \$9.76 in 1952 to \$10.11 per net ton. Reflecting a relatively stronger market demand, average realization on breaker shipments of the steam sizes increased from \$5.83 in 1952 to \$6.66 in 1953, or \$0.83 per ton, compared with an average increase of but \$0.24 on the domestic sizes.

TABLE 24.—Retail prices of selected fuels in 1953, by months, for various cities [1]

[Coal and coke, per net ton; heating oil, per 100 gallons; gas per 25 therms]

City and fuel	January	February	March	April	May	June	July	August	September	October	November	December
Baltimore, Md.:												
Anthracite:												
Stove	$24.25	$24.25	$24.25	$23.87	$22.85	$22.85	$22.85	$22.95	$23.15	$23.15	$23.15	$23.15
Buckwheat No. 1	17.77	17.77	17.77	17.68	17.81	17.81	17.81	17.94	18.07	18.07	18.07	18.07
Heating oil: Fuel oil No. 2	13.57	13.57	13.57	13.57	13.13	13.13	13.44	13.44	13.44	13.80	13.87	13.36
Gas: Natural	4.22	4.22	4.23	4.22	4.24	4.21	4.20	4.21	4.23	4.22	4.22	4.23
Boston, Mass.:												
Anthracite:												
Stove	27.88	27.88	27.88	27.88	26.14	26.14	27.14	27.14	27.14	27.14	27.14	27.14
Buckwheat No. 1	20.54	20.54	20.54	20.54	20.48	20.48	20.49	20.49	20.49	20.49	20.49	20.49
Heating oil: Fuel oil No. 2	13.40	13.40	13.40	13.40	13.07	12.98	13.28	13.29	13.28	13.70	13.70	13.40
Gas: Manufactured	7.09	7.10	7.09	7.12	7.12	7.13	7.12	7.12	7.13	7.13	7.60	7.59
New York, N. Y.:												
Anthracite:												
Stove	27.19	27.19	27.19	27.19	25.44	25.44	25.95	25.95	25.95	25.95	25.95	25.95
Pea	21.25	21.25	21.25	21.25	19.54	19.48	19.84	19.84	19.84	19.84	19.84	19.84
Buckwheat No. 1	18.27	18.27	18.27	18.27	18.24	18.24	18.60	18.60	18.60	18.60	18.60	18.60
Heating oil: Fuel oil No. 2	13.58	13.58	13.58	13.58	13.12	13.16	13.51	13.51	13.51	13.99	14.05	13.74
Gas:												
Manufactured: Co. 1.1	5.80	5.80	5.80	5.80	5.80	5.80	5.90	5.90	5.89	5.89	5.89	5.89
Natural:												
Co. 4	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.99	5.99	5.99	6.00	6.00
Co. 5	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.76	6.76	6.78	6.78	6.78
Co. 6	6.24	6.24	6.24	6.26	6.26	6.24	6.46	6.46	6.46	6.46	6.46	6.46
Co. 12	6.67	6.67	6.69	6.67	6.67	6.67	6.69	6.69	6.71	6.74	6.74	6.71
Philadelphia, Pa.:												
Anthracite:												
Chestnut	23.38	23.38	23.38	23.38	21.95	21.95	22.75	22.75	22.98	22.98	22.98	22.98
Buckwheat No. 1	17.33	17.33	17.33	17.33	17.95	17.95	17.95	17.95	18.13	18.13	18.13	18.13
Heating oil: Fuel oil No. 2	13.00	13.00	13.00	13.00	12.70	12.50	12.80	12.80	12.93	13.43	13.43	12.93
Gas: Mixed	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.49	4.49	4.49
Washington, D. C.:												
Anthracite:												
Chestnut	25.51	25.51	25.51	25.51	23.97	24.38	24.67	25.07	25.36	25.36	25.36	25.36
Buckwheat No. 1	18.41	18.41	18.41	18.41	18.56	18.81	18.81	19.06	19.06	19.06	19.06	19.06
Heating oil: Fuel oil No. 2	13.77	13.92	13.92	13.92	13.46	13.46	13.85	13.77	13.77	14.28	14.28	13.77
Gas: Natural	3.92	3.92	3.92	3.92	3.92	4.07	4.07	4.07	4.07	4.07	4.07	4.07

[1] Compiled from reports of Bureau of Labor Statistics. Prices are as of the 15th of each month. Data are preliminary. Sales tax included where applicable.

TABLE 25.—Average sales realization per net ton of Pennsylvania anthracite shipped from breakers to points outside producing region, 1949–53, by region and size

[Value does not include margins of separately incorporated sales companies]

Size	Lehigh region					Schuylkill region				
	1949	1950	1951	1952	1953	1949	1950	1951 [1]	1952 [1]	1953 [1]
Lump [2] and Broken	$11.98	$12.27	$13.26	$13.43	$14.52	$11.56	$12.14	$13.31	$13.44	$14.12
Egg	11.81	12.20	13.51	13.53	14.11	11.57	12.06	13.40	13.30	13.53
Stove	11.80	12.46	13.98	13.77	14.31	11.56	12.20	13.48	13.39	13.48
Chestnut	11.81	12.44	13.96	13.77	14.28	11.62	12.14	13.31	13.25	13.37
Pea	9.86	10.24	10.91	10.32	10.79	9.56	9.77	10.00	9.88	10.12
Total domestic	11.53	12.12	13.50	13.28	13.74	11.27	11.79	12.83	12.74	12.78
Buckwheat No. 1	6.64	6.90	7.68	8.03	9.47	6.43	6.64	7.38	7.85	9.15
Buckwheat No. 2 (Rice)	5.56	5.70	6.05	6.49	7.77	5.46	5.53	5.77	6.20	7.32
Buckwheat No. 3 (Barley)	4.36	4.50	4.75	5.01	5.56	4.26	4.37	4.58	4.81	5.25
Buckwheat No. 4	3.23	3.43	3.73	3.98	4.21	3.11	3.24	3.43	3.58	3.72
Other (including silt)	2.79	2.83	3.10	3.47	3.69	2.91	3.06	3.21	3.21	3.78
Total steam	4.80	5.08	5.40	5.51	6.40	4.79	4.94	5.15	5.46	6.21
Total all sizes	8.47	9.07	9.85	9.43	10.17	8.12	8.51	8.82	8.81	9.07

Size	Wyoming region					Sullivan County				
Lump [2] and Broken	$11.66	$12.10	$12.96	$13.33	$14.08	------	------	------	------	------
Egg	11.54	12.03	13.27	13.19	13.62	------	------	------	------	------
Stove	11.61	12.21	13.79	13.63	14.07	$10.96	$11.74	$12.56	$13.55	$14.27
Chestnut	11.60	12.20	13.62	13.60	13.91	10.98	11.50	13.14	13.47	14.18
Pea	9.70	9.98	10.62	10.42	10.69	8.88	9.50	10.33	10.55	11.24
Total domestic	11.42	11.99	13.37	13.26	13.59	10.71	10.89	12.06	12.35	12.94
Buckwheat No. 1	6.63	6.83	7.55	8.01	9.52	5.00	6.25	7.39	7.77	9.03
Buckwheat No. 2 (Rice)	5.63	5.76	6.04	6.43	7.76	------	------	3.80	------	------
Buckwheat No. 3 (Barley)	4.37	4.58	4.89	5.05	5.67	------	------	------	------	------
Buckwheat No. 4	3.32	3.54	3.94	4.20	4.76	------	------	------	------	------
Other (including silt)	2.81	2.72	3.00	3.07	3.59	3.26	4.00	------	3.81	4.27
Total steam	5.63	5.77	6.17	6.58	7.56	3.44	4.95	4.62	4.60	5.38
Total all sizes	9.77	10.17	11.20	11.12	11.53	9.26	8.58	7.99	7.86	9.19

Size	Total									
	Excluding Sullivan County					Including Sullivan County				
Lump [2] and Broken	$11.71	$12.15	$13.12	$13.39	$14.21	$11.71	$12.15	$13.12	$13.39	$14.21
Egg	11.60	12.07	13.36	13.29	13.65	11.60	12.07	13.36	13.29	13.65
Stove	11.63	12.25	13.72	13.57	13.90	11.63	12.25	13.72	13.57	13.90
Chestnut	11.64	12.21	13.56	13.49	13.77	11.64	12.21	13.56	13.49	13.77
Pea	9.67	9.94	10.38	10.16	10.43	9.67	9.94	10.38	10.16	10.43
Total domestic	11.39	11.94	13.19	13.07	13.31	11.39	11.94	13.19	13.07	13.31
Buckwheat No. 1	6.55	6.76	7.49	7.94	9.33	6.55	6.76	7.49	7.94	9.33
Buckwheat No. 2 (Rice)	5.54	5.65	5.91	6.33	7.53	5.54	5.65	5.90	6.33	7.53
Buckwheat No. 3 (Barley)	4.31	4.46	4.69	4.91	5.41	4.31	4.46	4.69	4.91	5.41
Buckwheat No. 4	3.18	3.33	3.56	3.74	3.99	3.18	3.33	3.56	3.74	3.99
Other (including silt)	2.87	2.96	3.17	3.28	3.74	2.87	2.97	3.17	3.29	3.74
Total steam	5.05	5.25	5.48	5.78	6.60	5.05	5.25	5.48	5.78	6.60
Total all sizes	8.90	9.34	9.94	9.81	10.15	8.90	9.34	9.94	9.81	10.15

[1] See footnote 1, table 1.
[2] Quantity of Lump included is insignificant.

TABLE 26.—Average sales realization per net ton of Pennsylvania anthracite shipped from breakers to points outside and inside producing region in 1953, by region and size

[Value does not include margins of separately incorporated sales companies]

Size	Lehigh region			Schuylkill region			Wyoming region		
	Shipped outside region	Local sales	Total	Shipped outside region	Local sales	Total	Shipped outside region	Local sales	Total
Lump [1] and Broken	$14.52	$13.33	$14.52	$14.12	$14.55	$14.15	$14.08	$13.73	$13.89
Egg	14.11	15.71	14.12	13.53	14.09	13.53	13.62	13.60	13.62
Stove	14.31	14.95	14.31	13.48	12.23	13.41	14.07	14.77	14.08
Chestnut	14.28	15.38	14.34	13.37	12.77	13.32	13.91	14.89	14.01
Pea	10.79	11.99	11.09	10.12	10.35	10.16	10.69	11.89	11.30
Total domestic	13.74	13.21	13.70	12.78	11.69	12.68	13.59	12.91	13.49
Buckwheat No. 1	9.47	10.23	9.54	9.15	8.64	9.12	9.52	9.98	9.62
Buckwheat No. 2 (Rice)	7.77	8.59	7.91	7.32	6.58	7.25	7.76	8.14	7.87
Buckwheat No. 3 (Barley)	5.56	6.35	5.60	5.25	4.86	5.22	5.67	5.93	5.74
Buckwheat No. 4	4.21	5.26	4.22	3.72	3.58	3.70	4.76	3.84	4.61
Other (including silt)	3.69		3.69	3.78	3.40	3.77	3.59	3.42	3.50
Total steam	6.40	8.89	6.57	6.21	5.95	6.19	7.56	7.39	7.52
Total all sizes	10.17	11.28	10.25	9.07	8.87	9.05	11.53	10.11	11.25

Size	Sullivan County			Total: Excluding Sullivan County			Total: Including Sullivan County		
Lump [1] and Broken				$14.21	$13.77	$14.06	$14.21	$13.77	$14.06
Egg				13.65	13.85	13.65	13.65	13.85	13.65
Stove	$14.27	$14.29	$14.27	13.90	13.24	13.88	13.90	13.24	13.88
Chestnut	14.18	14.18	14.18	13.77	14.18	13.81	13.77	14.18	13.81
Pea	11.24	11.24	11.24	10.43	11.60	10.82	10.43	11.60	10.82
Total domestic	12.94	12.94	12.94	13.31	12.59	13.22	13.31	12.59	13.22
Buckwheat No. 1	9.03	6.84	8.29	9.33	9.69	9.38	9.33	9.68	9.38
Buckwheat No. 2 (Rice)				7.53	7.84	7.58	7.53	7.84	7.58
Buckwheat No. 3 (Barley)				5.41	5.66	5.44	5.41	5.66	5.44
Buckwheat No. 4				3.99	3.68	3.96	3.99	3.68	3.96
Other (including silt)	4.27	4.27	4.27	3.74	3.41	3.71	3.74	3.42	3.71
Total steam	5.38	5.00	5.27	6.60	7.12	6.66	6.60	7.12	6.66
Total all sizes	9.19	8.86	9.09	10.15	9.87	10.11	10.15	9.87	10.11

[1] Quantity of Lump included is insignificant.

TABLE 27.—Average value per net ton of Pennsylvania anthracite from all sources, 1952–53, by regions [1]

[Data include washery and dredge coal]

Region	1952 [2]				1953 [2]			
	Shipped outside region	Local sales	Colliery fuel	Total production	Shipped outside region	Local sales	Colliery fuel	Total production
Lehigh	$9.02	$10.57	$7.34	$9.08	$9.66	$11.28	$7.67	$9.73
Schuylkill	8.42	8.21	3.20	8.36	8.66	8.13	3.84	8.58
Wyoming	11.07	9.22	4.28	10.53	11.42	10.08	4.43	10.93
Total, excluding Sullivan County	9.52	9.05	4.53	9.36	9.79	9.58	4.85	9.67
Sullivan County	7.86	10.46		8.58	9.19	8.86		9.09
Grand total	9.52	9.05	4.53	9.36	9.79	9.58	4.85	9.67

[1] Value given for shipments is value at which coal left possession of producing company and does not include margins of separately incorporated sales companies.

[2] See footnote 1, table 1.

EMPLOYMENT

The sharp decline in production between 1952 and 1953 was accompanied by a severe drop in the size of the labor force. According to data reported to the Bureau of Mines, the average number of men working daily in the anthracite industry in 1953 totaled 57,862, a decline of 12 percent from 1952.

In 1953, 64 percent of the total labor force was employed underground, 11 percent at strip pits, and 25 percent at culm banks, preparation plants, and other surface facilities. The average number of men working daily underground was 14 percent less than in 1952, while the number working in strip pits declined 13 percent. Employment at all other surface operations was proportionately stronger, dropping only 7 percent. Of the 1953 total, 47 percent was employed in the Wyoming region, 36 percent in the Schuylkill, and 17 percent in the Lehigh. These data reflect the efforts of the industry in recent years to obtain a larger percentage of the annual output from surface sources rather than from deep mines. Since the major part of pro-

TABLE 28.—Men employed and days worked at operations producing Pennsylvania anthracite in 1953, by region and type of plant

[Includes operations of strip contractors]

Region and type of plant	Average number of men working daily								Average number of days plant operated	Man-days of labor	Average tons per man per day
	Underground			Surface				Grand total			
	Miners and their laborers	Other	Total underground	In strip pits	In preparation plants	Other	Total surface				
Lehigh:											
Breaker	3,778	2,152	5,930	1,368	743	1,401	3,512	9,442	154	1,458,749	3.34
Washery [1]	------	------	------	------	31	33	64	64	231	14,758	25.86
Dredge	------	------	------	------	4	8	12	12	241	2,886	10.88
Total Lehigh	3,778	2,152	5,930	1,368	778	1,442	3,588	9,518	155	1,476,393	3.58
Schuylkill:											
Breaker	7,200	3,783	10,983	3,428	2,354	3,664	9,446	20,429	171	3,493,043	3.65
Washery [1]	------	------	------	------	129	201	330	330	162	53,477	14.46
Dredge	------	------	------	------	93	144	237	237	241	57,127	6.93
Total Schuylkill	7,200	3,783	10,983	3,428	2,576	4,009	10,013	20,996	172	3,603,647	3.86
Wyoming:											
Breaker	13,032	7,166	20,198	1,372	1,417	4,243	7,032	27,230	159	4,329,492	2.68
Washery [1]	------	------	------	------	27	37	64	64	236	15,086	8.45
Dredge	------	------	------	------	5	3	8	8	202	1,616	6.78
Total Wyoming	13,032	7,166	20,198	1,372	1,449	4,283	7,104	27,302	159	4,346,194	2.70
Total, excluding Sullivan County:											
Breaker	24,010	13,101	37,111	6,168	4,514	9,308	19,990	57,101	163	9,281,284	3.15
Washery [1]	------	------	------	------	187	271	458	458	182	83,321	15.39
Dredge	------	------	------	------	102	155	257	257	240	61,629	7.11
Total	24,010	13,101	37,111	6,168	4,803	9,734	20,705	57,816	163	9,426,234	3.28
Sullivan County: Breaker	26	9	35	------	8	3	11	46	151	6,946	2.48
Grand total	24,036	13,110	37,146	6,168	4,811	9,737	20,716	57,862	163	9,433,180	3.28

[1] Represents washeries for which production and employment were separately reported.

TABLE 29.—Men employed at operations producing Pennsylvania anthracite, 1952–53,[1] by counties

[Includes operations of strip contractors]

County	1952	1953	County	1952	1953
Carbon	3,208	3,037	Luzerne	27,213	23,217
Columbia	1,061	1,192	Northumberland	5,788	6,301
Dauphin, and Wayne [2]	143	490	Schuylkill	19,132	15,996
Lackawanna	9,210	7,501	Sullivan	56	46
Lancaster, Lebanon, Northampton, and Snyder [3]	112	82	Total	65,923	57,862

[1] See footnote 1, table 1.
[2] None employed in Wayne County in 1953.
[3] Counties producing dredge coal only.

duction in the Wyoming region is obtained from deep mines, employment in that region has declined more rapidly than in other regions.

As a result of disturbed conditions in the anthracite industry the Department of Mines, Commonwealth of Pennsylvania, published statistics on mine closures, openings, and the number of men affected in 1953. According to these data, 72 anthracite operations were closed during the year, resulting in the unemployment of 6,544 men. Opening of 27 small operations resulted in reemployment of 547 men. Although mine closings were reported for every month, the number of mines closed and the number of men affected grew progressively more severe during the latter half of the year as producers attempted to cut production costs and bring the active productive capacity of the industry more nearly in line with market demand. At year end this trend, with the necessity for working down the large stocks held by producers, presaged a lower level of employment in the industry for 1954.

Unemployment has characterized the anthracite regions' economy for 2 decades. Despite some relief obtained during World War II and for a time thereafter by persons entering the armed forces or migrating to other sections of the country in search of jobs, the latter months of 1953, particularly November and December, witnessed a drastic increase in the number of unemployed. Although the anthracite industry is no longer the largest employer in the region, having been superseded by the manufacturing industries in the number employed, and is responsible for only part of the increase in unemployment, declines in anthracite production and employment undoubtedly have had a more pronounced effect upon the economy of the region than would similar declines in other industrial or manufacturing activities because of the high wage level of the anthracite industry.

Lackawanna, Luzerne, and Schuylkill Counties combined produced 77 percent of the 1953 output of anthracite. Indicative of the serious unemployment situation in the region at the close of 1953, data compiled periodically by the Bureau of Employment Security, Commonwealth of Pennsylvania, show that in mid-January 1954 approximately 44,000 were unemployed in these counties and in the boroughs of Lansford, Summit Hill, Mauch Chunk, and East Mauch Chunk, Carbon County. The number of persons unemployed was estimated to comprise 12 percent of the total civilian labor force in Lackawanna County, 13 percent in Luzerne County, and 15 percent in Schuylkill

County. This reflects seasonal declines in some instances, particularly in the apparel branch of the manufacturing category, but since an estimated 90 percent of the employees in the apparel industry are women, any upturn in the apparel trades cannot be expected to materially improve job opportunities for males who make up the preponderant part of the unemployed total.

DISTRIBUTION

The Bureau of Mines collected and published detailed information on the distribution of Pennsylvania anthracite for the 1942–45 coal years (April 1–March 31) in collaboration with the Solid Fuels Administration for War, and the Bureau of Mines has continued the canvasses since World War II, but on a highly modified scale. For instance, during the war years shippers were required to report shipments to all destinations, whereas for the 1952–53 coal-year data were requested on rail shipments to only 356 cities in 20 States and Canadian Provinces, sizes of coal shipped, and States of destination only on coal moving from the preparation plants by truck. Results of these canvasses are published in a series of mineral market reports, copies of which may be obtained from Bureau of Mines, Washington 25, D. C.

Distribution data trace all rail shipments from the point of production to the city of destination, as each portion of the industry, including producers, wholesalers, and dock operators, supplies information on all sales made to others in the producing or wholesale categories. In addition to data on wholesale transactions, producers report on coal sold to employees, truckers, consumers in the "local sales" (producing region) area, and shipments to retail dealers or industrial users. American and Canadian wholesalers and dock operators are requested to file reports showing final destinations on all purchased tonnages. Schedules submitted by the producing companies are then checked against those of wholesalers and dock operators to eliminate duplicate reporting of the same tonnage and to verify coverage. This method has resulted in extremely high accuracy, and the degree of coverage is estimated to range between 98 and 100 percent of commercial production.

Shipments reported directly to the Bureau for the 1952–53 coal year totaled 33.8 million tons—16 percent less than in the preceding year (table 30). The larger part of the decline undoubtedly was due to continued inroads into the space-heating market by fuel oil and natural gas. Although several other factors have contributed to the downward trend in anthracite production and distribution in recent years, continued relatively mild winter weather in the principal anthracite-marketing areas and sharp drops in exports to Europe and Canada had a serious adverse effect upon shipments during the 1952–53 coal year.

In the 1952–53 coal year, all market areas in the United States reported decreases in total anthracite shipments received. Shipments to the New England States were 13 percent under the 1951–52 coal-year total; the Middle Atlantic States, 10 percent; and all other States, 17 percent. Exports to Canada were down 9 percent, but the sharpest decline occurred in exports to all other countries which fell from 2,889,000 tons to 561,000. Significantly, shipments of the domestic

TABLE 30.—Distribution of Pennsylvania anthracite, April 1, 1952, to March 31, 1953, by State, Province, and country of destination, in net tons

Destination	Domestic sizes						Steam sizes					Total all sizes	Percent of total
	Broken	Egg	Stove	Chestnut	Pea	Total domestic	Buckwheat No. 1	Buckwheat No. 2 (Rice)	Buckwheat No. 3 (Barley)	All other sizes	Total steam		
United States:													
New England States:													
Connecticut	161	8, 694	197, 725	214, 972	19, 432	440, 984	34, 782	36, 939	14, 968	60, 613	147, 302	588, 286	1. 74
Maine	--------	8, 993	82, 049	70, 127	3, 151	164, 320	24, 508	9, 046	1, 217	2, 357	37, 128	201, 448	. 60
Massachusetts	634	92, 181	650, 982	336, 707	29, 812	1, 110, 316	109, 634	70, 141	48, 990	29, 835	258, 600	1, 368, 916	4. 05
New Hampshire	--------	5, 812	65, 501	42, 864	3, 317	117, 494	18, 628	15, 036	66, 454	2, 095	102, 213	219, 707	. 65
Rhode Island	--------	6, 226	81, 412	53, 321	5, 069	146, 028	11, 175	9, 090	125	6, 290	26, 680	172, 708	. 51
Vermont	819	3, 838	69, 382	50, 530	6, 283	130, 852	34, 111	20, 779	11, 857	380	67, 127	197, 979	. 59
Total	1, 614	125, 744	1, 147, 051	768, 521	67, 064	2, 109, 994	232, 838	161, 031	143, 611	101, 570	639, 050	2, 749, 044	8. 14
Middle Atlantic States:													
New Jersey	7, 912	26, 927	480, 608	1, 117, 418	330, 866	1, 963, 731	582, 737	396, 266	953, 305	491, 390	2, 423, 698	4, 387, 429	13. 00
New York	12, 716	236, 841	2, 014, 206	1, 686, 220	825, 615	4, 775, 598	2, 328, 110	760, 648	841, 274	910, 753	4, 840, 785	9, 616, 383	28. 49
Pennsylvania	47, 403	66, 428	701, 940	1, 866, 598	1, 714, 216	4, 396, 585	1, 187, 945	1, 136, 928	1, 744, 005	2, 898, 093	6, 966, 971	11, 363, 556	33. 67
Total	68, 031	330, 196	3, 196, 754	4, 670, 236	2, 870, 697	11, 135, 914	4, 098, 792	2, 293, 842	3, 538, 584	4, 300, 236	14, 231, 454	25, 367, 368	75. 16
South Atlantic States: [1]													
Delaware	584	5, 370	41, 616	120, 497	7, 892	175, 959	5, 531	7, 750	23, 695	3, 747	40, 723	216, 682	0. 64
District of Columbia	--------	4, 681	38, 496	54, 203	5, 165	102, 545	15, 192	1, 512	--------	13	16, 717	119, 262	. 35
Maryland	1, 129	10, 633	127, 507	139, 738	25, 463	304, 470	79, 178	9, 714	18, 848	29, 008	136, 748	441, 218	1. 31
Virginia	--------	1, 041	18, 541	31, 300	5, 611	56, 493	19, 844	297	--------	478	20, 619	77, 112	. 23
Total	1, 713	21, 725	226, 160	345, 738	44, 131	639, 467	119, 745	19, 273	42, 543	33, 246	214, 807	854, 274	2. 53
Lake States: [2]													
Illinois	729	5, 136	15, 909	32, 999	286	55, 059	26, 508	14, 561	6, 668	26, 605	74, 342	129, 401	0. 38
Michigan	--------	7, 679	67, 374	40, 017	1, 098	116, 168	5, 542	8, 455	52	16, 114	30, 163	146, 331	. 44
Minnesota	--------	100	5, 935	7, 252	576	13, 863	600	1, 732	--------	55, 614	57, 946	71, 809	. 21
Ohio	--------	2, 668	2, 299	20, 535	1, 096	26, 598	9, 359	19, 217	6, 801	42, 950	78, 327	104, 925	. 31
Wisconsin	32	203	84, 644	133, 972	15, 693	234, 544	8, 588	3, 554	369	201, 577	214, 088	448, 632	1. 33
Total	761	15, 786	176, 161	234, 775	18, 749	446, 232	50, 597	47, 519	13, 890	342, 860	454, 866	901, 098	2. 67
All other States	2, 491	4, 330	5, 329	54, 965	3, 150	70, 265	25, 914	21, 517	4, 965	86, 356	138, 752	209, 017	. 62
Total United States	74, 610	497, 781	4, 751, 455	6, 074, 235	3, 003, 791	14, 401, 872	4, 527, 886	2, 543, 182	3, 743, 593	4, 864, 268	15, 678, 929	30, 080, 801	89. 12

For footnotes, see end of table.

TABLE 30.—Distribution of Pennsylvania anthracite, April 1, 1952, to March 31, 1953, by State, Province, and country of destination, in net tons—Continued

Destination	Domestic sizes						Steam sizes					Total all sizes	Percent of total
	Broken	Egg	Stove	Chestnut	Pea	Total domestic	Buckwheat No. 1	Buckwheat No. 2 (Rice)	Buckwheat No. 3 (Barley)	All other sizes	Total steam		
Canada:													
Ontario	116	39, 939	1, 225, 716	818, 201	78, 668	2, 162, 640	85, 549	88, 616	12, 381	2, 910	189, 456	2, 352, 096	6. 97
Quebec	103	15, 764	229, 829	125, 440	21, 613	392, 749	150, 179	117, 444	56, 487	3, 607	327, 717	720, 466	2. 13
Other Provinces	447	3, 177	15, 053	13, 419	6	32, 102	339	6, 248	1	144	6, 732	38, 834	. 12
Total Canada	666	58, 880	1, 470, 598	957, 060	100, 287	2, 587, 491	236, 067	212, 308	68, 869	6, 661	523, 905	3, 111, 396	9. 22
Other countries [3]	15, 217	15, 007	32, 537	12, 336	1, 672	76, 769	46, 282	150, 006	113, 122	175, 254	484, 664	561, 433	1. 66
Grand total	90, 493	571, 668	6, 254, 590	7, 043, 631	3, 105, 750	17, 066, 132	4, 810, 235	2, 905, 496	3, 925, 584	5, 046, 183	16, 687, 498	33, 753, 630	100. 00

[1] Shipments to other states generally referred to as being in the South Atlantic area are included in "All other States."
[2] Shipments to Indiana are included in "All other States."
[3] Of this total, 88 percent was shipped to Europe; 47 percent of the European tonnage was destined to The Netherlands; 28 percent to France; and 21 percent to Yugoslavia. Cuba and Mexico combined took more than 92 percent of the remainder.

or space-heating sizes of anthracite to United States destinations were 17 percent less than in the previous coal year, yet shipments of the steam sizes were down only 4 percent. This reflected not only the effect of competition and weather upon the demand for space-heating coal but the relatively stronger demand for the smaller sizes generally used in commercial or industrial installations for generating steam. The decline in shipments to Canada was due principally to curtailed demand for the domestic sizes, although imports of the smaller sizes were also under the 1951–52 coal-year level. As the bulk of Canadian imports of small coal are Buckwheat Nos. 1 and 2 sizes, which are customarily burned in stoker-fired or blower-equipped furnaces for space heating, the factors affecting imports of larger coal also apply to the smaller sizes.

Data collected by the Bureau of Mines on shipments of anthracite during the 1952–53 coal year indicate that approximately 27 million tons left the preparation plants by rail and 6.7 million by trucks, declines of 18 percent and 6 percent, respectively, from the 1951–52 coal year. A compilation of monthly data published by the Pennsylvania Department of Mines, however, shows that, although rail shipments continued to decline in 1953, totaling approximately 22 million tons for the calendar year, truck shipments increased so substantially during the last 9 months that the 1953 calendar-year truck total exceeded that for 1952 by 8 percent. The fact that truckers have continued to hold a fairly constant volume of anthracite tonnage despite recent sharp declines in production may indicate that high freight rates have encouraged diversion of some shipments to trucks.

Data compiled from reports of the Association of American Railroads and the Massachusetts Division on the Necessaries of Life on receipts of anthracite in the New England States are shown in table 33. These data indicate a decline of 27 percent from 1952 in rail receipts and 56 percent in tidewater movement. Reflecting the dras-

TABLE 31.—Rail shipments of Pennsylvania anthracite, 1950–53, by destination, in net tons [1]

[Pennsylvania Department of Mines]

Destination	1950	1951	1952	1953
New England States	3,551,489	2,955,785	2,725,609	2,067,189
New York	10,589,197	9,095,169	8,889,094	6,889,624
New Jersey	4,613,659	4,140,095	3,927,830	3,487,560
Pennsylvania	6,740,610	6,026,258	6,260,242	5,846,542
Delaware	245,097	222,750	200,389	184,665
Maryland	431,546	397,129	358,567	290,852
District of Columbia	177,754	135,742	123,322	101,911
Virginia	73,809	75,982	71,820	66,482
Ohio	94,022	85,303	118,378	97,346
Indiana	80,209	58,155	47,206	30,969
Illinois	211,366	207,291	143,085	107,618
Wisconsin	489,784	355,852	275,058	155,481
Minnesota	61,353	28,340	34,295	25,052
Michigan	249,088	171,315	138,440	93,024
Other States	86,213	144,861	144,762	160,971
Total United States	27,695,196	24,100,027	23,458,097	19,605,286
Canada	3,620,573	3,199,775	3,175,125	2,541,269
Other foreign countries	35,139	1,724,439	667,213	73,206
Grand total	31,350,908	29,024,241	27,300,435	22,219,761

[1] Does not include dredge coal.

tic curtailment in production, loadings over Lake docks also decreased sharply from 1952. Loadings over Lake Erie docks in 1953 were 45 percent less than the tonnage handled in 1952 and at Lake Ontario docks, 57 percent less, according to reports issued by the Ore and Coal Exchange, Cleveland, Ohio.

TABLE 32.—Truck shipments of Pennsylvania anthracite in 1953, by month and by State of destination, in net tons [1]

Destination	January	February	March	April	May	June	July
Pennsylvania:							
Within region	357,851	334,174	293,370	285,914	268,541	219,570	155,985
Outside region	191,402	180,151	158,928	160,661	191,076	187,253	167,548
New York	35,889	37,270	37,941	37,124	49,476	51,341	56,235
New Jersey	36,326	30,448	30,904	33,943	42,727	48,340	39,252
Delaware	2,129	3,143	1,957	1,005	694	1,414	1,107
Maryland	3,926	1,823	1,545	1,314	795	1,762	1,800
District of Columbia		276					15
Other States	1,526	1,195	1,249	804	545	493	302
Total: 1953	629,049	588,480	525,894	520,765	553,854	510,173	422,244
1952	754,019	645,000	593,950	445,256	536,685	423,065	249,878

Destination	August	September	October	November	December	Total	Percent of total trucked
Pennsylvania:							
Within region	160,505	244,831	309,585	325,950	409,881	3,366,157	50.0
Outside region	189,350	195,246	201,103	173,708	195,991	2,192,417	32.6
New York	54,168	60,669	60,785	60,530	71,241	612,669	9.1
New Jersey	41,269	44,723	47,536	39,645	44,814	479,927	7.1
Delaware	654	1,979	1,266	1,886	1,851	19,085	.3
Maryland	3,507	4,349	6,423	7,432	7,306	41,982	.6
District of Columbia	47	146	90			574	(2)
Other States	9,265	843	853	3,112	914	21,101	.3
Total: 1953	458,765	552,786	627,641	612,263	731,998	6,733,912	100.0
1952	420,513	515,339	549,250	476,968	606,513	6,216,436	100.0

[1] Compiled from reports of Pennsylvania Department of Mines. Does not include dredge coal.
[2] Less than 0.05 percent.

TABLE 33.—Receipts of anthracite in New England, 1917, 1920, 1923, 1927, and 1940–53, in thousand net tons

Year	Receipts by tidewater	Receipts by rail [1]	Imports [2]	Total receipts of Pennsylvania anthracite [3]	Year	Receipts by tidewater [4]	Receipts by rail [1]	Imports [2]	Total receipts of Pennsylvania anthracite [3]
1917	[1] 4,421	7,259	1	11,679	1945	331	4,750	(5)	5,081
1920	[1] 3,521	7,804	1	11,324	1946	399	5,244		5,643
1923	[1] 4,082	8,102	145	12,039	1947	240	4,498		4,738
1927	[1] 2,421	6,725	106	9,040	1948	217	4,646		4,863
1940	[1] 648	4,174	135	4,687	1949	110	3,336		3,446
1941	[1] 682	4,870	75	5,477	1950	81	3,615	18	3,678
1942	[4] 581	5,393	139	5,835	1951	66	3,135	27	3,174
1943	[4] 575	5,310	164	5,721	1952	70	2,847	29	2,888
1944	[4] 398	5,836	12	6,222	1953	49	2,088	31	2,106

[1] Commonwealth of Massachusetts, Division on the Necessaries of Life.
[2] U. S. Department of Commerce.
[3] Total receipts by rail and by tidewater less imports.
[4] Association of American Railroads.
[5] Less than 500 tons.

CONSUMPTION

The sharp decline in anthracite production in 1953 was accompanied by an almost equally severe drop in apparent consumption (calculated on the basis of production, imports, exports, and producers' stocks). The apparent consumption for 1953 was 28 million tons—approximately 21 percent less than in the preceding year. The largest decline probably occurred in the space-heating field because the production of the domestic sizes, which are used predominantly for that purpose, declined much more sharply than that of the steam sizes.

TABLE 34.—Apparent consumption of anthracite and selected competitive fuels in the principal anthracite markets, 1950–53

[Thousand net tons]

Fuel	New England	New York	New Jersey	Pennsylvania	Delaware	Maryland	District of Columbia	Total	Percent of total fuels
Anthracite (all users):[1]									
1950	3,552	[2]11,054	[2]5,007	12,690	266	464	179	33,212	34.0
1951	2,956	[2]9,482	[2]4,519	11,512	240	422	136	29,267	28.8
1952	2,726	[2]9,279	[2]4,347	11,575	219	379	126	28,651	27.4
1953	2,067	[2]7,502	[2]3,968	11,405	204	333	102	25,581	25.0
Imported:[3]									
1950	18	-------	-------	-------	-------	-------	-------	18	(4)
1951	27	-------	-------	-------	-------	-------	-------	27	(4)
1952	29	-------	-------	-------	-------	-------	-------	29	(4)
1953	31	-------	-------	-------	-------	-------	-------	31	(4)
Briquets (domestic use):									
1950	36	23	13	39	(5)	22	3	136	.1
1951	42	17	25	27	(5)	17	2	130	.1
1952	31	12	11	22	(5)	14	1	91	.1
1953	27	9	22	16	(5)	12	1	87	.1
Coke (domestic use):									
1950	617	545	348	186	(5)	1	-------	1,697	1.7
1951	542	343	321	168	(5)	1	-------	1,375	1.4
1952	525	264	298	134	(5)	1	-------	1,222	1.2
1953	439	200	259	126	(5)	(5)	-------	1,024	1.0
Imported:[3]									
1950	56	30	-------	-------	-------	-------	-------	86	.1
1951	(5)	9	-------	4	-------	-------	-------	13	(4)
1952	(5)	159	-------	-------	-------	-------	-------	159	.2
1953	1	18	-------	-------	-------	-------	-------	19	(4)
Oil (heating and range:)[6]									
1950	19,807	15,877	8,558	5,686	476	2,454	783	53,641	54.9
1951	21,302	16,846	8,701	6,637	558	2,979	990	58,013	57.0
1952	21,367	16,957	8,666	6,990	606	3,115	1,104	58,805	56.3
1953	21,354	17,099	8,655	7,130	630	3,136	1,162	59,166	57.7
Natural gas:[7]									
1950	-------	2,263	[8]147	5,490	(8)	463	[9]630	[9]8,993	9.2
1951	58	4,416	790	6,468	(10)	(10)	[10]1,248	12,980	12.7
1952	435	5,609	1,014	6,970	(10)	(10)	[10]1,439	15,467	14.8
1953	837	5,934	1,272	7,028	(10)	(10)	[10]1,542	16,613	16.2
Total:									
1950	24,086	29,792	[11]14,073	24,091	[11]742	3,404	[11]1,595	97,783	100.0
1951	24,927	31,113	14,356	24,816	[12]798	[12]3,419	[12]2,376	101,805	100.0
1952	25,113	32,280	14,336	25,691	[12]825	[12]3,509	[12]2,670	104,424	100.0
1953	24,756	30,762	14,176	25,705	[12]834	[12]3,481	[12]2,807	102,521	100.0

[1] Pennsylvania Department of Mines.
[2] An important but undetermined part of anthracite shown as shipped to New Jersey is reshipped to New York City.
[3] U. S. Department of Commerce.
[4] Less than 0.05 percent.
[5] Less than 500 tons.
[6] Converted to coal equivalent upon basis of 4 barrels of fuel oil equaling 1 ton of coal.
[7] Converted to coal equivalent upon basis of 24,190 cubic feet of natural gas equaling 1 ton of coal.
[8] Delaware included with New Jersey.
[9] Includes Virginia.
[10] Delaware and Maryland included with District of Columbia.
[11] Natural gas for Delaware included with New Jersey; District of Columbia includes Virginia
[12] Natural gas for Delaware and Maryland included with District of Columbia.

The coking industry produced a record tonnage of oven coke in 1953 and increased its consumption of anthracite fines 33 percent over the 1952 total. The consumption of anthracite by the briquetting industry again declined, falling 34 percent under the total for 1952. Consumption reported by public utilities in 1953 was about 4 percent under 1952, while the amount consumed by class I railroads was 15 percent less.

Mechanical Stokers.—According to data published by the Bureau of the Census, United States Department of Commerce, factory sales of class I stokers (capacity, less than 61 pounds of coal per hour) for residential use totaled 4,858 units in 1953, a decline of 40 percent from 1952. Sales of class II stokers (capacity, 61 to 100 pounds of coal per hour) decreased from 543 units in 1952 to 332 in 1953, or 39 percent.

STOCKS

Except for 1952, retail dealers have been carrying progressively less Pennsylvania anthracite in stock over the past few years, according to monthly estimates prepared by the Bureau of Mines. Stocks on December 31, 1953, were estimated at 2.3 million tons compared with 3 million in 1952, a decline of 24 percent. Monthly totals indicate that, although estimated stocks at the end of January and February 1953 exceeded those for the same months of 1952, stocks for the remaining 10 months of 1953 averaged approximately 500,000 tons less per month. Stocks of the larger domestic sizes (Egg, Stove, and Chestnut) were appreciably lower for each month of 1953, while stocks of Pea size exceeded 1952 only in January, indicating that retailers undoubtedly felt a smaller inventory of these sizes was required to meet the demand of a declining market. Conversely, retailers' stocks of Buckwheat Nos. 1 and 2, which were in relatively stronger demand in 1953 than the domestic sizes, exceeded 1952 stocks for 5 months of 1953.

Because of the decline in the volume of anthracite carried in retail yards, some producers, to protect consumers and avoid shut-downs, placed an unusually heavy supply of coal in storage. As a result, producers' stocks in December 1953 were 1.9 million tons, the largest figure in more than a decade and 12 percent greater than stocks held in December 1952.

Reflecting the decline in demand and a 46-percent decrease in anthracite loadings over Lake Ontario and Lake Erie docks, stocks of anthracite on the Upper Lake docks at the close of 1953 were approximately 34 percent less than comparable figures for 1952. Despite a slight decline in the consumption of anthracite at electric utility plants in 1953, the public utilities apparently found it necessary to stock additional supplies as a safeguard against possible future declines in anthracite output. Stocks held at plants in December 1953 were 5 percent over 1952 and totaled almost 5.9 million tons. At the end of 1953, stocks of class I railroads were also higher than in the preceding year, totaling 60,000 tons as against 45,000.

TECHNOLOGY

It has been evident for a number of years that, if the downward trend in the output of Pennsylvania anthracite were to be reversed, it would result primarily from research into the development of new mining methods and equipment and new uses for anthracite. High material and labor costs have forced the market price of anthracite to a level where competition from other fuels has become increasingly strong. Over the years, the mines have become deeper and transportation distances have increased, adding to the costs. New mining techniques that would overcome the effect of these factors on costs per ton could therefore be expected to help the anthracite industry materially.

The Federal Bureau of Mines currently is engaged in a cooperative research program with anthracite-producing companies on the mining, utilization, and preparation of anthracite at the Bureau's laboratory, Schuylkill Haven, Pa. It is hoped that the research program, on mining methods particularly, will aid in strengthening the economy of the region by the introduction of new techniques and/or machines that would reduce underground mining costs and, at the same time, enhance the safety of the workmen.

Through the mining-research program a modified method of block-caving anthracite has been devised that was based on observations of the use of this method in ore mining. Experiments based on this method were conducted in an anthracite mine in the Southern field; the results indicated great promise for application of the method to the recovery of coal in steeply pitching beds where conditions are favorable.[1] The experimental work demonstrated that high productivity and low-cost mining could be attained by using the block-caving method in steeply pitching anthracite beds. Other attendant benefits were a high percentage of recovery, an increase in underground safety, and less arduous work for the miner. It was concluded that additional research was warranted on the control of caving coal beds of different physical characteristics and that attempts should be made in the laboratory and underground to reduce dilution of the product obtained from underground sections using this method.

Anthracite research completed in past years has been discussed in previous Minerals Yearbooks chapters on Pennsylvania anthracite and references to such work have been made in those chapters. In recent years, practical research has been conducted on the Korfmann Universal shearing machine, model SK–20, to determine its maneuverability and performance in cutting anthracite beds. Experiments also have been made on scraper-shaker loading machines for driving gangways, and on the Eickoff shearing machine, model DEK, to obtain specific data on its cutting characteristics.

During 1953 work was continued on yielding roof supports (Becorit props) in combination with backfilling. The use of the yielding steel supports showed encouraging results, as they were found to provide better roof support in working areas and mining the entire pillar width on the advance. Tests were continued on the Brieden pneu-

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[1] Allan, Andrew, Jr., and Davies, R. S., Anthracite Mechanical-Mining Investigations, Progress Report 5; Recovery of Anthracite in a Steeply Pitching Bed by Induced Caving: Bureau of Mines Rept. of Investigations 5013, 1953, 12 pp.

matic packing machine, and Bureau engineers are expected to obtain complete data on the packing rate, air consumption, and pipe wear considered necessary for determining the applicability of this machine to anthracite mining operations. The Bureau of Mines is cooperating with the anthracite industry in designing and testing lightweight-aggregate concrete roof supports to provide safer, cheaper, and more permanent roof control in underground haulageways. Work was continued on devices to measure loads borne by underground roadway supports to expedite the design of an effective telescopic movable shield for protecting miners at the working face. Considerable work has been done on the design of a 5-foot-diameter boring machine for driving chutes and airways at various angles. Other research projects were also conducted by the laboratory on the preparation and utilization of anthracite.

The Bureau of Mines has cooperated closely with anthracite operators and the Commonwealth of Pennsylvania in obtaining data on the serious problem of underground mine water. Much of the data have been obtained by the Safety Branch of the Health and Safety Division of the Bureau of Mines. The Safety Branch has released considerable data on the results of its investigations into the mine-water problem in numerous Bureau of Mines publications which have been discussed in past Pennsylvania anthracite chapters of the Minerals Yearbook.

To obtain a comprehensive picture of the anthracite-mine-water problem and to assist in its solution, it was necessary for the Bureau to accumulate detailed data on the volume and physical and chemical characteristics of the mine water handled by the pumping plants in the anthracite region, as well as information on the kinds of pumps utilized and the problems involved in actual pumping operations.[2]

The seepage of ground water into anthracite mines has also been explored extensively.[3] [4] There is little doubt that water retained on the surface and diverted to surface drainage channels can be handled more economically than if it had to be pumped from the mines. Information on barrier pillars is also of importance in reaching any solution to the mine-water problem.[5]

The Anthracite Advisory Committee to the Secretary of the Interior held an organizational meeting on October 12, 1953, in Washington, D. C. The committee was created under section 4 of the Act of December 18, 1942 (56 Stat. 1056). The advice of the Anthracite Advisory Committee will be sought, from time to time, by the department on specific problems connected with administration of the research laboratory at Schuylkill Haven, Pa., in accordance with provisions of section 1 of the act. At the organizational meeting on October 12, a general discussion was held on the various research projects being conducted at the Bureau of Mines laboratory and on ways and means by which the anthracite industry might be helped further.

[2] Ash, S. H., Hower, C. S., Kennedy, D. O., and Lesser, W. H., Mine Pumping Plants, Anthracite Region of Pennsylvania: Bureau of Mines Bull. 531, 1953, 151 pp.

[3] Ash, S. H., and Link, H. B., Surface-Water Seepage Into Anthracite Mines in the Western Middle Field, Anthracite Region of Pennsylvania: Bureau of Mines Bull. 532, 1953, 26 pp.

[4] Ash, S. H., and Whaite, R. H., Surface-Water Seepage Into Anthracite Mines in the Wyoming Basin, Northern Field, Anthracite Region of Pennsylvania: Bureau of Mines Bull. 534, 1953, 30 pp.

[5] Ash, S. H., and Kynor, H. D., Barrier Pillars in the Southern Field, Anthracite Region of Pennsylvania: Bureau of Mines Bull. 526, 1953, 44 pp.

A second meeting of the committee was held October 28, 1953, at the Anthracite Research Laboratory, Schuylkill Haven, Pa. Following a detailed discussion of the Bureau's research work and its relationship to existing problems within the anthracite region, the committee made the following recommendations for the consideration of the Secretary of the Interior in developing a research program to assist the anthracite region:

(1) Mechanization:

(*a*) Continue work with the German shearing machines and coal planer where cooperative opportunities are offered.

(*b*) Continue design and development work on a large-diameter borehole drill in cooperation with contributing anthracite operating companies.

(*c*) Continue the project on induced-caving method of mining with companies interested in this type of mining.

(*d*) Conduct research on high-speed, high-bit-pressure drills.

(2) Preparation:

(*a*) Continue studies on crushing and grinding anthracite with various types of crushers, such as gyrators, hammer-mills, etc., to determine the most feasible method of obtaining a maximum recovery of fine sizes from Egg, Stove, and Pea coals.

(*b*) Continue work on the various methods of preparation, with particular emphasis on the use of the launder screen and the Humphrey spiral.

(3) Utilization:

(*a*) Actively proceed with a study on the use of anthracite in the ferrous and metallurgical fields.

1. In cupolas.
2. As a blast-furnace admixture.
3. For blending in byproduct coke production.

4. Miscellaneous work:

(*a*) Make advance design of a blast furnace for exclusive use of anthracite.

(*b*) Continue work in the fields of crop drying and frost control.

(*c*) Continue research covering industrial uses of anthracite producer gas.

(*d*) Continue research on the recovery of germanium from anthracite.

FOREIGN TRADE

According to data of the United States Department of Commerce, anthracite imported into the United States for consumption totaled 31,443 net tons in 1953; virtually all was imported from Great Britain through the Massachusetts customs district. It appears that the small annual token shipments to this country by Great Britain since the close of World War II have been prompted more by a desire to maintain commercial coal contacts and obtain dollar exchange than by any firm demand for British anthracite.

Exports of Pennsylvania anthracite dropped to 2.7 million tons in 1953, 41 percent less than was exported in 1952. Exports to Canada

TABLE 35.—Anthracite imported for consumption in the United States, 1952–53, by country and customs district, in net tons

[U. S. Department of Commerce]

Country	1952	1953	Customs district	1952	1953
Canada		66	Massachusetts	29,299	31,343
French Morocco	49		Michigan		66
Italy	22	34	New York	71	34
United Kingdom	29,299	31,343	St. Lawrence		(1)
Total	29,370	31,443	Total	29,370	31,443

[1] Less than 0.5 ton.

were off 28 percent from 1952 and the lowest since 1939. Inasmuch as Alberta natural gas was not yet available in eastern Canadian markets, continued relatively mild weather and competition from heating oil were considered the predominant reasons for the sharp decline in the demand for Pennsylvania anthracite, particularly in view of the fact that Canadian imports of Welsh anthracite in 1953 (338,861 net tons) were approximately the same as in 1952 (344,743 net tons).

Total European imports of Pennsylvania anthracite in 1953 represented only about 6 percent of the 1952 volume, with Yugoslavia and Greece the only countries importing full cargoes. The improvement noted in early 1952 in the European supply-demand situation con-

TABLE 36.—Anthracite exported from the United States, 1952–53, by country and customs district, in net tons

[U. S. Department of Commerce]

Country	1952	1953
North America:		
Bermuda	445	
British West Indies	225	362
Canada	3,606,618	2,601,818
Cuba	41,317	51,742
Mexico	15,723	8,381
South America:		
Brazil	518	
Colombia	105	165
Peru	3,720	
Uruguay		225
Venezuela	9	
Europe:		
Austria	10,496	
Belgium-Luxembourg	10,159	
France	486,139	
Greece		12,288
Italy	10,867	
Netherlands	339,704	
Norway		18
Switzerland	1,670	
Yugoslavia	63,598	39,830
Asia:		
Israel and Palestine		7,646
Japan	724	1,792
Saudi Arabia		3
Africa	23	
Total	4,592,060	2,724,270

Customs district	1952	1953
North Atlantic:		
Maine and New Hampshire	12,596	6,344
Massachusetts	25	
New York	792	1,228
Philadelphia	989,652	121,009
Rhode Island		5
South Atlantic:		
Maryland	111	3,923
Virginia	235	643
Gulf Coast:		
El Paso	48	2,158
Galveston	54	
Mexican border: Laredo	501	548
Northern border:		
Buffalo	2,371,145	1,716,647
Chicago		10,031
Dakota	96	46
Michigan	54	113
Montana and Idaho	58	
Ohio	18,466	14,308
Rochester	18,499	5,265
St. Lawrence	1,169,848	814,640
Vermont	9,880	27,302
Miscellaneous [1]		60
Total	4,592,060	2,724,270

[1] Estimated data; district breakdown not available.

tinued in 1953 and was responsible for the decline in United States exports. Such former heavy importers of anthracite as France, The Netherlands, Belgium, Italy, and the Scandinavian countries either succeeded in raising production or in procuring needed supplies from other European sources. The rapid growth of the petroleum and hydroelectric-power industries of western Europe has also been an important factor in alleviating the critical postwar shortage of fuel.

WORLD PRODUCTION

World production of anthracite dropped in 1953 to about the 1950 level—approximately 140 million metric tons. As the small decreases reported by several countries were more than compensated for by increases in others, the net decline was due entirely to the sharp downward trend of production in the United States.

Output of anthracite in Great Britain and the Union of Soviet Socialist Republics was relatively unchanged from 1952. The Government of the U. S. S. R. does not publish data on coal production; however, the estimates available show rapid resumption of anthracite production for several years after the recovery of the Donetz Basin from German occupation forces. Beginning with 1950, Russian production has been relatively stable, varying between 66 and 68 million metric tons annually, which may indicate that the amounts produced in those years either attained the goals set under the various 5-year plans or was considered adequate for domestic and export requirements. According to data released by the importing countries, 386,000 metric tons of Russian anthracite was exported in 1953 to France, The Netherlands, and Belgium, combined, compared with 268,000 tons in 1952. In 1953 Italy imported 46,000 tons, a decline of 62 percent from 1952.

Despite strenuous efforts by the National Coal Board of Great Britain to step up coal production and exports since nationalization of the coal-mining industry in 1946, the output of British anthracite has varied little quantitatively from year to year. Many anthracite mines of South Wales have been worked beyond sound economic limits. Therefore, the coal board has developed plans for completing several large new collieries in South Wales to raise future production to 6 million metric tons annually. However, as the mine-development work is a long-term project, output is expected to range between the 4- and 5-million-ton level for the next few years.

In 1953 a marked increase was noted in the output of anthracite in West Germany. The Republic of Korea continued to increase its anthracite production, as did Japan, Spain, and Belgium. Minor decreases in tonnage were reported in France, Indochina, and Italy.

TABLE 37.—World production of anthracite, in thousand metric tons,[1] 1949–53

[Compiled by Pearl J. Thompson]

Country	1949	1950	1951	1952	1953
Belgium	[2] 5,839	[2] 5,712	[2] 6,500	6,869	7,160
Bulgaria [2]	27	30	35	35	40
China [2]	1,000	2,000	4,000	4,000	4,000
France	10,446	8,885	[2] 9,800	[2] 11,075	[2] 10,900
French Morocco	341	368	394	460	565
Germany:					
East Germany [2]	217	238	238	238	247
West Germany	[2] 7,433	[2] 7,800	[2] 8,300	8,839	10,294
Indochina	376	502	645	860	833
Ireland	48	98	106	110	[2] 110
Italy	75	69	82	82	68
Japan	776	686	948	1,008	1,092
Korea:					
North Korea [2]	1,500	1,500	1,000	750	1,000
Republic	1,066	568	129	576	867
New Zealand	2	2	1	1	----------
Peru	28	33	64	80	[2] 80
Portugal	443	419	417	442	478
Rumania	35	[2] 30	[2] 35	[2] 50	[2] 50
Spain	1,439	1,504	1,601	1,836	1,950
Switzerland [2]	10	10	10	10	10
U. S. S. R.[2]	58,975	66,000	67,760	68,000	68,000
United Kingdom	4,400	4,630	4,419	4,251	4,267
United States (Pennsylvania)	38,738	39,986	38,709	36,816	28,076
Total (estimate)	133,200	141,100	145,200	146,400	140,100

[1] This table incorporates a number of revisions of data published in previous anthracite tables.
[2] Estimate.

NOTE.—Includes an undetermined amount of semianthracite for some countries.

Coke and Coal Chemicals

By J. A. DeCarlo, J. A. Corgan, and Maxine M. Otero

GENERAL SUMMARY

DURING 1953 the coke industry experienced a change from intensive activity to normal operations. Production of oven and beehive coke, excluding breeze, totaled 78.8 million net tons, a 16-percent gain over 1952 but nearly one-half million tons short of the record output of 1951. The oven-coke segment of the industry began the year with a high production rate, which was sustained through the second and most of the third quarter. In September the high rate began to decline, and at the end of the year slot-type coke ovens were operating at only 85 percent of capacity. The slackening in steel production in the later months of 1953 caused blast furnaces to reduce their operating rates, which, in turn, reduced coke requirements. In spite of the decline in coke-oven operations in the last quarter, production from this source for the year was the highest on record. The output of 73.6 million tons of oven coke, excluding breeze, was 9.7 million tons higher than the 1952 total, which was affected by strikes, and 1.6 million above the previous maximum of 1951.

The recession in steel production adversely affected beehive output, and many plants closed in 1953. Production of beehive coke averaged more than one-half million tons a month during the first half of the year but dropped steadily in the latter months. The average daily production of beehive coke in December was only one half the March rate. Expansion in slot-type carbonizing capacity also was an important factor in the sharp decline in beehive production.

There was, in general, enough coke for all essential requirements in the United States in 1953. In a few instances, particularly during the first part of the year, local shortages developed, and it was necessary to ship in coke from distant sources. Most of the deficit areas added new coke-oven capacity and brought production more in line with demand by the end of the year. Requirements for blast-furnace coke increased substantially during the year, and a greater proportion of the coke supply than ever before was used for smelting iron ore. Foundry-coke requirements remained about the same as in the previous year, but requirements of coke for manufacturing water gas and for residential heating decreased. According to reports from producing companies, 89 percent of all coke shipped was destined to blast-furnace plants, 4 percent to iron foundries, 2 percent to producer- and water-gas plants, and 3 percent to miscellaneous industrial plants (nonferrous smelting, chemical processing); 2 percent was used for residential heating.

The annual coke capacity of slot-type ovens increased 1.8 million tons during 1953 and reached 78.3 million tons. This gain was due

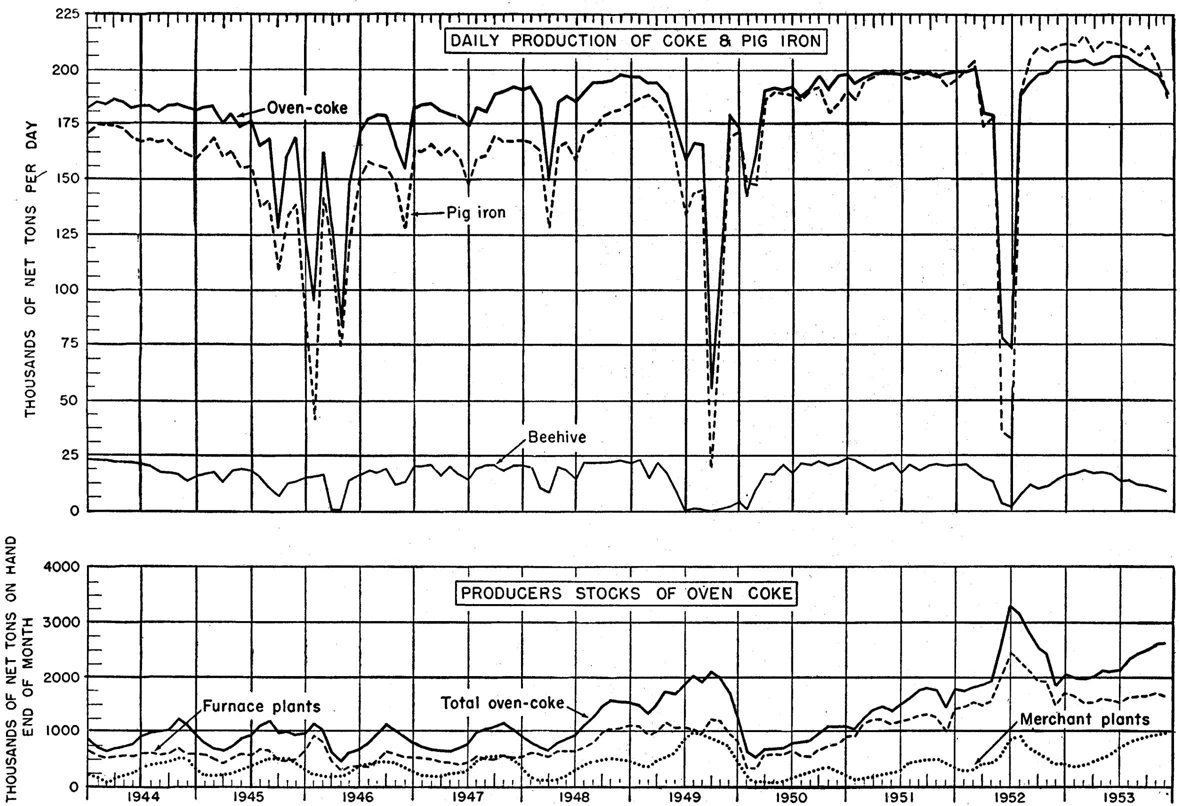

FIGURE 1.—Average daily production of oven and beehive coke and pig iron and producers' stocks of oven coke, 1944–53, by months.

to completion of the largest number of new ovens (1,027) for a single year since 1919. However, because a major part of the new ovens were replacements rather than additions to existing plants, the industry gained only 381 ovens, which raised the total in existence at the end of the year to 15,989. On April 9, 1953, the Office of Defense Mobilization amended Expansion Goal 4 on oven coke. This goal, announced and approved December 5, 1951, called for an annual coke capacity of slot-type ovens of 84 million net tons to be attained by December 31, 1953. The goal, as amended, raised the proposed annual coke capacity to 85.8 million tons of oven coke to be completed by January 1, 1955, with complementary facilities for mining and washing metallurgical-grade coal required for a balanced operation of this new oven-coke capacity. Coke capacity on January 1, 1950 (73.7 million tons), was used as the base period for establishing the expansion goal. In the 4 full years following that date, capacity increased 4.6 million tons. The capacity of ovens under construction on December 31, 1953, totaled 4.2 million tons. It was apparent that the goal of 85.8 million tons could not be attained on schedule because of the probable deterioration and failure of old ovens during 1954.

Prices of coke and coal chemicals, which had been under regulatory ceilings (Supplementary Regulation 13 of the General Ceiling Price Regulation) since March 16, 1951, were decontrolled by the Office of Price Stabilization on February 18, 1953. The removal of ceilings had little immediate effect on coke prices. The prices published weekly in various trade journals on oven-foundry coke showed little change throughout the year. Price data submitted to the Bureau of Mines by the producers on their commercial sales of coke showed only minor changes; blast-furnace grade, foundry grade, and domestic sizes increased slightly, but prices on sales for miscellaneous industrial purposes (other industrial) declined. Although prices on most of the coal chemicals advanced slightly, prices on pure benzene increased sharply. Spot prices quoted in trade journals showed that coke-oven pure benzene increased from $0.30 per gallon to $0.42 during the year.

Coal and labor costs in the coke industry advanced slightly in 1953. The reported average value of coal delivered at oven-coke plants increased only 1 cent per ton and $0.10 over 1952 at beehive plants. The calculated value of the coal required to make 1 ton of oven coke was $13.17, a gain of $2.08 since the base period 1947–49. The value of coal required to make 1 ton of beehive coke was $9.97 or $2.28 higher than in 1947–49. According to data published by the Bureau of Labor Statistics for 1953 on average hourly and weekly earnings of production workers for "coke and other petroleum and coal products," average weekly earnings were $78.81 compared with $73.74 in 1952 and $69.39 in 1951, the first year for which figures on this group were collected and published. Average hourly earnings increased $0.13 per hour and averaged $1.89 against $1.76 in 1952 and $1.66 in 1951.

Production of the primary coal-chemical materials and derivatives at coke ovens followed, in general, the increased coke output. Increases from 16 percent for gas to 19 percent for crude light oil were obtained by the primary products. The increases in production of derivatives, influenced by demand, fluctuated widely and were as follows: Benzene, 15 percent; toluene, 18 percent; xylene, 23 percent;

crude naphthalene, 6 percent; refined pyridine, 4 percent; ammonium sulfate, 18 percent; and ammonia liquor, 13 percent.

Expansion in productive capacity and imports and a drop in requirements caused some significant change in market conditions of some of the important coal chemicals in 1953. Imports of ammonium sulfate (523,858 tons) were the highest on record in 1953 and more than half of the production of coke-oven sulfate in the United States. About two-thirds of this foreign material originated in Europe and entered the United States through eastern ports where it was offered for sale for about $44 per ton. This was the same as the prevailing domestic price at coke-oven plants, most of which are inland. Sales of coke-oven sulfate lagged far behind production during the summer and fall, and stocks at producing plants reached an alltime high in November. Stocks declined slightly in December as sales increased sharply following price cuts.

The rapid expansion in naphthalene-producing capacity, commencing with the 1950 defense program, began to show its effect on the market early in 1953. Demand started the year at a slow pace, and a 6-month strike at a large naphthalene-consuming plant added to the sluggishness of the market. In addition, 41,668 tons of crude naphthalene was imported, mainly from Europe, and sold at the port of entry for approximately $0.035 per pound compared with $0.0675 for domestically produced material. Slackened demand, coupled with the large imports, resulted in a temporary oversupply of naphthalene and the first price cut was made in domestic material since 1950. Benzene, one of the most essential chemicals for civilian and military goods, started the year in short supply but ended in a balanced supply. It was used principally in the manufacture of styrene, phenol, and aniline, which are the intermediate products required to make synthetic rubber, plastics, and dyes. The large demand for all these materials built up during the Korean emergency carried over in the first part of 1953. Although insecticide production was not particularly good in the spring, this was more than offset by a high level of activity in the synthetic-rubber industry. The cutback in

TABLE 1.—Salient statistics of the coke industry in the United States, 1947–49 (average) and 1952–53

	1947–49 (average)	1952	1953
Coke produced:			
Oven net tons	65, 088, 462	63, 850, 115	73, 593, 528
Beehive do	5, 559, 940	4, 403, 994	5, 243, 329
Total do	70, 648, 402	68, 254, 109	78, 836, 857
Distribution, all coke sold or used:			
Blast-furnace do	56, 145, 621	58, 182, 747	69, 728, 500
Foundry do	3, 393, 176	3, 102, 446	3, 040, 971
Other industrial (including producer and water gas) net tons	7, 391, 615	4, 648, 077	4, 006, 560
Residential heating do	3, 392, 826	1, 932, 369	1, 467, 962
Imports, all coke do	181, 000	312, 519	157, 318
Exports, all coke do	696, 502	792, 072	520, 252
Apparent consumption, all coke do	69, 852, 671	67, 355, 871	77, 695, 872
Producers' stocks of coke, Dec. 31 do	[1] 1, 769, 456	1, 901, 657	2, 679, 708
Value of coal-chemical materials sold or used	$254, 681, 622	$300, 456, 613	$359, 879, 092
Value of coke and breeze produced	867, 047, 809	1, 005, 218, 886	1, 179, 400, 694
Total value of all products	1, 121, 729, 431	1, 305, 675, 499	1, 539, 279, 786

[1] 1949.

TABLE 2.—Statistical summary of the coke industry in the United States in 1953

	Slot-type ovens	Beehive ovens	Total
Coke produced—			
At merchant plants:			
Net tons	10,965,352	(2)	(2)
Value	$190,459,372		
At furnace plants: [1]			
Net tons	62,628,176		
Value	$889,844,784		
Total:			
Net tons	73,593,528	5,243,329	78,836,857
Value	$1,080,304,156	$76,257,848	$1,156,562,004
Breeze produced:			
Net tons	5,253,487	83,456	5,336,943
Value	$22,584,533	$254,157	$22,838,690
Coal carbonized:			
Bituminous:			
Net tons	104,648,330	8,226,097	112,874,427
Value	$966,960,567	$52,283,334	$1,019,243,901
Average per ton	$9.24	$6.36	$9.03
Anthracite:			
Net tons	274,597		274,597
Value	$2,347,801		$2,347,801
Average per ton	$8.55		$8.55
Total:			
Net tons	104,922,927	8,226,097	113,149,024
Value	$969,308,368	$52,283,334	$1,021,591,702
Average per ton	$9.24	$6.36	$9.03
Average yield in percent of total coal carbonized:			
Coke	70.14	63.74	69.68
Breeze (at plants actually recovering)	5.02	2.87	4.96
Ovens:			
In existence Jan. 1	15,608	17,551	33,159
In existence Dec. 31	15,989	15,092	31,081
Dismantled during year	646	[3] 2,564	3,210
In course of construction Dec. 31	779	22	801
Annual coke capacity Dec. 31 net tons	78,258,000	10,072,700	88,330,700
Coke used by producers—			
In blast furnaces:			
Net tons	48,960,723	392,268	49,352,991
Value	$686,500,287	$5,750,100	$692,250,387
In foundries:			
Net tons	119,271		119,271
Value	$2,040,322		$2,040,322
To make producer gas:			
Net tons	421,272		421,272
Value	$5,565,997		$5,565,997
To make water gas:			
Net tons	1,055,889		1,055,889
Value	$10,146,933		$10,146,933
For other purposes:			
Net tons	305,237	87	305,324
Value	$4,330,590	$1,266	$4,331,856
Coke sold—			
To financially affiliated companies—			
For blast-furnace use:			
Net tons	10,610,546	1,615,553	12,226,099
Value	$156,888,876	$22,717,161	$179,606,037
For foundry use:			
Net tons	58,682		58,682
Value	$1,132,807		$1,132,807
For manufacture of water gas:			
Net tons	196,184		196,184
Value	$3,132,467		$3,132,467
For other purposes:			
Net tons	154,701		154,701
Value	$2,238,317		$2,238,317
To other consumers—			
For blast-furnace use:			
Net tons	5,331,887	2,817,523	8,149,410
Value	$87,288,552	$41,362,646	$128,651,198
For foundry use:			
Net tons	2,795,312	67,706	2,863,018
Value	$66,733,989	$1,059,237	$67,793,226
For manufacture of water gas:			
Net tons	161,559	57,447	219,006
Value	$2,720,797	$868,902	$3,589,699
For other industrial use:			
Net tons	1,357,262	296,922	1,654,184
Value	$18,123,140	$4,534,089	$22,657,229
For residential heating:			
Net tons	1,459,420	8,542	1,467,962
Value	$22,257,637	$116,275	$22,373,912

For footnotes, see end of table.

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TABLE 2.—Statistical summary of the coke industry in the United States in 1953—Continued

	Slot-type ovens	Beehive ovens	Total
Disposal of breeze:			
Used by producers—			
For steam raising:			
Net tons	2,911,918		2,911,918
Value	$11,286,201		$11,286,201
To make producer or water gas:			
Net tons	24,455		24,455
Value	$186,412		$186,412
For other purposes:			
Net tons	908,228	13	908,241
Value	$3,759,260	$198	$3,759,458
Sold:			
Net tons	1,346,976	82,027	1,429,003
Value	$7,093,201	$302,540	$7,395,741
Average receipts per ton sold (merchant sales):			
Blast-furnace coke	$16.37	$14.68	$15.79
Foundry coke	$23.87	$15.64	$23.68
Water-gas coke	$16.84	$15.13	$16.39
Other industrial coke	$13.35	$15.27	$13.70
Residential heating coke	$15.25	$13.61	$15.24
Breeze	$5.27	$3.69	$5.18
Producers' stocks, Dec. 31:			
Blast-furnace coke net tons	1,992,469	9,044	2,001,513
Foundry coke do	39,202	2,504	41,706
Residential heating and other coke do	634,815	1,674	636,489
Breeze do	857,651	350	858,001
Coal-chemical materials produced:			
Tar gallons	828,728,761		828,728,761
Ammonium sulfate or equivalent pounds	2,091,032,132		2,091,032,132
Gas M cubic feet	1,069,140,519		1,069,140,519
Burned in coking process percent	35.00		35.00
Surplus sold or used do	62.94		62.94
Wasted do	2.06		2.06
Crude light oil gallons	295,725,435		295,725,435
Yield of coal-chemical materials per ton of coal:			
Tar do	7.90		7.90
Ammonium sulfate or equivalent pounds	20.09		20.09
Gas M cubic feet	10.19		10.19
Crude light oil gallons	2.90		2.90
Value of coal-chemical materials sold or used:			
Tar	$59,430,221		$59,430,221
Ammonia (sulfate and liquor)	$39,384,858		$39,384,858
Gas (surplus)	$147,727,356		$147,727,356
Crude light oil and derivatives	$87,442,736		$87,442,736
Other coal-chemical materials [4]	$25,893,921		$25,893,921

[1] Plants associated with iron blast furnaces (refer to definition in section on Production by Furnace and Merchant Plants).
[2] Not separately recorded.
[3] Idle and not expected to resume production; removed from list of available ovens.
[4] Naphthalene, tar derivatives, and miscellaneous materials.

the Government synthetic-rubber program in the latter part of the year reduced requirements of chemical grades of benzene. To maintain maximum production of benzene and prevent accumulation of excessive inventories, a few coke producers sold a small amount of surplus benzene as motor fuel. Although some benzene was sold in this manner, the price on specification grades of benzene was not reduced. Two other important coal chemicals in heavy demand throughout the year were toluene and xylene. Toluene was used almost exclusively in the manufacture of explosives and for enrichment of aviation gas. The government required over 70 percent of the coke-oven toluene for the manufacture of explosives. Termination of hostilities in Korea lessened the need for TNT and aviation gasoline, and some improvement in supply was noticed in the latter part of the year.

A coal-chemical material that has received a great deal of attention in recent years is refined (2°) pyridine. This tar base was consistently

TABLE 3.—Summary of coke-oven operations in the United States in 1953, by States

State	Oven coke: In existence Dec. 31 [1]: Plants	Oven coke: In existence Dec. 31 [1]: Ovens	Oven coke: Coal carbonized (net tons)	Oven coke: Yield of coke from coal (percent)	Oven coke: Coke produced (net tons)	Oven coke: Value of coke at ovens: Total	Oven coke: Value of coke at ovens: Per ton
Alabama	7	1,408	9,001,423	69.75	6,278,239	$72,501,622	$11.55
California	1	225	1,235,393	60.66	749,381	(2)	(2)
Colorado	1	266	1,406,095	68.78	967,074	(2)	(2)
Illinois	8	934	4,938,018	71.14	3,513,142	59,549,629	16.95
Indiana	5	1,890	12,443,623	71.41	8,886,502	159,966,820	18.00
Maryland	1	622	4,513,777	72.42	3,268,655	(2)	(2)
Massachusetts	1	108	1,206,980	70.39	849,535	(2)	(2)
Michigan	4	621	4,315,969	74.61	3,220,133	49,518,010	15.38
Minnesota	3	241	1,216,232	70.89	862,151	15,362,688	17.82
New Jersey	2	341	1,656,559	70.95	1,175,416	(2)	(2)
New York	5	973	6,624,717	69.28	4,589,609	69,906,676	15.23
Ohio	16	2,513	16,716,709	70.09	11,717,556	163,191,278	13.93
Pennsylvania	14	4,077	27,284,476	68.71	18,747,300	257,075,120	13.71
Tennessee	1	44	300,807	76.90	231,330	(2)	(2)
Texas	2	125	1,043,410	72.06	751,926	(2)	(2)
Utah	2	308	2,208,959	63.73	1,407,818	(2)	(2)
Virginia							
West Virginia	5	731	5,819,008	72.23	4,203,360	49,554,292	11.79
Connecticut, Kentucky, Missouri, and Wisconsin	4	562	2,990,772	72.70	2,174,401	37,990,772	17.47
Undistributed						145,687,249	15.50
Total 1953	82	15,989	104,922,927	70.14	73,593,528	1,080,304,156	14.68
At merchant plants	24	2,693	15,238,074	71.96	10,965,352	190,459,372	17.37
At furnace plants	58	13,296	89,684,853	69.83	62,628,176	889,844,784	14.21
Total 1952	82	15,608	90,909,495	70.23	63,850,115	925,300,448	14.49

State	Beehive coke: Ovens in existence Dec. 31	Beehive coke: Coal carbonized (net tons)	Beehive coke: Yield of coke from coal (percent)	Beehive coke: Coke produced (net tons)	Beehive coke: Value of coke at ovens: Total	Beehive coke: Value of coke at ovens: Per ton	Total: Coke produced (net tons)	Total: Value of coke at ovens
Alabama							6,278,239	$72,501,622
California							749,381	(2)
Colorado							967,074	(2)
Illinois							3,513,142	59,549,629
Indiana							8,886,502	159,966,820
Maryland							3,268,655	(2)
Massachusetts							849,535	(2)
Michigan							3,220,133	49,518,010
Minnesota							862,151	15,362,688
New Jersey							1,175,416	(2)
New York							4,589,609	69,906,676
Ohio							11,717,556	163,191,278
Pennsylvania	12,288	7,212,949	64.27	4,635,513	$66,927,383	$14.44	23,382,813	324,002,503
Tennessee							231,330	(2)
Texas							751,926	(2)
Utah	797	145,607	57.60	83,863	(2)	(2)	1,491,681	(2)
Virginia	848	314,079	59.87	188,033	2,851,499	15.16	188,033	2,851,499
West Virginia	964	440,966	62.00	273,420	3,932,576	14.38	4,476,780	53,486,868
Connecticut, Kentucky, Missouri, and Wisconsin	195	112,496	55.56	62,500	(2)	(2)	2,236,901	(2)
Undistributed					2,546,390	17.40		186,224,411
Total 1953	15,092	8,226,097	63.74	5,243,329	76,257,848	14.54	78,836,857	1,156,562,004
Total 1952	17,551	6,911,647	63.72	4,403,994	61,282,146	13.92	68,254,109	986,582,594

[1] Does not include plants retired permanently during year.
[2] Included with "Undistributed" to avoid disclosure of individual company figures.

in short supply since the outbreak of the Korean War. A large diversification of end uses was impeded by limited productive capacity in the heavy-buying period. However, discontinued uses, completion of a new synthetic pyridine-producing plant in 1953, and substitution of other materials reduced requirements of 2° pyridine, and by the end of the year there was an ample supply.

The increase in oven-coke production and sales of coal chemicals raised the value of all coke-oven products to more than $1.5 billion in 1953. This was $234 million higher than 1952 and $418 million above the 1947–49 average.

SCOPE OF REPORT

The statistics in this chapter, except where otherwise noted, are based on data voluntarily supplied to the Bureau of Mines by coke-plant operators within the continental limits of the United States. The data are confined to the products made in high-temperature slot-type and beehive-coke ovens. Coke made by other processes (in coal-gas retorts, by low-temperature carbonization of coal, and from carbonization of the residue from the refining of crude tar and petroleum) are not included. Statistics on retort and low-temperature coke in the United States are given in table 4. Production of petroleum coke totaled 4.3 million tons in 1953, and the United States Tariff Commission reported that 38,000 tons of coal-tar-pitch coke was produced.

The term "coke," as used in this chapter, refers only to the larger sizes (usually one-half inch plus) from which the smaller sizes (which are known as breeze) have been screened.

Forty-nine companies were operating 83 oven-coke plants in the United States in 1953. Completed reports were received from every plant. In the beehive industry, 138 plants owned by 105 companies were canvassed. Returns were not received from 30 plants, most of which were known to have been idle. In some instances, the operating companies went out of the coke business when the heavy demand for coke ended. As these plants would not again produce coke except under extraordinary conditions, they were removed from the active mailing list. It is therefore believed that the data presented on beehive coke in this chapter are accurate and complete.

Although the terms "merchant" and "furnace" plants originated in the beehive-coke industry, this classification is applied only to oven-coke plants in this chapter. Furnace plants are those under direct ownership of or having a financial affiliation with iron and steel companies whose main business is production of coke for use in their own blast furnaces. All other plants are classified as merchant and include those that manufacture metallurgical, industrial, and domestic grades of coke for sale on the open market; coke plants associated with chemical companies; gas utilities; and those affiliated with local iron works where only a minor part, less then 50 percent of their output, is used in affiliated blast furnaces.

The Bureau of Mines does not attempt to collect statistics on the costs of manufacturing coke. Values and prices on coke and other products shown in this chapter are compiled exactly as reported to the Bureau of Mines by the coke-oven operators. For the coke, gas, and coal chemicals sold (commercial sales), the values are the amounts received f. o. b. ovens. However, the greater part of the coke produced in the United States is made in ovens owned and operated by corporations which not only mine their coal but also operate blast furnaces and steel mills that consume the entire output. Under such conditions, the value of coal charged and of coke produced is governed by established accounting procedures. For example, at some plants the cost of coke to the blast-furnace department equals the cost of production; at others, a margin of profit is added; or the reported value is based on what the coke would cost if purchased on the open market.

Most of the tables in this chapter, in addition to 1953 figures, include data for 3 or 4 previous years for comparative purposes. The base year has been changed from 1937 to the average of 1947–49 to provide a period reflecting the changing pattern of industrial activity in the United States since World War II.

RETORT AND LOW-TEMPERATURE COKE

TABLE 4.—Salient statistics on retort and low-temperature coke in the United States in 1953

	Quantity	Value
Coke produced ... net tons	237,216	$2,276,796
Breeze produced ... do	2,414	
Coal carbonized ... do	424,141	1,897,997
Average value per ton		4.47
Average yield in percent of coal carbonized:		
Coke	55.93	
Breeze (at plants actually recovering)	7.34	
Retorts and ovens:		
In existence Dec. 31	52	
Annual coal capacity ... net tons	520,900	
Coke used by producers ... do	42,327	358,593
Coke sold to other consumers ... do	224,005	2,211,293
Stocks, Dec. 31:		
Coke ... do	8,927	
Breeze ... do	443	
Tar:		
Produced ... gallons	4,787,244	
Sold ... do	4,329,152	526,519
Stocks, Dec. 31 ... do	208,677	
Per ton of coal carbonized ... do	11.29	

OVEN AND BEEHIVE COKE AND BREEZE

MONTHLY AND WEEKLY PRODUCTION

Statistics on monthly production of coke in tables 5 and 8 were based upon reports received from producers. Weekly production of beehive coke in table 6 was estimated from reports of carloadings received from all coke-carrying railroads. The collection of these weekly data was discontinued at the end of 1953. Totals in these tables were adjusted to the totals ascertained by an annual canvass of the producers.[1]

[1] Data on monthly production for both oven and beehive coke are published in the Monthly Coke Report available upon request to the Publications Distribution Section, Bureau of Mines, Washington 25, D. C.

TABLE 5.—Coke produced in the United States and average per day, 1947–49 (average) and 1951–53, by months, in net tons [1]

Month	1947–49 (average)		1951		1952		1953	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
Oven coke:								
January	5,875,300	189,500	6,092,700	196,500	6,186,700	199,600	6,316,600	203,800
February	5,393,400	192,600	5,414,700	193,400	5,787,900	199,600	5,703,600	203,700
March	5,775,800	186,300	6,058,300	195,400	6,221,300	200,700	6,326,900	204,100
April	5,231,600	174,400	5,926,800	197,600	5,389,700	179,700	6,059,500	202,000
May	5,707,400	184,100	6,138,900	198,000	5,556,200	179,200	6,310,300	203,500
June	5,409,700	180,300	5,959,200	198,600	2,368,600	78,900	6,154,500	205,200
July	5,355,900	172,800	6,120,700	197,400	2,311,300	74,600	6,369,400	205,500
August	5,564,400	179,500	6,170,700	199,100	5,808,300	187,400	6,340,700	204,500
September	5,394,700	179,800	5,941,500	198,100	5,804,800	193,500	6,061,100	202,000
October	4,519,000	145,800	6,132,600	197,800	6,137,900	198,000	6,210,500	200,300
November	5,003,500	166,800	5,899,600	196,700	5,986,700	199,600	5,915,300	197,200
December	5,857,800	189,000	6,131,500	197,800	6,290,700	202,900	5,825,200	187,900
Total	65,088,500	178,300	71,987,200	197,200	63,850,100	174,500	73,593,600	201,600
Beehive coke:								
January	623,500	20,100	733,200	23,700	625,000	20,100	483,400	15,600
February	574,900	20,600	607,900	21,700	574,000	19,800	466,400	16,700
March	461,900	14,900	629,100	20,300	563,100	18,200	557,000	18,000
April	445,000	14,800	559,300	18,600	414,000	13,800	524,500	17,500
May	582,300	18,800	609,000	19,700	400,200	12,900	551,000	17,800
June	432,500	14,400	627,700	21,000	113,100	3,800	504,100	16,800
July	304,500	9,800	531,400	17,200	59,300	1,900	413,600	13,300
August	425,000	13,700	613,000	19,700	220,500	7,100	421,000	13,600
September	413,500	13,800	553,400	18,400	354,900	11,800	371,700	12,400
October	428,800	13,800	632,900	20,400	302,400	9,800	363,600	11,800
November	411,700	13,700	622,700	20,700	345,100	11,500	307,300	10,200
December	456,300	14,700	623,900	20,100	432,400	14,000	279,700	9,000
Total	5,559,900	15,300	7,343,500	20,100	4,404,000	12,000	5,243,300	14,400
Total:								
January	6,498,800	209,600	6,825,900	220,200	6,811,700	219,700	6,800,000	219,400
February	5,968,300	213,200	6,022,600	215,100	6,361,900	219,400	6,170,000	220,400
March	6,237,700	201,200	6,687,400	215,700	6,784,400	218,900	6,883,900	222,100
April	5,676,600	189,200	6,486,100	216,200	5,803,700	193,500	6,584,000	219,500
May	6,289,700	202,900	6,747,900	217,700	5,956,400	192,100	6,861,300	221,300
June	5,842,200	194,700	6,586,900	219,600	2,481,700	82,700	6,658,600	222,000
July	5,660,400	182,600	6,652,100	214,600	2,370,600	76,500	6,783,000	218,800
August	5,989,400	193,200	6,783,700	218,800	6,028,800	194,500	6,761,700	218,100
September	5,808,200	193,600	6,494,900	216,500	6,159,700	205,300	6,432,800	214,400
October	4,947,800	159,600	6,765,500	218,200	6,440,300	207,800	6,574,100	212,100
November	5,415,200	180,500	6,522,300	217,400	6,331,800	211,100	6,222,600	207,400
December	6,314,100	203,700	6,755,400	217,900	6,723,100	216,900	6,104,900	196,900
Grand total	70,648,400	193,600	79,330,700	217,300	68,254,100	186,500	78,836,900	216,000

[1] Daily average calculated by dividing monthly production by number of days in month.

TABLE 6.—Beehive coke produced in the United States in 1953, by weeks

[Estimated from railroad shipments]

Week ended—	Net tons	Week ended—	Net tons	Week ended—	Net tons
Jan. 3	[1] 38,900	May 9	141,900	Sept. 12	79,800
Jan. 10	107,700	May 16	119,400	Sept. 19	88,300
Jan. 17	110,700	May 23	138,000	Sept. 26	87,000
Jan. 24	116,900	May 30	130,600	Oct. 3	88,900
Jan. 31	109,200	June 6	129,800	Oct. 10	84,300
Feb. 7	114,500	June 13	125,600	Oct. 17	80,000
Feb. 14	115,800	June 20	111,500	Oct. 24	83,500
Feb. 21	117,400	June 27	122,500	Oct. 31	82,700
Feb. 28	118,600	July 4	53,800	Nov. 7	83,800
Mar. 7	121,500	July 11	91,100	Nov. 14	74,700
Mar. 14	128,000	July 18	93,900	Nov. 21	78,600
Mar. 21	114,700	July 25	98,100	Nov. 28	66,700
Mar. 28	142,800	Aug. 1	95,400	Dec. 5	74,100
Apr. 4	112,800	Aug. 8	90,300	Dec. 12	62,200
Apr. 11	122,300	Aug. 15	105,300	Dec. 19	64,400
Apr. 18	122,700	Aug. 22	96,300	Dec. 26	53,600
Apr. 25	120,500	Aug. 29	94,300	Jan. 2, 1954	[2] 28,900
May 2	115,500	Sept. 5	93,500		
				Total	5,243,300

[1] 3 days only. [2] 5 days only.

PRODUCTION BY FURNACE AND MERCHANT PLANTS

Production of oven coke at furnace plants in 1953 increased 20 percent over 1952, whereas output from the merchant group dropped 6 percent. The output of coke, excluding breeze, from the furnace plants was nearly six times larger than the merchant total and nearly equaled the average production from all oven-coke plants in the base period 1947–49. The large gain in coke production by the furnace group since World War II was due to the tremendous increase in blast-furnace coke requirements. While requirements of coke for blast furnaces skyrocketed, requirements of coke for other industrial applications and for residential heating declined. Production of coke at merchant plants reached a peak of over 15 million tons in 1942. Natural gas and fuel oil have made heavy inroads on coke markets, particularly for gas manufacture and residential heating. The decline in these markets resulted in a steady decrease in production as well as number of merchant plants. Since 1949, six merchant plants (gas utilities) have discontinued coke production. Five of the six plants have been dismantled, and one was acquired by a steel company which changed the classification of this plant. The number of merchant plants on December 31, 1953, was reduced to 24 as the coke plant at Providence, R. I., owned and operated by the Providence Gas Co. was retired permanently in December.

Production of coke declined at both furnace and merchant plants in the latter months of 1953. Production at furnace plants averaged 172,100 tons per day in the first half of the year, increased to 174,600 in the third quarter, and then tapered to 167,600 in the last quarter. In December, the average daily production was 7 percent below the January rate. For the merchant group, average daily production dropped even more in the latter part of the year and in December was 13 percent below January. The October daily average was the lowest for the merchant plants, excluding strike periods, since 1928.

TABLE 7.—Number and production of oven-coke plants in the United States, 1929, 1939, 1947–49 (average), and 1951–53, by type of plant

Year	Number of active plants [1]		Coke produced (net tons)		Percent of production	
	Furnace plants	Merchant plants	Furnace plants	Merchant plants	Furnace plants	Merchant plants
1929	46	41	41, 224, 387	12, 187, 439	77.2	22.8
1939	45	39	31, 811, 807	11, 070, 506	74.2	25.8
1947–49 (average)	[2] 55	[2] 31	51, 974, 089	13, 114, 373	79.9	20.1
1951	56	28	58, 796, 622	13, 190, 550	81.7	18.3
1952	57	27	52, 128, 906	11, 721, 209	81.6	18.4
1953	58	25	62, 628, 176	10, 965, 352	85.1	14.9

[1] Includes plants operating any part of year.
[2] On Dec. 31, 1949.

TABLE 8.—Monthly and average daily production of oven coke in the United States, 1947–49 (average) and 1952–53, by type of plant, in net tons

Month	1947–49 (average)		1952		1953	
	Furnace plants	Merchant plants	Furnace plants	Merchant plants	Furnace plants	Merchant plants
Monthly production:						
January	4, 700, 600	1, 174, 700	5, 103, 100	1, 083, 600	5, 334, 300	982, 300
February	4, 323, 300	1, 070, 100	4, 777, 100	1, 010, 800	4, 814, 500	889, 100
March	4, 618, 000	1, 157, 800	5, 148, 400	1, 072, 900	5, 343, 000	983, 900
April	4, 188, 600	1, 043, 000	4, 356, 800	1, 032, 900	5, 105, 500	954, 000
May	4, 578, 100	1, 129, 300	4, 523, 700	1, 032, 500	5, 331, 900	978, 400
June	4, 329, 000	1, 080, 700	1, 475, 700	892, 900	5, 212, 700	941, 800
July	4, 273, 800	1, 082, 100	1, 486, 600	824, 700	5, 419, 200	950, 200
August	4, 466, 700	1, 097, 700	4, 911, 700	896, 600	5, 420, 000	920, 700
September	4, 321, 900	1, 072, 800	4, 871, 100	933, 700	5, 230, 300	830, 800
October	3, 471, 600	1, 047, 400	5, 154, 000	983, 900	5, 367, 400	843, 100
November	3, 977, 500	1, 026, 000	5, 020, 800	965, 900	5, 081, 800	833, 500
December	4, 725, 000	1, 132, 800	5, 299, 900	990, 800	4, 967, 600	857, 600
Total	51, 974, 100	13, 114, 400	52, 128, 900	11, 721, 200	62, 628, 200	10, 965, 400
Average daily production:						
January	151, 600	37, 900	164, 600	35, 000	172, 100	31, 700
February	154, 400	38, 200	164, 700	34, 900	171, 900	31, 800
March	149, 000	37, 300	166, 100	34, 600	172, 400	31, 700
April	139, 600	34, 800	145, 200	34, 500	170, 200	31, 800
May	147, 700	36, 400	145, 900	33, 300	172, 000	31, 500
June	144, 300	36, 000	49, 200	29, 700	173, 800	31, 400
July	137, 900	34, 900	48, 000	26, 600	174, 800	30, 700
August	144, 100	35, 400	158, 500	28, 900	174, 800	29, 700
September	144, 100	35, 700	162, 400	31, 100	174, 300	27, 700
October	112, 000	33, 800	166, 300	31, 700	173, 100	27, 200
November	132, 600	34, 200	167, 400	32, 200	169, 400	27, 800
December	152, 400	36, 600	171, 000	31, 900	160, 200	27, 700
Average for year	142, 400	35, 900	142, 500	32, 000	171, 600	30, 000

PRODUCTION BY STATE AND DISTRICT

The pattern of coke production in 1953 has varied only slightly from the years following World War II. As comparison of 1953 production with 1952 would be meaningless, because of the steel strike that affected coke output in 1952, a better measure of trends in production is obtained by using 1947–49 as a base period. In States where beehive and slot-type ovens were active in 1953, production of coke increased in 14 and decreased in 9 compared with 1947–49. The States that showed the largest percentage gain were California, Texas, Maryland, Utah, and West Virginia; however, the largest increases in tonnages were in Pennsylvania, Ohio, Maryland, and West Virginia. Substantial losses occurred in New York, New Jersey, and Massachusetts. Losses in Massachusetts and New York were caused by the closing of a number of coke-oven batteries because of the substitution of natural gas for coke-oven gas in those States. The drop in production in New Jersey in 1953 was due to a 10-week work stoppage at the largest plant in that State.

Pennsylvania led all States in coke production by a wide margin, contributing 25 percent of the oven coke and 88 percent of the beehive. As in previous years, Ohio ranked second, followed by Indiana, Alabama, and New York. The only other State that produced over 4 million tons was West Virginia, which exceeded that mark for the first time in 1953. Other large-producing States were Illinois, Maryland, and Michigan, which combined produced about one eighth of the national output.

TABLE 9.—Coke produced in the United States, 1947–49 (average) and 1950–53, by States, in net tons

State	1947–49 (average)	1950	1951	1952	1953
Oven coke:					
Alabama	5,682,198	5,833,142	6,291,280	5,712,102	6,278,239
California	325,182	512,790	568,216	610,080	749,381
Colorado	851,906	804,979	995,332	816,140	967,074
Illinois	3,558,768	3,590,502	3,685,662	3,390,773	3,513,142
Indiana	8,301,067	8,255,622	8,843,452	7,611,090	8,886,502
Maryland	2,054,315	2,367,233	2,855,209	2,490,859	3,268,655
Massachusetts	1,048,037	855,217	1,108,826	1,055,529	849,535
Michigan	2,717,650	2,730,847	2,920,082	2,862,873	3,220,133
Minnesota	841,976	833,861	971,913	868,523	862,151
New Jersey	1,396,082	1,481,030	1,538,953	1,472,245	1,175,416
New York	5,507,449	5,412,318	5,610,975	4,342,583	4,589,609
Ohio	9,847,621	10,313,767	11,151,201	9,638,904	11,717,556
Pennsylvania	15,964,464	16,332,998	17,250,217	15,100,698	18,747,300
Tennessee	235,577	243,950	250,658	254,319	231,330
Texas	468,083	686,407	755,418	652,179	751,926
Utah	978,701	1,140,737	1,226,536	1,125,729	1,407,818
West Virginia	3,101,109	3,388,626	3,829,879	3,798,215	4,203,360
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	2,208,277	2,106,592	2,133,363	2,047,274	2,174,401
Total	65,088,462	66,890,618	71,987,172	63,850,115	73,593,528
Beehive coke:					
Colorado	7,163		716	600	
Kentucky	81,871	49,233	123,753	81,407	62,500
Pennsylvania	4,848,550	5,193,191	6,396,480	3,750,606	4,635,513
Tennessee			1,638		
Utah	129,680	84,808	101,672	85,111	83,863
Virginia	190,200	197,879	287,116	202,328	188,033
West Virginia	302,476	302,309	432,155	283,942	273,420
Total	5,559,940	5,827,420	7,343,530	4,403,994	5,243,329
Grand total	70,648,402	72,718,038	79,330,702	68,254,109	78,836,857

TABLE 10.—Oven coke produced in the United States in 1953, by steel-producing districts [1]

District	In existence Dec. 31		Coal carbonized (net tons)	Yield of coke from coal (percent)	Coke produced (net tons)	Value of coke at ovens	
	Plants	Ovens				Total	Per ton
Eastern	18	3,658	24,199,209	71.34	17,262,579	$264,066,425	$15.30
Pittsburgh-Youngstown	22	4,706	33,805,610	68.40	23,121,697	293,828,201	12.71
Cleveland-Detroit	10	1,888	12,022,631	72.31	8,693,542	128,972,672	14.84
Chicago	18	3,361	19,699,390	71.73	14,129,942	253,793,539	17.96
Southern	10	1,577	10,345,640	70.19	7,261,495	87,296,513	12.02
Western	4	799	4,850,447	64.41	3,124,273	52,346,806	16.75
Total	82	15,989	104,922,927	70.14	73,593,528	1,080,304,156	14.68

[1] As defined by American Iron and Steel Institute.

TABLE 11.—Coke produced in Pennsylvania in 1953, by districts

District	In existence Dec. 31		Coal carbonized (net tons)	Yield of coke from coal (percent)	Coke produced (net tons)	Value of coke at ovens	
	Plants	Ovens				Total	Per ton
Oven coke:							
Eastern [1]	6	1,050	6,173,172	72.04	4,447,164	$74,723,935	$16.80
Western [2]	8	3,027	21,111,304	67.74	14,300,136	182,351,185	12.75
Total	14	4,077	27,284,476	68.71	18,747,300	257,075,120	13.71
Beehive coke:							
Fayette County	47	8,180	5,032,212	64.97	3,269,302	46,402,116	14.19
Westmoreland County	31	2,880	1,485,781	63.12	937,865	14,206,270	15.15
Other counties [3]	7	1,228	694,956	61.64	428,346	6,318,997	14.75
Total	85	12,288	7,212,949	64.27	4,635,513	66,927,383	14.44
Grand total	99	16,365	34,497,425	67.78	23,382,813	324,002,503	13.86

[1] Includes plants at Bethlehem, Chester, Morrisville, Philadelphia, Steelton, and Swedeland.
[2] Includes plants at Aliquippa, Clairton, Erie, Johnstown, Midland, Monessen, Neville Island, and Pittsburgh.
[3] Beaver, Greene, and Indiana.

TABLE 12.—Analysis of oven coke in the United States, 1943–45 and 1951–53, in percent

	Volatile matter	Fixed carbon	Ash	Sulfur		Volatile matter	Fixed carbon	Ash	Sulfur
Blast furnace:					Foundry:				
1943 [1]	1.1	89.2	9.7	0.8	1943	0.9	91.0	8.1	0.6
1944 [1]	1.0	88.8	10.2	.8	1944	1.0	90.7	8.3	.6
1945 [1]	1.0	88.5	10.5	.8	1945	.9	90.5	8.6	.6
1951	.9	89.2	9.9	.9	1951	.9	90.4	8.7	.6
1952	.9	89.2	9.9	.9	1952	.9	90.4	8.7	.6
1953:					1953:				
January	.9	89.1	10.0	.9	January	.9	90.5	8.6	.6
February	.9	89.2	9.9	.9	February	.9	90.5	8.6	.6
March	.9	89.2	9.9	.9	March	.9	90.4	8.7	.6
April	.9	89.3	9.8	.9	April	.9	90.5	8.6	.7
May	.9	89.4	9.7	.9	May	.9	90.5	8.6	.6
June	.9	89.4	9.7	.9	June	.9	90.4	8.7	.6
July	.9	89.3	9.8	.9	July	.9	90.4	8.7	.6
August	1.0	89.4	9.6	.9	August	1.0	90.3	8.7	.6
September	.9	89.4	9.7	.9	September	.9	90.5	8.6	.6
October	.9	89.5	9.6	.9	October	.9	90.0	9.1	.7
November	.9	89.5	9.6	.9	November	.9	90.6	8.5	.6
December	.9	89.5	9.6	.9	December	.9	90.6	8.5	.6
The year	.9	89.4	9.7	.9	The year	.9	90.4	8.7	.6

[1] Includes all grades of coke other than foundry and presumed to be mostly blast furnace.

COKE BREEZE

TABLE 13.—Coke breeze recovered at coke plants in the United States in 1953, by States

State	Yield per ton of coal [1] (percent)	Produced		Used by producers— For steam raising		Used by producers— For other purposes [2]		Sold		Wasted (net tons)	On hand Dec. 31 (net tons)
		Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value		
Oven coke:											
Alabama	3.73	335,400	$2,346,227	112,331	$674,309	77,002	$500,076	181,272	$1,434,797	----------	9,860
California	5.05	62,346	(3)	----------	----------	47,208	(3)	9,016	(3)	----------	----------
Colorado	6.55	92,034	(3)	----------	----------	58,230	(3)	31,534	(3)	----------	4,398
Illinois	5.87	289,854	1,136,811	116,940	371,490	18,157	80,217	135,418	601,593	----------	37,082
Indiana	5.66	704,276	3,107,884	353,062	1,441,895	152,534	622,769	130,012	740,085	----------	176,139
Maryland	5.21	235,010	(3)	255,900	(3)	28,103	(3)	25	(3)	----------	83,925
Massachusetts	7.25	87,552	(3)	87,552	(3)	----------	----------	----------	----------	----------	----------
Michigan	4.29	185,063	805,959	96,737	350,222	53,157	203,400	31,641	228,235	----------	9,274
Minnesota	4.58	55,762	248,792	28,782	96,572	7,594	(3)	13,349	(3)	----------	20,445
New Jersey	6.30	104,385	(3)	90,399	(3)	----------	----------	23,274	(3)	----------	14,504
New York	5.20	344,222	1,962,745	210,882	1,193,404	50,935	321,166	43,798	202,304	----------	187,542
Ohio	5.51	920,578	3,659,573	312,964	1,170,543	229,812	725,835	348,755	1,647,149	----------	81,591
Pennsylvania	4.61	1,256,967	3,999,580	983,884	3,075,180	64,545	198,746	220,415	731,491	----------	143,692
Texas	4.69	48,923	(3)	----------	----------	31,328	(3)	17,281	(3)	----------	668
Utah	6.60	145,688	(3)	2,425	(3)	78,496	(3)	67,735	(3)	----------	4,434
West Virginia	3.80	221,080	601,404	150,170	400,106	35,582	90,327	51,081	146,108	----------	60,463
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	5.50	164,347	783,198	109,890	401,973	----------	----------	42,370	343,152	----------	23,634
Undistributed	----------	----------	3,932,360	----------	2,110,507	----------	1,203,136	----------	1,018,287	----------	----------
Total 1953	5.02	5,253,487	22,584,533	2,911,918	11,286,201	932,683	3,945,672	1,346,976	7,093,201	----------	857,651
At merchant plants	5.08	774,006	4,291,916	528,500	2,517,550	27,687	218,097	190,879	1,407,664	----------	141,606
At furnace plants	5.01	4,479,481	18,292,617	2,383,418	8,768,651	904,996	3,727,575	1,156,097	5,685,537	----------	716,045
Total 1952	5.10	4,639,369	18,500,418	2,894,374	10,507,030	832,155	3,141,090	1,131,858	5,572,413	4,592	754,167
Beehive coke:											
Pennsylvania	2.38	53,651	103,614	----------	----------	----------	----------	41,248	85,007	12,068	335
Utah	9.83	14,319	(3)	----------	----------	----------	----------	27,565	(3)	----------	----------
Virginia	2.54	6,759	57,906	----------	----------	13	198	6,746	57,708	----------	15
West Virginia	3.62	8,727	(3)	----------	----------	----------	----------	6,468	(3)	2,259	----------
Undistributed	----------	----------	92,637	----------	----------	----------	----------	----------	159,825	----------	----------
Total 1953	2.87	83,456	254,157	----------	----------	13	198	82,027	302,540	[4] 14,327	350
Total 1952	2.74	64,261	135,874	5,094	(5)	13	(5)	62,293	165,104	[4] 11,125	2,526

[1] Computed by dividing production of breeze by coal carbonized at plants actually recovering breeze.
[2] Includes water gas.
[3] Included with "Undistributed" to avoid disclosure of individual company figures.
[4] As reported; quantity produced but not used undoubtedly greater. See Mineral Resources of the United States, 1922, pt. II, pp. 726–727.
[5] Included with value of sales to avoid disclosure of individual company figures.

NUMBER AND TYPE OF OVENS

Slot-Type Coke Ovens.—In 1953 the oven-coke industry experienced one of the best years on record in new oven construction, as 1,027 new ovens were completed and placed in operation. Ovens permanently retired or dismantled for rebuilding totaled 646, resulting in a net gain of 381 ovens for the year. At the end of 1953, 15,989 slot-type ovens were in existence, excluding ovens under construction, of which 31 percent were Koppers, 44 percent Koppers-Becker, 14 percent Wilputte, 10 percent Semet-Solvay, and 1 percent other types.

New ovens were built at a rapid pace during the past several years, but the net gain has not been large. Since December 31, 1949, 3,244 new coke ovens have been completed and placed in operation, yet the net gain at the end of 1953 was only 885. This indicated that in the 4-year period, 1950–53, for every 4 ovens built 3 ovens were replacements, and only 1 was additional capacity. It appeared that this high replacement rate would be necessary for a number of years, as 41 percent of the ovens in existence at the end of 1953 were over 25 years old. It is not intended to infer that 25 years is the maximum life expectancy of a coke oven, but past experience has shown that, generally, ovens over 25 years old become increasingly difficult to maintain. The estimated life of a coke oven depends largely on the operating conditions at each plant and upon the decision of the owners as to when maintenance and repair expenditures become excessive.

TABLE 14.—Slot-type coke ovens completed and abandoned in the United States in 1953 and number in existence at end of year, by States

State	Plants in existence Dec. 31	Ovens						
		In existence Dec. 31		New		Abandoned during year [1]	Under construction Dec. 31	
		Number	Annual coke capacity (net tons)	Number	Annual coke capacity (net tons)		Number	Annual coke capacity (net tons)
Alabama	7	1,408	6,669,800	25	64,000		83	473,500
California	1	225	1,006,000	90	466,500			
Colorado	1	266	1,000,000					
Connecticut	1	70	410,000					
Illinois	8	934	4,025,600	27	150,000	3		
Indiana	5	1,890	9,363,600			70	154	764,500
Kentucky	1	196	1,038,100	76	515,000			
Maryland	1	622	3,354,000	126	562,000		65	412,000
Massachusetts	1	108	657,000			96		
Michigan	4	621	3,241,800				70	480,000
Minnesota	3	241	968,000	29	125,500			
Missouri	1	96	365,000					
New Jersey	2	341	1,500,000					
New York	5	973	5,459,400					
Ohio	16	2,513	12,365,900	178	939,200	76	159	895,200
Pennsylvania	14	4,077	20,011,400	429	2,291,200	252	192	884,000
Rhode Island						65		
Tennessee	1	44	250,000					
Texas	2	125	688,500				15	48,000
Utah	2	308	1,212,300					
West Virginia	5	731	4,151,600	47	228,100	84	41	256,000
Wisconsin	1	200	520,000					
Total 1953	82	15,989	78,258,000	1,027	5,341,500	646	779	4,213,200
At merchant plants	24	2,693	12,090,900	101	579,000	189	44	195,100
At furnace plants	58	13,296	66,167,100	926	4,762,500	457	735	4,018,100
Total 1952	82	15,608	76,428,000	947	5,317,400	658	1,075	5,983,600

[1] Includes ovens dismantled for rebuilding.

TABLE 15.—Age of slot-type coke ovens in the United States on Dec. 31, 1953 [1]

Age	Merchant plants: Number of ovens	Merchant plants: Annual coke capacity (net tons)	Furnace plants: Number of ovens	Furnace plants: Annual coke capacity (net tons)	Total: Number of ovens	Total: Percent of total	Total: Annual coke capacity (net tons)	Total: Percent of total
Under 5 years	257	1,365,300	2,965	16,158,600	3,222	20.2	17,523,900	22.4
From 5 to 10 years	221	954,600	1,665	9,062,000	1,886	11.8	10,016,600	12.8
From 10 to 15 years	416	2,175,900	2,315	12,413,300	2,731	17.1	14,589,200	18.6
From 15 to 20 years	157	591,800	1,098	6,232,700	1,255	7.8	6,824,500	8.7
From 20 to 25 years	83	469,200	194	1,103,000	277	1.7	1,572,200	2.0
25 years and over	1,559	6,534,100	5,059	21,197,500	6,618	41.4	27,731,600	35.5
Total	2,693	12,090,900	13,296	66,167,100	15,989	100.0	78,258,000	100.0

[1] Age dates from first entry into operation or from last date of rebuilding.

There were 779 ovens under construction at the close of the year. Of this total, 411 were being built on old foundations and, although considered new, were actually replacements of old ovens; only 368 represented additional ovens.

Beehive Ovens.—In all, 15,092 beehive ovens were reported in existence at 101 plants on December 31, 1953, a decrease of 2,459 ovens and 38 plants from 1952. This change was not significant, however, as operators may report certain ovens in existence one year and not the next, according to industrial activity and general business conditions. Unlike slot-type ovens, which cannot be operated intermittently without damage to brickwork, beehive ovens can easily be started or taken out of production with a minimum of damage to brickwork. Therefore, the number of beehives in existence fluctuated widely in recent years according to activity in the iron and steel industry. The greatest number of ovens in operation in 1953 was in May, when 10,901 were active. This was 3,326 ovens less than the 14,227 active in December 1950, the peak since September 1943. The decline in demand for beehive coke in the latter months of 1953 caused a drop in production, and the number of active ovens declined steadily. Tables 16 and 17 show the capacity and number of ovens active in 1953.

TABLE 16.—Beehive coke ovens reconstructed and abandoned in the United States in 1953 and number in existence at end of year, by States

State	Plants in existence Dec. 31	Ovens: In existence Dec. 31: Number	Ovens: In existence Dec. 31: Annual coke capacity (net tons)	Ovens: In operating condition Dec. 31: Number	Ovens: In operating condition Dec. 31: Annual coke capacity (net tons)	Ovens: Not in operating condition Dec. 31: Number	Ovens: Not in operating condition Dec. 31: Annual coke capacity (net tons)	Ovens: Rebuilt or repaired	Ovens: Abandoned or dismantled during year	Ovens: In course of reconstruction Dec. 31
Colorado									20	
Kentucky	1	195	120,000	195	120,000					
Pennsylvania	85	12,288	8,720,300	11,238	7,950,700	1,050	769,600	105	2,406	22
Tennessee									90	
Utah	2	797	285,000	297	100,000	500	185,000			
Virginia	5	848	424,200	705	353,600	143	70,600			
West Virginia	8	964	523,200	662	362,500	302	160,700		48	
Total 1953	101	15,092	10,072,700	13,097	8,886,800	1,995	1,185,900	105	[1] 2,564	22
Total 1952	139	17,551	12,004,800	14,797	10,304,400	2,754	1,700,400	480	[1] 3,235	56

[1] Idle and not expected to resume production; removed from list of available ovens.

TABLE 17.—Average number of beehive-coke ovens active in the United States in 1953, by months

Month	Number	Month	Number	Month	Number
January	9,769	May	10,901	September	7,961
February	10,429	June	10,767	October	7,627
March	10,693	July	9,382	November	7,215
April	10,661	August	8,777	December	6,708

CAPACITY OF OVEN-COKE PLANTS

The potential maximum annual coke capacity of the oven-coke industry totaled 78.3 million net tons on December 31, 1953, a new record. This was 1.8 million tons (2 percent) above the 1952 capacity and was due mainly to the completion of additional capacity at a number of iron and steel works. The capacity of coke ovens is geared closely to pig-iron capacity, as about 0.907 ton of coke is required for each ton of pig iron produced. In recent years, the iron and steel industry has been integrating its steel-, iron-, and coke-making facilities more closely to make each blast-furnace operation more self-sufficient. This became necessary because many of the merchant plants, formerly relied upon as a source of coke, have discontinued operations. In addition, the depletion of local reserves and the lower quality of the coal available for coking in beehive ovens have forced many beehive plants to curtail production or cease operation. Therefore, to make up the deficit in coke capacity at merchant oven- and beehive-coke plants, the furnace plants were forced to increase their coking capacity. Since 1949, the furnace plants increased their capacity 6.7 million tons (11 percent), whereas the capacity of merchant plants decreased 2.1 million tons (15 percent).

The rate of coke production shown in table 19 is calculated monthly from production reports submitted by the coke-producing companies to the Bureau of Mines. Allowances are made each month for new capacity added or taken out of production. In this way the percentage of capacity utilized each month is fairly accurate, and the cumulative average is more indicative of the rate of coke production than would be the case if based on capacities at the beginning and at the end of the year.

In 1953 the rate of production was relatively high, except for a tapering off in November and December.

TABLE 18.—Potential maximum annual coke capacity of all oven-coke plants in existence in the United States, 1949–53

Year	Merchant plants				Furnace plants				Total			
	In existence Dec. 31		Potential maximum annual coke capacity (net tons)	Change from 1949 (percent)	In existence Dec. 31		Potential maximum annual coke capacity (net tons)	Change from 1949 (percent)	In existence Dec. 31		Potential maximum annual coke capacity (net tons)	Change from 1949 (percent)
	Plants	Ovens			Plants	Ovens			Plants	Ovens		
1949	30	3,057	14,209,200	-----	55	12,047	59,500,900	-----	85	15,104	73,710,100	-----
1950	29	3,036	13,959,300	−1.8	55	11,946	58,528,900	−1.6	84	14,982	72,488,200	−1.7
1951	27	2,958	13,535,500	−4.7	56	12,361	60,692,900	+2.0	83	15,319	74,228,400	+0.7
1952	25	2,781	12,779,700	−10.1	57	12,827	63,648,300	+7.0	82	15,608	76,428,000	+3.7
1953	24	2,693	12,090,900	−14.9	58	13,296	66,167,100	+11.2	82	15,989	78,258,000	+6.2

TABLE 19.—Relationship of production to potential maximum capacity [1] at oven-coke plants in the United States, 1949–53, by months, in percent

Month	1949	1950	1951	1952	1953	Month	1949	1950	1951	1952	1952
January	95.2	85.6	97.8	97.7	96.8	August	80.3	91.8	96.5	90.2	93.5
February	95.0	70.0	95.5	97.7	96.4	September	79.8	94.0	96.2	92.9	92.5
March	93.3	79.3	96.2	97.7	95.8	October	26.9	96.2	95.4	94.3	91.8
April	93.3	92.9	96.7	86.5	93.9	November	55.8	93.8	95.3	95.0	89.6
May	90.8	92.7	97.6	86.1	93.8	December	86.2	95.8	95.8	95.7	85.0
June	84.9	92.4	97.9	38.1	94.3						
July	77.0	93.7	97.3	36.1	93.9	Year	79.7	90.0	96.5	84.0	93.1

[1] Capacity of all ovens in existence, whether active or idle, based upon maximum daily capacity times days in month.

QUANTITY AND COST OF COAL CARBONIZED

Coke ovens (slot-type and beehive) carbonized 112.9 million tons of bituminous coal in 1953, which was approximately one fourth of the bituminous coal produced. The quantity of coal charged into coke ovens slightly exceeded the tonnage consumed by electric-power utilities, and coke ovens remained the largest consumer of bituminous coal. Slot-type coke ovens operated at a more uniform rate in 1953 than beehive ovens and carbonized 93 percent of the total quantity of bituminous coal charged. The reduction in blast-furnace operating rates in the latter part of 1953 caused a slight drop in consumption of coal in slot-type ovens in the last quarter; beehive ovens were affected to a greater extent by the reduction in blast-furnace coke demand, and consumption of coal in the last quarter was only 63 percent of the quantity used in the first quarter. In addition to the 112.9 million tons of bituminous coal carbonized, 274,600 tons of anthracite fines were used by 18 plants for blending purposes. The practice of using a small percentage of anthracite in the coal admixture was started during World War II as a substitute for low-volatile coal for the manufacture of foundry coke. The quantity used in 1953 was 33 percent higher than in 1952.

There have been only minor changes since before World War I in the geographic location of coking-coal consuming centers. At the turn of the century, beehive ovens were used almost exclusively for carbonization, and the States producing coking coal were the largest users. In 1900 about 97 percent of all coal carbonized was charged into ovens within the coal-producing field. The development of slot-type ovens, together with the tremendous growth of heavy industry, the principal consumer of coke at the beginning of World War I, caused a shift in coking-coal consuming centers away from the coal-producing fields. At the beginning of World War I, the coking-coal-producing States used 79 percent of the coal within their borders. There was little change between the two world wars; but there was some decentralization of coke capacity during the last world war, and several additional coke-producing States were added as new ovens were constructed. In 1953, of the 104.6 million tons of bituminous coal charged into slot-type coke ovens, States that do not produce any coking coal used 50 percent of the total. The largest consumer, however, was Pennsylvania, which was also one of the leading producing States. This State carbonized 26 percent of all coal charged into slot-type ovens and 88 percent of the bituminous coal carbonized in beehive ovens. Ohio was second in the use of coking coal and carbonized 16 percent of all coal carbonized in slot-type ovens. Indiana, Alabama, and New York followed Ohio and together used about the same quantity as Pennsylvania. Other large users were West Virginia, Illinois, Maryland, and Michigan.

The delivered cost of coal to oven-coke plants is important because this represents about 80 percent of the total manufacturing costs. Many of the oven-coke plants are great distances from the coalfields, and transportation charges are high. It is estimated that the average length of haul on all coal in the oven-coke industry is between 360 and 375 miles. In 1953, the average value per net ton of coal delivered at oven-coke plants was $9.24, a slight gain over 1952 and 19 percent above the average for the base period 1947–49. The average cost declined in 5 States in 1953 and increased in 17. States in which the average value dropped were Indiana, Alabama, Colorado, Texas, and Rhode Island. Of the States where the average value increased, the largest gains were in California and Tennessee, with a rise of 11 percent each over 1952, Missouri with 5 percent, and Connecticut, Kentucky, Maryland, New York, and Ohio with 3 percent each.

The average value of coal at beehive plants increased $0.10 per ton over 1952 and reached $6.36 per ton, a new peak. In the past decade the average value of coal for beehive coking has more than doubled and in 1953 was more than three times higher than the pre-World War II value. Other than increased mining costs, another factor that raised the average value of coal at beehive plants was that a large part of the coal used since the beginning of World War II in western Pennsylvania was trucked, which increased the cost for beehive-plant operators. Most of the coal beds adjacent to the ovens in this area have been exhausted, and coal was brought from distances as far as 50 miles. As the preponderance of beehive coke is made in western Pennsylvania, the average value of coal in this area influenced the average for the entire beehive industry. West Virginia, where the ovens are near the sources of the coking coal, had the lowest coal costs, and the average value was $5.27, or $1.19 per ton less than in Pennsylvania.

TABLE 20.—Bituminous coal carbonized in coke ovens in the United States, 1947–49 (average) and 1952–53, by months, in net tons

Month	1947–49 (average)			1952			1953		
	Slot type	Beehive	Total	Slot type	Beehive	Total	Slot type	Beehive	Total
Jan	8,320,100	987,400	9,307,500	8,796,100	979,500	9,775,600	8,960,200	759,700	9,719,900
Feb	7,647,600	906,500	8,554,100	8,207,200	904,400	9,111,600	8,101,800	733,300	8,835,100
Mar	8,195,000	726,000	8,921,000	8,845,300	878,800	9,724,100	8,993,600	867,100	9,860,700
Apr	7,448,200	700,900	8,149,100	7,660,900	647,600	8,308,500	8,620,000	820,000	9,440,000
May	8,096,100	905,800	9,001,900	7,895,200	627,300	8,522,500	9,030,700	866,000	9,896,700
June	7,697,200	673,900	8,371,100	3,343,400	182,400	3,525,800	8,762,900	790,700	9,553,600
July	7,631,400	482,200	8,113,600	3,301,700	99,100	3,400,800	9,074,000	649,400	9,723,400
Aug	7,901,400	665,500	8,566,900	8,295,300	343,600	8,638,900	8,985,200	661,000	9,646,200
Sept	7,617,700	645,000	8,262,700	8,265,400	561,500	8,826,900	8,591,200	587,300	9,178,500
Oct	6,397,800	669,100	7,066,900	8,676,900	471,500	9,148,400	8,802,200	567,300	9,369,500
Nov	7,118,300	641,900	7,760,200	8,481,100	539,600	9,020,700	8,387,000	478,400	8,865,400
Dec	8,326,100	712,700	9,038,800	8,934,100	676,300	9,610,400	8,339,500	445,900	8,785,400
Total	92,396,900	8,716,900	101,113,800	90,702,600	6,911,600	97,614,200	104,648,300	8,226,100	112,874,400

TABLE 21.—Anthracite carbonized at oven-coke plants in the United States, 1947–49 (average) and 1950–53, by months, in net tons

Month	1947–49 (average)	1950	1951	1952	1953
January	17,600	8,900	13,500	18,400	18,900
February	16,600	7,500	12,000	16,800	17,500
March	19,300	14,200	18,800	16,600	21,500
April	21,500	12,400	22,600	16,600	22,800
May	18,800	17,400	23,900	18,100	26,300
June	19,800	14,700	21,000	16,400	24,300
July	18,200	16,900	20,500	14,400	24,500
August	18,900	19,700	19,100	14,900	24,500
September	20,100	14,500	20,000	15,200	20,800
October	22,000	16,000	23,300	18,000	22,900
November	20,900	14,200	22,800	23,400	23,700
December	16,700	12,900	19,600	18,100	26,900
Total	230,400	169,300	237,100	206,900	274,600

TABLE 22.—Quantity and value at ovens of coal carbonized in the United States in 1953, by States

State	Coal carbonized (net tons)	Value of coal		Coal per ton of coke	
		Total	Per ton	Net tons	Value
Oven coke:					
Alabama	9,001,423	$62,376,771	$6.93	1.43	$9.94
California	1,235,393	(1)	(1)	1.65	(1)
Colorado	1,406,095	(1)	(1)	1.45	(1)
Illinois	4,938,018	52,418,053	10.62	1.41	14.92
Indiana	12,443,623	131,129,397	10.54	1.40	14.76
Maryland	4,513,777	(1)	(1)	1.38	(1)
Massachusetts	1,206,980	(1)	(1)	1.42	(1)
Michigan	4,315,969	41,900,726	9.71	1.34	13.01
Minnesota	1,216,232	13,084,751	10.76	1.41	15.18
New Jersey	1,656,559	(1)	(1)	1.41	(1)
New York	6,624,717	70,443,278	10.63	1.44	15.35
Ohio	16,716,709	154,005,882	9.21	1.43	13.14
Pennsylvania	27,284,476	221,158,248	8.11	1.46	11.80
Tennessee	300,807	(1)	(1)	1.30	(1)
Texas	1,043,410	(1)	(1)	1.39	(1)
Utah	2,208,959	(1)	(1)	1.57	(1)
West Virginia	5,819,008	42,389,838	7.28	1.38	10.08
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	2,990,772	30,489,606	10.19	1.38	14.02
Undistributed		149,911,818	11.05		15.95
Total 1953	104,922,927	969,308,368	9.24	1.43	13.17
At merchant plants	15,238,074	152,575,403	10.01	1.39	13.91
At furnace plants	89,684,853	816,732,965	9.11	1.43	13.04
Total 1952	90,909,495	839,300,722	9.23	1.42	13.14
Beehive coke:					
Kentucky	112,496	(1)	(1)	1.80	(1)
Pennsylvania	7,212,949	46,582,845	6.46	1.56	10.05
Utah	145,607	(1)	(1)	1.74	(1)
Virginia	314,079	1,897,258	6.04	1.67	10.09
West Virginia	440,966	2,325,119	5.27	1.61	8.50
Undistributed		1,478,112	5.73		10.10
Total 1953	8,226,097	52,283,334	6.36	1.57	9.97
Total 1952	6,911,647	43,258,781	6.26	1.57	9.82

[1] Included with "Undistributed" to avoid disclosure of individual company figures.

TABLE 23.—Average value per net ton of coal carbonized at oven-coke plants in the United States, 1947–49 (average) and 1950–53, by States

State	1947–49 (average)	1950	1951	1952	1953
Alabama	$6.27	$6.96	$7.39	$7.06	$6.93
Illinois	9.00	9.98	10.25	10.59	10.62
Indiana	8.99	9.87	10.13	11.33	10.54
Michigan	7.98	9.01	9.18	9.52	9.71
Minnesota	9.40	10.21	10.44	10.61	10.76
New York	9.00	9.85	10.15	10.33	10.63
Ohio	7.75	8.51	8.70	8.96	9.21
Pennsylvania	6.88	7.82	8.02	8.06	8.11
West Virginia	5.79	6.72	6.54	7.13	7.28
Other States [1]	8.58	9.57	10.10	10.58	10.89
United States average	7.79	8.67	8.94	9.23	9.24
Value of coal per ton of coke	11.09	12.30	12.70	13.14	13.17

[1] California, Colorado, Connecticut, Kentucky, Maryland, Massachusetts, Missouri, New Jersey, Rhode Island, Tennessee, Texas, Utah, and Wisconsin.

TABLE 24.—Value of coal and products per net ton of coal carbonized in the United States, 1947–49 (average) and 1950–53

Year	Oven coke					Beehive coke	
	Value of coal per ton	Value per ton of coal				Value of coal per ton	Value per ton of coal
		Coke produced	Breeze produced	Coal-chemical materials used or sold [1]	Total		
1947–49 (average)	$7.79	$8.49	$0.19	$2.75	$11.43	$4.90	$7.22
1950	8.67	9.48	.19	2.98	12.65	5.70	8.50
1951	8.94	9.94	.19	3.28	13.41	6.15	8.97
1952	9.23	10.18	.20	3.31	13.69	6.26	8.87
1953	9.24	10.30	.21	3.43	13.94	6.36	9.27

[1] Includes value of surplus gas and tar burned.

PREPARATION AND SOURCE OF COAL

Washed and Unwashed Coal.—Coke ovens used the highest proportion of washed coal (including coal pneumatically cleaned) on record in 1953. The 63.2 million tons of washed coal charged into slot-type ovens and the 3.2 million tons in beehive ovens represented 60 and 39 percent, respectively, of the total quantity of coal charged into the 2 types of ovens, compared with 54 and 34 percent in 1952 and 28 and 14 percent in 1945. The proportions of washed coal carbonized in slot-type and beehive ovens have increased markedly since World War II. The diminishing reserves of the better quality coking coals and the rapid increase in coal-mine mechanization, with its attendant increase in impurities, has necessitated washing or cleaning a larger part of the available coals. Accordingly, large and modern plants have been constructed to clean metallurgical coal, particularly in West Virginia, Pennsylvania, and Kentucky. The installation of these plants has resulted in shipment of more washed coal to coke plants in Illinois, Indiana, Pennsylvania, and other States. Indiana, which did not use any washed coal as late as 1944, carbonized almost 10 million tons or 78 percent of the total used in the State in 1953. The use of washed coal in Pennsylvania has almost doubled since 1944. In 1953 the quantity of washed coal charged into slot-type ovens in Pennsylvania was equivalent to 62 percent of the total used in that State and 27 percent of the washed coal carbonized by all oven-coke plants. Beehive ovens, which used little washed coal in early years, had to use more than ever before to produce satisfactory coke. All coking coal mined and used for coke in Colorado and Alabama was washed. Most of the washing was done in cleaning or washing plants at or near the coal mines. However, five oven-coke plants cleaned coal in washeries adjacent to their plants.

TABLE 25.—Washed and unwashed coal used in manufacturing coke in the United States in 1953, by States in which used, in net tons

State	Slot-type ovens				Beehive ovens		
	Bituminous		Anthracite	Total	Bituminous		
	Washed	Unwashed			Washed	Unwashed	Total
Alabama	8,714,062	286,828	533	9.001,423			
California	1,061,941	173,452		1,235,393			
Colorado	1,406,095			1,406,095			
Illinois	2,742,807	2,176.815	18,396	4,938,018			
Indiana	9,719,553	2,711,476	12,594	12,443,623			
Maryland		4,513,777		4,513,777			
Massachusetts		1,192.042	14,938	1,206,980			
Michigan	2,478,404	1,813,829	23,736	4,315,969			
Minnesota	410,591	786,302	19,339	1,216,232			
New Jersey	757,857	860,050	38,652	1,656,559			
New York	3,523,333	3.099,435	1,949	6,624,717			
Ohio	11,058,567	5,647,598	10,544	16,716,709			
Pennsylvania	16,905,878	10,305,565	73,033	27,284,476	2.738,789	4,474,160	7,212,949
Tennessee		300,807		300,807			
Texas	744,002	299,408		1,043,410			
Utah		2,208,959		2,208,959	145,607		145,607
Virginia					155,412	158,667	314,079
West Virginia	1,649,485	4,168,433	1,090	5,819.008	91,704	349,262	440,966
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	2,034.323	896,656	59,793	2,990,772	112,496		112,496
Total 1953	63.206,898	41,441,432	274,597	104,922,927	3,244,008	4,982,089	8,226,097
At merchant plants	6,916,920	8.095,587	225,567	15,238,074			
At furnace plants	56,289,978	33,345.845	49,030	89,684,853			
Total 1952	49,406,131	41,296,504	206,860	90,909,495	2,377,425	4,534,222	6,911,647

Sources.—The principal source of coking coal in the United States is the Appalachian region.[2] The coking-coal deposits of this region have been responsible, in large measure, for the tremendous growth of the iron and steel industry in the United States. These deposits are very important to the security and welfare of our country because coal for manufacturing coke is fundamentally necessary for the production of pig iron, which is essential for making steel. The heavy demand for steel resulting from 2 world wars in 30 years, with the concomitant demand for coke, has seriously depleted some of the finest seams of coal in this region. To obtain an accurate appraisal of the remaining coking-coal reserves in the United States, the Bureau of Mines initiated a detailed survey in 1949.[3] The first area of inves-

[2] Averitt, Paul, Berryhill, Louise R., and Taylor, Dorothy A., Coal Resources of the United States: Geol. Survey Circ. 293, 1953, 49 pp.
[3] Brown, Ralph L., Bureau of Mines Program of Appraising Minable Reserves of Coking Coal: Am. Gas Assn., Operating Section, Pamph. PC 50-4, May 1950 pp. 483-486.

tigation centered on coals of the Appalachian region; and, as work in each county in the respective States was completed, reports were issued. Progress and results of investigative work done in 1953 were published in a number of reports.[4]

Table 26 shows the origin and volatile content of coal received by oven-coke plants in 1953. The bituminous-coal fields of West Virginia supplied the largest tonnage of coal to oven-coke plants, with 35 percent of the total shipments. This State was the principal source of low-volatile coal and furnished 67 percent of the total quantity of such coal delivered to oven-coke plants. Pennsylvania ranked second in total shipments to oven-coke plants and furnished the largest tonnage of high-volatile coal followed by Kentucky and Alabama; the latter State led in shipments of medium-volatile coal to oven-coke plants. Other States that supplied significant tonnages of coking coal were Virginia, Utah, Oklahoma, and Colorado.

Origin and destination of coking-coal shipments to oven-coke plants in 1953 are summarized in table 27. West Virginia, which led all States in total shipments, also had the widest distribution, and shipped coal to 17 other States. Of the total quantity of coal originating in West Virginia, all but 6 percent was shipped outside the State. Pennsylvania, the leading coking-coal consumer in 1953, followed West Virginia in total coking-coal shipments. Kentucky, which used only a small fraction of the total within the State, ranked third, and 13 million tons was shipped to other States. Alabama, which was fourth-ranking State in coking-coal shipments, used 99 percent within the State.

All of the Virginia coal for use in manufacturing oven coke was shipped outside the State; 41 percent went to Indiana. The coal originating in Utah was either used within the State (60 percent) or shipped to California, and 92 percent of the Colorado coking coal was consumed within the State.

Many of the larger coke-producing companies, particularly those connected with iron and steel works, own or control coal mines. These mines are generally referred to as "captive." Data on the proportion of coal received from captive mines have been summarized and published for the first time in table 28. In recent years coke producers have tended to increase the proportion of captive coal to maintain better control of coal quality and be assured of an adequate supply during periods of heavy demand. During 1932–36, an average of only 34 percent of the coal received by oven-coke plant operators was captive. In this period furnace plants obtained 44 percent from captive mines, while merchant plants received 17 percent. In 1953, 62 percent of all coal received at oven-coke plants was captive. Furnace plants obtained 66 percent of their total requirements from captive mines in 1953; while the merchant plants received 39 percent.

[4] Brown, Ralph L. and Carman, E. P., Report of Research and Technologic Work on Coal and Related Investigations, July 1, 1952—December 31, 1953: Bureau of Mines Inf. Circ. 7699, 1954, 102 pp.

TABLE 26.—Origin of coal received for manufacturing oven coke in the United States in 1953, by volatile content, in net tons

State and field [1] where coal was produced	Volatile content [2]			Total
	High	Medium	Low	
Alabama	476,398	7,813,123		8,289,521
Arkansas			591,236	591,236
Colorado	1,197,078	36,638		1,233,716
Georgia			476	476
Illinois	405,344			405,344
Indiana	2,836			2,836
Kentucky:				
Elkhorn	7,132,048			7,132,048
Harlan	5,488,995			5,488,995
Kenova-Thacker	427,105			427,105
Maryland			321	321
New Mexico	359,018			359,018
Ohio	15,037			15,037
Oklahoma	543,035	494,172	278,387	1,315,594
Pennsylvania:				
Anthracite			234,999	234,999
Bituminous:				
Central Pennsylvania	1,258,390	237,646	5,434,675	6,930,711
Connellsville	12,459,524			12,459,524
Freeport	3,833,962			3,833,962
Pittsburgh	12,935,596			12,935,596
Somerset			442,935	442,935
Westmoreland	411,850			411,850
Tennessee		181,163		181,163
Utah	2,803,730			2,803,730
Virginia:				
Buchanan	293,546	28,111		321,657
Clinch Valley	251,232	176,777		428,009
Pocahontas			1,098,252	1,098,252
Southwestern	1,349,791	76,074		1,425,865
Washington		1,720		1,720
West Virginia:				
Coal River	316,520			316,520
Fairmont	5,610,193			5,610,193
Kanawha	7,352,505	666,151		8,018,656
Kenova-Thacker	92,364			92,364
Logan	3,718,223	748,878		4,467,101
New River	46,338	121	277,560	324,019
Pocahontas			13,168,457	13,168,457
Randolph-Barbour	707,951	180,135		888,086
Tug River			602,062	602,062
Webster-Gauley	619,960	865,559		1,485,519
Winding Gulf		52,005	2,279,511	2,331,516
Canada		520		520
Total	70,108,569	11,558,793	24,408,871	106,076,233

[1] As defined by the United States Coal Commission of 1922.
[2] High-volatile—dry volatile matter over 31 percent; medium-volatile—dry volatile matter 31 percent or less and over 22 percent; low-volatile—dry volatile matter 22 percent or less and over 14 percent.

TABLE 27.—Coal received for manufacturing oven coke in the United States in 1953, by producing and consuming States, in net tons

Coal consumed in—	Coal produced in—																		
	Alabama	Arkansas	Colorado	Georgia	Illinois	Indiana	Kentucky	Maryland	New Mexico	Ohio	Oklahoma	Pennsylvania	Tennessee	Utah	Virginia	Washington	West Virginia	Canada	Total
Alabama:																			
Merchant plants	989,220											1,861					174,115		1,165,196
Furnace plants	7,213,926																13,841		7,227,767
Total Alabama	8,203,146											1,861					187,956		8,392,963
California: Furnace plant		45,541							104,353		152,048			1,129,466					1,431,408
Colorado: Furnace plant		221,436	1,137,643						254,665										1,613,744
Illinois:																			
Merchant plants							61,973					20,118					702,156		784,247
Furnace plants					405,344		2,050,270								156,100		1,651,339		4,263,053
Total Illinois					405,344		2,112,243					20,118			156,100		2,353,495		5,047,300
Indiana:																			
Merchant plants						2,836						20,676			52,462		1,043,773		1,119,747
Furnace plants							5,191,126								1,285,352		4,618,086		11,094,564
Total Indiana						2,836	5,191,126					20,676			1,337,814		5,661,859		12,214,311
Maryland: Furnace plant												644,610			59,287		4,229,978		4,933,875
Massachusetts: Merchant plant							777								2,405		1,188,860		1,192,042
Michigan:																			
Merchant plants												221,022			85,528		648,931		955,481
Furnace plants							1,803,123					8,111			152,451		1,483,940		3,447,625
Total Michigan							1,803,123					229,133			237,979		2,132,871		4,403,106
Minnesota:																			
Merchant plant												21,536					240,457		261,993
Furnace plants							407,696										484,319		892,015
Total Minnesota							407,696					21,536					724,776		1,154,008
New Jersey: Merchant plants							46,526					38,713			113,502		1,373,423		1,572,164

New York:																			
Merchant plants							370,088					310,118			167,756		1,096,475		1,944,437
Furnace plants							603,880					2,913,911			328,173		906,459		4,752,423
Total New York							973,968					3,224,029			495,929		2,002,934		6,696,860
Ohio:																			
Merchant plants							95,917								216,568		1,107,771		1,420,256
Furnace plants							2,038,812			15,037		6,565,179			355,890		6,459,411		15,434,329
Total Ohio							2,134,729			15,037		6,565,179			572,458		7,567,182		16,854,585
Pennsylvania:																			
Merchant plants												10,433					823,517		833,950
Furnace plants							254,916	321				23,124,445			993		4,015,313		27,395,988
Total Pennsylvania							254,916	321				23,134,878			993		4,838,830		28,229,938
Tennessee: Furnace plant				476									181,163		93,572		29,429		304,640
Texas: Furnace plants	86,375										963,245								1,049,620
Utah: Furnace plants		324,259	96,073								200,301			1,674,264		1,720		520	2,297,137
West Virginia:																			
Merchant plants												78,777					1,014,796		1,093,573
Furnace plants												3,210,956					1,361,190		4,572,146
Total West Virginia												3,289,733					2,375,986		5,665,719
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin: Merchant plants							123,044					59,111			203,744		2,636,914		3,022,813
Grand total	8,289,521	591,236	1,233,716	476	405,344	2,836	13,048,148	321	359,018	15,037	1,315,594	37,249,577	181,163	2,803,730	3,273,783	1,720	37,304,493	520	106,076,233
At merchant plants	989,220					2,836	698,325					782,365			841,965		12,051,188		15,365,899
At furnace plants	7,300,301	591,236	1,233,716	476	405,344		12,349,823	321	359,018	15,037	1,315,594	36,467,212	181,163	2,803,730	2,431,818	1,720	25,253,305	520	90,710,334

TABLE 28.—Quantity and percentage of captive coal received by oven-coke plants in the United States, 1932–53, in net tons

Year	At merchant plants			At furnace plants			Total		
	Total coal received	Captive coal		Total coal received	Captive coal		Total coal received	Captive coal	
		Quantity	Percent		Quantity	Percent		Quantity	Percent
1932–36 (average)	15, 806, 095	2, 668, 932	16. 9	29, 808, 889	12, 981, 389	43. 5	45, 614, 984	15, 650, 321	34. 3
1937–41 (average)	17, 211, 908	4, 175, 511	24. 3	50, 510, 941	28, 894, 043	57. 2	67, 722, 849	33, 069, 554	48. 8
1942–46 (average)	19, 294, 621	5, 988, 339	31. 0	68, 686, 475	49, 073, 264	71. 4	87, 981. 096	55, 061, 603	62. 6
1947–49 (average)	18, 321, 004	5, 286, 361	28. 9	76, 138. 301	48, 371, 093	63. 5	94, 459, 305	53, 657. 454	56. 8
1950	18, 473, 328	5, 368. 204	29. 1	82. 406, 983	50, 661, 001	61. 5	100, 880, 311	56, 029, 205	55. 5
1951	18, 043, 398	6, 057, 169	33. 6	84, 536, 657	52, 471, 260	62. 1	102, 580, 055	58, 528, 429	57. 1
1952	15, 747, 658	5, 542, 423	35. 2	75, 452, 183	47, 290, 610	62. 7	91, 199, 841	52, 833, 033	57. 9
1953	15, 365, 899	5, 923, 998	38. 6	90, 710, 334	60, 121, 968	66. 3	106, 076, 233	66, 045, 966	62. 3

Blending.—Blending or mixing various types of coal before charging into ovens is an integral part of coal preparation at virtually all oven-coke plants. Many coke plants received coal from numerous mines and different coal-producing fields. The quality of coal varies widely from field to field and within the same field, and ample mixing facilities are necessary to obtain a uniform quality. A better coke can be obtained by a proper blend of 2, 3, or more different coals than from any 1 alone. The primary objective of blending is to produce economically a quality of coke satisfactory for the use intended. It also permits the use of coals that have good coking properties but may be otherwise objectionable from the standpoint of excessive ash, sulfur, or phosphorus content and cannot be used alone as a 100-percent charge. Thus, in addition to providing a means of controlling the quality and strength of the coke and the yield of coproducts, blending permits flexible operation at oven-coke plants and use of a wider variety of coking coals. All oven-coke plants mix, or blend, coals before charging them into ovens. However, the mixing of coal of different volatile content was practiced at only 78 of the 83 active oven-coke plants in 1953. Of these, 54 used high- and low-volatile coals; 21, high-, medium-, and low-volatile; 1, high- and medium-volatile; and 2, low- and medium-volatile. Of those that did not mix coals of different volatile content, 1 plant used straight high-volatile and 4 used medium-volatile. The proportion of the different volatile contents of coal mixed before charging into ovens, where practiced, varies widely from plant to plant according to local conditions. In 1953 the proportion of low-volatile coal used in coke-plant admixtures ranged from 1 to 56 percent.

TABLE 29.—Coal received for manufacturing oven coke in the United States in 1953, by States where consumed and volatile content [1]

Coal consumed in—	High-volatile		Medium-volatile		Low-volatile		Total coal received (net tons)
	Net tons	Percent of total	Net tons	Percent of total	Net tons	Percent of total	
Alabama:							
Merchant plants	390,023	33.5	599,197	51.4	175,976	15.1	1,165,196
Furnace plants	----------	--------	7,214,047	99.8	13,720	.2	7,227,767
Total Alabama	390,023	4.6	7,813,244	93.1	189,696	2.3	8,392,963
California: Furnace plant	1,233,819	86.2	----------	--------	197,589	13.8	1,431,408
Colorado: Furnace plant	1,392,308	86.3	----------	--------	221,436	13.7	1,613,744
Illinois:							
Merchant plants	105,754	13.5	359,721	45.9	318,772	40.6	784,247
Furnace plants	3,080,482	72.3	----------	--------	1,182,571	27.7	4,263,053
Total Illinois	3,186,236	63.1	359,721	7.1	1,501,343	29.8	5,047,300
Indiana:							
Merchant plants	530,226	47.4	104,467	9.3	485,054	43.3	1,119,747
Furnace plants	6,313,076	56.9	----------	--------	4,781,488	43.1	11,094,564
Total Indiana	6,843,302	56.0	104,467	.9	5,266,542	43.1	12,214,311
Maryland: Furnace plant	3,210,534	65.1	----------	--------	1,723,341	34.9	4,933,875
Massachusetts: Merchant plant	620,813	52.1	307,505	25.8	263,724	22.1	1,192,042
Michigan:							
Merchant plants	564,569	59.1	----------	--------	390,912	40.9	955,481
Furnace plants	2,324,931	67.4	----------	--------	1,122,694	32.6	3,447,625
Total Michigan	2,889,500	65.6	----------	--------	1,513,606	34.4	4,403,106
Minnesota:							
Merchant plant	71,204	27.2	78,346	29.9	112,443	42.9	261,993
Furnace plants	613,513	68.8	68,624	7.7	209,878	23.5	892,015
Total Minnesota	684,717	59.3	146,970	12.7	322,321	28.0	1,154,008
New Jersey: Merchant plants	786,252	50.0	296,273	18.8	489,639	31.2	1,572,164
New York:							
Merchant plants	1,547,635	79.6	----------	--------	396,802	20.4	1,944,437
Furnace plants	3,527,075	74.2	399,292	8.4	826,056	17.4	4,752,423
Total New York	5,074,710	75.8	399,292	6.0	1,222,858	18.2	6,696,860
Ohio:							
Merchant plants	840,225	59.2	137,634	9.7	442,397	31.1	1,420,256
Furnace plants	11,397,708	73.8	305,025	2.0	3,731,596	24.2	15,434,329
Total Ohio	12,237,933	72.6	442,659	2.6	4,173,993	24.8	16,854,585
Pennsylvania:							
Merchant plants	292,367	35.1	370,927	44.5	170,656	20.4	833,950
Furnace plants	21,912,626	80.0	440,414	1.6	5,042,948	18.4	27,395,988
Total Pennsylvania	22,204,993	78.7	811,341	2.9	5,213,604	18.4	28,229,938
Tennessee: Furnace plant	93,572	30.7	181,163	59.5	29,905	9.8	304,640
Texas: Furnace plants	629,410	60.0	293,871	28.0	126,339	12.0	1,049,620
Utah: Furnace plants	1,733,699	75.5	239,179	10.4	324,259	14.1	2,297,137
West Virginia:							
Merchant plants	1,014,796	92.8	----------	--------	78,777	7.2	1,093,573
Furnace plants	3,913,127	85.6	----------	--------	659,019	14.4	4,572,146
Total West Virginia	4,927,923	87.0	----------	--------	737,796	13.0	5,665,719
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin: Merchant plants	1,968,825	65.1	163,108	5.4	890,880	29.5	3,022,813
Grand total	70,108,569	66.1	11,558,793	10.9	24,408,871	23.0	106,076,233
At merchant plants	8,732,689	56.8	2,417,178	15.7	4,216,032	27.5	15,365,899
At furnace plants	61,375,880	67.7	9,141,615	10.1	20,192,839	22.2	90,710,334

[1] High-volatile—dry volatile matter over 31 percent; medium-volatile—dry volatile matter 31 percent or less and over 22 percent; low-volatile—dry volatile matter 22 percent or less and over 14 percent.

CONSUMPTION OF COKE

The apparent consumption of coke in the United States in 1953 was the second largest on record; it fell 397,481 tons short of the peak year 1951 but was 10.3 million tons above 1952. The 1952 figure was not normal because consumption of coke was affected by strikes in the iron and steel industry. Coke consumption increased substantially from the 1947–49 base period, largely because of the tremendous gain in blast-furnace coke requirements. In 1947–49 blast furnaces of the United States consumed 80 percent of the apparent coke consumption. However, as requirements of coke for smelting iron ore increased, markets for coke in such fields as gas manufacture and residential heating have dropped sharply. As shown in table 30, nearly 14 million tons of coke was consumed for other than blast-furnace use during 1947–49, whereas in 1953 the total was slightly above 8 million tons. The proportion of coke used in blast furnaces almost reached 90 percent of the total consumption in 1953.

For the second consecutive year, fuel efficiency of blast furnaces improved. Although the quantity of coke required to produce 1 ton of pig iron was substantially less than in 1947–49, it was higher than in the best year (1941). In that year, only 1,745.2 pounds of coke was required to produce 1 ton of pig iron. Poorer quality coke and leaner ores caused a steady rise in coke consumption per ton of metal in the ensuing years, until a peak of 1,908 pounds was reached in 1948. Installation of coal-preparation plants has improved the quality of coke, which has helped reverse this trend. Table 31 has been prepared to show the improvement that has been made in the quality of coke since 1945.

Tables 32 and 33 show the principal end uses of coke produced. Many of the larger oven-coke plants are integrated with iron blast furnaces, and virtually all of the coke output at these plants is used for metallurgical fuel on the premises. Some of these plants, in addition to providing the coke required by integrated furnaces, also ship coke to other furnaces of the same company or to affiliated companies in other localities. These shipments, although shown as sales in the accompanying tables, are really intracompany transfers where the ownership does not change and would not therefore constitute commercial sales. The furnace plants endeavor to produce a maximum quantity of coke suitable for blast-furnace use and usually only the small-size coke, not suitable for metallurgical purposes, is sold. In 1953, the furnace plants used 78 percent of their production in integrated blast furnaces, 17 percent was shipped to affiliated companies, and only 3 percent was sold on the open market (commercial sales). Merchant plants usually sell all of their output, although several companies making chemical products use their entire output. The markets for foundry, water-gas, and domestic cokes are supplied generally by the merchant operators.

Beehive coke was used mainly in blast furnaces in 1953. Small tonnages were sold to foundries, other industrial plants, and for residential heating. As is the case with oven-coke plants, some of the larger beehive-coke plants are owned and operated by steel-producing companies. In 1953, of the 5.3 million tons of beehive coke distributed by the operators, 38 percent (2 million tons) was used by the producers or shipped to affiliated company furnaces.

TABLE 30.—Apparent consumption of coke in the United States, 1947–49 (average) and 1950–53, in net tons

Year	Total production	Imports	Exports	Net change in stocks	Apparent United States consumption [1]	Consumption: Iron furnaces [2] Quantity	Consumption: Iron furnaces [2] Percent	Consumption: All other purposes Quantity	Consumption: All other purposes Percent
1947–49 (av.)	70, 648, 402	181, 000	696, 699	+280, 230	69, 852, 473	55, 877, 463	80. 0	13, 975, 010	20. 0
1950	72, 718, 038	437, 585	397, 801	−658, 742	73, 416, 564	61, 039, 227	83. 1	12, 377, 337	16. 9
1951	79, 330, 702	161, 639	1, 026, 730	+372, 258	78, 093, 353	66, 623, 205	85. 3	11, 470, 148	14. 7
1952	68, 254, 109	312, 519	792, 072	+418, 685	67, 355, 871	57, 969, 044	86. 1	9, 386, 827	13. 9
1953	78, 836, 857	157, 318	520, 252	+778, 051	77, 695, 872	69, 596, 514	89. 6	8, 099, 358	10. 4

[1] Production plus imports minus exports, plus or minus net change in stocks.
[2] American Iron and Steel Institute; figures include coke consumed in manufacture of ferroalloys.

TABLE 31.—Coke and coking coal consumed per net ton of pig iron produced in the United States, 1913, 1918, 1929, 1939, 1947–49 (average), and 1951–53

Year	Coke per net ton of pig iron and ferroalloys [1] (pounds)	Yield of coke from coal (percent)	Coking coal per net ton of pig iron and ferroalloys (pounds calculated)	Year	Coke per net ton of pig iron and ferroalloys [1] (pounds)	Yield of coke from coal (percent)	Coking coal per net ton of pig iron and ferroalloys (pounds calculated)
1913	2, 172. 6	66. 9	3, 247. 5	1947–49 (av.)	1, 919. 7	69. 7	2, 754. 2
1918	2, 120. 7	66. 4	3, 193. 8	1951	1, 870. 7	69. 8	2, 680. 1
1929	1, 838. 0	69. 0	2, 663. 8	1952	1, 865. 4	69. 8	2, 672. 5
1939	1, 778. 0	69. 8	2, 547. 3	1953	1, 834. 9	69. 7	2, 632. 6

[1] American Iron and Steel Institute; consumption per ton of pig iron only, excluding furnaces making ferroalloys, was 2,172.6 pounds in 1913, 2,120.7 in 1918, 1,813.3 in 1929, 1,760.0 in 1939, 1,892.8 in 1947–49 (average), 1,848.7 in 1951, 1,843.4 in 1952, and 1,812.6 in 1953.

TABLE 32.—Oven coke produced, used by producers, and sold in the United States in 1953, by States

State	Produced		Used by producers—				Sold [1]	
			In blast furnaces		For other purposes [2]		For blast-furnace use [3]	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Alabama	6,278,239	$72,501,622	5,155,059	$51,345,635	23,646	$237,710	292,068	$5,062,787
California	749,381	(4)	770,545	(4)	351	(4)		
Colorado	967,074	(4)	901,432	(4)	4,337	(4)	36,287	(4)
Illinois	3,513,142	59,549,629	2,024,927	31,172,604	3,341	44,395	1,125,006	21,477,113
Indiana	8,886,502	159,966,820	6,815,237	119,388,346	21,491	292,574	1,415,132	27,464,286
Maryland	3,268,655	(4)	3,227,441	(4)	6,200	(4)		
Massachusetts	849,535	(4)	144,202	(4)	117,451	(4)	31,300	(4)
Michigan	3,220,133	49,518,010	2,025,451	(4)	173,888	2,808,658	271,407	(4)
Minnesota	862,151	15,362,688	608,532	(4)	7,358	64,522	78,253	(4)
New Jersey	1,175,416	(4)			166,954	(4)	413,623	(4)
New York	4,589,609	69,906,676	2,118,454	(4)	219,155	3,084,269	1,870,219	25,909,813
Ohio	11,717,556	163,191,278	9,382,473	126,256,913	80,759	1,403,828	1,664,044	24,838,978
Pennsylvania	18,747,300	257,075,120	10,483,147	136,161,555	120,036	1,425,140	7,510,655	107,786,832
Tennessee	231,330	(4)	106,559	(4)	24,313	(4)	75,751	(4)
Texas	751,926	(4)	699,869	(4)	8,416	(4)	2,587	(4)
Utah	1,407,818	(4)	1,261,083	(4)	1,309	(4)	19,304	(4)
West Virginia	4,203,360	49,554,292	3,236,312	41,254,226	797,163	6,375,495	89,166	(4)
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	2,174,401	37,990,772			125,501	1,731,738	1,047,631	15,159,612
Undistributed		145,687,249		180,921,008		4,615,513		16,478,007
Total 1953	73,593,528	1,080,304,156	48,960,723	686,500,287	1,901,669	22,083,842	15,942,433	244,177,428
At merchant plants	10,965,352	190,459,372	144,202	(5)	1,602,082	17,765,566	3,591,579	58,845,009
At furnace plants	62,628,176	889,844,784	48,816,521	(5)	299,587	4,318,276	12,350,854	185,332,419
Total 1952	63,850,115	925,300,448	39,636,150	547,167,058	1,844,445	21,443,179	14,801,509	223,785,887

State	Sold [1]—Continued							
	For foundry use [6]		For other industrial use [7]		For residential heating [8]		Total	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Alabama	555,288	$12,006,179	169,961	$2,762,793	54,560	$634,914	1,071,877	$20,466,673
California	----	----	----	----	----	----	----	----
Colorado	4,804	(4)	26,507	(4)	58	(4)	67,656	(4)
Illinois	205,441	(4)	71,608	(4)	33,102	485,602	1,435,157	27,531,696
Indiana	392,111	(4)	170,594	(4)	76,178	876,751	2,054,015	40,310,166
Maryland	----	----	2,383	(4)	----	----	2,383	(4)
Massachusetts	70,877	(4)	66,113	(4)	275,370	(4)	443,660	(4)
Michigan	416,415	(4)	252,601	3,266,583	148,751	1,834,410	1,089,174	20,032,530
Minnesota	139,667	(4)	34,624	(4)	13,195	(4)	265,739	(4)
New Jersey	69,387	(4)	99,822	(4)	331,464	(4)	914,296	(4)
New York	15,738	(4)	124,721	1,776,321	95,054	(4)	2,105,732	29,586,889
Ohio	245,067	5,944,790	283,602	3,944,714	62,532	778,004	2,255,245	35,506,486
Pennsylvania	244,460	5,789,021	219,735	2,662,684	153,943	2,183,345	8,128,793	118,421,882
Tennessee	19,925	(4)	187	(4)	----	----	95,863	(4)
Texas	450	(4)	42,299	(4)	----	----	45,336	(4)
Utah	----	----	53,130	(4)	2,151	(4)	74,585	(4)
West Virginia	----	----	70,316	487,834	102	(4)	159,584	1,793,929
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	474,364	12,149,908	181,503	2,797,349	212,960	3,650,263	1,916,458	33,757,132
Undistributed	----	31,976,898	----	8,516,443	----	11,814,348	----	33,109,199
Total 1953	2,853,994	67,866,796	1,869,706	26,214,721	1,459,420	22,257,637	22,125,553	360,516,582
At merchant plants	2,637,985	62,808,074	1,160,804	18,528,461	1,229,061	19,855,172	8,619,429	160,036,716
At furnace plants	216,009	5,058,722	708,902	7,686,260	230,359	2,402,465	13,506,124	200,479,866
Total 1952	2,919,626	65,499,469	2,352,542	33,979,210	1,916,609	28,272,441	21,990,286	351,537,007

[1] Includes intracompany transfers.
[2] Comprises 119,271 tons valued at $2,040,322 used in foundries; 421,272 tons, $5,565,997 to make producer gas; 1,055,889 tons, $10,146,933 to make water gas; and 305,237 tons, $4,330,590 for other purposes.
[3] Includes 10,610,546 tons valued at $156,888,876 sold to financially affiliated companies.
[4] Included with "Undistributed" to avoid disclosure of individual company figures.
[5] Concealed to avoid disclosure of individual company figures.
[6] Includes 58,682 tons valued at $1,132,807 sold to financially affiliated companies.
[7] Includes 196,184 tons valued at $3,132,467 for manufacture of water gas and 154,701 tons, $2,238,317 for other industrial use sold to financially affiliated companies and 161,559 tons, $2,720,797 for manufacture of water gas sold to other consumers.
[8] Includes commercial.

TABLE 33.—Beehive coke produced, used by producers, and sold in the United States in 1953, by States

State	Produced		Used by producers— In blast furnaces		Used by producers— For other purposes		Sold [1] For blast-furnace use [2]	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Kentucky	62,500	(3)					45,250	(3)
Pennsylvania	4,635,513	$66,927,383	381,665	(3)	87	$1,266	4,135,203	$59,860,732
Utah	83,863	(3)	10,603	(3)				
Virginia	188,033	2,851,499					80,899	(3)
West Virginia	273,420	3,932,576					171,724	2,371,310
Undistributed		2,546,390		$5,750,100				1,847,765
Total: 1953	5,243,329	76,257,848	392,268	5,750,100	87	1,266	4,433,076	64,079,807
1952	4,403,994	61,282,146	295,669	4,511,081	4,011	59,169	3,449,419	47,114,186

State	Sold [1]—Continued For foundry use		For other industrial use [4]		For residential heating [5]		Total	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Kentucky	15,739	(3)					60,989	(3)
Pennsylvania	37,746	$589,830	82,989	$1,003,674	7,017	$91,577	4,262,955	$61,545,813
Utah			73,901	(3)			73,901	(3)
Virginia	5,543	(3)	100,078	1,522,891	1,522	(3)	188,042	2,851,273
West Virginia	8,678	159,575	97,401	(3)	3	(3)	277,806	3,997,133
Undistributed		309,832		2,876,426		24,698		2,264,091
Total: 1953	67,706	1,059,237	354,369	5,402,991	8,542	116,275	4,863,693	70,658,310
1952	130,361	2,009,656	499,538	7,254,548	15,760	204,032	4,095,078	56,582,422

1 Includes intracompany transfers.
2 Includes 1,615,553 tons valued at $22,717,161 sold to financially affiliated companies.
3 Included with "Undistributed" to avoid disclosure of individual company figures.
4 Includes 57,447 tons valued at $868,902 sold to other consumers for manufacture of water gas.
5 Includes commercial.

DISTRIBUTION OF OVEN AND BEEHIVE COKE

Distribution of coke and breeze in 1953 was the second largest on record, exceeding the 1952 figure by 10.7 million tons (15 percent), but was 939,571 tons short of the peak reached in 1951. Coke was shipped to every State in the Union, the District of Columbia, and 10 foreign countries. Pennsylvania, the leading coke-producing State, was the largest consumer, and deliveries of 21.3 million tons of coke (27 percent), and 1.2 million tons of breeze (23 percent) were made to coke consumers there in 1953. Ohio, where coke consumers received 14.7 million tons (19 percent) ranked second, followed by Indiana, Illinois, Alabama, and New York. These 6 States received 77 percent of all coke shipments from coke producers in 1953. Before World War II, when shipments of domestic coke were 20 percent of the total, New York ranked third; however, the decrease in use of coke for residential heating and for the manufacture of water gas was greater than the increase in blast-furnace usage, and New York dropped to sixth place.

Coke for blast-furnace use was delivered to 18 States in 1953. Expansion in blast-furnace capacity in California, Michigan, New

TABLE 34.—Distribution of oven and beehive coke and breeze in 1953, in net tons

[Based upon reports from producers showing destination and principal end-use of coke used or sold. Does not include imported coke which totaled 157,318 tons in 1953]

Consuming State	Coke							Breeze
	Blast-furnace use	Foundry use	Making producer gas	Making water gas	Other industrial use	Residential heating	Total	
Alabama	5,186,791	173,354	--------	--------	64,067	20,073	5,444,285	277,827
Arizona	--------	5,203	--------	--------	--------	--------	5,203	102
Arkansas	--------	1,989	--------	--------	928	--------	2,917	4,784
California	788,358	59,180	--------	--------	61,288	--------	908,826	54,735
Colorado	901,432	13,313	--------	--------	26,047	28	940,820	60,627
Connecticut	--------	54,083	82,682	56,961	5,086	88,791	287,603	46,226
Delaware	--------	2,353	--------	--------	1,997	242	4,592	53
District of Columbia	--------	--------	--------	--------	166	--------	166	--------
Florida	--------	1,588	--------	23,352	2,420	902	28,262	41,179
Georgia	--------	12,378	--------	3,039	3,085	11,357	29,859	2,147
Idaho	--------	565	--------	--------	29,766	116	30,447	55,614
Illinois	5,726,599	276,896	--------	82	57,168	53,892	6,114,637	291,578
Indiana	7,094,974	158,887	--------	2,744	61,601	68,515	7,386,721	577,680
Iowa	--------	50,215	--------	--------	32,805	3,609	86,629	12,946
Kansas	--------	9,547	--------	--------	625	30	10,202	1,102
Kentucky	663,563	48,122	--------	--------	89,403	11,856	812,944	37,123
Louisiana	--------	3,776	--------	--------	53,285	494	57,555	353
Maine	--------	3,918	--------	13,597	294	11,929	29,738	--------
Maryland	3,238,873	27,508	--------	--------	11,175	3	3,277,559	291,865
Massachusetts	144,202	54,948	110,207	52,003	12,536	291,104	665,000	97,012
Michigan	2,363,720	665,599	--------	--------	222,491	138,031	3,389,841	185,574
Minnesota	608,532	28,345	3,655	798	20,831	10,821	672,982	51,551
Mississippi	--------	1,005	--------	--------	--------	77	1,082	--------
Missouri	--------	73,937	--------	--------	20,936	263	95,136	5,740
Montana	--------	1,407	--------	--------	22,877	--------	24,284	35,684
Nebraska	--------	3,532	--------	--------	2,130	74	5,736	--------
Nevada	--------	--------	--------	--------	12,196	--------	12,196	1,010
New Hampshire	--------	3,563	--------	611	215	12,074	16,463	--------
New Jersey	--------	73,610	28,512	140,952	82,119	259,047	584,240	124,998
New Mexico	--------	900	--------	--------	371	--------	1,271	694
New York	4,296,130	119,136	99,208	113,994	160,065	199,640	4,988,173	306,315
North Carolina	--------	15,594	--------	1,510	7,160	1,454	25,718	7,184
North Dakota	--------	256	--------	--------	149	346	751	--------
Ohio	13,884,660	335,410	--------	127,191	268,188	48,711	14,664,160	756,906
Oklahoma	--------	5,511	--------	--------	100	--------	5,611	27,830
Oregon	--------	5,256	--------	--------	22,771	--------	28,027	26,758
Pennsylvania	20,585,583	234,976	70,064	9,647	242,483	126,157	21,268,910	1,232,397
Rhode Island	--------	12,962	26,492	45,678	945	30,912	116,989	20,769
South Carolina	--------	5,038	--------	1,456	7,819	893	15,206	5,488
South Dakota	--------	298	--------	--------	388	55	741	--------
Tennessee	106,559	91,713	--------	--------	124,256	2,049	324,577	186,754
Texas	700,450	45,695	--------	--------	73,996	202	820,343	81,904
Utah	1,441,013	15,960	--------	--------	45,964	2,035	1,504,972	93,004
Vermont	--------	5,302	--------	--------	232	3,919	9,453	--------
Virginia	112,857	51,162	--------	83,962	67,776	1,916	317,673	8,763
Washington	--------	7,372	--------	--------	6,086	--------	13,458	7,835
West Virginia	1,749,690	8,142	--------	781,214	46,091	3,857	2,588,994	208,924
Wisconsin	--------	142,009	452	--------	10,230	42,066	194,757	23,148
Wyoming	--------	--------	--------	--------	2,333	--------	2,333	--------
Total	69,593,986	2,911,513	421,272	1,458,791	1,984,940	1,447,540	77,818,042	5,252,183
Exported	134,514	129,458	--------	12,288	129,269	20,422	425,951	21,434
Grand total	69,728,500	3,040,971	421,272	1,471,079	2,114,209	1,467,962	78,243,993	5,273,617

York, Ohio, and West Virginia resulted in the largest movement of coke to blast furnaces on record, exceeding the 1951 maximum by 2.3 million tons (3 percent). Foundry coke was distributed to all but 2 States and the District of Columbia in 1953; Michigan alone received 22 percent. The large tonnage of coke delivered to foundries in Michigan was for iron castings required by the automobile-manufacturing plants. Coke for making producer gas was used in 8 States, and 18 States required coke for manufacturing water gas. The volume of water-gas coke was further reduced in 1953, with the largest decreases in Virginia, Ohio, Connecticut, and New York. In Ohio and Virginia, natural gas was substituted for coke as a raw material in manufacturing synthetic ammonia. In Connecticut and New York, several gas utilities converted to the distribution of natural gas instead of manufactured gas. Coke for other industrial uses was consumed in all but two States; the largest tonnages were destined to consumers in Ohio, Pennsylvania, and Michigan. Coke for residential heating was delivered to 38 States, but the total distribution for this use was 24 percent less than in 1952 and about one sixth as large as in 1940.

STOCKS OF COKE AND COKING COAL

Coke.—Data on coke stocks in tables 35 and 36 represent material on hand at producing plants and do not include coke stocked by some producers at affiliated steel plants. As a rule, coke stocks increase when steel production drops, and this was true in 1953. Beehive coke is rarely stocked by the producing companies, which explains the small tonnage shown in table 35. Stocks of oven coke, which increased 42 percent during the year, were divided about 60 : 40 between furnace and merchant plants. Stocks of coke at merchant plants more than doubled during the year. However, as the average daily production of coke at merchant plants was far smaller than at furnace plants, the

TABLE 35.—Producers' stocks of coke and breeze in the United States on December 31, 1953, by States, in net tons

State	Coke				Breeze
	Blast furnace	Foundry	Residential heating and other	Total	
Oven coke:					
Alabama	137,431	7,956	15,510	160,897	9,860
California	3,739			3,739	
Colorado	3,821			3,821	4,398
Illinois	152,489	503	4,823	157,815	37,082
Indiana	190,193	1,549	82,833	274,575	176,139
Maryland	77,753			77,753	83,925
Massachusetts	168,985	535	90,756	260,276	
Michigan	19,086	5,476	35,218	59,780	9,274
Minnesota	28,838	1,031	15,364	45,233	20,445
New Jersey	69,818	920	78,452	149,190	14,504
New York	288,159		3,072	291,231	187,542
Ohio	106,101	10,447	28,707	145,255	81,591
Pennsylvania	439,198	249	93,222	532,669	143,692
Tennessee	10,584	212	2,648	13,444	
Texas	763	85	1,061	1,909	668
Utah	125,444		477	125,921	4,434
West Virginia	122,908		24,344	147,252	60,463
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	47,159	10,239	158,328	215,726	23,634
Total	1,992,469	39,202	634,815	2,666,486	857,651
At merchant plants	525,289	33,511	481,473	1,040,273	141,606
At furnace plants	1,467,180	5,691	153,342	1,626,213	716,045
Beehive coke:					
Kentucky	1,500			1,500	
Pennsylvania	6,076	486	1,674	8,236	335
Utah	188			188	
Virginia	915	410		1,325	15
West Virginia	365	1,608		1,973	
Total	9,044	2,504	1,674	13,222	350

TABLE 36.—Producers' month-end stocks of oven coke in the United States, 1952–53, in net tons

[Includes blast-furnace, foundry, and domestic coke]

Month	Furnace plants		Merchant plants		Total	
	1952	1953	1952	1953	1952	1953
January	1,421,459	1,672,422	388,946	402,280	1,810,405	2,074,702
February	1,455,488	1,641,343	309,875	353,660	1,765,363	1,995,003
March	1,529,813	1,581,167	302,162	391,719	1,831,975	1,972,886
April	1,459,313	1,541,336	413,451	467,251	1,872,764	2,008,587
May	1,537,618	1,605,740	423,814	529,001	1,961,432	2,134,741
June	2,006,680	1,572,492	549,997	556,976	2,556,677	2,129,468
July	2,478,853	1,528,749	818,618	691,943	3,297,471	2,220,692
August	2,293,595	1,598,150	848,064	777,547	3,141,659	2,375,697
September	2,132,274	1,624,340	705,656	850,203	2,837,930	2,474,543
October	1,957,307	1,630,009	583,254	883,342	2,540,561	2,513,351
November	1,920,322	1,698,241	524,390	959,488	2,444,712	2,657,729
December	1,445,048	1,626,213	432,217	1,040,273	1,877,265	2,666,486

increase in coke stocks, in terms of days' production, zoomed from 13 days in January to 38 in December. The largest part of this increase occurred in the last 6 months, when steel companies reduced their purchases of blast-furnace coke from the merchant ovens. Stocks of coke at furance plants increased 13 percent; about half of the increase resulted from the accumulation of small-size material listed in table 35 as "residential heating and other."

Coal.—Tables 37 and 38 show stocks of bituminous coal and anthracite, by months, for 1953 and prior years. Stocks of bituminous coal increased 14 percent during 1953 and at the end of the year represented 61 days' supply at the rate of consumption prevailing in December. Because of the continuous nature of the carbonization process, the maintenance of adequate stocks of bituminous coal is essential. A 30-day supply is the minimum desired by most oven-coke plant operators as a safeguard against disruption in the flow of coal to the ovens. However, coke plants on the Upper Lakes, which are supplied principally by boat, build up inventories during the shipping season for an adequate tonnage for the winter. These plants usually have an aggregate of 4 to 5 months' supply at the end of the lake shipping season.

TABLE 37.—Month-end stocks of bituminous coal at oven-coke plants in the United States, 1949–53, in net tons

Month	1949	1950	1951	1952	1953
January	12,480,691	7,087,355	16,960,185	14,827,371	13,400,118
February	13,758,864	3,448,610	16,366,139	15,786,416	13,381,865
March	11,451,673	4,847,923	16,751,447	16,726,606	13,278,027
April	12,913,613	7,490,871	16,464,045	16,652,421	13,408,394
May	15,870,342	9,572,167	16,179,877	16,799,063	13,898,342
June	15,746,565	11,279,551	16,254,127	16,894,290	14,537,894
July	13,895,773	10,385,780	14,034,705	16,135,572	13,220,760
August	13,610,849	12,339,744	14,448,916	16,066,471	14,698,394
September	11,774,213	13,964,334	14,426,401	15,728,472	15,910,098
October	9,946,089	15,665,689	14,953,056	14,436,545	16,609,099
November	10,059,834	16,329,150	15,123,117	13,637,219	16,719,776
December	9,892,891	16,776,070	15,257,762	14,429,783	16,485,527

TABLE 38.—Month-end stocks of anthracite at oven-coke plants in the United States, 1949–53, in net tons

Month	1949	1950	1951	1952	1953
January	47,418	68,715	31,618	46,933	44,803
February	33,362	60,899	26,094	38,495	35,389
March	23,929	49,900	22,634	34,719	32,513
April	16,707	41,873	24,406	30,506	33,480
May	41,416	67,687	32,971	29,399	44,524
June	53,585	29,710	44,193	42,216	58,561
July	71,609	28,703	44,036	41,583	57,989
August	76,438	28,671	46,191	45,300	60,010
September	75,230	29,388	39,280	43,865	61,559
October	81,369	34,260	51,656	50,148	70,066
November	74,792	35,710	58,903	58,422	74,386
December	69,580	33,496	57,122	54,720	79,381

VALUE AND PRICE

The average values and prices of oven and beehive coke produced and sold, as reported by the producing companies, are shown in tables 39 and 40. The average monthly prices of furnace and foundry beehive coke and foundry oven coke in certain markets, as quoted by Steel Magazine in 1953, are shown in table 41.

The average unit value of coke produced and average price of commercial sales of coke advanced slightly in 1953. Because of the different procedures used by the reporting companies of assigning a value for that part of the coke used and not sold, referred to under Scope of Report (p. 220), a better index of changes in the market is provided by the average receipts per ton of coke sold (commercial sales). As table 39 shows, the 1953 average price on oven coke increased 3 percent over 1952 and was 28 percent higher than the 1947–49 average. The price increase of beehive coke was not quite as large, being 2 percent over 1952 and 24 percent above the 1947–49 figure.

Prices on coke vary between grades as well as types. Prices of oven coke are higher than on beehive because of higher coal costs resulting in part from freight charges. Table 40 shows the prices, by grade and State, of oven and beehive coke in 1953. Foundry coke always commands the highest price because of more stringent standards on quality and size. Prices of foundry oven coke varied widely between producers and ranged as much as $5.42 per ton, depending on distances from coalfields.

TABLE 39.—Average value per net ton of coke produced and average receipts per net ton from coke sold (merchant sales) in the United States, 1947–49 (average) and 1950–53.

Year	Value per ton produced			Receipts per ton sold		
	Oven coke	Beehive coke	Total	Oven coke	Beehive coke	Total
1947–49 (average)	$12.08	$11.32	$12.02	$13.87	$11.95	$13.41
1950	13.45	13.25	13.43	15.66	13.63	15.15
1951	14.13	13.95	14.11	17.04	14.33	16.25
1952	14.49	13.92	14.45	17.26	14.43	16.72
1953	14.68	14.54	14.67	17.75	14.76	17.07

TABLE 40.—Average receipts per net ton of coke sold (merchant sales) in the United States in 1953, by States

State	Oven coke				Beehive coke			
	Blast furnace	Foundry	Other industrial [1]	Residential heating [2]	Blast furnace	Foundry	Other industrial [1]	Residential heating [2]
Alabama	$18.06	$21.62	$16.25	$11.64	--------	--------	--------	--------
California, Colorado, Texas, and Utah	18.24	23.80	15.41	9.17	--------	--------	(3)	--------
Connecticut, Massachusetts, and Rhode Island	16.28	23.80	17.16	17.31	--------	--------	--------	--------
Illinois	17.90	(3)	11.93	14.67	--------	--------	--------	--------
Indiana	(3)	(3)	14.47	11.51	--------	--------	--------	--------
Kentucky, Missouri, and Tennessee	13.58	27.04	12.10	(3)	(3)	(3)	--------	--------
Michigan, Minnesota, and Wisconsin	17.59	24.56	13.17	13.49	--------	--------	--------	--------
New Jersey and New York	16.54	22.85	14.13	15.94	--------	--------	--------	--------
Ohio	16.54	24.28	11.72	12.44	--------	--------	--------	--------
Pennsylvania	15.84	23.72	12.82	14.18	$14.74	$15.63	$12.09	$13.05
Virginia	--------	--------	--------	--------	15.01	16.14	15.22	(3)
West Virginia	(3)	--------	6.94	(3)	(3)	(3)	(3)	(3)
Undistributed	18.09	24.13	--------	10.55	13.85	15.56	16.79	16.20
United States average 1953	16.37	23.87	13.72	15.25	14.68	15.64	15.25	13.61
At merchant plants	16.38	23.91	15.97	16.15	--------	--------	--------	--------
At furnace plants	16.34	23.49	10.82	10.43	--------	--------	--------	--------
United States average 1952	16.29	22.49	14.10	14.75	14.36	15.42	14.52	12.95

[1] Includes water gas.
[2] Includes commercial.
[3] Included with "Undistributed" to avoid disclosure of individual company figures.

TABLE 41.—Average monthly prices per net ton of furnace and foundry beehive coke and foundry oven coke in the United States in 1953 [1]

	January	February	March	April	May	June
Beehive coke, at ovens:						
Connellsville furnace	$14.75	$14.75	$14.75	$14.75	$14.75	$14.75
Connellsville foundry	17.00	17.00	17.00	17.00	16.75	16.75
Oven foundry coke, at ovens:						
Birmingham	21.65	21.65	21.65	21.65	21.65	21.65
Chicago	24.50	24.50	24.50	24.50	24.50	24.50
Detroit	25.50	25.50	25.50	25.50	25.50	25.50
Erie	25.00	25.00	25.00	25.00	25.00	25.00
Everett [2]	26.05	26.05	26.05	26.04	26.00	26.00
Indianapolis	24.25	24.25	24.25	24.25	24.25	24.25
Kearny	24.00	24.00	24.00	24.00	24.00	24.00
Lone Star	18.50	18.50	18.50	18.50	18.50	18.50
Milwaukee	25.25	25.25	25.25	25.25	25.25	25.25
Painesville	25.50	25.50	25.50	25.50	25.50	25.50
Philadelphia	23.95	23.95	23.95	23.95	23.95	23.95
Portsmouth	24.00	24.00	24.00	24.00	24.00	24.00
St. Louis [3]	26.00	26.00	26.00	26.00	26.00	26.00
St. Paul	(4)	(4)	(4)	(4)	(4)	23.75
Swedeland	23.85	23.85	23.85	23.85	23.85	23.85
Terre Haute	24.05	24.05	24.05	24.05	24.05	24.05

	July	August	September	October	November	December
Beehive coke, at ovens:						
Connellsville furnace	$14.75	$14.75	$14.75	$14.75	$14.75	$14.75
Connellsville foundry	16.75	16.75	16.75	16.75	16.75	16.75
Oven foundry coke, at ovens:						
Birmingham	21.65	21.65	21.65	22.15	22.65	22.65
Chicago	24.50	24.50	24.50	24.50	24.50	24.50
Detroit	25.50	25.50	25.50	25.50	25.50	25.50
Erie	25.00	25.00	25.00	25.00	25.00	25.00
Everett [2]	26.00	26.00	26.00	26.00	26.00	26.00
Indianapolis	24.25	24.25	24.25	24.25	24.25	24.25
Kearny	24.00	24.00	24.00	24.00	24.00	24.00
Lone Star	18.50	18.50	18.50	18.50	18.50	18.50
Milwaukee	25.25	25.25	25.25	25.25	25.25	25.25
Painesville	25.50	25.50	25.50	25.50	25.50	25.50
Philadelphia	23.95	23.95	23.95	23.95	23.95	23.95
Portsmouth	24.00	24.00	24.00	24.00	24.00	24.00
St. Louis [3]	26.00	26.00	26.00	26.00	26.00	26.00
St. Paul	23.75	23.75	23.75	23.75	23.75	23.75
Swedeland	23.85	23.85	23.85	23.85	23.85	23.85
Terre Haute	24.05	24.05	24.05	24.05	24.05	24.05

[1] Average of weekly quotations by Steel magazine.
[2] New England delivered or within $4.55 freight zone from works.
[3] Delivered.
[4] Not available.

FOREIGN TRADE [5]

Imports.—Imports of coke were small in proportion to production in the United States. The quantity in 1953 was only about half of that imported in 1952, and virtually all came from Canada. Most of the Canadian coke entered the United States through the Montana-Idaho customs district. Substantial tonnages also entered through the Michigan, Buffalo, Dakota, and Washington customs districts.

[5] Figures on imports and exports compiled by Mae B. Price and Elsie D. Page, of the Bureau of Mines from records of the U. S. Department of Commerce.

TABLE 42.—Coke imported for consumption in the United States, 1951–53, by country and customs district

[U. S. Department of Commerce]

	1951		1952		1953	
	Net tons	Value	Net tons	Value	Net tons	Value
COUNTRY						
Brazil	23	$95				
Canada	157, 631	1, 872, 437	308, 803	$4, 462, 891	157, 318	$1, 714, 540
France					(1)	2
Germany	54	821				
Netherlands			3, 696	62, 862		
Netherlands Antilles			9	375		
United Kingdom	3, 931	58, 932	11	465		
Total	161, 639	1, 932, 285	312, 519	4, 526, 593	157, 318	1, 714, 542
CUSTOMS DISTRICT						
Buffalo	3, 696	57, 331	144, 368	2. 707, 502	15, 796	255, 557
Chicago	54	821				
Dakota	1, 097	14, 787	17, 044	87, 522	12, 279	57, 040
Duluth and Superior	44	355				
Maine and New Hampshire	291	4, 735	259	3, 444	250	4, 207
Michigan	63, 339	799, 930	47, 044	531, 786	47, 093	464, 254
Montana and Idaho	80, 889	904, 481	80, 057	874, 210	67, 397	835, 417
New York	23	95	11	465	(1)	2
Philadelphia	3, 931	58, 932				
Puerto Rico			3, 696	62, 862		
St. Lawrence	4, 971	78, 398	13, 918	231, 372	2, 790	43, 495
San Francisco			9	375		
Vermont	141	2, 270	87	1, 770	357	5, 791
Washington	3. 163	10, 150	6, 026	25, 285	11, 356	48, 779
Total	161, 639	1, 932, 285	312, 519	4, 526, 593	157, 318	1, 714, 542

[1] Less than 1 ton.

Exports.—Exports of coke decreased 34 percent from 1952 and were only about half of the total shipped to foreign countries in 1951. Exports to Canada, the principal market outside the United States for American coke, declined 31 percent. Many of the European countries that had purchased American coke in 1951 and 1952, when Germany, Great Britain, and other European producing countries were unable to supply them, did not buy any in 1953. Shipments to Spain increased, however, and were more than the total to all other countries except Canada. The average value at port of the coke exported was $17.82 per net ton. The average value of coke destined to different countries varied widely because of the different grades shipped. For example, the coke shipped to Spain, which averaged $16.01 per ton, was blast-furnace grade, whereas nearly all of the coke shipped to South American countries was foundry grade, much of which was bagged and shipped in small lots. The Canadian figures include some breeze, which is cheaper than the larger-size coke.

TABLE 43.—Coke exported from the United States, 1951–53, by country and customs district

[U. S. Department of Commerce]

	1951		1952		1953	
	Net tons	Value	Net tons	Value	Net tons	Value
COUNTRY						
North America:						
Canada	610,343	$9,671,585	533,832	$8,497,230	369,745	$6,500,463
Mexico	20,504	382,911	21,592	482,543	8,044	154,137
Panama	56	3,553	93	3,503	56	2,770
West Indies:						
Cuba	8,020	169,276	15,743	272,642	18,644	342,719
Trinidad and Tobago	207	4,572	220	5,762	---	---
Other North America	1,065	45,722	924	37,015	877	34,147
South America:						
Argentina	3,358	72,157	5,583	117,107	15,946	391,435
Bolivia	897	34,457	616	26,712	187	7,254
Brazil	22,359	593,337	22,389	755,670	12,097	271,502
Chile	875	21,759	1,019	21,711	389	8,483
Ecuador	68	2,462	269	10,847	28	1,014
Peru	839	19,156	855	23,757	36	1,377
Uruguay	1,431	46,832	104	4,556	---	---
Venezuela	527	18,695	481	23,154	233	9,300
Other South America	11	605	71	3,035	20	827
Europe:						
Denmark	13	329	---	---		
Finland	150,987	2,964,883	22,652	468,619	---	---
France	---	---	4,800	115,703	---	---
Germany	20	300	[1] 2,616	[1] 32,901	---	---
Ireland	1,369	31,399	---	---	---	---
Norway	1,699	23,938	35,732	550,638	---	---
Spain	78,310	1,381,359	54,868	925,433	92,008	1,473,108
Yugoslavia	121,641	2,160,840	62,762	1,228,820	---	---
Other Europe	263	5,863	34	1,077	---	---
Asia:						
Lebanon	---	---	18	1,925	---	---
Philippines	296	16,355	1,608	52,684	1,942	70,366
Thailand	451	18,714	---	---	---	---
Other Asia	6	584	152	6,650	---	---
Africa:						
Egypt	1,115	22,888	3,005	57,970	---	---
Other Africa	---	---	34	801	---	---
Total	1,026,730	17,714,531	792,072	13,728,465	520,252	9,268,902
CUSTOMS DISTRICT						
Buffalo	301,866	4,663,010	224,566	3,591,567	128,743	2,335,216
Dakota	14,951	289,106	12,862	269,928	12,709	291,355
Duluth and Superior	8,319	142,622	6,148	120,289	4,845	104,986
El Paso	280	3,874	300	1,802	57	1,404
Florida	3,420	95,490	1,849	52,417	1,717	52,236
Laredo	18,594	335,441	20,019	447,977	6,791	126,759
Maryland	171,072	3,174,366	28,367	641,877	4,244	88,440
Michigan	250,730	4,232,747	252,523	4,209,477	193,835	3,550,450
Mobile	6,949	247,163	1,033	24,386	1,384	34,760
Montana and Idaho	71	1,669	36	852	---	---
New Orleans	4,071	166,757	6,343	242,325	3,758	118,052
New York	92,834	1,609,962	101,340	1,781,801	105,502	1,731,609
Ohio	31,056	261,901	30,878	200,631	9,530	47,346
Philadelphia	114,337	2,289,978	87,095	1,749,279	22,259	527,242
Rhode Island	---	---	---	---	3,500	57,750
St. Lawrence	252	4,440	5,397	69,801	17,082	102,481
San Diego	791	14,651	717	14,093	231	5,889
San Francisco	33	1,545	---	---	44	2,310
South Carolina	---	---	4,800	115,703	---	---
Virginia	3,566	88,697	5,960	146,227	82	2,280
Washington	3,058	75,193	1,422	34,685	1,844	55,083
Other districts	480	15,919	417	13,348	[2] 2,095	[2] 33,254
Total	1,026,730	17,714,531	792,072	13,728,465	520,252	9,268,902

[1] West Germany.
[2] Includes some estimated data for which customs district is not available.

TECHNOLOGY

Research studies and scientific work on coal carbonization conducted during 1953 were described and made available to the public in various reports, trade journals, and books. The Eighteenth Annual Report of Research and Technologic Work on Coal, Coke, and Related Products summarized studies and investigations conducted by the Bureau of Mines and described in publications issued from July 1, 1952, to December 31, 1953.[6] Studies and reports relating to coal carbonization included testing the carbonizing properties of various coals, yields of gas and chemical products, and expanding and contracting characteristics of coals where investigations have shown substantial reserves of recoverable coal. Correlation of carbonizing-test data, from long-standing operation of the Bureau of Mines-American Gas Association (BM-AGA) pilot-scale retorts at Pittsburgh, was begun, and preliminary results were described of a fundamental investigation of the basic factors and causes involved in coking coal. The Tuscaloosa oven, a larger scale test oven, was used in combination with a sole-flue expansion oven to determine the effects of operating variables on the quality of coke. Another semicommercial test oven, comparable in size but different in details of construction, was constructed and given preliminary tests by the Illinois State Geological Survey at Urbana.

The British Coke Research Association published two pamphlets that contained extensive bibliographies of material, issued between January–December 1953, relating to carbonization and other subjects of interest to the coke industry.[7] A similar bibliography of material on coal and oil-shale pyrolysis, published from June 1952 to June 1953, was issued in September 1953. This review contained 640 references and covered studies and investigative work on high- and low-temperature carbonization of coal, raw materials, product and byproduct characteristics and properties, coke-oven equipment and improvements, and coke analyzing and testing procedures.[8]

The Research and Development Division, Pittsburgh Consolidation Coal Co., constructed a small pilot plant to carbonize coal-tar pitch and heavy petroleum residue.[9] Basic process data were obtained from less than 1 pound of liquid fuel. It was claimed that the equipment and technique appeared to have application in fields other than the coking of coal tar and petroleum pitch.

The blending of coal and iron ore before carbonization in coke ovens has intrigued coke and steel-plant engineers for many years, and several articles were published describing research work and tests in Germany and Great Britain.[10]

[6] Work cited in footnote 4, p. 236.
[7] British Coke Research Association (74 Grosvenor Street, London W. 1), Coke Review: No. 3, January–June 1953, 61 pp. No. 4, July–December 1953, 61 pp.
[8] Prien, Charles N., Pyrolysis of Coal and Shale: Ind. Eng. Chem., vol. 45, No. 9, September 1953, pp. 2022–2033.
[9] Jones, D. C., Kelly, T. E., and Newworth, M. B., Moving-Bed Contact Coking Apparatus: Ind. Eng. Chem., vol. 46, No. 1, January 1954, pp. 12–15.
[10] Barking, H. and Eymann C., [The Production of Ferrocoke From Fine Ore and Gas Coal]: Glückauf, vol. 53, September 1953, pp. 993–1003.
Cellan-Jones, Gwynne, Ferrocoke: Coke and Gas, vol. 15, September 1953, pp. 315–319.

A new self-sealing coke-oven door, which eliminates the carbon deposits and pitchy residue that gather on doorframes of some types of self-sealing doors, was patented in Germany in 1953.[11]

A product with properties similar to charcoal, which is a suitable starting material for activated carbon, carbon bisulfide, and carbon for reduction processes, is obtained by grinding coal to below 0.2 mm. (preferably below 0.1 mm.), oxidizing it with air at below its ignition point so that the waste gases still contain perceptible amounts of oxygen, and then carbonizing the coal at 800–1,000° C. Binding agents may be added after oxidization and the mixture briquetted and carbonized.[12]

WORLD REVIEW

Prepared by George D. Drechsler

Estimated world production of coke in 1953 was 258 million metric tons (excluding breeze), as shown in tables 44 and 45; 87 percent was oven and beehive and 13 percent gashouse, low-, and medium-temperature coke. Approximately 369 million tons of coal was carbonized to produce the 1953 coke supply. In comparing the 1953 world coke production with data reported for 1952, oven and beehive output increased 17 million metric tons (8 percent), and production of other types of coke remained the same.

The most notable increases of oven and beehive coke in 1953 were in the United States and the U. S. S. R., where output was 9.6 and 4.5 million metric tons (16 and 13 percent), respectively, higher than in 1952. The increase for the United States occurred as the result of heavy demand for metallurgical coke in 1953, as work stoppages in the iron and steel industry in 1952 caused blast-furnace coke requirements to decline approximately 9 million tons below their maximum capacity, and coke production was curtailed accordingly. Other important oven-coke producing countries that reported substantial increases in 1953 were: Japan, China, Poland, West Germany, United Kingdom, Czechoslovakia, Australia, Canada, Yugoslavia, and Turkey. Yugoslavia began producing coke at the steel plant near Lukovac in January 1953, which accounted for the large increase reported for this country.

The beehive-coke industry in the United States was almost entirely inactive by the end of 1953. This industry is a marginal source of supply and is significant only when the oven-coke output is inadequate to meet requirements. Oven-coke demand continued at a high level in most countries where metallurgy has economic importance. West Germany was the only country reporting an approximate 2-million-metric-ton surplus of coke at the end of 1953. This surplus developed primarily from the decline in the iron and steel industry of the Ruhr and the reluctance to curtail output of coke, gas, and coal chemicals.

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[11] Cellan-Jones, Gwynne, A New Self-Sealing Coke-Oven Door: Coke and Gas, June 1953, pp. 221–222.
[12] Grosskinsky, O., Klempt, W., Karweil, J., and Huck, G., Process for Producing Charcoal Substitute: British Patent 680,497.

Gashouse-, low-, and medium-temperature-coke production in 1953 remained at the 1952 level. The output of 12.7 million metric tons in the United Kingdom far exceeded that in all other countries. West Germany was second in production, reporting an output of 4.9 million tons. These two countries supplied 52 percent of the world output. A significant upward trend was reported in 1953 in Japan and India, where output of gashouse and low-temperature coke was 252,000 and 360,000 tons, respectively, higher than for 1952.

TABLE 44.—World production of oven and beehive coke (excluding breeze) 1949–53, by country, in thousands of metric tons [1]

[Compiled by Pauline Roberts]

Country	1949	1950	1951	1952	1953
North America:					
Canada	3,041	3,154	3,086	3,260	[2] 3,500
Mexico	375	392	389	463	389
United States	57,731	65,968	71,967	61,919	71,519
South America:					
Brazil	272	287	286	300	332
Chile			249	232	243
Peru				[2] 5	[2] 5
Europe:					
Austria	776	987	1,083	1,230	1,212
Belgium	5,007	4,585	6,106	6,419	5,953
Bulgaria [2]	8	10	10	15	21
Czechoslovakia	4,686	4,876	5,076	5,580	[2] 5,913
France	6,903	7,035	8,079	9,216	8,631
Germany:					
East [2]	275	300	300	350	400
West	25,140	27,333	33,626	37,268	37,776
Italy	1,408	1,416	2,082	2,350	2,310
Netherlands	2,474	2,804	2,973	3,228	3,204
Poland	5,751	5,976	6,336	7,358	7,873
Rumania [2]	100	120	150	260	312
Saar	3,328	3,227	3,766	3,887	3,589
Spain	967	946	995	1,189	1,180
Sweden	83	72		66	101
Trieste	102	99	99	120	112
U. S. S. R. [2]	24,000	27,000	30,000	33,500	38,000
United Kingdom	15,740	15,628	16,354	17,366	17,762
Yugoslavia				14	235
Asia:					
China [2]	[3] 100	1,000	1,300	1,500	2,175
India	2,038	2,251	2,183	2,077	2,043
Iran	[4] 4	[4] 3	5	7	4
Japan	2,580	2,712	3,864	3,996	4,776
Korea:					
Republic of	4	[5] 5	[5] 3	1	[2] 1
North [2]	400	500	250	250	300
Taiwan (Formosa)	36	39	87	144	143
Turkey	293	308	306	400	538
Africa:					
Southern Rhodesia	81	96	94	110	[2] 160
Union of South Africa	956	1,036	1,254	1,353	1,445
Oceania:					
Australia [6]	1,168	1,202	1,540	1,663	1,930
New Caledonia [2]	80	80	80	80	80
New Zealand	5	6	6	7	[2] 7
Total (estimate)	166,000	182,000	204,000	207,000	224,000

[1] Includes revisions of data published previously.
[2] Estimate.
[3] National Resources Commission only.
[4] Year ended Mar. 20 of year following that stated.
[5] Includes gashouse coke.
[6] Year ended June 30 of year stated.

TABLE 45.—World production of gashouse, low-, and medium-temperature coke (excluding breeze), 1949–53, by country, in thousands of metric tons [1]

[Compiled by Pauline Roberts]

Country [2]	1949	1950	1951	1952	1953
North America:					
Canada	239	220	222	159	[3] 140
United States	[4] 344	[4] 158	[4] 115	[4] 41	211
South America:					
Argentina [3]	50	50	50	50	50
Chile	124	122	116	113	[3] 110
Peru, medium-temperature	[3] 20	[3] 20	[3] 20	20	[3] 20
Uruguay	28	33	34	36	36
Europe:					
Austria	564	556	457	454	383
Belgium	34	28	23	21	20
Czechoslovakia [3]	400	450	450	450	450
Denmark	378	363	408	417	376
Finland	68	68	76	115	119
France:					
Gashouse	1,510	1,441	1,572	1,490	1,315
Low-temperature	236	252	272	279	267
Germany:					
East [3]	276	300	348	408	335
West:					
Gashouse	2,705	3,139	3,696	4,203	4,208
Low-temperature	602	665	691	702	724
Greece	16	[3] 25	31	30	[3] 30
Hungary [3]	110	115	120	120	120
Ireland (Eire)	169	175	179	179	177
Italy	982	1,067	1,092	1,113	1,046
Luxembourg	30	31	33	32	31
Netherlands	1,015	996	958	928	824
Norway [5]	59	61	61	65	[3] 68
Poland:					
Gashouse [3]	375	400	400	400	400
Low-temperature	85	[3] 90	[3] 90	[3] 95	[3] 95
Portugal	15	25	27	28	34
Saar:					
Gashouse	2	1	----------	----------	----------
Low-temperature	38	51	87	94	83
Spain	214	200	216	222	227
Sweden	579	576	608	671	617
Switzerland	[5] 396	[5] 410	[5] 466	[5] 458	300
United Kingdom	11,624	11,994	12,522	12,733	12,502
Northern Ireland	170	167	176	173	173
Yugoslavia	31	37	[3] 40	[3] 40	[3] 30
Asia:					
Ceylon	13	14	15	[3] 15	[3] 15
India:					
Gashouse	81	77	76	90	[3] 90
Low-temperature	1,042	1,289	1,278	1,310	1,670
Japan:					
Gashouse	1,308	1,332	1,692	1,884	2,136
Low-temperature [3]	175	175	190	120	120
Korea, Republic of	6	[3] 6	[3] 3	1	1
Malaya	11	11	14	[3] 15	[3] 15
Taiwan (Formosa)	1	[3] 1	[3] 1	[3] 1	4
Turkey:					
Gashouse	54	56	60	60	63
Low-temperature	71	69	72	42	----------
Africa:					
Algeria	87	88	96	92	52
Canary Islands	1	1	(6)	(6)	(6)
Egypt	23	23	27	[3] 27	[3] 27
Tunisia	19	13	13	16	[3] 16
Union of South Africa	[3] 70	[3] 70	[3] 75	[3] 75	94
Oceania:					
Australia [7]	1,200	1,067	1,130	1,223	[3] 1,225
New Zealand	97	100	61	[3] 60	[3] 60
Total (estimate)	30,000	31,000	33,000	34,000	34,000

[1] Gashouse coke unless otherwise specified.
[2] Production data for China, Mexico, Rumania, and U. S. S. R. are not available; estimates for these countries included in total.
[3] Estimate.
[4] Retort coke only.
[5] Includes breeze.
[6] Less than 500 tons.
[7] Year ended June 30 of year stated.

COAL-CHEMICAL MATERIALS

GENERAL SUMMARY

The synthetic organic chemical industry of the United States was established during World War I, largely from chemical raw materials obtained from the carbonization of coal. In the past 2 decades, technologic developments in the chemical industries have resulted in significant changes in the supply of raw materials. Products formerly made solely from the carbonization of coal are now being obtained from the processing of petroleum and natural gas. However, carbonization of coal is still an important source of some of the basic organic chemicals, such as benzene, toluene, phenol, and naphthalene, which are sometimes referred to as the building blocks for such end products as synthetic rubber, plastics, textiles, dyes, drugs, explosives, and a host of other essential materials. The rapid growth in the synthetic organic chemical industry since World War I tremendously increased the requirements of chemical raw materials. The oven-coke industry expanded also, but its rate of growth was governed largely by the growth of the iron and steel industry. Thus, while the oven-coke industry has grown at the rate of only about 2 percent annually since 1920, the growth in demand for synthetic organic chemicals, particularly aromatic, has exceeded 15 percent a year since World War II, and consumption of certain important aromatic products has climbed 20 to 40 percent yearly despite their costly production from petroleum. According to reports published by the United States Tariff Commission, the value of synthetic organic chemicals swelled from about \$206 million in 1918 to over \$4 billion in 1953. In this same period, the value of coal-chemical materials, including surplus coke-oven gas, at oven-coke plants increased only from \$74.6 million to \$346.5 million.

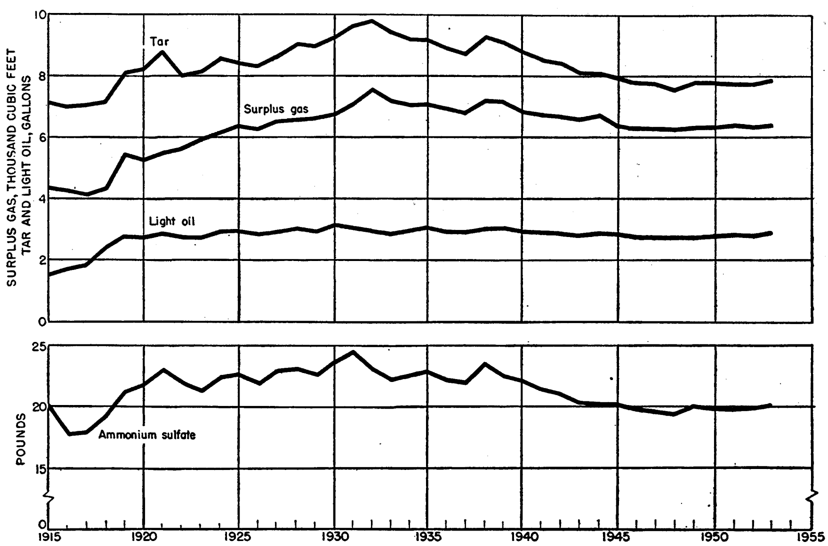

FIGURE 2.—Average yield of principal coal-chemical materials per net ton of coal carbonized in coke ovens, 1915–53. Yields of light oil and ammonium sulfate equivalent represent average for plants recovering these products.

The astronomical rise in value of synthetic organic chemicals was due, in addition to increased supply of raw materials from coal carbonization, to the tremendous growth in production of the so-called "petrochemicals." The high-temperature carbonization of coal in the United States has been applied more to the manufacture of coke for metallurgical uses than to the recovery of chemicals. In this process roughly 75 percent by weight of the coal charged into the ovens is recovered as coke, about 17 percent as gas, and the remaining 8 percent as chemical raw materials. It is apparent, therefore, that the economy of the high-temperature coking process in conventional coke ovens is governed largely by the markets for coke and to a smaller extent by markets for gas and chemical raw materials. Figure 3 shows the shifts in values of the products from coke ovens since 1929. In that year, coke and breeze represented 60 percent of the total value of all products, increased steadily in the ensuing years, and reached a peak of 77 percent in 1949. Since then the percentage has declined slightly and in 1953 was 75 percent.

The position of surplus gas as a revenue producer in the coke industry has changed drastically since 1929. In that year, surplus gas represented 19 percent of the total value of all products. The proportions of total value supplied by surplus gas increased during the depression years and reached 21 percent by 1939. Since then, the proportion of the total value of coke-oven products supplied by surplus gas declined steadily and in 1953 represented only 10 percent. The expansion and extension of natural-gas pipelines into areas using coke-oven gas caused many utilities to discontinue the distribution of coke-oven gas and to convert to natural gas.

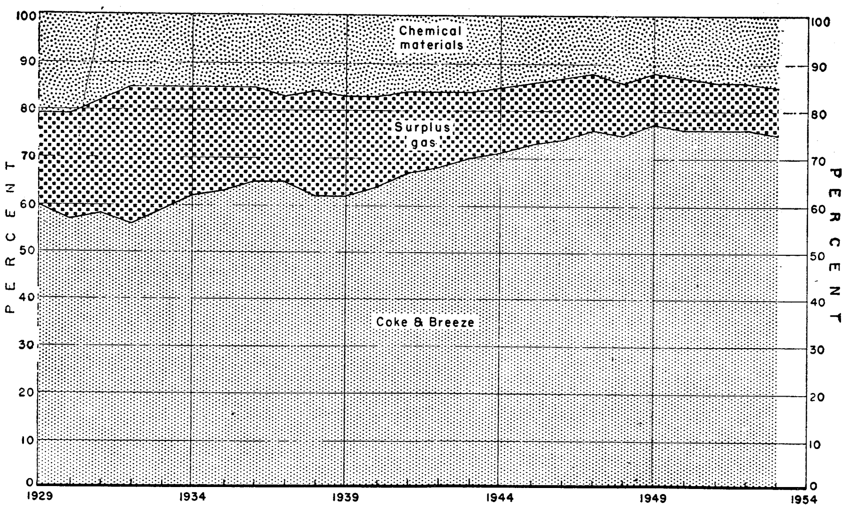

FIGURE 3.—Percentage of total value of coke-oven products from slot-type ovens supplied by coke and breeze, surplus gas, and chemical materials, 1929–53.

The value of chemical raw materials amounted to 21 percent of the total in 1929; but the proportionate share of revenue dropped sharply in subsequent years, principally because of the large reduction in prices of tar, ammonium sulfate, benzene, and toluene. Between 1929–39, the average unit value of ammonium sulfate dropped from \$0.018 per pound in 1929 to \$0.011 per pound, tar from \$0.051 per gallon to \$0.048, benzene (all grades) from \$0.169 to \$0.102 per gallon, and toluene from \$0.386 to \$0.194 per gallon. The low prices of coal chemicals that prevailed before World War II were, in most instances, unchanged during the emergency period by Government regulations, but coke prices were increased to compensate producers for increases in their coal and manufacturing costs. Thus the proportion of total value credited to coke and breeze increased, while gas and coal chemicals decreased. In 1949 the proportion credited to chemical raw materials was only 12 percent of the total value of all products. The substantial increase in benzene prices since 1949 (from \$0.189 to \$0.384), was responsible for the rise in proportion of value credited to coal chemicals (15 percent) in 1953.

The values of the various coal-chemical materials per ton of coal carbonized are shown in table 47. The value of ammonia and its compounds and other products declined slightly in 1953, but those for light oil and its derivatives, gas, and tar increased.

The total value of surplus gas used and sold, together with value of commercial sales of all other coal-chemical materials, totaled \$346.5 million, a new record. However, the value of surplus gas used under boilers and in affiliated steel works represented approximately one-third of this total. Benzene was the leading revenue producer in 1953, based on commercial sales, and furnished about one-fourth of the total revenue obtained from sales of coal chemicals. Detailed statistics on production and sales of coal-chemical materials are shown in table 46.

TABLE 46.—Coal-chemical materials produced at coke-oven installations in the United States in 1953 [1]

[Exclusive of breeze]

Product	Produced	Sold: Quantity	Sold: Value: Total	Sold: Value: Average	On hand Dec. 31
Tar, crude ... gallons	828,728,761	448,504,349	$46,070,522	$0.103	33,494,891
Tar derivatives:					
Creosote oil, distillate as such ... do	31,342,703	31,303,068	6,031,444	.193	2,141,065
Creosote oil, in coal-tar solution ... do	5,983,719	5,640,797	952,312	.169	42,977
Crude chemical oil ... do	24,812,283	23,690,856	6,147,300	.259	1,438,607
Phenol ... pounds	9,656,959	7,355,938	1,115,065	.152	331,256
Pitch of tar:					
Soft [2] ... net tons	579,641	55,528 (Soft and Hard)	1,542,260	27.774	8,011
Hard [3] ... do	301,529				5
Other tar derivatives [4]			2,061,011		
Ammonia:					
Sulfate ... pounds	1,892,266,104	1,678,791,696	37,726,492	.022	315,177,365
Liquor (NH_3 content) ... do	49,691,507	39,267,730	1,658,366	.042	1,615,979
Total			39,384,858		
Sulfate equivalent of all forms ... pounds	2,091,032,132	1,835,862,616			321,641,281
NH_3 equivalent of all forms ... do	522,758,033	458,965,654			80,410,320
Gas:					
Used under boilers, etc. ... M cubic feet	[5]1,069,140,519 (all gas uses)	53,748,111	7,573,669	.141	
Used in steel or allied plants ... do		480,541,315	93,915,597	.195	
Distributed through city mains ... do		99,523,061	39,011,656	.392	
Sold for industrial use ... do		39,144,163	7,226,434	.185	
Total	[5]1,069,140,519	672,956,650	147,727,356	.220	
Crude light oil ... gallons	[6]295,725,435	18,438,408	4,616,477	.250	4,089,341
Light-oil derivatives:					
Benzol:					
Specification grades (1°, 2°, and 90%) ... gallons	175,579,003	170,456,681	65,767,936	.386	8,457,413
Other industrial grades ... do	2,013,762	1,948,525	711,163	.365	123,455
Motor grade ... do	1,160,043	1,150,220	183,687	.160	25,444
Toluol (all grades) ... do	36,036,486	35,444,655	11,074,653	.312	1,281,760
Xylol (all grades) ... do	9,928,224	9,759,168	3,118,497	.320	642,843
Solvent naphtha (crude and refined) gallons	6,285,346	6,068,379	1,522,532	.251	513,388
Other light-oil products ... do	6,097,437	3,257,336	447,791	.137	306,029
Total	237,100,301	228,084,964	82,826,259	.363	11,350,332
Intermediate light oil ... gallons	1,062,422	1,065,467	204,362	.192	58,687
Naphthalene (crude):					
Solidifying at less than 74° C ... pounds	56,676,867	52,974,072	1,938,497	.037	5,310,151
Solidifying at 74° and less than 79° C. pounds	56,260,347	38,568,039	2,448,929	.063	6,438,493
Pyridine:					
Crude bases (dry basis) ... gallons	550,965	455,561	963,257	2.114	221,554
Refined (2° C.) ... pounds	1,292,415	973,463	1,086,024	1.116	340,776
Picolines ... do	762,470	755,753	280,668	.371	31,398
Sodium phenolate ... gallons	2,934,813	2,806,380	624,890	.223	823,679
Sulfur ... pounds	8,585,290	8,826,460	119,553	.014	1,594,960
Other coal-chemical materials [7]			378,349		
Value of all coal-chemical materials sold			346,519,393		

[1] Includes products of tar distillation conducted by coke-oven operators under same corporate name.
[2] Water-softening point, less than 110° F. Includes some medium pitch-of-tar reported by 2 producers.
[3] Water-softening point, above 160° F. Sales and value included with soft pitch-of-tar to avoid disclosure of individual company figures.
[4] Cresols, cresylic acid, pitch coke, road tar, tar paint, and topped or refined tar.
[5] Includes gas used for heating ovens and gas wasted.
[6] 278,905,871 gallons refined by coke-oven operators to make derived products shown.
[7] Ammonium thiocyanate and holder oil.

TABLE 47.—Value of coal-chemical materials, coke, and breeze per ton of coal carbonized in the United States, 1947–49 (average) and 1950–53

Product	1947–49 (average)	1950	1951	1952	1953
Ammonia and its compounds	$0.356	$0.330	$0.352	$0.391	$0.376
Light oil and its derivatives (including naphthalene)	.451	.613	.830	.808	.875
Surplus gas sold or used	1.292	1.393	1.353	1.353	1.408
Tar and its derivatives:					
Sold	.501	.526	.597	.594	.609
Tar burned by producers	.130	.091	.107	.123	.127
Other products	.020	.028	.036	.036	.035
Total	2.750	2.981	3.275	3.305	3.430
Coke produced	8.488	9.477	9.945	10.178	10.296
Breeze produced	.191	.196	.194	.204	.215
Grand total	11.429	12.654	13.414	13.687	13.941

TABLE 48.—Percentage of value of coal recovered by coal-chemical materials in the United States, 1947–49 (average) and 1950–53

	Coal value recovered (percent)				
	1947–49 (average)	1950	1951	1952	1953
Product:					
Ammonia and its compounds	4.6	3.8	3.9	4.2	4.0
Light oil and its derivatives (including naphthalene)	5.8	7.1	9.3	8.7	9.5
Surplus gas sold or used	16.6	16.1	15.1	14.7	15.2
Tar and its derivatives	6.4	7.1	7.9	7.8	6.6
Other products	.2	.3	.4	.4	.4
Total	33.6	34.4	36.6	35.8	35.7
Value of coal per net ton	$7.79	$8.67	$8.94	$9.23	$9.24

TABLE 49.—Coal equivalent of the thermal materials, except coke, produced at oven-coke plants in the United States, 1913, 1918, 1929, 1939, 1947–49 (average), and 1951–53

Year	Materials produced				Estimated equivalent in heating value [1] (billion B. t. u.)					Coal equivalent (thousand net tons)
	Coke breeze (thousand net tons)	Surplus gas (billion cubic feet)	Tar (thousand gallons)	Light oil (thousand gallons)	Coke breeze	Surplus gas	Tar	Light oil	Total	
1913	735	64	115,145	3,000	14,700	35,200	17,272	390	67,562	2,600
1918	1,999	158	263,299	87,562	39,980	86,900	39,495	11,383	177,758	6,785
1929	4,853	508	680,864	200,594	97,060	279,400	102,130	26,077	504,667	19,262
1939	3,354	434	554,406	170,963	67,080	238,700	83,161	22,225	411,166	15,693
1947-49 (av.)	5,390	582	715,779	246,607	107,800	320,100	107,367	32,059	567,326	21,654
1951	5,126	653	795,311	284,497	102,520	359,150	119,297	36,985	617,952	23,586
1952	4,639	576	703,890	249,284	92,780	316,800	105,584	32,407	547,571	20,900
1953	5,253	673	828,729	295,725	105,060	370,150	124,309	38,444	637,963	24,350

[1] Breeze, 10,000 B. t. u. per pound; gas, 550 B. t. u. per cubic foot; tar, 150,000 B. t. u. per gallon; and light oil, 130,000 B. t. u. per gallon.

COKE-OVEN GAS

Production of coke-oven gas in 1953 totaled 1,069.1 billion cubic feet, a new record. Slightly more than one-third of the gas recovered was used to heat the coke ovens. The remainder (surplus gas) was used by producers in integrated metallurgical operations and under boilers, or sold for distribution through city mains for public use. Most of the gas produced at coke plants integrated with iron and steel works was used in steel-melting furnaces (open hearths). The value assigned to this gas was, therefore, governed by the accounting procedures of the respective companies. In 1953, 83 percent of the surplus gas at furnace-coke plants was burned in steel or allied plants and assigned a value of $0.195 per thousand cubic feet. The merchant plants, including those operated by gas utilities, used only 18 percent of their surplus gas and sold 82 percent. The coke-oven gas distributed through city mains by the merchant plants averaged $0.445 per thousand cubic feet. Of the coke-oven gas distributed through city mains, more than two-thirds was supplied by the merchant plants; however, the total quantity distributed through city mains was the lowest since 1926. The proportion of coke-oven gas distributed through city mains fluctuated widely in the past two decades and ranged from 64 percent of the surplus in 1932 to 15 percent in 1953. Detailed data on surplus gas are given in table 51.

TABLE 50.—Production and distribution of coke-oven gas in the United States in 1953, by States, in thousands of cubic feet

State	Produced		Used in heating ovens	Surplus sold or used			Wasted
	Total	Per ton of coal coked		Quantity	Value		
					Total	Average	
Alabama	85,176,199	9.46	40,680,223	42,521,520	$4,946,807	$0.116	1,974,456
California	14,166,894	11.47	865,067	12,229,798	(1)	(1)	1,072,029
Colorado	16,511,055	11.74	8,429,406	7,975,124	(1)	(1)	106,525
Illinois	48,928,165	9.91	18,335,965	30,006,575	4,272,081	.142	585,625
Indiana	120,446,989	9.68	39,972,041	78,958,760	18,368,012	.233	1,516,188
Maryland	47,477,300	10.52	9,386,262	37,540,301	(1)	(1)	550,737
Massachusetts	12,836,501	10.64	1,801,620	11,034,881	(1)	(1)	----------
Michigan	42,717,285	9.90	7,296,187	35,368,482	7,506,785	.212	52,616
Minnesota	12,787,752	10.51	4,889,766	7,219,652	1,701,956	.236	678,334
New Jersey	18,042,153	10.89	5,064,765	12,977,388	(1)	(1)	----------
New York	69,955,796	10.56	21,829,893	47,122,513	14,195,460	.301	1,003,390
Ohio	167,587,734	10.03	67,079,822	97,641,560	19,876,341	.204	2,866,352
Pennsylvania	276,748,725	10.14	108,349,507	163,356,598	37,731,085	.231	5,042,620
Tennessee	2,791,691	9.28	1,230,563	1,558,551	(1)	(1)	2,577
Texas	11,403,010	10.93	4,673,478	4,657,783	(1)	(1)	2,071,749
Utah	26,716,944	12.09	6,415,976	17,525,353	(1)	(1)	2,775,615
West Virginia	64,022,210	11.00	17,389,476	45,678,550	7,420,268	.162	954,184
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	30,824,116	10.31	10,498,261	19,583,261	6,940,732	.354	742,594
Undistributed	------------	-------	------------	------------	24,767,829	.235	----------
Total 1953	1,069,140,519	10.19	374,188,278	672,956,650	147,727,356	.220	21,995,591
At merchant plants	153,560,648	10.08	48,450,268	103,153,468	35,945,833	.348	1,956,912
At furnace plants	915,579,871	10.21	325,738,010	569,803,182	111,781,523	.196	20,038,679
Total 1952	922,631,185	10.15	330,306,433	576,358,364	122,982,113	.213	15,966,388

[1] Included with "Undistributed" to avoid disclosure of individual company figures.

TABLE 51.—Surplus coke-oven gas sold and used by producers in the United States in 1953, by States, in thousands of cubic feet

State	Used by producers—						Sold					
	Under boilers			In steel or allied plants			Distributed through city mains			For industrial purposes		
	Quantity	Value		Quantity	Value		Quantity	Value		Quantity	Value	
		Total	Average		Total	Average		Total	Average		Total	Average
Alabama	12,154,090	$1,260,472	$0.104	22,917,585	$2,911,716	$0.127	6,036,089	(1)	(1)	1,413,756	(1)	(1)
California	3,259,249	(1)	(1)	8,636,792	(1)	(1)	---	---	---	333,757	(1)	(1)
Colorado	---	---	---	7,975,124	(1)	(1)	---	---	---	---	---	---
Illinois	4,132,493	377,437	.091	11,571,754	1,814,829	.157	14,302,328	$2,079,815	$0.145	---	---	---
Indiana	5,286,693	1,035,214	.196	54,665,730	(1)	(1)	6,082,487	2,948,855	.485	12,923,850	(1)	(1)
Maryland	---	---	---	37,540,301	(1)	(1)	---	---	---	---	---	---
Massachusetts	650	(1)	(1)	---	---	---	11,034,231	(1)	(1)	---	---	---
Michigan	1,284,843	(1)	(1)	32,166,578	6,946,253	.216	---	---	---	1,917,061	(1)	(1)
Minnesota	522,996	62,086	.119	3,200,922	(1)	(1)	2,384,829	(1)	(1)	1,110,905	(1)	(1)
New Jersey	332,600	(1)	(1)	93	(1)	(1)	12,644,695	(1)	(1)	---	---	---
New York	2,059,704	(1)	(1)	25,392,772	6,672,298	.263	19,379,149	7,148,522	.369	290,888	(1)	(1)
Ohio	7,246,180	1,494,408	.206	80,888,417	16,823,526	.208	360,995	(1)	(1)	9,145,968	(1)	(1)
Pennsylvania	7,571,402	1,172,412	.155	136,853,205	28,253,511	.206	16,058,182	(1)	(1)	2,873,809	(1)	(1)
Tennessee	386,926	(1)	(1)	---	---	---	1,171,625	(1)	(1)	---	---	---
Texas	3,259,490	(1)	(1)	1,363,235	(1)	(1)	---	---	---	35,058	(1)	(1)
Utah	31,894	(1)	(1)	17,130,619	(1)	(1)	---	---	---	362,840	(1)	(1)
West Virginia	4,083,866	(1)	(1)	40,238,188	6,904,059	.172	---	---	---	1,356,496	(1)	(1)
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	2,135,035	373,136	.175	---	---	---	10,068,451	5,418,315	.538	7,379,775	$1,149,281	$0.156
Undistributed	---	1,798,504	.122	---	23,589,405	.181	---	21,416,149	.431	---	6,077,153	.191
Total 1953	53,748,111	7,573,669	0.141	480,541,315	93,915,597	0.195	99,523,061	39,011,656	0.392	39,144,163	7,226,434	0.185
At merchant plants	10,686,655	1,365,397	0.128	7,657,164	1,566,148	0.205	67,193,020	29,895,570	0.445	17,616,629	3,118,718	0.177
At furnace plants	43,061,456	6,208,272	.144	472,884,151	92,349,449	.195	32,330,041	9,116,086	.282	21,527,534	4,107,716	.191
Total 1952	45,479,955	5,939,637	0.131	367,510,295	65,939,749	0.179	120,172,674	44,295,161	0.369	43,195,440	6,807,566	0.158

1 Included with "Undistributed" to avoid disclosure of individual company figures.

TABLE 52.—Coke-oven gas and other gases used in heating coke ovens in 1953, by States, in thousands of cubic feet [1]

State	Coke-oven gas	Producer gas	Blue-water gas	Blast-furnace gas	Other gases [2]	Total coke-oven gas equivalent
Alabama	40,680,223				265,094	40,945,317
California	865,067			4,636,991		5,502,058
Colorado	8,429,406					8,429,406
Illinois	18,335,965			4,987,295		23,323,260
Indiana	39,972,041			2,126,772	2,042,353	44,141,166
Maryland	9,386,262			9,406,000		18,792,262
Massachusetts	1,801,620	3,496,388				5,298,008
Michigan	7,296,187			10,971,472		18,267,659
Minnesota	4,889,766	493,337	19,555			5,402,658
New Jersey	5,064,765	915,000			1,979,502	7,959,267
New York	21,829,893	4,104,144		79,398	146,400	26,159,835
Ohio	67,079,822			4,885,534		71,965,356
Pennsylvania	108,349,507	2,031,450		5,108,143	227,070	115,716,170
Tennessee	1,230,563					1,230,563
Texas	4,673,478					4,673,478
Utah	6,415,976			3,974,002		10,389,978
West Virginia	17,389,476			7,022,956	2,110,700	26,523,132
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	10,498,261	3,417,843			288,165	14,204,269
Total 1953	374,188,278	14,458,162	19,555	53,198,563	7,059,284	448,923,842
At merchant plants	48,450,268	13,672,816			6,870,710	68,993,794
At furnace plants	325,738,010	785,346	19,555	53,198,563	188,574	379,930,048
Total 1952	330,306,433	16,218,658	901	42,100,603	11,985,749	400,612,344

[1] Adjusted to an equivalent of 550 B. t. u. per cubic foot.
[2] Butane, liquefied-petroleum, natural, refinery-oil, and spillage gases.

CRUDE COAL TAR AND DERIVATIVES

Crude coke-oven tar is a black, viscous liquid that condenses from the volatile matter during the high-temperature carbonization of coal. The yield of tar varies widely from plant to plant, depending on the kind of coal carbonized, oven temperatures, completeness of tar recovery, and other factors. Yields varied from 9.56 to 5.67 gallons per ton of coal in 1953 and averaged 7.90 gallons for the industry.

Crude tar may be utilized as fuel or it may be distilled into various tar products. In the early days of the oven-coke industry, most of the tar was burned by the producers in integrated or affiliated steel works. The quantity that was not burned was sold to refiners for processing into tar products. The early tar-refining plants were operated independently of the coke ovens, although many were established near the ovens to be close to the source of supply. However, as new markets for coal-tar products developed, the burning of tar diminished, and more tar was available for distillation, and some of the coke-oven operators began to distill or top their tar. This practice expanded in the ensuing years as more coke plants installed tar-processing equipment. Topping is primarily to strip the low-boiling fraction (distillation range usually under 300° C.), which is rich in tar acids, bases, and naphthalene from the crude tar. The distillate or crude chemical oil is sold to tar refineries for further processing. The residual tar or soft pitch is generally used by the producing company as fuel. Other coke-oven operators distill their tars to pitches of medium hardness and then flux such pitches with crude tar or highly aromatic fuel oils. The distillates in such instances

TABLE 53.—Coke-oven tar produced, used by producers, and sold in the United States in 1953, by States, in thousands of gallons

State	Produced		Used by producers—				Sold					On hand Dec. 31
									Total			
										Value		
	Total	Gallons per ton of coal coked	For refining or topping [1]	As fuel under boilers	In open hearth or allied plants	Otherwise	For use as fuel [2]	For refining into tar products	Quantity	Total	Average per gallon	
Alabama	65,173	7.24	1,250	-----	12,329	224	-----	51,202	51,202	$5,118,323	$0.100	2,355
California	11,486	9.30	-----	-----	-----	-----	-----	11,485	11,485	(3)	(3)	347
Colorado	13,445	9.56	10,623	-----	2,489	-----	-----	326	326	(3)	(3)	536
Illinois	34,111	6.91	12,147	266	-----	386	-----	29,886	29,886	3,227,038	.108	2,834
Indiana	74,229	5.97	15,667	-----	1,302	671	9	56,430	56,439	5,726,193	.101	4,262
Maryland	36,605	8.11	-----	-----	35,206	2	-----	1,282	1,282	(3)	(3)	1,769
Massachusetts	9,591	7.95	-----	-----	-----	-----	-----	9,640	9,640	(3)	(3)	87
Michigan	28,560	6.62	-----	-----	-----	-----	-----	28,277	28,277	3,007,219	.106	1,439
Minnesota	9,030	7.42	-----	-----	172	-----	4,182	4,570	8,752	872,266	.100	785
New Jersey	13,169	7.95	-----	-----	-----	628	-----	13,264	13,264	(3)	(3)	123
New York	52,630	7.94	20,122	-----	-----	87	270	30,433	30,703	3,385,350	.110	3,374
Ohio	125,649	7.52	4,783	2,799	14,841	228	9,978	90,052	100,030	9,592,843	.096	5,181
Pennsylvania	251,886	9.23	170,206	87	41,934	66	2,552	36,905	39,457	4,093,380	.104	7,500
Tennessee	2,144	7.13	-----	-----	-----	-----	-----	2,144	2,144	(3)	(3)	53
Texas	5,918	5.67	-----	-----	-----	42	-----	5,974	5,974	(3)	(3)	314
Utah	21,097	9.55	-----	-----	15,908	-----	-----	5,366	5,366	(3)	(3)	938
West Virginia	52,560	9.03	19,650	-----	-----	-----	-----	32,804	32,804	3,808,332	.116	808
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	21,446	7.17	-----	-----	-----	39	-----	21,473	21,473	2,266,155	.106	790
Undistributed	-----	-----	-----	-----	-----	-----	-----	-----	-----	4,973,423	.101	-----
Total 1953	828,729	7.90	254,448	3,152	124,181	2,373	16,991	431,513	448,504	46,070,522	0.103	33,495
At merchant plants	115,825	7.60	1,250	-----	-----	668	-----	113,546	113,546	11,943,886	0.105	4,249
At furnace plants	712,904	7.95	253,198	3,152	124,181	1,705	16,991	317,967	334,958	34,126,636	0.102	29,246
Total 1952	703,890	7.74	219,892	1,666	107,734	2,758	5,192	371,956	377,148	37,803,630	0.100	31,145

[1] Includes 6,088,000 gallons valued at $627,093 also shown under "Sold—for refining into tar products."
[2] Comprises 12,536,000 gallons sold to affiliated companies and 4,455,000 gallons sold to other consumers.
[3] Included under "Undistributed" to avoid disclosure of individual company figures.

contain more creosote in addition to the tar acids, bases, and naphthalene contained in the distillates from the softer residues. At other plants the tar is distilled to hard pitch, which is added to the coal charged into the coke ovens.

In 1953 coke-oven operators processed 31 percent of the total production and sold 52 percent to tar refineries. Of the 254 million gallons of tar processed by coke-oven operators, 60 percent was topped, and the balance was distilled to a higher temperature range to make creosote oil.

Although the quantities of crude tar used as fuel have declined in recent years, substantial quantities are still burned. In 1953, 15 percent of the total production was burned. Iron and steel companies operating coke ovens either burn or sell their tar, depending on the economics involved. Merchant-coke plants, however, do not burn tar and, unless tar-processing facilities are available, must market their entire output.

The principal commerical tar products produced by coke-oven operators are creosote oil and crude chemical oil (tar-acid oil). Production of creosote oil decreased 5 percent in 1953, but crude chemical oil increased 22 percent. Although the volume of crude chemical oil sold was 13 million gallons less than creosote, the value of sales was almost the same because of the higher unit price of the chemical oil.

COKE-OVEN AMMONIA

Production of coke-oven ammonia reached a new record of 522.8 million pounds in 1953, a gain of 17 percent over 1952 and 23.9 million pounds above the previous maximum of 1951. Although coke ovens were the principal source of chemical nitrogen in the United States before the 1930's, synthetic-ammonia plants have increased capacity tremendously in the past 2 decades, particularly since the beginning of World War II, and production of coke-oven ammonia was only one seventh of the United States production in 1953.

Coke-oven ammonia is recovered either in water solution (ammonia liquor) or as a crystallized ammonium sulfate. In 1953, 80 of the 83 active plants recovered ammonia, 67 made ammonium sulfate, and 15 made ammonia liquor (2 plants made both sulfate and liquor). Most of the coke-plant operators convert the ammonia into ammonium sulfate. In 1953, 90 percent of the total ammonia recovered was made into sulfate, all of which was used as a nitrogenous fertilizer. Part of the ammonia liquor, which is a relatively strong solution of ammonia in water, was used for making soda ash, ammonium chloride, and sulfuric acid and part for agricultural purposes.

The yield of ammonia per ton of coal varied among plants in 1953, but the industrial average yield has not varied much in the past decade. The 1953 average yield was 20.09 pounds of ammonia per ton of coal, which was slightly higher than in 1952 but substantially below the yields obtained during the midthirties, when ovens were operated at lower temperatures to lengthen coking cycles, which tended to increase ammonia yields.

TABLE 54.—Coke-oven ammonia produced and sold in the United States in 1953, by States, in thousands of pounds

State	Active plants (1)	Produced				Sold as—				On hand Dec. 31	
		Sulfate equivalent	Pounds per ton of coal coked	As sulfate	As liquor (NH_3 content)	Sulfate		Liquor (NH_3 content)		Sulfate	Liquor (NH_3 content)
						Quantity	Value	Quantity	Value		
Alabama	7	192,434	21.38	183,354	2,270	133,549	$3,174,401	2,252	(2)	50,723	51
California	1	28,787	23.30	28,787		22,822	(2)			5,883	
Colorado	1	31,502	22.40	31,502		27,916	(2)			7,267	
Illinois	7	91,334	18.83	91,334		109,883	2,511,191			10,998	
Indiana	5	216,515	17.40	182,789	8,432	161,283	3,714,974	1,230	$40,389	27,727	163
Maryland	1	90,716	20.10	90,716		89,661	(2)			5,942	
Massachusetts	1	22,486	18.63	22,486		18,031	(2)			5,085	
Michigan	4	80,878	18.74	30,237	12,660	27,254	(2)	11,055	(2)	3,448	391
Minnesota	3	22,955	18.87	22,954		22,743	529,968			1,278	
New Jersey	2	30,739	18.56	30,739		30,352	(2)			2,604	
New York	5	150,142	22.66	128,205	5,484	118,682	2,627,587	5,316	(2)	16,448	92
Ohio	16	327,387	19.58	277,457	12,482	240,300	5,280,057	11,105	450,085	44,681	442
Pennsylvania	14	565,010	20.71	562,380	658	485,244	10,418,971	673	(2)	110,770	31
Tennessee	1	6,196	20.60	6,196		5,913	(2)			364	
Texas	2	20,736	19.87	20,736		18,067	(2)			3,303	
Utah	2	55,882	25.30	55,882		52,743	(2)			4,083	
West Virginia	4	110,291	20.73	110,291		98,553	2,119,598			13,978	
Connecticut, Kentucky, Missouri, and Wisconsin	4	47,044	17.35	16,221	7,706	15,796	365,935	7,637	309,150	595	446
Undistributed							6,983,810		858,742		
Total 1953	80	[3] 2,091,034	20.09	1,892,266	49,692	1,678,792	37,726,492	39,268	1,658,366	315,177	1,616
At merchant plants	22	290,112	20.18	177,084	28,257	163,112	3,753,391	32,022	1,345,324	20,561	1,359
At furnace plants	58	1,800,922	20.08	1,715,182	21,435	1,515,680	33,973,101	7,246	313,042	294,616	257
Total 1952	79	1,781,301	19.92	1,604,825	44,119	1,605,092	33,960,125	39,451	1,563,588	81,013	1,633

[1] Number of plants that recovered ammonia.
[2] Included with "Undistributed" to avoid disclosure of individual company figures.
[3] Difference from figure reported in table 46 due to rounding to thousands of pounds.

CRUDE LIGHT OIL AND DERIVATIVES

A new record was established for coke-oven light oil in 1953, when production reached 295.7 million gallons. This total was 4 percent above the previous maximum of 1951, largely the result of the peak tonnage of coal charged into slot-type ovens and to an improvement in yields. The yield of crude light oil was the highest since 1941, because of improvement in coal quality and increased efficiency of scrubbing and refining facilities at the coke plants. Crude light oil, when fractionally distilled, yields about 64 percent benzene, 14 percent toluene, 5 percent xylene, 8 percent other aromatic hydrocarbons and derivatives, and 9 percent contaminants, such as distillation forerunnings, unsaturated hydrocarbons, and absorbent oil. Actual yields at oven-coke plants in 1953 and prior years are shown in table 56.

Coke-oven operators refined 94 percent of the crude light oil produced. The coke industry supplied the bulk of the benzene used in the United States in 1953, furnishing 65 percent of the total United States production. Production of benzene from certain petroleum fractions increased sharply in 1953 and represented 23 percent of the total, production from tar distillation supplied the balance (12 percent). Part of the benzene made by the tar distillers was produced from imported crude benzene. Although coke ovens were the principal source of toluene and xylene before World War II, the petroleum industry supplied the bulk of these two chemicals in 1953. Coke-plant operators produced only 23 percent of the national production of toluene and 9 percent of the xylene. Output of coke-oven solvent naphtha, an aromatic material used mainly as a solvent, increased slightly in 1953. Details on production and sales of the light-oil derivatives are shown in tables 55 and 57.

CRUDE NAPHTHALENE

Coal carbonization was the source of virtually all of the naphthalene originating in the United States in 1953. Experimental quantities were produced by coal hydrogenation in a large-scale pilot plant operated by the Carbide & Carbon Chemical Corp. at Institute, W. Va. Coal hydrogenation will probably provide large quantities of naphthalene in future. Coke-plant operators recover crude naphthalene either from the refining of crude light oil and coal tar or from the final coolers. The commercial grades of crude naphthalene are determined by the melting point of the material. Crude grades ranging from 74° to 79° C. are suitable for some industrial uses without further refining. Crude naphthalene below 74° has virtually no direct commercial use and is sold by the coke-plant operators to tar refiners for further processing and upgrading. As shown in table 46, about half of the naphthalene recovered by coke-plant operators in 1953 was less than 74° C. Some of the crude naphthalene produced (melting point, above 74°) was used by the producers for the production of phthalic anhydride and other intermediate products. The balance of this grade was sold for direct application into intermediate chemicals.

TABLE 55.—Coke-oven crude light oil produced in the United States and derived products produced and sold in 1953, by States, in gallons

State	Active plants[1]	Crude light oil				Derived products		
		Produced	Per ton of coal coked	Refined on premises[2]	On hand Dec. 31	Produced	Sold[3]	
							Quantity	Value
Alabama	7	22,625,743	2.51	22,191,571	275,965	18,959,283	18,343,287	$6,723,024
California	1	3,453,329	2.80	3,456,302	8,543	3,046,781	2,674,944	(4)
Colorado	1	4,958,027	3.53	4,890,600	27,644	4,229,962	4,206,915	(4)
Illinois	7	12,921,221	2.66	8,934,990	180,204	7,466,530	7,567,407	2,772,507
Indiana	4	31,593,145	2.74	32,363,898	315,966	27,051,411	26,564,118	9,392,811
Maryland	1	14,421,582	3.20	16,268,411	236,664	14,089,673	13,212,735	(4)
Massachusetts	1	3,595,162	2.98	3,775,647	49,627	3,355,192	3,126,199	(4)
Michigan	4	10,839,810	2.51	6,275,070	117,619	5,608,361	5,290,606	1,925,228
New Jersey	1	2,998,521	2.59	------	9,100	------	------	------
New York	5	20,531,500	3.10	26,712,117	407,227	22,824,753	21,706,848	8,180,045
Ohio	16	48,902,841	2.93	44,679,243	514,670	36,177,165	35,610,803	12,897,350
Pennsylvania	14	82,413,123	3.02	78,751,436	1,398,520	68,086,938	65,010,827	23,332,429
Tennessee	1	790,360	2.63	789,311	5,039	708,197	446,891	(4)
Texas	2	2,614,108	2.51	2,614,108	11,059	2,258,231	2,249,220	(4)
Utah	2	8,222,124	3.72	8,240,387	80,882	6,597,913	6,691,535	(4)
West Virginia	5	18,248,536	3.14	16,264,299	181,565	14,302,039	13,095,241	4,790,494
Connecticut, Kentucky, Missouri, and Wisconsin	4	6,596,303	2.43	2,698,481	269,047	2,337,872	2,287,388	796,217
Undistributed	------	------	------	------	------	------	------	12,016,154
Total 1953	76	295,725,435	2.90	278,905,871	4,089,341	237,100,301	228,084,964	82,826,259
At merchant plants	20	33,196,059	2.51	24,205,547	1,055,162	21,436,298	19,311,703	6,880,183
At furnace plants	56	262,529,376	2.96	254,700,324	3,034,179	215,664,003	208,773,261	75,946,076
Total 1952	79	249,283,837	2.79	237,312,046	3,990,324	204,600,586	199,801,721	65,219,720

[1] Number of plants that recovered crude light oil.
[2] Comprises 276,570,632 gallons of crude light oil from own production and 2,335,239 gallons purchased from other coke plants.
[3] Excludes 18,438,408 gallons of crude light oil valued at $4,616,477 sold as such.
[4] Included with "Undistributed" to avoid disclosure of individual company figures.

TABLE 56.—Yield of light-oil products from refining crude light oil at oven-coke plants in the United States, 1929, 1939, 1947–49 (average), and 1951–53, in percent.

Year	Benzol		Toluol, crude and refined	Xylol, crude and refined	Solvent naphtha	Other light-oil products
	Motor	All other grades				
1929	54.4	12.8	9.4	(1)	3.7	3.4
1939	48.6	15.4	12.1	2.5	2.9	3.8
1947-49 (average)	6.5	59.2	11.7	3.1	2.3	3.3
1951	1.9	63.9	12.7	3.4	2.2	2.6
1952	(2)	65.4	12.9	3.4	2.0	2.6
1953	.4	63.7	12.9	3.6	2.2	2.2

[1] Included with solvent naphtha.
[2] Included with "Other light-oil products" to avoid disclosure of individual company figures.

TABLE 57.—Benzene and toluene produced at oven-coke plants in the United States, 1941, 1947–49 (average), and 1951–53, by grades, in gallons

Year	Benzene				Toluene		
	Motor	Nitration or 1° C.	Pure commercial or 2° C.	All other	Nitration or 1° C.	Pure commercial or 2° C.	All other
1941	106,372,000	15,414,500	18,286,400	4,182,600	14,689,800	13,268,500	1,378,900
1947-49 (average)	15,246,900	38,335,100	98,395,100	2,535,900	21,407,400	5,529,200	568,600
1951	5,103,700	45,057,500	123,315,700	4,476,100	24,772,500	8,689,700	839,300
1952	(1)	46,211,300	104,030,800	4,872,200	21,342,000	7,613,400	1,567,100
1953	1,160,000	51,566,400	120,939,500	5,086,900	26,834,400	8,330,500	871,600

[1] Withheld to avoid disclosure of individual company figures.

TABLE 58.—Crude naphthalene produced and sold by coke-plant operators in the United States, 1947–49 (average) and 1950–53

Year	Produced (pounds)	Sold		
		Pounds	Value	
			Total	Average per pound
1947–49 (average)	90,969,911	84,134,022	$3,467,526	$0.041
1950	99,729,587	102,657,724	4,425,894	.043
1951	125,579,578	130,200,785	6,849,831	.053
1952	106,903,506	96,457,812	4,961,657	.051
1953	112,937,214	91,542,111	4,387,426	.048

COKE OVENS OWNED BY CITY GAS COMPANIES

(PUBLIC UTILITIES)

Table 59 separates carbonization activities of oven-coke plants operated by gas utilities from those owned by other interests for 1952 and 1953 to provide data on the coking operations of city gas works proper and to indicate their relative importance to the oven-coke industry. Before the development of long-distance natural-gas pipelines in the United States, slot-type coke-ovens operated by gas utilities furnished a large part of the manufactured gas distributed for residential and commercial heating. The number of oven-coke plants operated by gas utilities reached a peak in 1934, when 23 such plants were active. In that year, gas utility plants produced 11 percent of the United States oven-coke output, 12 percent of the crude coke-oven tar and gas, 9 percent of the coke-oven ammonia, and 4 percent of the crude light oil. Vigorous competition from natural gas immediately before and since World War II has reduced the number of gas-utility coke plants. The latest plant to retire its coke ovens permanently was the Providence Gas Co., which closed its Providence, R. I., coking operations in December. This reduced the number of active plants at the end of the year to 5, and 1 of these was expected to close as soon as coal stocks were lowered. Utility plants produced 3 percent each of total oven coke, crude tar, coke-oven gas, and ammonia and 1 percent of the crude light oil.

TABLE 59.—Coke, breeze, and coal-chemical materials produced in the United States at oven-coke plants owned by city gas companies (public utilities) [1] compared with all other oven-coke plants, 1952–53

Product	1952			1953		
	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total
Number of active plants	76	8	84	77	6	83
Coke:						
Produced ... net tons	61, 120, 358	2, 729, 757	63, 850, 115	71, 235, 958	2, 357, 570	73, 593, 528
Value	$878, 383, 963	$46, 916, 485	$925, 300, 448	$1, 037, 472, 389	$42, 831, 767	$1, 080, 304, 156
Average per ton	$14. 37	$17. 19	$14. 49	$14. 56	$18. 17	$14. 68
Breeze:						
Produced ... net tons	4, 394, 518	244, 851	4, 639, 369	5, 046, 623	206, 864	5, 253, 487
Sold ... do	1, 121, 829	10, 029	1, 131, 858	1, 342, 965	4, 011	1, 346, 976
Value of sales	$5, 505, 452	$66, 961	$5, 572, 413	$7, 064, 600	$28, 601	$7, 093, 201
Average per ton	$4. 91	$6. 68	$4. 92	$5. 26	$7. 13	$5. 27
Coal carbonized:						
Bituminous ... net tons	86, 899, 003	3, 803, 632	90, 702, 635	101, 358, 237	3, 290, 093	104, 648, 330
Anthracite ... do	178, 933	27, 927	206, 860	234, 007	40, 590	274, 597
Total ... do	87, 077, 936	3, 831, 559	90, 909, 495	101, 592, 244	3, 330, 683	104, 922, 927
Value	$798, 716, 344	$40, 584, 378	$839, 300, 722	$933, 306, 490	$36, 001, 878	$969, 308, 368
Average per ton	$9. 17	$10. 59	$9. 23	$9. 19	$10. 81	$9. 24
Coke—						
Used by producers:						
Net tons	41, 028, 732	451, 863	41, 480, 595	50, 472, 155	390, 237	50, 862, 392
Value	$562, 395, 338	$6, 214, 899	$568, 610, 237	$703, 071, 732	$5, 512, 397	$708, 584, 129
Sold:						
Net tons	19, 659, 908	2, 330, 378	21, 990, 286	20, 329, 320	1, 796, 233	22, 125, 553
Value	$309, 997, 836	$41, 539, 171	$351, 537, 007	$326, 189, 659	$34, 326, 923	$360, 516, 582
Coal-chemical materials:						
Tar:						
Produced ... gallons	672, 125, 418	31, 764, 235	703, 889, 653	802, 044, 151	26, 684, 610	828, 728, 761
Sold ... do	344, 973, 433	32, 174, 305	377, 147, 738	422, 028, 219	26, 476, 130	448, 504, 349
Value of sales	$34, 627, 261	$3, 176, 369	$37, 803, 630	$43, 175, 826	$2, 894, 696	$46, 070, 522
Ammonia:						
Produced (NH_3 equivalent of all forms) ... pounds	428, 181, 551	17, 143, 786	445, 325, 337	507, 364, 578	15, 393, 455	522, 758, 033
Liquor (NH_3 content):						
Produced ... do	42, 628, 776	1, 490, 384	44, 119, 160	48, 276, 077	1, 415, 430	49, 691, 507
Sold ... do	38, 658, 032	793, 458	39, 451, 490	38, 258, 965	1, 008, 765	39, 267, 730
Value of sales	$1, 536, 410	$27, 178	$1, 563, 588	$1, 623, 592	$34, 774	$1, 658, 366
Sulfate:						
Produced ... pounds	1, 542, 211, 099	62, 613, 609	1, 604, 824, 708	1, 836, 354, 004	55, 912, 100	1, 892, 266, 104
Sold ... do	1, 540, 840, 496	64, 251, 945	1, 605, 092, 441	1, 624, 457, 694	54, 334, 002	1, 678, 791, 696
Value of sales	$32, 612, 999	$1, 347, 126	$33, 960, 125	$36, 501, 834	$1, 224, 658	$37, 726, 492

See footnote 1 ,p. 274.

TABLE 59.—Coke, breeze, and coal-chemical materials produced in the United States at oven-coke plants owned by city gas companies (public utilities) [1] compared with all other oven-coke plants, 1952–53—Continued

Product	1952			1953		
	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total
Coal-chemical materials—Continued						
Gas:						
Produced ---- M cubic feet--	880, 978, 590	41, 652, 595	922, 631, 185	1, 034, 329, 004	34, 811, 515	1, 069, 140, 519
Disposal of surplus:						
Used under boilers:						
M cubic feet----	45, 479, 955	----	45, 479, 955	53, 634, 460	113, 651	53, 748, 111
Value----	$5, 939, 637	----	$5, 939, 637	$7, 539, 142	$34, 527	$7, 573, 669
Average per M cubic feet----	$0. 131	----	$0. 131	$0. 141	$0. 304	$0. 141
Used in steel or allied plants:						
M cubic feet----	367, 510, 295	----	367, 510, 295	480, 541, 315	----	480, 541, 315
Value----	$65, 939, 749	----	$65, 939, 749	$93, 915, 597	----	$93, 915, 597
Average per M cubic feet----	$0. 179	----	$0. 179	$0. 195	----	$0. 195
Distributed through city mains:						
M cubic feet----	83, 601, 103	36, 571, 571	120, 172, 674	72, 270, 652	27, 252, 409	99, 523, 061
Value----	$31, 441, 668	$12, 853, 493	$44, 295, 161	$28, 106, 058	$10, 905, 598	$39, 011, 656
Average per M cubic feet----	$0. 376	$0. 351	$0. 369	$0. 389	$0. 400	$0. 392
Sold for industrial use:						
M cubic feet----	41, 431, 595	1, 763, 845	43, 195, 440	37, 142, 817	2, 001, 346	39, 144, 163
Value----	$6, 072, 963	$734, 603	$6, 807, 566	$6, 580, 832	$645, 602	$7, 226, 434
Average per M cubic feet----	$0. 147	$0. 416	$0. 158	$0. 177	$0. 323	$0. 185
Crude light oil:						
Produced ---- gallons--	244, 950, 744	4, 333, 093	249, 283, 837	292, 249, 185	3, 476, 250	295, 725, 435
Sold ---- do----	11, 272, 740	3, 382, 163	14, 654, 903	14, 956, 294	3, 482, 114	18, 438, 408
Value of sales----	$2, 591, 206	$667, 243	$3, 258, 449	$3, 861, 693	$754, 784	$4, 616, 477
Light-oil derivatives:						
Produced ---- gallons--	203, 675, 384	925, 202	204, 600, 586	237, 100, 301	----	237, 100, 301
Sold ---- do----	198, 661, 238	1, 140, 483	199, 801, 721	228, 084, 964	----	228, 084, 964
Value of sales----	$64, 878, 328	$341, 392	$65, 219, 720	$82, 826, 259	----	$82, 826, 259
Naphthalene (crude):						
Produced ---- pounds--	106, 445, 786	457, 720	106, 903, 506	112, 937, 214	----	112, 937, 214
Sold ---- do----	96, 000, 092	457, 720	96, 457, 812	91, 542, 111	----	91, 542, 111
Value of sales----	$4, 943, 477	$18, 180	$4, 961, 657	$4, 387, 426	----	$4, 387, 426
All other coal-chemical materials, value----	$19, 434, 549	$56, 930	$19, 491, 479	$21, 388, 863	$117, 632	$21, 506, 495

[1] Coke ovens built by city gas companies, some of which are operated in conjunction with coal- and water-gas plants. Does not include independent oven-coke plants that may sell gas to public-utility companies for distribution.

Fuel Briquets and Packaged Fuel

J. A. DeCarlo and Maxine M. Otero

GENERAL SUMMARY

PRODUCTION of fuel briquets and packaged-fuel cubes or blocks dropped for the third consecutive year in 1953, reflecting a continuing decline in demand for these types of manufactured solid fuels. The output of briquets was 22 percent below 1952 and 39 percent less than the average for the base period, 1947–49. The decrease for packaged-fuel cubes was even greater, as the 1953 production was about half of the average for 1947–49. The growing acceptance of natural gas and fuel oil by home owners was a principal factor in the sharp decline in production. Other contributing factors were high costs for materials and manufacturing, which weakened the competitive position of these processed fuels in virtually every major residential-fuel market. As briquets and packaged-fuel cubes are primarily adapted for hand firing, they are subject to the further handicap of the trend toward automatic equipment. There are still, however, a large number of hand-fired furnaces and other heating equipment for which briquets and packaged-fuel cubes are ideally suited, and the cleanliness and ease of handling make them still attractive.

Although coal briquetting was started in the United States to utilize the large quantities of anthracite silt and culm for which there was no market, low-volatile bituminous coal quickly became the predominant raw fuel used in the manufacture of briquets and packaged-fuel cubes, and this type of coal still leads by a wide margin.

The two processed fuels differ widely, however, in the kind of binding material used. Petroleum asphalt is the principal binder used for manufacturing fuel briquets in the United States, as only three plants used other types of binders in 1953. Starch, mostly in the form of corn or wheat flour, is the principal binder employed in manufacturing packaged fuel. In 1953 only one plant used an asphaltic binder, while all others used starch in one form or another. In the manufacture of fuel briquets, an average of 142 pounds of binding material per ton of raw fuel was used in 1953, whereas only 14 pounds of binder was used in making packaged fuel.

The average value per net ton f.o.b. plant of fuel briquets in 1953 was \$11.86, an increase of \$0.13 per ton, whereas the average value per ton for packaged fuel (\$18.71) was substantially higher. There are several reasons for this difference in average values. Fuel briquets are made in large quantities for bulk shipment to wholesalers and retailers, with only a small percentage sold direct to consumers, while packaged fuel is made for local consumption in relatively small plants, resulting in higher manufacturing costs. The marketing of packaged fuel is also quite different, inasmuch as the preponderance of production is sold in small lots to consumers who pick up a supply in their passenger cars at the retail dealers' yards.

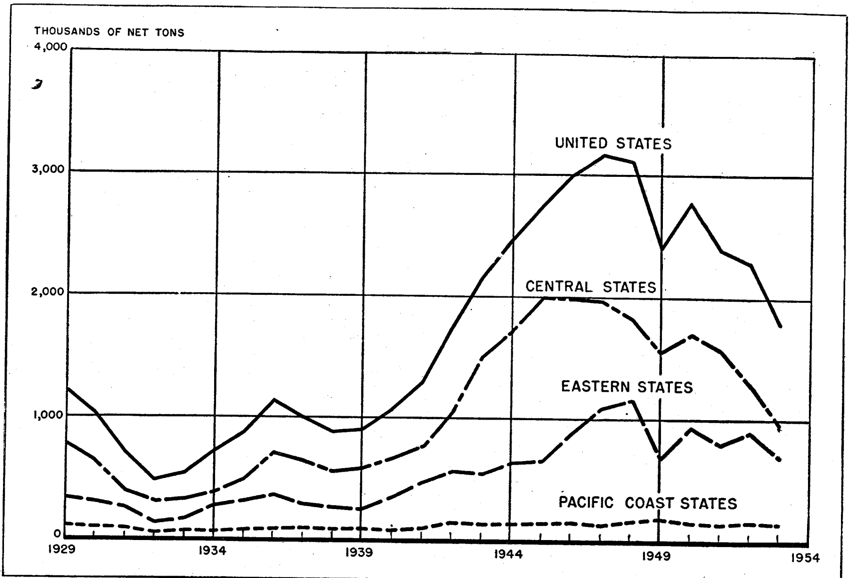

FIGURE 1.—Production of fuel briquets in the United States, 1929–53, by regions.

TABLE 1.—Salient statistics of the fuel-briquetting industry in the United States, 1947–49 (average) and 1950–53

	1947–49 (average)	1950	1951	1952	1953
Production:					
Eastern States .... net tons	971,895	934,635	796,359	886,627	[1] 819,153
Central States .... do	1,781,575	1,691,914	1,464,185	1,250,365	960,908
Pacific Coast States .... do	147,878	143,471	126,675	142,764	(2)
Total .... do	2,901,348	2,770,020	2,387,219	2,279,756	1,780,061
Value of production	$31,805,000	$32,039,379	$27,454,638	$26,743,120	$21,111,293
Average value per net ton, f. o. b. plant:					
Eastern States	$8.93	$9.50	$9.79	$10.00	$10.04
Central States	$11.84	$12.46	$12.31	$12.79	$12.91
Pacific Coast States	$13.77	$14.49	$12.90	$13.23	$13.52
Imports [3] .... net tons	360	804	123	168	97
Exports [3] .... do	207,928	175,768	168,780	132,786	102,907
Apparent consumption [4] .... do	2,693,780	2,595,056	2,218,562	2,147,138	1,677,251
World production .... do	62,000,000	90,000,000	97,000,000	99,000,000	100,000,000

[1] Includes Pacific Coast States.
[2] Combined with Eastern States to avoid disclosure of individual company figures.
[3] Compiled from records of U. S. Department of Commerce.
[4] Production plus imports minus exports.

TABLE 2.—Salient statistics of the packaged-fuel industry in the United States, 1947–49 (average) and 1950–53

	1947–49 (average)	1950	1951	1952	1953
Production:					
Eastern States .... net tons	1,656	[1] 135,682	[1] 119,535	[1] 96,267	[1] 79,732
Central States .... do	153,625				
Total .... do	155,281	135,682	119,535	96,267	79,732
Value of production	$2,618,238	$2,430,847	$2,169,539	$1,780,471	$1,492,119
Average value per net ton f. o. b. plant:					
Eastern States	$17.21	$17.19	$18.08	[1] $18.50	[1] $18.71
Central States	$16.86	$17.92	$18.15		

[1] Combined to avoid disclosure of individual company figures.

SCOPE OF REPORT

The statistics in this chapter, except where otherwise noted, are based on data voluntarily supplied to the Bureau of Mines by the manufacturers of fuel briquets and packaged fuel within the continental limits of the United States. Data on fuel briquets have been collected and published without interruption since 1907, when the Federal Geological Survey began an annual canvass of the industry. Statistics on packaged fuel, however, go back only to 1935. Briquets made from charcoal, wood scraps, and fruit pits are not included in the Bureau of Mines review. The base year has been changed from the average of the 4 years 1935–39 to 1947–49 to provide a period reflecting the changing pattern of fuel economy in the United States since World War II.

In 1953, questionnaires were sent to 40 fuel-briquet plants, and returns were received from 36. In the packaged-fuel industry, 53 plants were canvassed, with replies received from 44. In no instance was an attempt made to estimate for the nonreporting plants. For both fuel-briquet and packaged-fuel plants, the companies that did not reply were small, operating intermittently in previous years, and were assumed to be idle in 1953.

The standard unit of measurement used in this report is the short or net ton of 2,000 pounds.

FUEL BRIQUETS

CAPACITY

The annual productive capacity of the briquet industry declined slightly during 1953 and at the end of the year totaled 4.2 million tons. Briquet plants are larger operations than packaged-fuel plants, and

TABLE 3.—Annual capacity and production of briquetting plants in the United States, 1949–53

	Active plants	Annual capacity (net tons)	Production	
			Net tons	Percent of annual capacity
1949	33	4,616,360	2,403,971	52.1
1950	31	4,455,000	2,770,020	62.2
1951	28	4,406,680	2,387,219	54.2
1952	28	4,442,500	2,279,756	51.3
1953:				
Plants with capacity of—				
Less than 25,000 tons	---	---	---	---
25,000 to less than 100,000 tons	10	480,000	188,238	39.2
100,000 to less than 200,000 tons	8	876,000	319,433	36.5
200,000 to less than 400,000 tons	5	1,360,000	645,019	47.4
400,000 or more tons	3	1,500,000	627,371	41.8
Total	26	4,216,000	1,780,061	42,2
Plants with production of—				
Less than 5,000 tons	2	[1] 240,000	[1] 33,036	13.8
5,000 to less than 10,000 tons	3			
10,000 to less than 25,000 tons	3	170,000	55,651	32.7
25,000 to less than 100,000 tons	11	1,146,000	470,793	41.1
100,000 or more tons	7	2,660,000	1,220,581	45.9
Total	26	4,216,000	1,780,061	42.2

[1] Combined to avoid disclosure of individual company figures.

annual capacity averaged 162,000 tons per plant. The rate of production dropped markedly from 1952 to average 42.2 percent of capacity for the year. Smaller plants were affected to a greater extent by the decline in briquet demand than the larger operations. As indicated in table 3, the 8 plants that had an average capacity of over 200,000 tons a year operated at 44.5 percent of capacity compared with an average of 37.4 percent for the 18 plants having an average capacity of less than 200,000 tons.

DOMESTIC PRODUCTION

Briquetting converts coal fines or other pulverized material into coherent shapes by either directly compressing the fine material itself or by compacting an intimate mixture of the fine material and an appropriate binding agent. The briquets are produced in a variety of sizes, shapes, and weights, depending upon the purpose for which they are intended. Most of the briquets produced are pillow shaped and weigh about 3 ounces each. Fuel briquets are designed to be strong and durable to withstand railroad transportation, deterioration in storage, and rough treatment in mechanical fuel-handling equipment. Fuel-briquetting plants, usually of large capacity, are located at the mines, docks, or near large culm banks where fine coal is concentrated and seldom are operated in conjunction with a retail coalyard.

Production of fuel briquets has centered largely in areas wherever large quantities of fine coal are available. Thus, the principal bituminous-coal-and anthracite-mining areas and the docks along the Great Lakes continue as the principal sources of fuel briquets. The decline in briquet production in 1953 was general, with all of the producing regions sharing in the decrease. The Central States, including the States along the lakes, maintained their rank as the leading producing region with 54 percent of the total output in 1953. Wisconsin, located on the lakes, produced about two thirds of the tonnage made in this area. Production for the Eastern States and Pacific Coast States could not be shown separately in 1953 without disclosing individual company figures, and the total for the two regions was less than that for the Eastern States alone in 1952. The ranking States, in

TABLE 4.—Production and value of fuel briquets in the United States, 1952–53, by areas

Area [1]	1952			1953				
	Active plants	Production (net tons)	Value	Active plants	Production (net tons)	Value	Change from 1952 (percent)	
							Tonnage	Value
Eastern States	6	[2] 1,029,391	[2] $10,755,096	5	[2] 819,153	[2] $8,705,536	−20.4	−19.1
Central States	20	1,250,365	15,988,024	19	960,908	12,405,757	−23.1	−22.4
Pacific Coast States	2	(3)	(3)	2	(3)	(3)	(3)	(3)
Total	28	2,279,756	26,743,120	26	1,780,061	21,111,293	−21.9	−21.1

[1] Eastern States include Pennsylvania and West Virginia; Central States—Arkansas, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, North Dakota, and Wisconsin; Pacific Coast States—Oregon and Washington.
[2] Includes Pacific Coast States.
[3] Combined with Eastern States to avoid disclosure of individual company figures.

order of tonnage, in these two geographic areas were as follows: West Virginia, Pennsylvania, Oregon, and Washington. West Virginia alone produced 27 percent of the national total.

TABLE 5.—Production of fuel briquets in the United States in 1953, by months

Month	Net tons	Month	Net tons	Month	Net tons
January	241,904	May	69,271	September	181,949
February	152,596	June	103,601	October	236,734
March	79,000	July	111,564	November	205,064
April	57,862	August	131,017	December	209,499

Raw Fuels.—The briquetting process is applied to a wide variety of raw fuels, ranging from North Dakota lignite (after carbonization at low temperature) to Pennsylvania anthracite, petroleum coke, and residual carbon from oil-gas manufacture. The principal fuel in 1953 was bituminous coal, which represented 65 percent of the total raw fuels used. All but a small quantity of bituminous coal was of the low-volatile variety. Approximately 18 percent of Pennsylvania anthracite and 10 percent of residual carbon were also used. The remaining percentage was made up of semianthracite and anthracite (mostly from Arkansas), lignite char, and petroleum coke. Bituminous coal was used widely in the Eastern and Central States; Pennsylvania anthracite, either alone or combined with bituminous coal, was used in Pennsylvania and Wisconsin. Residual carbon was the only raw fuel used on the Pacific coast.

Binders.—One of the important factors in the briquetting of solid fuels is the binder. Although the Bureau does not collect information on the cost of raw materials, the cost of binders, no doubt, is one of the major expenses, and the manufacturers of briquets select with care the kind of binding material and the rate of application. An informative paper on briquet binders was presented at the Third Biennial Briquetting Conference held at Banff, Alberta, Canada, on August 31, 1953.[1] Petroleum asphalt is used almost exclusively and, based on reports received from the briquet producers, 117,000 tons was used. The percentage of binder used per ton of raw material ranged from 5 to 11 percent and averaged 7.1 percent for the entire industry. Only 1 plant used a mixture of petroleum asphalt and coal-tar pitch, and 2 plants reported that no binding material was used.

SHIPMENTS

According to reports submitted by producing companies, distribution of briquets was widespread, extending to 35 States, the District of Columbia, Alaska, Canada, Sweden, Japan, France, and Italy. Although shipments are extensive and in some instances cover great distances, the principal centers of consumption are the producing States. Wisconsin, the principal producing State, was the final destination of 18 percent of the total tonnage distributed in the United States. Missouri and Michigan followed in the order named, and the combined tonnage destined to consumers in these States amounted

[1] Miller, Joseph G., The Cost of Briquetting Binder.: Inf. Circ. 6, Proc. 3d Biennial Briquetting Conf., Natural Resources Research Inst., University of Wyoming, November 1953, pp. 23–29.

TABLE 6.—Raw fuels used in making fuel briquets in the United States in 1953

Type	Plants using raw fuels	Raw fuels used (net tons)
Anthracite:		
Pennyslvania	11	305,124
Other than Pennsylvania	2	[2] 49,060
Semianthracite	4	
Bituminous coal:		
Low-volatile	16	[2] 1,072,670
High-volatile	2	
Petroleum coke	3	73,366
Residual carbon from manufacture of oil gas	2	[2] 161,923
Semicoke (lignite char)	1	
Total	[3] 26	1,662,143

Source	Plants using raw fuels	Net tons: Yard screenings	Net tons: Other raw fuels	Net tons: Total
Yard screenings	1	(1)	----------	(1)
Raw fuels (other than yard screenings)	18	--------	1,125,233	1,125,233
Yard screenings and other raw fuels	7	348,728	188,182	536,910
Total	26	348,728	1,313,415	1,662,143

[1] Combined with "Yard screenings and other raw fuels" to avoid disclosure of individual company figures.
[2] Combined to avoid disclosure of individual company figures.
[3] Some plants used over 1 type of raw fuel; hence, the sum of the plants exceeds the total.

TABLE 7.—Number of briquetting plants in the United States, 1949–53, by type of binder used

Type	1949	1950	1951	1952	1953
No binder [1]	2	2	2	2	2
Asphalt	30	28	26	26	23
Asphalt and coal-tar pitch	1	1	--------	--------	1
Total	33	31	28	28	26

[1] Residual carbon from manufacture of oil gas was used as raw fuel necessitating no binder.

to 25 percent. Substantial tonnages were delivered in Minnesota, Indiana, and Illinois which combined totaled 25 percent. As in former years, Canada was the principal market outside the United States. The exported tonnage shown in the accompanying table differs from the data compiled by the United States Department of Commerce, Bureau of the Census. The Bureau of Mines figures include briquets made from residual carbon and petroleum coke, whereas the Bureau of the Census figures do not. Also, the Bureau of the Census does not include in its export data shipments to our Armed Forces overseas made by the Department of Defense, whereas such shipments are reported as exports to the Bureau by the producing companies.

VALUE

The total sales value, f. o. b. plants, of the briquets manufactured in 1953 was $21 million, a decrease of 21 percent from 1952. The average sales value per ton produced was $11.86 compared with $11.73 for 1952. The industry average is of doubtful significance because of the differences in cost of raw material and in prices of competing fuels in the various parts of the country. The average prices received in the three major sections of the country are shown in table 1. The lowest average per ton was in the Eastern States, largely because of

TABLE 8.—Destination of shipments of fuel briquets in 1952–53, in net tons

[Based upon reports from producers]

Destination	1952	1953	Destination	1952	1953
Arkansas	2, 351	5, 062	New York	12, 150	8, 930
California	36	953	North Carolina	33, 031	27, 941
Connecticut	1, 945	2, 263	North Dakota	73, 217	59, 430
Delaware	122	222	Ohio	91, 897	83, 725
District of Columbia	1, 143	1, 230	Oklahoma	----------	362
Florida	385	160	Oregon	48, 015	38, 244
Idaho	34	----------	Pennsylvania	21, 856	15, 639
Illinois	152, 913	108, 242	Rhode Island	908	593
Indiana	148, 230	122, 644	South Carolina	4, 441	2, 716
Iowa	59, 218	48, 277	South Dakota	79, 709	59, 849
Kansas	7, 686	7, 698	Tennessee	2, 811	2, 122
Kentucky	6, 550	5, 859	Vermont	1, 955	1, 437
Maine	6, 036	4, 289	Virginia	39, 857	34, 119
Maryland	13, 843	11, 904	Washington	19, 631	17, 214
Massachusetts	18, 312	16, 020	West Virginia	2, 009	1, 279
Michigan	231, 965	194, 428	Wisconsin	372, 632	280, 020
Minnesota	244, 137	158, 144			
Missouri	238, 802	200, 148	Total	1, 970, 351	1, 560, 877
Nebraska	19, 035	15, 165	Exported	290, 686	207, 618
New Hampshire	2, 203	2, 117			
New Jersey	10, 840	22, 432	Grand total	2, 261, 037	1, 768, 495
New Mexico	446	----------			

TABLE 9.—Shipments of fuel briquets in the United States, 1952–53, by method of transportation, in net tons [1]

Origin	1952			1953		
	Rail	Truck [2]	Total	Rail	Truck [2]	Total
Eastern States [3]	936, 181	89, 915	1, 026, 096	750, 647	72, 348	822, 995
Central States	842, 841	392, 100	1, 234, 941	620, 108	325, 392	945, 500
Pacific Coast States	(4)	(4)	(4)	(4)	(4)	(4)
Total	1, 779, 022	482, 015	[5] 2, 261, 037	1, 370, 755	397, 740	[5] 1, 768, 495

[1] Includes shipments destined for export as reported by producers directly to Bureau of Mines.
[2] Includes quantities shipped by barge.
[3] Includes Pacific Coast States.
[4] Combined with Eastern States to avoid disclosure of individual company figures.
[5] An additional 4,990 tons was used by 4 producers as fuel at their plants in 1952 and 260 tons by 2 producers in 1953.

lower raw material and freight charges. The average realization of the plants in the Central States was nearly $3 per ton higher than for the Eastern States because of higher fuel costs, due partly to freight charges. The highest plant values are in the Pacific Coast States, where the raw fuel is residual carbon from the manufacture of oil gas.

FOREIGN TRADE [2]

Imports of fuel briquets were insignificant, as only 97 tons, all of which came from Canada, entered the United States in 1953. Exports, however, which usually range between 5 and 10 percent of the production, declined 23 percent from 1952 and totaled 102,907 tons valued at $1,676,746. All but 154 tons of the briquets exported was destined to Canada, and over half of these Canadian shipments moved through the Buffalo customs district. Substantial tonnages also entered Canada at the Dakota, St. Lawrence, Duluth-Superior, and Michigan

[2] Figures on imports and exports compiled by Mae B. Price and Elsie D. Page, of the Bureau of Mines' from records of the U. S. Department of Commerce.

customs districts. As previously noted, export data shown in table 10, compiled from the records of the United States Department of Commerce, differ widely from the export figures reported by the producing companies to the Bureau of Mines (see discussion in Shipments section).

TABLE 10.—Fuel briquets (coal and coke) exported from the United States, 1951–53, by country of destination and customs district

[U. S. Department of Commerce]

	1951		1952		1953	
	Net tons	Value	Net tons	Value	Net tons	Value
COUNTRY						
Afghanistan	3	$180				
Bolivia					154	$2,379
Canada	168,676	2,387,477	132,751	$2,258,558	102,753	1,674,367
Cuba			30	2,131		
Dominican Republic			5	129		
El Salvador	101	2,000				
Total	168,780	2,389,657	132,786	2,260,818	102,907	1,676,746
CUSTOMS DISTRICT						
Buffalo	85,488	1,392,942	62,586	1,106,583	51,847	896,361
Dakota	24,324	302,515	25,050	327,619	19,714	232,891
Duluth and Superior	21,196	267,837	12,406	173,529	12,139	165,049
Maine and New Hampshire	1,077	18,955	1,885	32,274	994	18,850
Michigan	4,941	44,605	2,731	30,353	3,814	49,709
New Orleans	101	2,000				
New York	16,741	65,391	35	2,260		
Ohio					75	1,012
St. Lawrence	14,855	294,632	27,995	587,148	13,820	306,255
San Francisco	3	180				
Vermont	54	600	98	1,052		
Virginia					154	2,379
Other [1]					350	4,240
Total	168,780	2,389,657	132,786	2,260,818	102,907	1,676,746

[1] Estimated from sample data; district data not available.

TECHNOLOGY

Considerable research and technological studies have been made in recent years in a number of countries on the briquetting of solid fuels. The countries that have made the greatest strides in briquetting peat, lignite, and various ranks of coals are those where there are vast tonnages of such fuels which, in their natural state, do not lend themselves well to storage, handling, or combustion. In Germany, France, U. S. S. R., and Canada the so-called brown coal or lignite is very poor in its natural state but, when relieved of its excess moisture and briquetted, serves a definite economic need.

Developments and future possibilities for briquetting coal in western Canada were summarized in an article published in 1950.[3]

Extensive and systematic research has been conducted over many years in Germany, resulting in the adoption in March 1950 of tentative standards on briquet-plant operations and final standards for briquetting equipment similar to the technical standards on various materials and testing methods approved and published by the American Society for Testing Materials.

[3] Long, W. A., Briquetting of Alberta Coals: Trans. Canadian Inst. Min. and Met., vol. 53, 1950, 9 pp.

Briquetting in the United States and other countries was initiated primarily to upgrade or salvage waste, such as anthracite culm or silt, and degradations from low-volatile bituminous coal. However, the vast reserves of lignite and subbituminous coal of the United States offer promising possibilities for supplying future energy requirements, and studies on drying, carbonizing, and briquetting of these coals are being made by Government agencies, research laboratories, and colleges. One of the organizations interested in the briquetting of coals is the Natural Resources Research Institute of the University of Wyoming. As an outgrowth of briquetting-industry contacts, the institute sponsored the First Briquetting Conference at Laramie, Wyo., June 24–25, 1949. A number of papers were presented on various aspects of the fuel-briquet industry, among which were: (1) Latest developments in briquetting machinery, (2) availability and known properties of various binder materials, and (3) drying and preheating of coal for briquetting, etc. A complete report on this first meeting was published in October 1949.[4] A second biennial conference was held on August 2–3, 1951, at Superior, Wis., and among the topics covered were: (1) Developments and status of briquetting in Canada, Japan, Germany, and Australia, (2) binder materials, and (3) new machinery. The complete report was published in October 1951.[5] The latest or third conference was held at Banff, Alberta, Canada, August 31–September 2, 1953. Papers were presented and discussed on such topics as: (1) Fundamental aspects of coal briquetting, (2) briquetting binders, (3) briquetting properties of fluidized chars, (4) present status and recent developments of the German fuel-briquetting industry, (5) cleaning coal for briquetting, and (6) various other subjects pertinent to the industry. The results of the Third Biennial Briquetting Conference were published in November 1953.[6]

PACKAGED FUEL

CAPACITY

Packaged-fuel plants usually are operated as part of the normal business procedure of retail coalyards and, as such, are not of large capacity. Seventy percent, or 26 of the 37 active plants in 1953, had yearly capacities of less than 5,000 tons. Of the remainder, only 2 had annual capacities in excess of 25,000 tons. The manufacture of packaged fuel follows the heating seasons closely, and output fluctuates widely during the year. Thus, the rate of production ranges from low in summer months to high during the winter. However, the annual averages for the last 4 years have ranged from a low of 26.8 percent of capacity in 1952 to 46.2 percent in 1950. In 1953, the rate of production averaged 34.2 percent. The total capacity of the industry dropped 35 percent in 1953.

[4] Natural Resources Research Institute, University of Wyoming, Proceedings of a Coal Briquetting Conference: Inf. Circ. 3, October 1949, 118 pp.
[5] Natural Resources Research Institute, University of Wyoming, Proceedings of a Coal Briquetting Conference: Inf. Circ. 5, October 1951, 100 pp.
[6] Natural Resources Research Institute, University of Wyoming, Proceedings of the Third Biennia Briquetting Conference: Inf. Circ. 6, November 1953, 106 pp.

TABLE 11.—Annual capacity and production of packaged-fuel plants in the United States, 1949–53

	Active plants	Annual capacity (net tons)	Production	
			Net tons	Percent of annual capacity
1949	57	331,300	125,948	38.0
1950	54	293,560	135,682	46.2
1951	53	277,010	119,535	43.2
1952	43	358,858	96,267	26.8
1953:				
Plants with capacity of—				
Less than 5,000 tons	26	61,050	18,710	30.6
5,000 to less than 10,000 tons	6	43,800	12,860	29.4
10,000 to less than 15,000 tons	2	[1] 128,000	[1] 48,162	37.6
15,000 to less than 25,000 tons	1			
25,000 or more tons	2			
Total	37	232,850	79,732	34.2
Plants with production of—				
Less than 1,000 tons	19	39,150	7,188	18.4
1,000 to less than 3,000 tons	14	77,700	22,139	28.5
3,000 to less than 5,000 tons				
5,000 to less than 10,000 tons	2	[1] 116,000	[1] 50,405	43.5
10,000 or more tons	2			
Total	37	232,850	79,732	34.2

[1] Combined to avoid disclosure of individual company figures.

DOMESTIC PRODUCTION

Packaged fuel is the trade name applied by the industry to a combination of briquetting and packaging of the fine coal (screenings) or other raw fuels compressed into 3- or 4-inch cubes, wrapped (generally 6 to the package) in sturdy brown paper sealed with gum tape, and to be burned in the package for home consumption. The average weight per package in 1953 was 10.9 pounds. Packaged fuel is made for local sale and cannot withstand rough treatment after manufacture, as it is not designed for bulk handling, and special methods must be employed to move it. Most of the packaged-fuel plants are relatively small and were first designed for use by retail dealers as a means to utilize the fine coal resulting from breakage of larger sizes in shipment and handling.

The manufacture of packaged fuel originated around 1928 to utilize the degradations resulting from the handling of coarser sizes of solid fuels at retail coalyards. The cleanliness and ease of handling packaged fuel appealed to many homeowners, and by 1935 production was 25,244 tons. Output increased steadily in the ensuing years and reached a peak in 1940, when 285,000 tons valued at $2.4 million was produced. Since that time, however, vigorous competition from natural gas and fuel oil has adversely affected the market for packaged fuel, and production has declined sharply. In the past 4 years, output dropped about 12 percent annually.

Production of packaged fuel in 1953 was the lowest since 1936, and the number of active plants (37) dropped to the lowest figure since 1935. Michigan continued as the leading producing State, and its 12 active plants in 1953 supplied 42 percent of the total packaged-fuel production. Ohio, with 11 producers and 17 percent of the national output, ranked second, and Wisconsin, with only 3 plants, produced almost as much as Ohio. As indicated in table 13, production of packaged fuel is highly seasonal and in 1953 was lowest during June and July and highest during January, February, and December.

TABLE 12.—Production and value of packaged fuel in the United States, 1952–53, by States

State	1952			1953				
	Active plants	Production (net tons)	Value	Active plants	Production (net tons)	Value	Change from 1952 (percent)	
							Tonnage	Value
Indiana	3	12,676	$251,640	3	10,567	$211,200	−16.6	−16.1
Michigan	15	37,989	647,308	12	33,483	577,362	−11.9	−10.8
Minnesota	3	6,420	153,697	3	4,715	113,735	−26.6	−26.0
Ohio	13	17,872	341,694	11	13,885	272,850	−22.3	−20.1
Wisconsin	4	18,654	327,312	3	13,701	245,397	−26.6	−25.0
Other States [1]	5	2,656	58,820	5	3,381	71,575	+27.3	+21.7
Total	43	96,267	1,780,471	37	79,732	1,492,119	−17.2	−16.2

[1] Comprises 2 plants in Illinois and 1 plant each in Iowa, Nebraska, and Virginia.

TABLE 13.—Production of packaged fuel in the United States in 1953, by months

Month	Net tons	Month	Net tons	Month	Net tons
January	11,676	May	3,359	September	5,526
February	10,183	June	499	October	7,993
March	9,529	July	332	November	9,562
April	8,296	August	2,400	December	10,377

Raw Fuels.—Bituminous low-volatile coal was the principal fuel used in manufacturing packaged fuel and represented 94 percent of the total quantity of raw fuels used in its manufacture in 1953. Small quantities of bituminous high-volatile coal, semianthracite, and petroleum coke were also used. Although the number of plants using yard screenings is far greater, 55 percent of the raw fuels used is slack coal purchased directly from the mines. Five plants used a mixture of yard screenings and other raw fuels.

Binders.—Table 15 shows the number of plants active in 1953 and the type of binders used. Although portland cement was the binding agent used at the two plants first reported making packaged fuel in the United States (1928–30), none was used in 1953. Starch was the predominant type of binder and was used by all but one plant, which used a petroleum asphalt. Starch is preferred because it makes a stronger cube or block than asphalt or pitch and does not add any ash or volatile matter to the product. Portland cement increases the ash content, and petroleum asphalt and coal-tar pitch tend to make the packaged fuel smoky. The amount of starch added varied from 10 to 20 pounds per ton of coal and averaged 14.1 pounds for the entire industry in 1953. The quantity of starch used in the manufacture of packaged fuel in 1953 was about 437 tons.

TABLE 14.—Raw fuels used in making packaged fuel in the United States in 1953

Type	Plants using raw fuels	Raw fuels used (net tons)
Bituminous coal:		
Low-volatile	31	74,331
High-volatile	3	2,092
Semianthracite	1	[1] 2,736
Petroleum coke	4	
Total	[2] 37	79,159

Source	Plants using raw fuels	Net tons: Yard screenings	Net tons: Other raw fuels	Net tons: Total
Yard screenings	22	18,822		18,822
Raw fuels (other than yard screenings)	10		43,349	43,349
Yard screenings and other raw fuels	5	3,064	13,924	16,988
Total	37	21,886	57,273	79,159

[1] Combined to avoid disclosure of individual company figures.
[2] Some plants used over 1 type of raw fuel; hence, the sum of the plants exceeds the total.

TABLE 15.—Number of packaged-fuel plants in the United States, 1949–53, by type of binder used

Type	1949	1950	1951	1952	1953
Starch	52	48	48	39	36
Asphalt	3	2	2	1	1
Starch and asphalt	1	1		1	
Cement	2	2	2	2	
Starch and cement			1		
Coal-tar pitch		1			
Total	[1] 57	54	53	43	37

[1] 1 plant used over 1 type of binder; hence, the sum of the plants exceeds the total.

SHIPMENTS

Table 16 shows the shipments of packaged fuel, by method of movement, for 1949–53. Packaged fuel was used almost exclusively for residential heating in the vicinity of the producing plants in 1953. Although precise figures on the quantity of packaged fuel picked up by the consumers in their own cars were not available, no doubt a substantial part of the tonnage shown as local sales, shipped by truck, was marketed in this way. Many of the packaged-fuel manufacturers have vending machines, and consumers may drive up at any hour of the day or night and obtain as many packages as needed. The small percentage of rail shipments over the years indicates that packaged fuel does not lend itself to shipments over long distances.

TABLE 16.—Shipments of packaged fuel in the United States, 1949–53, by method of transportation, in net tons

Year	Shipped by truck: Local sales	Shipped by truck: Other than local sales	Shipped by truck: Total	Shipped by rail	Total
1949	108,606	11,036	119,642	6,306	125,948
1950	112,962	13,774	126,736	7,814	134,550
1951	98,324	13,566	111,890	7,950	119,840
1952	76,874	9,698	86,572	6,864	93,436
1953	68,275	8,254	76,529	3,582	80,111

VALUE

The total sales value, f.o.b. plants, of the packaged fuel manufactured in 1953 was $1.5 million, a 16-percent decrease from 1952. The average sales value per ton increased $0.21 and reached $18.71, an all-time peak. Table 12 shows production and value, by State, for 1952–53. The value shown in this table represents the selling price of the packaged fuel f.o.b. plants, including cost of coal, binder, paper, tape, and manufacturing costs but does not include delivery costs. The average values varied rather widely among the States for which data can be shown because of the differences in the cost of labor, materials, and fuels in each State. Michigan had the lowest average value, while Minnesota had the highest. The average value for Michigan was influenced to some extent by several large producers who sold both to retailers and consumers.

WORLD REVIEW

The total world production of fuel briquets in 1953 was approximately 91 million metric tons, representing an increase of 1 million tons over 1952 output and 20 million tons over 1949. Table 17 shows production statistics by individual countries.

In 1953, Germany (East and West), the U. S. S. R., France, and Japan produced over 80 million metric tons or 88 percent of the world's production. East Germany continued to be the largest briquet producer, attaining an estimated output of 41.5 million tons in 1953. West Germany ranked second, with 21.5 million tons. The combined production in both areas of Germany was 69 percent of the world total.

Significant production increases in 1953 over 1952 were made in East Germany (Soviet-controlled) and the U. S. S. R., amounting to 2 million and 1.4 million metric tons, respectively. Small increases in output were also indicated in Poland and Hungary, both satellites of the U. S. S. R. Although production in the U. S. S. R. and satellite countries in 1953 showed the substantial increase of about 3.4 million tons, a decline of approximately 2.4 million tons occurred in other European countries, notably the United Kingdom, France, Belgium, and Spain, and in the United States.

Most of the fuel-briquet production in Europe is derived from lignite after treatment for removing the high moisture content in the raw material. However, large quantities of briquets (including patent fuel) are made from bituminous and anthracite fines and dust, particularly in the United Kingdom, France, and West Germany. Bituminous coal and anthracite are the principal raw materials in the United States and Japan, where the annual briquetted fuel production is approximately 2 million tons each, and in other smaller countries in Asia and North Africa.

TABLE 17.—World production of fuel briquets (and packaged fuel), 1949–53, by countries, in thousands of metric tons [1]

[Compiled by Pauline Roberts]

Country	1949	1950	1951	1952	1953
North America:					
Canada	460	410	359	645	643
United States:					
Briquets	2,181	2,513	2,166	2,068	1,615
Packaged fuel	114	123	108	87	72
Europe:					
Austria	28	46	80	50	17
Belgium	783	1,020	1,810	1,483	1,323
Bulgaria [2]	150	200	200	225	225
Czechoslovakia:					
Bituminous coal	388	[2] 388	[2] 395	[2] 400	[2] 400
Lignite [2]	297	303	400	425	425
Denmark	39	[2] 40	51	[2] 20	[2] 20
Finland (capacity)	----------	80	[2] 80	[2] 80	[2] 80
France	6,270	6,312	8,047	7,941	6,983
Germany:					
East Germany, lignite [2]	30,000	38,000	39,500	39,500	41,500
West Germany:					
Bituminous coal	3,586	3,722	4,104	4,961	4,899
Lignite	14,250	14,912	15,924	16,403	16,580
Hungary [2]	100	125	150	160	175
Ireland [3]	17	28	27	32	31
Italy:					
Anthracite	} [2] 10	2	(4)	----------	----------
Lignite		----------	----------	----------	----------
Netherlands:					
Bituminous coal	992	1,049	1,062	945	904
Lignite	61	57	73	73	84
Poland:					
Bituminous coal	695	631	[2] 622	[2] 650	[2] 650
Lignite	170	169	[2] 159	[2] 165	[2] 170
Portugal	72	79	91	94	83
Rumania [2]	200	250	250	260	260
Spain	1,136	1,130	1,161	1,148	1,044
Sweden [3]	59	3	58	55	[2] 55
Switzerland [2]	100	100	100	100	100
U. S. S. R. [2] [3]	5,500	6,000	7,000	7,000	8,400
United Kingdom	1,536	1,419	1,775	1,805	1,599
Yugoslavia:					
Bituminous coal	} [2] 175	[2] 200	22	16	16
Lignite			[2] 178	178	[2] 178
Asia:					
Indochina	22	34	42	70	[2] 70
Indonesia	25	25	27	38	34
Japan [2]	1,000	1,500	1,800	[3] 2,100	[3] 2,100
Korea, Republic of	168	37	27	47	58
Pakistan	9	[2] 7	[2] 8	[2] 10	[2] 12
Turkey	40	29	30	37	[2] 37
Africa:					
Algeria	57	66	67	52	41
French Morocco	15	35	25	16	18
Tunisia	44	43	38	15	14
Oceania:					
Australia	[5] 568	[5] 598	[5] 520	569	569
New Zealand	14	11	11	11	[2] 11
Total (estimate)	71,000	82,000	89,000	90,000	91,000

[1] Contains revisions of data previously published.
[2] Estimate.
[3] Includes peat briquets.
[4] Less than 500 tons.
[5] Year ended June 30 of year stated.

Peat

J. A. DeCarlo and Maxine M. Otero

GENERAL SUMMARY

PRODUCTION of peat in the United States in 1953 decreased slightly (3 percent) from the record established in 1952 and totaled 204,209 net tons valued at $1,617,947. Peat is the first step in nature's transformation of vegetable matter, through chemical and microbiological processes, to coal. Peat is used as fuel in a number of European countries but is not so used in the United States because of ample supplies of superior fuels, with much higher calorific values, that do not contain the large amount of water present in raw peat. In this country, peat is used almost exclusively for agricultural and horticultural purposes; and its largest market is as a soil conditioner for lawns, golf courses, gardens, nurseries, and greenhouses. It is also employed as an ingredient or filler in mixed fertilizers; as litter for barns and poultry yards; as packing material for plants, shrubbery, eggs, fruit, vegetables, and fragile materials; and for other miscellaneous uses.

Although the Bureau of Mines does not collect detailed information on marketing methods, a number of the producers indicated that virtually all of their sales were in bulk shipment. In addition to bulk shipments by the cubic yard or ton, peat also is shipped in smaller lots in bags, bales, and crates. Recent improvements in bagging materials, including polyethylene products and other paper or textile bags treated with resins, make packaging more feasible, permitting shipment over long distances and storage for lengthy periods without deterioration of the bags or the product.

TABLE 1.—Salient statistics of the peat industry in the United States, 1947–49 (average) and 1950–53

	1947–49 (average)	1950	1951	1952	1953
Production.....net tons..	131,782	130,723	194,416	210,582	204,209
Imports.....do....	88,462	124,382	144,390	[1] 167,404	199,887
Apparent consumption.....do....	220,244	255,105	338,806	[1] 377,986	404,096
Value of production.....	$939,518	$1,142,566	$1,489,225	$1,729,511	$1,617,947
Average per net ton.....	$7.13	$8.74	$7.66	$8.21	$7.92
World production.....net tons..	50,000,000	56,000,000	58,000,000	60,000,000	58,000,000

[1] Revised figure.

Consumption of peat has risen sharply in the past 2 decades and in 1953 was nearly 5 times greater than in 1934 and nearly double that of the 1947–49 base period. Although the supply of domestically produced material has increased 55 percent since the base period, imports have risen 126 percent. Thus, imports have increased more rapidly than domestic output to supply the demand and in 1953 were nearly as large as the total domestic production. Germany and Canada are the principal sources of the foreign shipments. One of the principal reasons for the increased demand for peat is the decrease in organic waste material from livestock in and near our metropolitan areas, particularly in the eastern part of the United States. The two major selling seasons for peat are in the spring (February–April), when peat is used for mixing with heavy soils, and in the fall (August–October), when it is used for mulching.

GOVERNMENT REGULATIONS

The Federal Trade Commission established trade practice rules for the peat industry in January 1950. These rules were instituted by the Commission after general industry conferences and public hearings and were designed to foster and promote fair competitive practices to protect both the industry and the public. Copies of the rules can be obtained from the Federal Trade Commission, Washington 25, D. C.

Although these rules clearly outline definitions of the industry, product, use of terms and trade-marks, there are no standard specifications for general use for the various grades of peat suitable for different purposes. However, some municipal and State governments do specify standards for peat that they purchase, and all peat procured by the Federal Government must conform to specifications defined in the Federal Stock Catalog (section IV, part 5) Q–P 166–3 (November 1947).

Imports of peat moss, the only type imported, are subject to a 25-cent duty per ton. However, the duty is levied only on peat that meets certain specifications and is used for agricultural purposes.

SCOPE OF REPORT

The statistics presented in this chapter, unless otherwise specified, are voluntarily supplied annually to the Bureau of Mines by the producers of peat in the continental limits of the United States.

The Federal Geological Survey canvassed the peat-producing industry annually from 1908 until 1926. Since 1934, when the survey was resumed, the Bureau of Mines has collected statistics relating to location of operations, size of deposits, production by kinds, sales by uses, and total selling price or value at plant of the peat (exclusive of containers) by kind and by use. The Bureau does not collect any information on stocks, as producers normally do not stock peat.

The Bureau of Mines attempts to obtain complete coverage of all commercial producers of peat, but undoubtedly a few small producers operate part time and fail to submit data. As no attempt is made to estimate the output of these operations, data are based only on reports received by the Bureau. However, results obtained probably represent almost complete coverage of all commercial producers. To keep mailing lists up to date, companies canvassed are asked to provide the names and addresses of other producers in the vicinity, and lists of producers compiled by the various State organizations are used to supplement the mailing list.

The production figures shown are not adjusted for moisture and are on an air-dried basis only. Although peat is usually recovered and sold by the cubic yard, the unit of measurement in this chapter is the net (short) ton of 2,000 pounds.

RESERVES

The United States contains extensive reserves of peat in some 26 States. Table 2 shows the approximate distribution of known reserves, by region and State. Minnesota has the largest reserves, followed by Wisconsin, Florida, and Michigan in the order named. The northern region, embracing the New England States, those bordering on the Great Lakes, and Iowa contain 80 percent of the total deposits of the country. Three States in this region—Minnesota, Wisconsin, and Michigan—contain 75 percent of the estimated deposits of the country. The Atlantic coastal region holds 19 percent of the total peat reserves, and the Pacific and Gulf Coast States (exclusive of Florida) have less than 1 percent of the total.

Peat deposits vary in important characteristics because of surface vegetation and climatic and other conditions affecting their formation. The Minnesota and Wisconsin deposits are largely the result of the decomposition of mosses, grasses, sedges, heath shrubs, and trees, and the texture varies from fibrous in the top layer to plastic in the bottom layer. The peats of Iowa, Illinois, Indiana, Ohio, Pennsylvania, and New Jersey are of similar texture, although usually more fibrous. Sphagnum (moss) peat abounds in the deposits of northern Minnesota, Wisconsin, Michigan, and Maine, and some is also found in other New England States. Sedges dominate plant life in the salt marshes of the New England coast. Peat of the Atlantic coast region south of New Jersey is different in composition; there is little sphagnum in this region, and coniferous and deciduous trees both contributed a large proportion of the vegetable matter from which this peat was formed. The peat of the Everglades in Florida is composed largely of the remains of saw grass and sedge.

TABLE 2.—Known original reserves of peat in the United States, estimated on an air-dried basis, by region and State [1]

[Thousands of short tons]

Region and State	Reserves	Region and State	Reserves
Northern region:		Atlantic coastal region:	
Minnesota	6,835,000	Virginia and North Carolina	700,000
Wisconsin	2,500,000	Florida	2,000,000
Michigan	1,000,000	Other States [2]	2,000
Iowa	22,000		
Illinois	10,000	Total	2,702,000
Indiana	13,000		
Ohio	50,000	Other regions:	
Pennsylvania	1,000	Gulf Coast [3]	2,000
New York	480,000	California	72,000
New Jersey	15,000	Oregon and Washington	1,000
Maine	100,000		
New Hampshire	1,000	Total	75,000
Vermont	8,000		
Massachusetts	12,000		
Connecticut	2,000		
Rhode Island	1,000		
Total	11,050,000	Total, all regions	13,827,000

[1] Geological Survey, Coal Resources of the United States (Progress Report: Circ. 293, Oct. 1, 1953, p. 38).
[2] Includes Delaware, Maryland, South Carolina, and Georgia.
[3] Exclusive of Florida.

DOMESTIC PRODUCTION

There were 68 producers in 18 States in 1953. Production increased in 10 States, but, because of decreases in the 8 other States, total production declined 3 percent from output of 1952 (table 3).

Washington led all States in peat production and supplied about one-sixth of the total national output. Ohio replaced Michigan as the second largest producer, followed by Florida, Michigan, and New Jersey, and these five States produced 66 percent of the total output.

Over half of the production in 1953 was reported as peat humus. Reed or sedge peat comprised 37 percent of the total and the remainder was moss peat (table 4).

TABLE 3.—Peat produced in the United States, 1951–53, by States

State	1951		1952		1953	
	Net tons	Value	Net tons	Value	Net tons	Value
California	6,432	$42,016	10,527	$76,706	9,196	$73,897
Colorado	2,241	(1)	2,312	(1)	6,067	(1)
Connecticut	5,586	33,702	10,300	(1)	7,475	30,450
Florida	25,748	161,417	23,729	154,164	27,678	185,524
Georgia	2,250	(1)	2,150	(1)	2,305	(1)
Illinois	5,437	(1)	4,918	(1)	2,151	(1)
Indiana	5,699	22,824	10,115	49,775	6,919	41,049
Iowa	13,545	(1)	14,500	(1)	17,233	(1)
Maine	1,805	36,870	1,695	(1)	2,428	73,564
Massachusetts	318	(1)	351	(1)	2,061	15,962
Michigan	20,180	320,100	29,304	419,856	25,439	257,176
New Hampshire			20	(1)		
New Jersey	27,678	(1)	21,800	(1)	21,706	(1)
New York			1,606	(1)	3,775	46,307
Ohio	21,378	261,891	24,828	290,664	27,696	260,474
Pennsylvania	8,591	46,568	7,898	43,874	8,232	47,516
Texas	1,238	(1)	1,200	(1)	1,375	(1)
Washington	45,304	98,955	42,580	111,386	32,107	104,274
Wisconsin	986	(1)	749	(1)	366	(1)
Undistributed		464,882		583,086		481,754
Total	194,416	1,489,225	210,582	1,729,511	204,209	1,617,947

[1] Included with "Undistributed" to avoid disclosure of individual company figures.

TABLE 4.—Peat produced in the United States, 1952–53, by kinds

Kind	1952			1953		
	Net tons	Value		Net tons	Value	
		Total	Average per ton		Total	Average per ton
Moss [1]	15,053	$156,273	$10.38	18,595	$220,741	$11.87
Reed or sedge	63,312	627,739	9.92	74,708	659,188	8.82
Humus	132,217	945,499	7.15	110,906	738,018	6.65
Total	210,582	1,729,511	8.21	204,209	1,617,947	7.92

[1] Includes small quantity of "Other" types of peat reported by 2 producers.

CONSUMPTION AND USES

The principal use for peat is for soil improvement (table 5). Of the total sales reported for the year, 75 percent was so consumed. Although some peats contain a relatively high percentage of nitrogen (N) (3 percent or more), peat is not a natural fertilizer because the nitrogen present is not readily given up as plant food like the "soluble nitrogen" of artificial fertilizer. Peat contains a large percentage of organic matter (humus), a characteristic that makes it an excellent soil conditioner when used in sufficient quantities. The second largest use is as a conditioner and filler in mixed fertilizers, for which well-decomposed peat, suitably dried and ground, is ordinarily used. In mixed fertilizers peat acts as a carrier or filler for the primary nutrients, namely nitrogen (N), phosphoric oxide (P_2O_5), and potash (K_2O), not as an agent for supplying plant food. Fibrous peat is also used as mull or litter material for bedding stock and for stable and poultry yards. Because of its moisture-absorbing qualities, it is used generally for stock bedding. Its deodorizing capacity lends itself to barnyard and stable use, as it delays the decomposition of the nitrogenous and other organic substances deposited thereon. Nurserymen, gardeners, and others use peat as a packing material for plants, shrubbery, fruit, vegetables, eggs, and fragile materials. There are other uses for peat, including filtering and as a deodorizing agent, but quantities so used are small, and detailed figures are not available.

TABLE 5.—Peat sold in the United States, 1950–53, by uses

Use	1950		1951		1952		1953	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Soil improvement	87,090	$704,200	138,712	$962,002	159,203	$1,189,195	149,964	$1,103,260
Mixed fertilizers	36,433	391,174	37,233	364,164	37,957	401,180	37,997	413,939
Other uses	7,198	47,345	14,800	141,268	9,159	80,060	10,884	141,217
Total	130,721	1,142,719	190,745	1,467,434	206,319	1,670,435	198,845	1,658,416

VALUE AND PRICE

The total value of peat produced and average value per ton of the various types are based on producers' selling price (or value at plant), exclusive of containers. The value assigned by the producers to the moss type produced is usually higher than to the reed or sedge and humus types. In 1953 the average value of moss peat produced was $11.87 per ton, a gain of 14 percent over 1952, whereas reed or sedge type declined $1.10 per ton (11 percent), and humus dropped $0.50 per ton (7 percent) (table 6).

The average selling price per ton of all peat sold in 1953 increased slightly to $8.34 from the $8.10 per ton reported in 1952. Peat sold for soil improvement had the lowest average price, while peat for "Other uses" had the highest. In the latter group some peat that was marketed in small packages for household plants averaged as high as $50.00 per ton and influenced the average for this type.

TABLE 6.—Average value per ton of peat produced, by type, and sold, by uses, 1947–49 (average) and 1950–53

Year	Average value per ton produced			Average value per ton sold		
	Moss	Reed and sedge	Humus	Soil improvement	Mixed fertilizers	Other uses
1947–49 (average)	$12.20	$7.64	$6.86	$6.33	$9.13	$7.43
1950	11.95	9.17	8.26	8.09	10.74	6.58
1951	5.87	9.93	7.15	6.94	9.78	9.55
1952	10.38	9.92	7.15	7.47	10.57	8.74
1953	11.87	8.82	6.65	7.36	10.89	12.97

FOREIGN TRADE [1]

Imports of peat in 1953 reached an alltime high and almost equaled the output of domestic producers (table 7). The total dollar value of the imported material, however, was over four times greater than the reported value of the production in this country. All of the imported material was of the moss-peat type and, according to classifications maintained by the United States Department of Commerce, was divided into two grades, (1) the poultry and stable grade and (2) the fertilizer grade. The quantity of the poultry and stable grade declined slightly in 1953, whereas the tonnage of fertilizer grade increased 35,777 tons (25 percent). The latter grade is usually of a higher quality, and the average unit value is correspondingly higher. The principal sources of imports are Germany, Canada, and the Netherlands. Germany alone furnished 58 percent of the total imports, most of which is used along the east coast and in the Middle Atlantic region. Canadian imports, slightly higher than in the previous year, were over one-third of the total. The Netherlands shipped a substantial quantity, and 2,010 tons came from Ireland. Imports from the five other countries were insignificant.

TABLE 7.—Peat moss imported for consumption in the United States, 1951–53, by kind and by country

[U. S. Department of Commerce]

Country	Poultry and stable grade					
	1951		1952		1953	
	Net tons	Value	Net tons	Value	Net tons	Value
Canada	17,963	$734,549	11,967	$664,467	8,490	$487,040
Germany	11,539	343,769	[1] 9,815	341,015	[1] 9,965	343,482
Ireland	97	3,320	78	3,010	45	1,407
Mexico	---	---	---	---	3	125
Netherlands	1,083	43,916	325	20,458	388	12,775
Sweden	65	2,008	---	---	---	---
United Kingdom	18	790	---	---	---	---
Total	30,765	1,128,352	22,185	1,028,950	18,891	844,829

Country	Fertilizer grade					
	1951		1952		1953	
	Net tons	Value	Net tons	Value	Net tons	Value
Belgium-Luxembourg	---	---	---	---	(2)	$12
Canada	56,101	$2,196,367	54,676	$2,504,359	61,669	2,716,835
Denmark	325	6,507	140	3,987	9	489
France	---	---	5	142	4	188
Germany	47,559	1,230,544	---	---	---	---
East	---	---	85	1,680	---	---
West	---	---	[3] 81,626	[3] 2,657,072	106,922	3,361,039
Ireland	1,139	40,921	1,165	48,040	1,965	79,338
Mexico	---	---	---	---	57	2,966
Netherlands	6,485	189,331	7,365	253,563	10,286	325,090
Poland-Danzig	1,846	53,815	---	---	---	---
Sweden	22	556	---	---	---	---
United Kingdom	148	4,143	157	4,659	84	2,963
Total	113,625	3,722,184	[3] 145,219	[3] 5,473,502	180,996	6,488,920

[1] West Germany. [2] Less than 1 ton. [3] Revised figure.

[1] Figures on imports compiled by Mae B. Price and Elsie D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TECHNOLOGY

The greatest progress in technology has been made in those countries where peat necessarily is used for fuel purposes, either because of lack of coal or because of the great distances between the coal fields and centers of fuel consumption within the country's borders. An excellent summary of the investigative work conducted in recent years on low-temperature carbonization of peat and peat constituents in Sweden was published in 1953.[2] This report covers the work begun in 1947 on peat carbonization at the Research Station of the Royal Swedish Academy of Engineering Sciences, Stockholm, Sweden, and completed in 1951.

Battelle Institute, Columbus, Ohio, recently completed technical studies for the Irish Turf Board, Dublin, Ireland, which, it is believed, will aid that country in solving its fuel and power-generating problems. One of the recommendations of the institute was a method of firing by which peat is burned in suspension after pulverization in a German-developed Kramer-type mill.[3] It was reported that the Irish Government accepted the recommendation and orders were placed for three boilers for a new 40,000-kw. station.

The Iron Range Resources and Rehabilitation Office, St. Paul, Minn., in 1949 published a comprehensive review of technological developments on the industrial and agricultural utilization of peat.[4] This publication contains data on methods of winning and processing peat and present and potential uses of this material.

Indications are that the U. S. S. R. produces and consumes more peat than any other nation. Some of the recent developments in burning peat for large power stations in the U. S. S. R. were summarized and published in the transactions of the Fourth World Power Conference.[5]

WORLD REVIEW

The estimated world production of peat in 1953 was 53 million metric tons, a decrease of approximately 1 million tons compared with the 1952 output. The largest decline in 1953 was in Denmark, where production was off 65 percent because a larger share of fuel requirements was met by imports of other types of fuel.

Of the total estimated 1953 world output, approximately 45 million metric tons or 85 percent was produced in the U. S. S. R., where large quantities are used in electric power generation. Other significantly large producing countries were: Ireland (Eire), Germany, Netherlands, and Denmark, where the combined output was about 7 million tons (13 percent), while the remaining peat-producing areas of the world supplied only 2 percent of the total production.

Fuel peat is generally produced by three principal methods: (1) Hand cutting by spade and the sod squares air dried; (2) mechanical dredging (hydropeat); and (3) mechanical scraping in thin layers and drying (milled peat).

[2] Christianson, Bengt, Studies on Low-Temperature Carbonization of Peat and Peat Constituents: Esselte Aktiebolog, Stockholm, 1953, 128 pp.

[3] Colliery Guardian, Production and Use of Peat: Vol. 186, No. 4813, May 29, 1953, p. 662.

[4] Plummer, Clayton E., Report of Progress in Peat Development: Office Commissioner, Iron Range Resources and Rehabilitation, St. Paul, Minn., 1949, 142 pp.

[5] Shershnev A. A., Shershnev Pneumatic Furnaces for Burning Milled Peat Designed in the Central Boiler and Turbine Institute: Trans. 4th World Power Conf., London, 1950, vol. 3, pp. 1457–1462.
Shil'dkret, M. M., Combustion of Milled Peat in Large Furnaces With Shaft Pulverizers: pp. 1462–1470.

Aside from use as fuel for generating electric power, peat is employed for space heating and industrial steam raising, as well as for cooking and heating by the rural population in the areas of the bogs or deposits. Large quantities of the European production are used for animal bedding or litter and as a soil conditioner in agricultural and horticultural activities. Almost the entire output of peat in the United States and Canada is employed for soil conditioning and for mixed fertilizers.

Other products derived from peat but not produced on a wide scale in certain European countries include montan wax, peat coke or char, gas, and tar products.

The first International Peat Symposium to discuss resources, production methods, and industrial fuel utilization, was scheduled to be held in Dublin in July 1954. Over 130 delegates representing 12 countries were expected to attend the conferences.

TABLE 8.—World production of peat, 1949–53, by countries, in thousand metric tons [1]

[Compiled by Pauline Roberts]

Country	1949	1950	1951	1952	1953
Austria [2]	50	50	50	50	50
Canada, agricultural use [3]	73	68	70	68	77
Denmark	1,416	902	2,014	1,626	574
Finland:					
Agricultural use	19	7	7	[2] 250	[2] 250
Fuel	179	197	200		
France	45	10	[2] 20	[2] 15	[2] 15
Germany:					
East [2]	500	500	500	500	500
West	1,203	[2] 1,200	[4] 423	[4] 1,151	[4] 1,340
Hungary [2]	8	8	8	50	50
Iceland [2]	3	3	2	3	2
Ireland	[2] 4,079	3,114	[5] 3,992	[5] 3,864	[2] 3,850
Italy	4	4	5	[2] 5	[2] 5
Japan	(6)	(6)	(6)	30	[2] 50
Korea, Republic of	[2] 250	[2] 200	319	81	75
Netherlands	779	528	642	695	[2] 700
Norway:					
Agricultural use	[2] 20	25	25	26	[2] 25
Fuel	382	361	328	332	[2] 335
Portugal	(6)	(6)	----------	(6)	(6)
Spain	1	5	4	2	[2] 2
Sweden:					
Agricultural use	106	99	103	[2] 120	[2] 120
Fuel	94	75	116	91	[2] 90
U. S. S. R. [2]	36,000	44,000	44,000	45,000	45,000
United States, agricultural use	118	119	176	191	185
Total (estimate)	45,000	51,000	53,000	54,000	53,000

[1] Contains revisions of data previously published.
[2] Estimate.
[3] Also produces less than 100 tons per year for fuel.
[4] Includes 280,959 tons for agricultural use in 1951, 337,497 tons in 1952, and 439,639 tons in 1953.
[5] Includes 3,419 tons for agricultural use in 1951 and 4,471 tons in 1952.
[6] Less than 500 tons.

B. Petroleum and Related Products

Asphalt and Related Bitumens

By A. T. Coumbe and I. F. Avery

SCOPE OF REPORT

FROM 1921 until 1953 there were no major changes in the scope and coverage of the annual survey of the petroleum-asphalt industry except to classify sales by petroleum-refinery districts and to present a more detailed breakdown of products. For 1953, after consultation with some of the leading asphalt producers, the American Petroleum Institute, and the Asphalt Institute, the Bureau of Mines decided to revise the reporting form drastically by requesting data on a State rather than on a refinery-district basis and by reducing the breakdown of sales by end use to three main groups: (1) Paving, (2) roofing, and (3) miscellaneous uses. A petroleum-refining company now is requested to file a single report covering all of its refineries, whereas previously reports were requested for each refinery. The questionnaire has been further simplified by eliminating the request for a breakdown of asphalt and asphaltic products manufactured from domestic and foreign crude petroleum and by eliminating the value at refineries. Also export data are no longer requested because this information is available from the Bureau of the Census.

Production data are based upon monthly reports submitted by the refining companies, not on the annual canvass.

TABLE 1.—Salient statistics of petroleum asphalt in the United States, 1952–53

[Thousands of short tons]

	1952	1953	Change from 1952 (percent)
Production	12,784	13,165	+3.0
Imports (including natural)	490	434	−11.0
Exports	418	303	−28.0
Stocks	1,149	1,330	+16.0
Apparent domestic consumption [1]	12,910	13,115	+2.0

[1] Production, plus imports less exports and plus or minus change in stocks.

TABLE 2.—Salient statistics of road oil in the United States, 1952–53

[Thousands of short tons]

	1952	1953	Change from 1952 (percent)
Production	1,272	1,199	−6.0
Stocks	82	79	−4.0
Apparent domestic consumption [1]	1,263	1,202	−5.0

[1] Production, plus or minus change in stocks.

SALES

The reported sales in 1953 of 14.0 million short tons of asphalt and asphaltic products are 12 percent above the 1952 total of 12.5 million; however, because of differences in reporting end uses in 1953 the totals of the individual items are not comparable for the 2 years. Sales of 1.3 million short tons of road oil in 1953 were approximately 7 percent higher than in 1952.

Virtually all companies reporting in 1953 complied with the Bureau's request by submitting a breakdown, by States, of asphalt and road-oil sales totals. However, a few distributors during this transitional period were unable to make the changeover during the first year but could show only deliveries by refinery or marketing districts, as in previous years. The sales, by States, for these companies were estimated by the Bureau, so that individual company operations would not be disclosed.

All asphalt-producing companies solicited for a report of their sales in 1953 cooperated with the Bureau in the survey; 91 made direct replies and 2 reported through associated companies. Twenty-six asphalt-emulsion manufacturers were also asked for a detailed report of their sales in 1953. All but three responded, either by direct replies, or through associated companies. No estimating was done by the Bureau of Mines for the nonrespondents.

CONSUMPTION

The total petroleum asphalt, including cements, cutback asphalt, and emulsified products, was 9.2 million short tons, sold for paving purposes such as use for public highways, roads on private property, sidewalks, automobile parking areas, and airfield runways. The comparable quantity of portland cement, a competitive product, is not available. However, data of the Bureau of Public Roads, United States Department of Commerce, indicate that, of these two competitive materials, about 6.3 million short tons of asphaltic products and about 5.8 million short tons of portland cement were used for the paving and maintenance of public highways in 1953 and that an additional 1.9 million short tons of portland cement was used for bridges, culverts, and other structures on public highways in 1953.

BITUMINOUS ROCK

Sales of bituminous rock totaled 1.4 million short tons in 1953 (valued at $4.3 million) compared with 1.6 million in 1952 (valued at $4.7 million) a decline of 8 percent. The limestone sold comprised 92 percent of the total in 1953 and 91 percent in 1952. The balance was sandstone. Limestone was produced in Alabama, Oklahoma, and Texas, while the sandstone output came from Missouri, Kentucky, and Oklahoma.

Producers sold 60,505 short tons of gilsonite, valued at $2.2 million, in 1953 and 60,740 short tons, valued at $1.8 million, in 1952. All the gilsonite was mined in Utah.

TABLE 3.—Sales of petroleum asphalt and road oil in 1953, by State and refinery district

[Short tons]

States by districts [1]	Paving products				Roofing products		Miscellaneous products	
	Asphalt cements	Cutback asphalts	Emulsified asphalts	Road oil	Asphalt cements and fluxes	Emulsified asphalts	Asphalt cements and fluxes	Emulsified asphalts
District 1:								
Connecticut	33, 525	33, 809	10, 342	--------	14, 410	226	6, 265	622
Delaware	8, 266	1, 656	22	70	19, 496	5	626	4
District of Columbia	6, 691	2, 162	1, 781	50	1, 331	--------	45	--------
Florida	93, 668	124, 970	16, 871	611	68, 078	705	21, 887	4, 246
Georgia	144, 198	49, 146	38, 214	325	43, 933	153	6, 155	2, 130
Maine	20, 876	38, 606	7, 494	116	87	--------	3, 604	342
Maryland	132, 724	90, 153	15, 541	800	66, 087	106	22, 248	1, 144
Massachusetts	165, 208	69, 160	5, 487	945	80, 679	528	31, 866	2, 012
New Hampshire	6, 949	24, 662	339	26	663	--------	485	61
New Jersey	159, 662	98, 321	9, 025	6, 688	376, 459	841	111, 942	4, 323
New York	322, 211	159, 080	79, 574	427	136, 483	774	50, 265	2, 124
North Carolina	101, 582	25, 421	27, 098	239	45, 920	3, 051	16, 697	4, 376
Pennsylvania	296, 079	142, 575	24, 350	4, 737	169, 245	93	108, 197	1, 989
Rhode Island	45, 122	33, 230	4, 737	206	3, 683	62	87, 559	221
South Carolina	71, 703	46, 032	32, 000	3, 852	4, 711	--------	1, 427	--------
Vermont	7, 942	20, 872	561	2	1, 754	4	151	24
Virginia	86, 431	79, 784	34	284	9, 792	173	13, 558	232
West Virginia	36, 237	25, 901	8, 820	289	20, 483	--------	43, 480	1, 107
Total	1, 739, 074	1, 065, 540	282, 290	19, 667	1, 063, 294	6, 721	526, 457	24, 957
District 2:								
Illinois	195, 485	179, 955	5, 064	152, 157	515, 829	525	174, 673	2, 714
Indiana	76, 888	107, 850	62, 306	20, 213	115, 567	30	32, 737	638
Iowa	42, 867	58, 168	12, 365	39, 612	9, 195	1	2, 889	113
Kansas	63, 047	180, 136	112	4, 206	37, 605	--------	12, 071	39
Kentucky	66, 531	64, 752	13, 014	2, 986	18, 664	302	14, 013	162
Michigan	138, 552	83, 707	29, 016	34, 332	53, 358	420	50, 018	1, 940
Minnesota	64, 902	129, 223	5, 550	65, 099	97, 145	7	37, 835	1, 511
Missouri	75, 938	96, 990	8, 884	62, 807	178, 880	901	31, 988	857
Nebraska	24, 211	45, 105	70	6, 379	3, 165	--------	4, 582	36
North Dakota	42, 534	25, 590	881	15, 456	667	--------	4, 506	93
Ohio	218, 680	219, 359	84, 189	21, 239	107, 088	276	99, 804	6, 498
Oklahoma	101, 259	162, 244	--------	7, 275	4, 902	--------	29, 221	369
South Dakota	33, 002	21, 447	--------	29, 263	901	--------	1, 340	--------
Tennessee	143, 253	51, 894	6, 600	5, 629	28, 521	502	4, 399	1, 737
Wisconsin	73, 419	88, 249	6, 099	176, 225	8, 113	10	62, 248	2, 006
Total	1, 360, 568	1, 514, 669	234, 150	642, 878	1, 179, 600	2, 974	562, 324	18, 713
District 3:								
Alabama	83, 795	99, 911	24, 762	102	70, 833	80	3, 143	97
Arkansas	35, 638	65, 479	12, 846	2, 696	40, 727	--------	16, 679	5
Louisiana	87, 243	16, 514	10, 412	656	97, 845	7	15, 059	13, 771
Mississippi	18, 134	38, 541	12, 167	495	1, 688	--------	9, 715	438
New Mexico	63, 456	47, 727	4	3, 840	5, 911	--------	5, 564	144
Texas	387, 476	306, 295	11, 522	7, 109	185, 154	--------	52, 871	3, 661
Total	675, 742	574, 467	71, 713	14, 898	402, 158	87	103, 031	18, 116
District 4:								
Colorado	79, 059	101, 809	1, 335	18, 566	23, 892	--------	10, 463	501
Idaho	5, 914	35, 818	1, 714	17, 203	812	1	1, 094	--------
Montana	5, 820	43, 321	2, 834	8, 078	53	--------	2, 693	41
Utah	49, 937	48, 961	18	23, 869	10, 710	--------	4, 544	9
Wyoming	12, 826	41, 818	308	15, 939	6, 974	--------	830	--------
Total	153, 556	271, 727	6, 209	83, 655	42, 441	1	19, 624	551
District 5:								
Arizona	18, 925	23, 357	9, 623	21, 659	555	1	481	63
California	588, 890	142, 490	103, 275	481, 976	610, 819	366	103, 576	4, 541
Nevada	23, 259	5, 900	2, 644	17, 445	3, 628	--------	492	55
Oregon	109, 025	33, 006	7, 360	18, 387	110, 008	5	3, 545	2, 953
Washington	76, 153	57, 168	7, 032	29, 779	36, 650	47	10, 062	17, 983
Total	816, 252	261, 921	129, 934	569, 246	761, 660	419	118, 156	25, 595
Total United States	4, 745, 192	3, 688, 324	724, 296	1, 330, 344	3, 449, 153	10, 202	1, 329, 592	87, 932

[1] States are grouped according to petroleum-marketing districts rather than to conventional geographic regions.

TABLE 4.—Sales of petroleum asphalt and road oil in 1953, by State and refinery district

[Short tons]

States, by districts [1]	Asphalt cements and fluxes	Emulsified asphalts	Cutback asphalts	Total asphalts	Percent of total	Road oil	Percent of total
District 1:							
Connecticut	54,200	11,190	33,809	99,199	2.1		
Delaware	28,388	31	1,656	30,075	.6	70	0.3
District of Columbia	8,067	1,781	2,162	12,010	.3	50	.3
Florida	183,633	21,822	124,970	330,425	7.0	611	3.1
Georgia	194,286	40,497	49,146	283,929	6.0	325	1.7
Maine	24,567	7,836	38,606	71,009	1.5	116	.6
Maryland	221,059	16,791	90,153	328,003	7.0	800	4.1
Massachusetts	277,753	8,027	69,160	354,940	7.5	945	4.8
New Hampshire	8,097	400	24,662	33,159	.7	26	.1
New Jersey	648,063	14,189	98,321	760,573	16.2	6,688	34.0
New York	508,959	82,472	159,080	750,511	15.9	427	2.2
North Carolina	164,199	34,525	25,421	224,145	4.8	239	1.2
Pennsylvania	573,521	26,432	142,575	742,528	15.8	4,737	24.1
Rhode Island	136,364	5,020	33,230	174,614	3.7	206	1.0
South Carolina	77,841	32,000	46,032	155,873	3.3	3,852	19.6
Vermont	9,847	589	20,872	31,308	.7	2	
Virginia	109,781	439	79,784	190,004	4.0	284	1.4
West Virginia	100,200	9,927	25,901	136,028	2.9	289	1.5
Total	3,328,825	313,968	1,065,540	4,708,333	100.0	19,667	100.0
District 2:							
Illinois	885,987	8,303	179,955	1,074,245	22.1	152,157	23.7
Indiana	225,192	62,974	107,850	396,016	8.1	20,213	3.1
Iowa	54,951	12,479	58,168	125,598	2.6	39,612	6.2
Kansas	112,723	151	180,136	293,010	6.0	4,206	.7
Kentucky	99,208	13,478	64,752	177,438	3.6	2,986	.5
Michigan	241,928	31,376	83,707	357,011	7.3	34,332	5.3
Minnesota	199,882	7,068	129,223	336,173	6.9	65,099	10.1
Missouri	286,806	10,642	96,990	394,438	8.1	62,807	9.8
Nebraska	31,958	106	45,105	77,169	1.6	6,379	1.0
North Dakota	47,707	974	25,590	74,271	1.5	15,456	2.4
Ohio	425,572	90,963	219,359	735,894	15.1	21,239	3.3
Oklahoma	135,382	369	162,244	297,995	6.1	7,275	1.1
South Dakota	35,243		21,447	56,690	1.2	29,263	4.5
Tennessee	176,173	8,839	51,894	236,906	4.9	5,629	.9
Wisconsin	143,780	8,115	88,249	240,144	4.9	176,225	27.4
Total	3,102,492	255,837	1,514,669	4,872,998	100.0	642,878	100.0
District 3:							
Alabama	157,771	24,939	99,911	282,621	15.3	102	0.7
Arkansas	93,044	12,851	65,479	171,374	9.3	2,696	18.1
Louisiana	200,147	24,190	16,514	240,851	13.0	656	4.4
Mississippi	29,537	12,605	38,541	80,683	4.4	495	3.3
New Mexico	74,931	148	47,727	122,806	6.7	3,840	25.8
Texas	625,501	15,183	306,295	946,979	51.3	7,109	47.7
Total	1,180,931	89,916	574,467	1,845,314	100.0	14,898	100.0
District 4:							
Colorado	113,414	1,836	101,809	217,059	43.9	18,566	22.2
Idaho	7,820	1,715	35,818	45,353	9.2	17,203	20.6
Montana	8,566	2,875	43,321	54,762	11.1	8,078	9.7
Utah	65,191	27	48,961	114,179	23.1	23,869	28.5
Wyoming	20,630	308	41,818	62,756	12.7	15,939	19.0
Total	215,621	6,761	271,727	494,109	100.0	83,655	100.0
District 5:							
Arizona	19,961	9,687	23,357	53,005	2.5	21,659	3.8
California	1,303,285	108,182	142,490	1,553,957	73.5	481,976	84.7
Nevada	27,379	2,699	5,900	35,978	1.7	17,445	3.1
Oregon	222,578	10,318	33,006	265,902	12.6	18,387	3.2
Washington	122,865	25,062	57,168	205,095	9.7	29,779	5.2
Total	1,696,068	155,948	261,921	2,113,937	100.0	569,246	100.0
Total United States	9,523,937	822,430	3,688,324	14,034,691		1,330,344	

[1] States are grouped according to petroleum-marketing districts rather than to conventional geographic regions.

TABLE 5.—Petroleum asphalt and products exported from the United States, 1952–53, by countries of destination

[U. S. Department of Commerce]

Country	1952 [1]		1953 [2]	
	Thousand short tons	Thousand dollars	Thousand short tons	Thousand dollars
North America:				
British Honduras	(3)	(3)	2	61
Canada	3	178	13	789
Canal Zone	6	94	3	65
Costa Rica	5	201	1	45
Cuba	1	28	(3)	21
Haiti	1	20	2	43
Mexico	29	710	20	577
Panama	1	10	(3)	1
Other North America	(3)	50	(3)	35
Total North America	46	1, 291	41	1, 637
South America:				
Bolivia	1	39	(3)	4
Brazil	3	135	17	954
Chile	3	95	5	200
Colombia	[4] 10	[4] 286	11	363
Ecuador	1	30	1	41
Venezuela	(3)	7	1	60
Other South America	(3)	10	(3)	17
Total South America	[4] 18	[4] 602	35	1, 639
Europe:				
Belgium-Luxembourg	2	50	(3)	16
France	31	913	(3)	7
Greece	4	148	----------	----------
Spain	(3)	3	1	15
Switzerland	1	44	1	56
Turkey	3	90	2	52
Other Europe	(3)	46	(3)	82
Total Europe	41	1, 294	4	228
Asia:				
British Malaya	3	81	3	86
Burma	1	40	7	282
Ceylon	15	484	3	83
Hong Kong	4	133	(3)	31
India	56	1, 815	12	362
Indochina	51	1, 692	21	625
Indonesia	24	846	22	680
Iraq	19	980	4	160
Japan	1	26	3	109
Jordan	2	76	----------	----------
Korea, Republic of	----------	----------	7	304
Kuwait	8	469	----------	----------
Pakistan	30	1, 032	29	806
Philippines	15	605	26	1, 074
Thailand	18	541	5	270
Other Asia	1	52	(3)	47
Total Asia	248	8, 872	142	4, 919
Africa:				
Belgian Congo	6	251	9	331
French Morocco	1	50	19	776
Mozambique	1	34	2	59
Union of South Africa	19	601	19	621
Other Africa	1	64	4	131
Total Africa	28	1, 000	53	1, 918
Oceania:				
New Zealand	7	234	2	55
Other Oceania	1	21	(3)	6
Total Oceania	8	255	2	61
Grand total	[4] 389	[4] 13, 314	277	10, 402

[1] In addition, exports of "petroleum-asphalt manufactures" were valued at $4,567,595. Quantities not available.
[2] Data not strictly comparable with that for earlier years.
[3] Less than 1,000.
[4] Revised figure.

IMPORTS[1]

Virtually all imports of petroleum asphalts were from the Netherlands Antilles, and the quantity declined slightly from 478,812 short tons in 1952 to 450,214 in 1953. The value of these receipts was reported as $5.6 million in 1952 and $5.1 million in 1953. In addition, some liquid petroleum asphalt, mostly from Venezuela, was imported. The quantities were 9,663 short tons in 1953 (value $145,000) compared with 14,299 in 1952 (value $201,000).

Imports of natural asphalt and bitumens dropped noticeably from 4,201 short tons in 1952 to 2,699 in 1953. They were mostly lake asphalt from Trinidad. The values were reported as $98,000 in 1952 and $71,000 in 1953.

[1] Figures on imports and exports compiled by Mae B. Price and Elsie D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

Carbon Black

By D. S. Colby, H. J. Barton, and B. E. Oppegard

GENERAL SUMMARY

PRODUCTION of carbon black in the United States in 1953 totaled 1,610 million pounds, a negligible increase over 1952. Although output of the furnace grades increased 11 percent over 1952, production of contact blacks was decreased 20 percent because output of this type had exceeded shipments since 1951 and large inventories had accumulated since that time.

Sales (including exports) increased 8 percent over the previous year because of increased demand by rubber processors and increased exports. Although sales of contact blacks remained at the previous year's level, sales of furnace blacks were 11 percent greater than in 1952.

The trend favoring the use of furnace blacks over contact blacks continued. Furnace blacks had been preferred for compounding with synthetic rubber, and their use increased as synthetic rubber consumption grew. Previously, contact blacks had been more satisfactory for use in compounding natural rubber. Because of declining prices, natural rubber consumption has increased in the past 2 years and composed 41 percent of the total new production in 1953. However, the preference for furnace blacks did not diminish because oil furnace blacks were found to have superior properties even with natural rubber.

Another trend continued during 1953 was the production of furnace blacks from liquid hydrocarbons instead of natural gas because these blacks imparted superior abrasion resistance to the tread of pneumatic tires.

TABLE 1.—Salient statistics of carbon black produced from natural gas and liquid hydrocarbons in the United States, 1949–53, in thousand pounds

	1949	1950	1951	1952	1953
Production:					
Contact process (chiefly channel)	627, 650	616, 765	645, 881	563, 597	453, 345
Furnace processes	595, 986	765, 225	1, 031, 482	1, 040, 505	1, 157, 092
Total	1, 223, 636	1, 381, 990	1, 677, 363	1, 604, 102	1, 610, 437
Shipments:					
Domestic sales	822, 166	1, 109, 071	1, 129, 645	1, 154, 274	1, 200, 871
Exports	303, 244	399, 568	433, 493	292, 908	358, 620
Total	1, 125, 410	1, 508, 639	1, 563, 138	1, 447, 182	1, 559, 491
Losses	8	269	534	804	12
Stocks of producers Dec. 31	216, 461	89, 543	203, 234	359, 350	410, 284
VALUE					
Production .... thousand dollars	74, 685	84, 604	107, 436	101, 988	104, 868
Average per pound .... cents	6. 10	6. 12	6. 41	6. 36	6. 51

SCOPE OF REPORT

Annual statistics of the carbon-black industry were obtained from reports submitted to the Bureau of Mines from all operating plants in the United States by producers who represent 100 percent of commercial production. Carbon black is a very pure grade of quasi-graphitic carbon, with particle diameters ranging from 50 to 5,000 angstrom units.

Export and import figures are compiled by the United States Department of Commerce. Monthly figures are based on reports

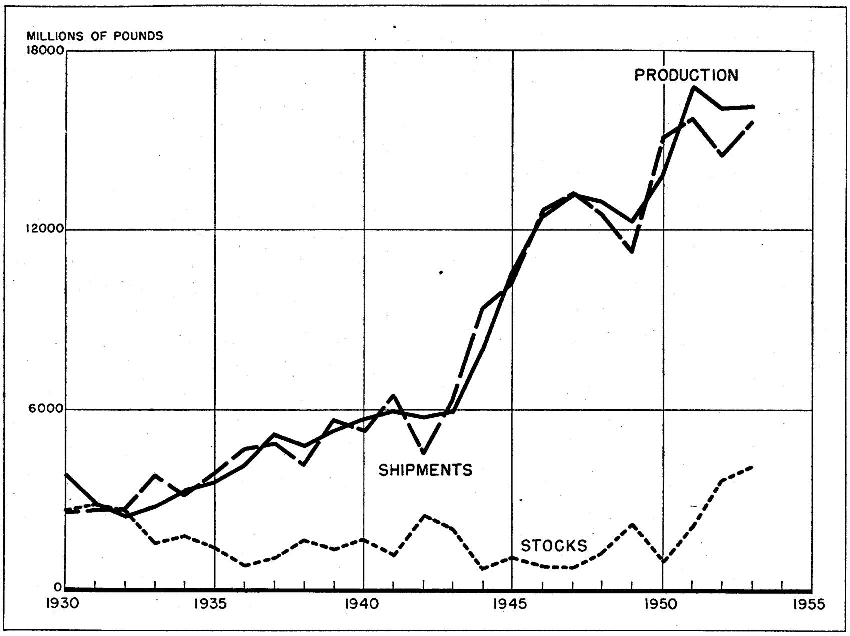

FIGURE 1.—Production, stocks, and shipments of carbon black, 1930–53.

prepared by the National Gas Products Association and adjusted to agree with the annual reports received by the Bureau of Mines.

Data are obtained on furnace and contact blacks, the two general types produced commercially. Substantially all contact blacks are made by the channel process. Furnace blacks are broken down into five grades: Semireinforcing Furnace (SRF), High-Modulus Furnace (HMF), Fast-Extruding Furnace (FEF), High-Abrasion Furnace (HAF), and Other. The production and uses of the various grades are described in Minerals Yearbooks for 1948 and 1949.

PRODUCTION

Number and Capacity of Plants.—The preference for furnace blacks resulted in 1953 in the closing of 6 contact-type plants—4 in the Panhandle district of Texas, 1 in Louisiana, and 1 in Kansas. One unit of a contact-type plant on the Texas gulf was also shut down. These shutdowns reduced daily operating capacity of contact-type plants by 464,000 pounds to 1,304,000 pounds per day.

TABLE 2.—Carbon black produced from natural gas and liquid hydrocarbons in the United States, 1949–53, by State and district, in thousand pounds

State and district	1949	1950	1951	1952	1953	Percent change from 1952
Louisiana	160,460	226,177	258,989	255,939	376,818	47.2
Texas:						
Panhandle district	625,760	638,159	700,659	613,298	542,006	−11.6
Rest of State	249,083	310,705	449,287	460,462	444,421	−3.5
Total Texas	874,843	948,864	1,149,946	1,073,760	986,427	−8.1
Other States	188,333	206,949	268,428	274,403	247,192	−9.9
Grand total	1,223,636	1,381,990	1,677,363	1,604,102	1,610,437	0.4

TABLE 3.—Carbon black produced in the United States in 1953, by State and district, and natural gas and liquid hydrocarbons used in its manufacture

State	Producers reporting [1]	Number of plants	Production					
			Furnace black			Contact black		
			Thousand pounds	Value at plant		Thousand pounds	Value at plant	
				Total (thousand dollars)	Cents per pound		Total (thousand dollars)	Cents per pound
Louisiana	7	9	376,025	22,129	5.88	793	168	21.19
Texas:								
Panhandle district	9	18	386,702	22,748	5.88	155,304	12,904	8.31
Rest of State	6	16	267,310	17,768	6.65	177,111	13,099	7.40
Total Texas	11	34	654,012	40,516	6.19	332,415	26,003	7.82
Arkansas	1	1						
California	1	1	127,055	7,089	5.58	--------	--------	--------
Kansas	2	2				120,137	8,963	7.46
New Mexico	5	5	--------	--------	--------			
Grand total:								
1953	16	52	1,157,092	69,734	6.03	453,345	35,134	7.75
1952	18	59	1,040,505	58,938	5.66	563,597	43,050	7.64

State	Natural gas used					Liquid hydrocarbons used			
	Million cubic feet	Average yield [2] (pounds per M cubic feet)		Value		Thousand gallons	Average yield (pounds per gallon)	Value	
		Furnace	Contact	Total (thousand dollars)	Average (cents per M cu. ft.)			Total (thousand dollars)	Average (cents per gallon)
Louisiana	24,595	7.66	0.68	1,546	6.29	48,467	4.05	3,484	7.19
Texas:									
Panhandle district	103,849	7.07	1.78	6,206	5.98	78,903	3.42	7,155	9.07
Rest of State	97,639	5.27	2.11	5,396	5.53	50,435	3.86	3,446	6.83
Total Texas	201,488	6.25	1.94	11,602	5.76	129,338	3.59	10,601	8.20
Arkansas									
California	[3] 74,859	8.67	--------	[4] 4,520	6.04	9,402	3.04	308	3.27
Kansas			1.89						
New Mexico		--------				--------	--------	--------	--------
Grand total:									
1953	300,942	7.18	1.92	17,668	5.87	187,207	3.68	14,393	7.69
1952	368,399	7.39	1.87	20,108	5.46	163,392	3.35	13,318	8.15

[1] Detail will not add to totals, because some producers operate in more than one area.
[2] Partly estimated.
[3] Comprises 11,364 million cubic feet used by furnace-plant operations in Arkansas, California, and Kansas and 63,495 million cubic feet used by contact-plant operations in Kansas and New Mexico.
[4] Comprises 1,100 thousand dollars (9.68 cents per M cu. ft.) of natural gas used in Arkansas, California, and Kansas for manufacture of furnace black and 3,420 thousand dollars (5.39 cents per M cu. ft.) used in Kansas and New Mexico for manufacture of contact black.

One furnace-type plant shut down—the only carbon-black plant that had been operating in Oklahoma. This action was doubtless caused by the high value of natural gas in the Oklahoma Guymon-Hugoton Field. Total daily furnace capacity, however, increased 163,000 pounds to 4,038,000 pounds.

Producers.—During 1953 two producers, the Peerless Carbon Black Co. and the Southern Carbon Co., merged with the Columbian Carbon Co., reducing the number of producers from 18 in 1952 to 16.

Method and Yield.—Less natural gas was used as a raw material for the production of carbon black in 1953 because of reduced output of contact blacks and the replacement of natural gas by oil as a feed-stock for furnace blacks. Production of furnace blacks from gas declined 27 million pounds in 1953, while the output of furnace black from oil increased 143 million pounds because tire treads compounded with blacks produced from oil have superior abrasion-resisting qualities.

TABLE 4.—Production and shipments of carbon black in the United States in 1953, by month and grade, in thousand pounds

Month	Furnace						Contact	Total
	SRF [1]	HMF [2]	FEF [3]	HAF [4]	Other	Total		
PRODUCTION								
January	22,266	9,189	18,820	39,261	11,331	100,867	41,376	142,243
February	20,874	8,693	16,532	37,967	11,247	95,313	37,510	132,823
March	22,214	10,244	18,463	40,852	11,451	103,224	41,212	144,436
April	22,323	10,478	17,233	37,085	11,672	98,791	39,513	138,304
May	22,803	8,444	19,006	41,734	11,056	103,043	40,229	143,272
June	25,189	7,108	18,438	36,751	9,822	97,308	38,446	135,754
July	21,772	8,522	18,425	38,613	11,443	98,775	38,104	136,879
August	23,119	7,636	20,162	36,585	11,736	99,238	36,810	136,048
September	21,518	6,600	19,758	33,526	12,010	93,412	35,222	128,634
October	21,877	7,144	15,912	33,815	11,904	90,652	35,626	126,278
November	23,180	6,010	15,556	30,268	11,253	86,267	34,916	121,183
December	23,196	7,526	14,721	32,441	12,318	90,202	34,381	124,583
Total	270,331	97,594	213,026	438,898	137,243	1,157,092	453,345	1,610,437
SHIPMENTS (INCLUDING EXPORTS) [5]								
January	24,037	9,769	18,364	36,139	11,628	99,937	38,520	138,457
February	22,123	9,848	17,506	33,090	9,866	92,433	34,071	126,504
March	26,340	11,244	21,157	41,490	10,166	110,397	39,652	150,049
April	24,448	11,881	19,411	40,116	9,576	105,432	38,288	143,720
May	23,117	8,070	18,668	38,170	10,791	98,816	37,335	136,151
June	31,193	9,210	16,097	34,183	9,046	99,729	40,643	140,372
July	20,237	7,559	14,996	32,713	10,503	86,008	40,918	126,926
August	18,031	7,133	14,582	31,499	9,185	80,430	33,298	113,728
September	20,632	8,051	14,917	33,217	10,171	86,988	42,075	129,063
October	20,468	7,449	14,776	32,460	9,899	85,052	33,260	118,312
November	19,539	7,336	13,692	28,498	9,170	78,235	35,179	113,414
December	20,524	7,618	13,432	31,070	10,830	83,474	39,321	122,795
Total	270,689	105,168	197,598	412,645	120,831	1,106,931	452,560	1,559,491

[1] Semireinforcing Furnace.
[2] High-modulus Furnace.
[3] Fast-Extrusion Furnace.
[4] High-Abrasion Furnace.
[5] Compiled from reports of the National Gas Products Association and of producing companies not included in the association figures. Figures adjusted to agree with annual reports of individual producers.

TABLE 5.—Natural gas and liquid hydrocarbons used in the manufacture of carbon black in the United States, and average yield, 1949–53

	1949	1950	1951	1952	1953
Natural gas used ... million cubic feet	427,892	410,852	426,423	368,399	300,942
Average yield of carbon black per thousand cubic feet ... pounds	2.38	2.57	2.67	2.87	3.06
Average value of natural gas used per thousand cubic feet ... cents	4.76	4.79	5.21	5.46	5.87
Liquid hydrocarbons used ... thousand gallons	72,387	107,707	182,343	163,392	187,207
Average yield of carbon black per gallon ... pounds	2.86	3.02	2.96	3.35	3.68
Average value of liquid hydrocarbons used per gallon ... cents	-------	-------	-------	8.15	7.69
Number of producers reporting	20	20	20	18	16
Number of plants	63	53	58	59	52

TABLE 6.—Number and capacity of carbon-black plants operated in the United States, 1952–53

State or district	County or parish	Number of plants				Total daily capacity (pounds)	
		1952		1953			
		Contact	Furnace	Contact	Furnace	1952	1953
Texas: Panhandle district	Carson	1	-------	1	-------	2,114,500	1,752,400
	Gray	6	1	4	1		
	Hutchinson	4	4	4	4		
	Moore	4	1	2	1		
	Wheeler	-------	1	-------	1		
Total Panhandle district	-------	15	7	11	7	2,114,500	1,752,400
Rest of State	Aransas	1	2	1	2	1,494,700	1,461,400
	Brazoria	1	-------	1	-------		
	Brooks	1	-------	1	-------		
	Ector	1	-------	1	-------		
	Gaines	1	-------	1	-------		
	Harris	-------	2	-------	2		
	Howard	-------	1	-------	1		
	Montgomery	-------	1	-------	1		
	Nueces	1	-------	1	-------		
	Reagan	1	-------	1	-------		
	Terry	-------	1	-------	1		
	Ward	1	-------	1	-------		
	Winkler	1	-------	1	-------		
Total rest of State	-------	9	7	9	7	1,494,700	1,461,400
Total Texas	-------	24	14	20	14	3,609,200	3,213,800
Louisiana	Avoyelles	-------	1	-------	1	1,050,100	1,259,800
	Calcasieu	-------	1	-------	1		
	Evangeline	-------	1	-------	1		
	Ouachita	1	2	-------	2		
	Richland	2	-------	2	-------		
	St. Mary	-------	2	-------	2		
Total Louisiana	-------	3	7	2	7	1,050,100	1,259,800
Arkansas	Union	-------	1	-------	1	628,500	[1] 535,300
California	Contra Costa	-------	1	-------	1		
Kansas	Grant	1	2	-------	2		
Oklahoma	Texas	-------	1	-------	-------		
New Mexico	Lea	5	-------	5	-------	355,300	333,200
Total United States	-------	33	26	27	25	5,643,100	5,342,100

[1] Excludes Oklahoma in 1953.

CONSUMPTION AND USES

Domestic sales of carbon black showed a moderate increase in 1953; gains made in sales for use in rubber and ink were partly offset by the substantial declines in sales for paint and miscellaneous uses. No sales of carbon black for carburizing were reported, which accounted for the large decline in carbon-black sales for miscellaneous uses.

Sales for use in rubber increased in approximately the same proportion as consumption of virgin rubber. The average loading of virgin rubber in 1953 was 825 pounds per long ton compared with 828 pounds in 1952.

As the result of falling natural-rubber prices, natural rubber was 41 percent of the total virgin rubber consumed in 1953 compared with 36 percent in 1952. Increased natural-rubber consumption did not reverse the trend of favoring furnace blacks over contact blacks for compounding, indicating that processors of natural rubber have come to prefer furnace blacks.

TABLE 7.—Sales of carbon black for domestic consumption in the United States, 1949–53, by use, in thousand pounds

Use	1949	1950	1951	1952	1953	Change from 1952 (percent)
Rubber	767, 131	1, 030, 368	1, 061, 229	1, 074, 545	1, 133, 594	5. 5
Ink	32, 054	50, 903	45, 496	44, 116	45, 801	3. 8
Paint	7, 005	11, 139	11, 366	10, 628	8, 464	−20. 4
Miscellaneous	15, 976	16, 661	11, 554	24, 985	13, 012	−47. 9
Total	822, 166	1, 109, 071	1, 129, 645	1, 154, 274	1, 200, 871	4. 0

STOCKS

Production of contact blacks was curtailed in 1953 to about the level of shipments for the year to avoid a continuation of the increasing stock accumulation of 1952.

Stocks of furnace grades increased 50 million pounds, because production cutbacks did not offset declining sales.

TABLE 8.—Producers' stocks of contact- and furnace-type blacks in the United States, Dec. 31, 1949–53, in thousand pounds

Year	Furnace						Contact	Total
	SRF [1]	HMF [1]	FEF [1]	HAF [1]	Other	Total		
1949	(2)	(2)	(2)	(2)	(2)	96, 862	119, 599	216, 461
1950	5, 275	[3] 6, 276	[3] 3, 381	7, 831	1, 438	24, 201	65, 342	89, 543
1951	15, 340	15, 119	19, 729	23, 642	6, 105	79, 935	123, 299	203, 234
1952	31, 220	33, 375	23, 211	31, 509	4, 464	123, 779	235, 571	359, 350
1953	30, 861	25, 801	38, 638	57, 757	20, 875	173, 932	236, 352	410, 284

[1] For explanation, see table 4.
[2] Data not available.
[3] Adjusted figures (reclassification of grade).

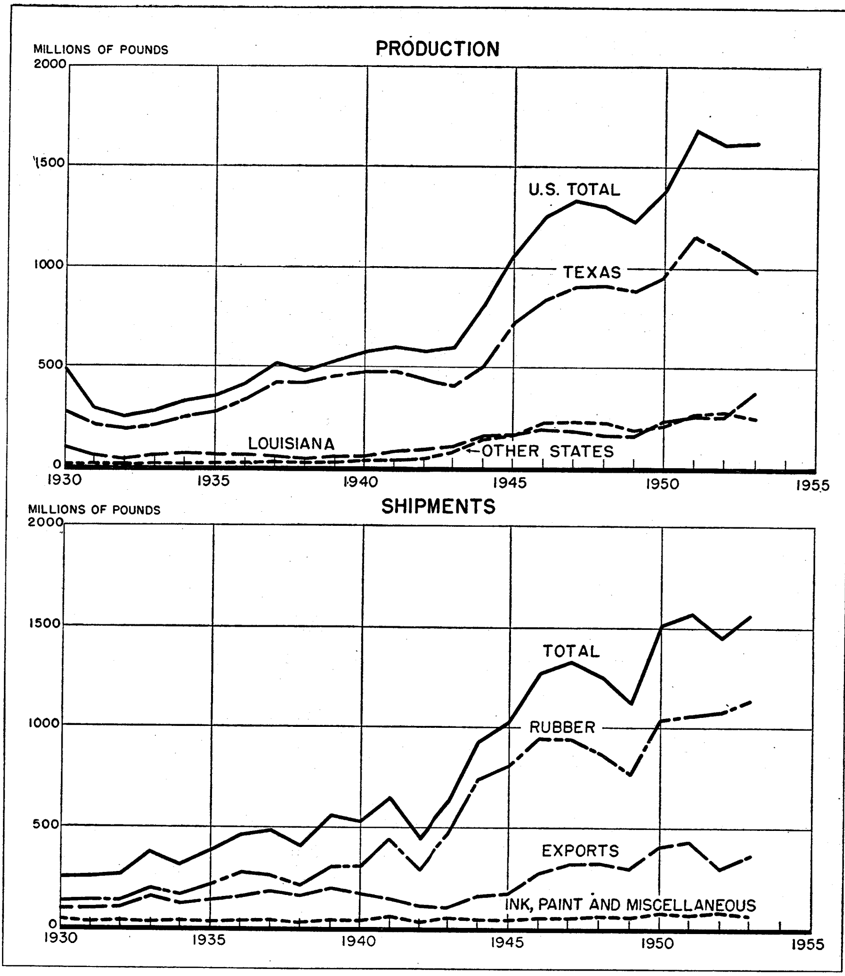

FIGURE 2.—Production and shipments of carbon black, 1930–53.

VALUE

The only reported open-market price change during 1953 was the 0.50-cent-per-pound increase in Semireinforcing Furnace grade. The average value to producers of both furnace and contact grades was reported to have increased.

Feedstock value of gas and oil combined declined from 33 percent of the total value of finished product in 1952 to 31 percent in 1953. This decline was due mainly to the decreasing production of contact blacks. Feedstock represents nearly 40 percent of the cost of contact blacks, whereas it is approximately 20 percent of the cost of gas-produced furnace blacks and 30 percent of the cost of oil-produced furnace blacks.

TABLE 9.—Prices of carbon black in carlots, f. o. b. plant, 1949–53, in cents per pound

[Oil, Paint and Drug Reporter]

Date of change	Channel blacks: Ordinary rubber grades[1]		Furnace blacks: Semireinforcing grades (SRF)	Furnace blacks: High-Modulus grades (HMF)	Furnace blacks: Fast-Extrusion grades (FEF)	Furnace blacks: High-Abrasion grades (HAF)
	Bags	Bulk	Bags	Bags	Bags	Bags
Jan. 7, 1949	7.40	7.00	3.50	5.00	5.50	(2)
July 1, 1949	6.90	6.50	3.50	5.00	5.50	(2)
Oct. 1, 1950	7.40	7.00	4.00	5.50	6.00	(2)
Jan. 5, 1951	7.40	7.00	4.00	5.50	6.00	7.90
July 1, 1953	7.40	7.00	4.50	5.50	6.00	7.90

[1] Chiefly Easy-Processing (EPC) and Medium-Processing (MPC), but also includes Hard-Processing (HPC) and Conductive (CC) channel blacks.
[2] No quotation.

FOREIGN TRADE

Imports.—Imports of acetylene black from Canada returned to 9.0 million pounds per year in 1953 after having declined to 6.8 million in 1952. The average value also increased to 15.9 cents per pound from 15.2 cents in 1952. Twenty-four hundred pounds of acetylene black was imported from Switzerland. Acetylene black is not produced in the United States. It is used to impart electrical conductivity to rubber.

Imports of other carbon blacks from Canada declined from 2.0 million pounds in 1952 to 1.1 million in 1953. Small quantities totaling 5,600 pounds were imported from the United Kingdom, West Germany, and Switzerland.

Exports.—Exports of all carbon black in 1953 partly recovered from the decline of 1952 but still were 17 percent less than quantities exported in 1951. Larger amounts of both contact and furnace grades were exported, although furnace-black exports increased much more than those of contact black and were at the highest level yet reported.

Exports to Canada increased slightly, in spite of the opening in June of the first carbon-black producing plant (excluding acetylene black) in that country. Exports to the United Kingdom also increased substantially from the very low level reported for 1952.

TABLE 10.—Carbon black exported from the United States, 1951–53, by country of destination

[U. S. Department of Commerce]

Country	1951		1952		1953	
	Thousand pounds	Thousand dollars	Thousand pounds	Thousand dollars	Thousand pounds	Thousand dollars
Argentina	10,732	1,087	11,023	1,202	10,872	1,147
Australia	27,139	2,406	16,475	1,445	20,187	1,720
Austria	3,618	321	1,689	159	2,929	249
Belgium-Luxembourg	10,443	987	5,881	534	10,086	920
Brazil	20,571	1,841	22,272	1,920	15,987	1,507
Canada	55,542	3,971	56,943	4,229	57,465	4,301
Chile	1,557	147	1,961	182	1,670	136
Colombia	2,340	226	2,575	252	3,737	343
Cuba	1,495	130	816	69	862	72
Denmark	1,490	147	864	83	748	68
Ecuador	4	1	17	4	196	19
Finland	1,824	162	833	72	748	71
France	73,872	6,842	54,661	4,941	66,360	5,949
Germany	2,366	289	[1] 2,259	[1] 263	[1] 1,570	[1] 201
Greece	120	13	265	26	313	28
India	11,960	1,051	12,144	1,130	9,181	832
Indochina	33	2	176	17	181	17
Indonesia	2,293	211	3,715	386	3,790	362
Ireland	1,601	166	542	58	772	66
Israel and Palestine	785	70	224	20	1,610	132
Italy	27,477	2,576	17,979	1,659	30,621	2,703
Japan	7,933	814	7,497	739	17,846	1,723
Malaya	964	98	885	88	442	41
Mexico	12,904	935	8,850	624	11,932	867
Mozambique	9	(2)	6	(2)	622	52
Netherlands	3,194	372	2,509	232	4,616	406
New Zealand	5,224	457	704	65	2,320	206
Norway	1,907	163	1,214	112	1,662	150
Pakistan	133	15	401	41	299	34
Peru	1,556	140	1,380	124	1,821	158
Philippines	124	12	95	9	292	25
Portugal	1,724	167	899	78	1,065	86
Spain	3,236	295	4,982	446	5,008	474
Sweden	9,441	897	15,734	1,422	11,077	970
Switzerland	4,547	435	4,686	464	3,173	364
Taiwan	190	19	312	37	74	8
Trieste	1	(2)	180	11		
Turkey	493	40	1,297	98	1,397	107
Union of South Africa	18,203	1,646	14,131	1,310	18,269	1,715
United Kingdom	100,928	9,665	11,122	1,274	31,739	3,346
Uruguay	1,146	119	702	74	2,128	216
Venezuela	654	58	1,270	115	1,613	128
Yugoslavia	1,225	115	112	12	874	87
Other countries	495	47	626	74	466	48
Total	433,493	39,155	292,908	26,100	358,620	32,054

[1] West Germany.
[2] Less than $500.

TABLE 11.—Carbon black exported from the United States in 1953, by months, in thousand pounds

[U. S. Department of Commerce]

Month	Contact	Furnace	Total	Month	Contact	Furnace	Total
January	13,843	13,968	27,811	August	9,608	11,745	21,353
February	9,775	12,152	21,927	September	24,234	15,557	39,791
March	16,409	12,913	29,322	October	11,680	13,741	25,421
April	14,767	12,332	27,099	November	14,474	11,586	26,060
May	18,601	14,471	33,072	December	22,453	16,840	39,293
June	13,602	11,657	25,259				
July	25,188	17,024	42,212	Total:			
				1953	194,634	163,986	358,620
				1952	167,377	125,531	292,908

TECHNOLOGY

Commercial production of a new grade of furnace black was begun in 1953. This grade, called Superabrasion furnace (SAF), has an average particle diameter of 185 Ångstrom units compared with 250 for HAF grade. The SAF grade is an oil black. The yield from oil is smaller than that obtained when HAF grade is produced. SAF grade is reported to produce higher tensile strength and greater abrasion resistance when compounded with GR–S cold rubber than is obtained with HAF. In tire tests with cold rubber, SAF is reported to have given 40 percent better abrasion resistance than HAF, and with natural rubber 20 percent better abrasion resistance than easy-processing channel black.

WORLD PRODUCTION

The opening of a second unit of the carbon-black plant of Cabot Carbon, Ltd., near Liverpool, England, doubled that plant's capacity, bringing it to 40 million pounds a year. Production of carbon black in the United Kingdom in 1953 totaled 103 million pounds compared with 70 million in 1952.

Canada became a producer of carbon black in 1953, with completion in June of an oil-black furnace plant at Sarnia, Ontario, having capacity of 20 million pounds per year.

Japan produced approximately the same quantity in 1953 as in 1952—just under 10 million pounds.

Natural Gas

By D. S. Colby, B. E. Oppegard, and L. V. Harvey

GENERAL SUMMARY

MARKETED production of natural gas in the United States increased 5 percent in 1953, the smallest gain reported since 1949. Most of the gain was in Texas, Louisiana, Oklahoma, and New Mexico.

Interstate movements accounted for most of the growth in shipments, with large increases of deliveries to California and New England. Rhode Island received natural gas for the first time.

Mild winter weather in 1953 curtailed the expansion of residential-gas consumption, and a mild decline in industrial activity in the latter half of the year kept down industrial sales of natural gas.

Prices of natural gas at the wellhead continued to increase, and the average wellhead value for the United States made the sharpest annual upward movement since figures have been collected by the Bureau of Mines. The average value at point of consumption maintained a steady rise.

TABLE 1.—Salient statistics of natural gas in the United States, 1949–53

	1949	1950	1951	1952	1953
MILLION CUBIC FEET					
Supply:					
Marketed production [1]	5, 419, 736	6, 282, 060	7, 457, 359	8, 013, 457	8, 396, 916
Withdrawn from storage	106, 368	175, 260	209, 428	221, 909	246, 802
Imports				7, 807	9, 225
Total supply	5, 526, 104	6, 457, 320	7, 666, 787	8, 243, 173	8, 652, 943
Disposition:					
Consumption	5, 195, 484	6, 026, 404	7, 102, 562	7, 613, 478	7, 979, 338
Exports	20, 054	25, 727	24, 163	27, 456	28, 322
Stored	172, 051	229, 752	347, 690	398, 593	404, 838
Lost in transmission, etc	138, 515	175, 437	192, 372	203, 646	240, 445
Total disposition	5, 526, 104	6, 457, 320	7, 666, 787	8, 243, 173	8, 652, 943
VALUE					
Production (at wells)...thousand dollars	344, 034	408, 521	542, 964	623, 649	774, 966
Average per M cubic feet.......cents	6.3	6.5	7.3	7.8	9.2

[1] Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.

SCOPE OF REPORT

Statistics of natural-gas production, consumption, and value are collected on an annual questionnaire sent to producers of oil and gas, natural-gasoline-plant operators, gas-pipeline companies, and gas-utility companies. A separate report is filed by the respondent for each State in which he operates.

Volumes are reported at the pressure base selected by the reporting company. Only those reports that deviate more than 5 percent above or below 14.65 p. s. i. a. at 60° F. are corrected to 14.65.

Reports are received covering approximately 75 percent of gross natural-gas production. The large number of returns necessary and the difficulty of contacting each small producer make direct compilation of total production impractical. The output of nonreporting producers will in most instances be accounted for in the purchases of reporting companies. Marketed production for each State is determined by adding consumption in a State, plus gas placed in storage, plus shipments to other States, less gas withdrawn from storage, less receipts from other States.

Gross production is the total of marketed production plus the reported repressuring figure plus the partly estimated "vent-and-waste" figure. Data on gas vented and wasted are based on figures given on the reporting forms, supplemented by estimates of wastage derived from figures published by the American Gas Association Reserves Committee and State conservation bodies.

GOVERNMENT REGULATIONS

The Petroleum Administration for Defense on March 1, 1953, removed its Order 2,[1] which had limited extension of natural-gas service to industrial and central heating customers. The order was rescinded because steel was in sufficient supply to permit the pipeline expansion needed to satisfy consumer demand for gas.

On August 13 the President signed into law a bill permitting natural-gas interstate pipeline companies to cross Federal Government land without incurring the obligation to become common carriers, as previous law had required.[1]

The United States Supreme Court on November 30, 1953, refused to review a Court of Appeals ruling that the Federal Power Commission must fix rates for interstate sales of natural gas by companies that produce and gather it. In 1951 the Federal Power Commission had issued an opinion that the Phillips Petroleum Co. was not a natural-gas company within the meaning of the Natural Gas Act and the Commission had no jurisdiction over its rates.[1] (On January 19, 1954, the United States Supreme Court decided to grant a rehearing of the Phillips case.)

On December 4, 1953, the Federal Power Commission issued Opinion 264 on Docket R–126 stating its policies regarding ratemaking where Federal income taxes were affected by accelerated amortization. The funds temporarily available as the result of reduced taxes during the period of accelerated amortization need not be passed on to customers as lower rates but must be retained for future income-tax payments.

RESERVES

The American Gas Association Committee on Natural Gas Reserves reported that in 1953 additions to reserves both through new discoveries and through extensions and revisions of previous discoveries were higher than in any year since the committee was formed in 1946.

For 1953 a new system of accounting for native gas in underground storage reservoirs places these data in the "underground-storage" column of reserves rather than the "nonassociated" or "associated" columns of table 2. Net change in underground storage therefore is inflated for this year.

[1] See Minerals Handbook 1951, p. 867.

TABLE 2.—Estimated proved recoverable reserves of natural gas in the United States, 1952–53, in million cubic feet [1]

[Committee on Natural-Gas Reserves, American Gas Association]

State	Reserves [2] as of Dec. 31, 1952	Changes in reserves during 1953: Extensions and revisions [2]	Discoveries of new fields and new pools in old fields [2]	Net change in underground storage [3]	Net production [4]
Arkansas	984,582	252,566	10,983	2,588	39,453
California [5]	9,340,022	219,205	50,348	50,717	500,945
Colorado	1,164,249	542,852	213,313	-----------	56,139
Illinois	211,651	48,856	929	-----------	30,185
Indiana	36,714	215	2,150	3,901	7,150
Kansas	14,193,565	466,236	1,587,106	8,457	467,762
Kentucky	1,313,523	42,014	11,160	5,836	71,000
Louisiana [5]	31,451,614	3,144,349	1,294,440	-----------	1,431,491
Michigan	254,543	−83,567	250	110,964	6,671
Mississippi	2,364,060	248,669	156,372	196	200,116
Montana	827,603	−50,924	925	19,493	33,097
Nebraska	93,958	87,954	12,300	-----------	12,102
New Mexico	14,038,889	3,539,961	301,459	78,003	436,102
New York	68,640	−2,688	-----------	7,414	2,362
Ohio	731,483	−36,247	5,618	86,408	31,280
Oklahoma	11,764,829	875,175	427,602	26,238	865,471
Pennsylvania	709,585	9,442	75,450	55,673	98,306
Texas [5]	105,732,763	2,591,789	2,868,008	5,466	4,668,400
Utah	283,412	826,517	12,820	-----------	9,691
West Virginia	1,660,070	88,247	21,850	49,775	166,000
Wyoming	2,321,124	481,122	23,795	5,302	91,712
Other States [6]	169,346	79,612	4,783	-----------	13,105
Total	199,716,225	13,371,355	7,081,661	516,431	9,238,540

State	Reserves as of Dec. 31, 1953 [2]: Nonassociated [7]	Associated [8]	Dissolved [9]	Underground storage [10]	Total
Arkansas	758,404	162,085	285,563	5,214	1,211,266
California [5]	2,352,644	2,137,871	4,605,198	63,634	9,159,347
Colorado	1,191,520	57,810	614,945	-----------	1,864,275
Illinois	10,001	2,500	218,750	-----------	231,251
Indiana	3,152	2,700	23,240	6,738	35,830
Kansas	15,287,581	139,158	319,669	41,194	15,787,602
Kentucky	1,226,061	-----------	56,072	19,400	1,301,533
Louisiana [5]	27,505,549	4,508,051	2,445,312	-----------	34,458,912
Michigan	34,629	-----------	46,780	194,110	275,519
Mississippi	1,947,388	390,302	230,838	653	2,569,181
Montana	616,312	34,375	84,206	29,107	764,000
Nebraska	148,696	6,646	26,768	-----------	182,110
New Mexico	14,075,903	1,754,422	1,594,172	97,713	17,522,210
New York	42,452	-----------	468	28,084	71,004
Ohio	497,645	-----------	33,453	224,884	755,982
Oklahoma	6,882,492	1,782,641	3,488,472	74,768	12,228,373
Pennsylvania	501,751	-----------	37,171	212,922	751,844
Texas [5]	69,324,826	20,661,008	16,536,493	7,299	106,529,626
Utah	1,108,297	-----------	4,761	-----------	1,113,058
West Virginia	1,428,425	-----------	59,503	166,014	1,653,942
Wyoming	1,840,794	349,154	531,695	17,988	2,739,631
Other States [6]	65,878	-----------	174,758	-----------	240,636
Total	146,850,400	31,988,723	31,418,287	1,189,722	211,447,132

[1] Volumes are reported at a pressure base of 14.65 pounds per square inch absolute and at a standard temperature of 60° F.
[2] Excludes gas loss from recovery of natural-gas liquids.
[3] The net difference between gas stored in and gas withdrawn from underground storage reservoirs including adjustments.
[4] Net production equals gross withdrawals less gas injected into underground reservoirs; changes in underground storage and gas loss from recovery of natural-gas liquids are excluded. December production partly estimated.
[5] Includes offshore reserves.
[6] Includes Alabama, Florida, Maryland, Missouri, North Dakota, and Virginia.
[7] Nonassociated gas is free gas not in contact with crude oil in the reservoir.
[8] Associated gas is free gas in contact with crude oil in the reservoir.
[9] Dissolved gas is gas in solution with crude oil in the reservoir.
[10] Net gas placed in underground reservoirs for storage purposes only.

PRODUCTION

GROSS WITHDRAWAL

The gross withdrawal of natural gas from formation increased 4 percent in 1953. Quantity repressured increased slightly, whereas vent and waste decreased slightly.

TABLE 3.—Gross withdrawals and disposition of natural gas in the United States, 1952–53, by States, in million cubic feet

State	Gross withdrawals [1]			Disposition		
	From gas wells	From oil wells	Total	Marketed production [2]	Repressuring	Vented and wasted [3]
1952						
Arkansas	40,400	27,200	67,600	42,325	22,070	3,205
California	170,000	600,300	770,300	517,450	244,450	8,400
Colorado	29,200	22,100	51,300	34,260	2,225	14,815
Illinois	900	35,000	35,900	10,183	2,369	23,348
Indiana	150	7,200	7,350	836	48	6,466
Kansas	382,000	80,300	462,300	412,544	1,197	48,559
Kentucky	70,000	4,800	74,800	73,427		1,373
Louisiana	1,185,900	339,000	1,524,900	1,237,143	201,405	86,352
Maryland	2,372		2,372	2,372		
Michigan	6,600	5,000	11,600	9,052	708	1,840
Mississippi	184,200	81,500	265,700	174,100	47,605	43,995
Montana	25,900	3,400	29,300	28,714	376	210
Nebraska	4,400	1,600	6,000	5,568	48	384
New Mexico	170,700	242,000	412,700	359,377	9,005	44,318
New York	3,300	370	3,670	3,627		43
North Dakota	320	1,450	1,770	369		1,401
Ohio	30,900	1,700	32,600	30,993	33	1,574
Oklahoma	420,000	404,100	824,100	554,033	80,109	189,958
Pennsylvania	106,400	3,000	109,400	108,684	234	482
Texas	3,779,100	1,507,700	5,286,800	4,147,805	784,892	354,103
Utah	2,870	420	3,290	3,006		284
Virginia	1,133		1,133	1,133		
West Virginia	178,500	4,700	183,200	180,995	724	1,481
Wyoming	43,800	60,500	104,300	75,313	13,003	15,984
Other States [4]	132	49	181	148		33
Total	6,839,177	3,433,389	10,272,566	8,013,457	1,410,501	848,608
1953						
Arkansas	38,100	27,000	65,100	41,510	20,003	3,587
California	200,700	590,000	790,700	531,346	252,145	7,209
Colorado	19,000	28,200	47,200	28,509	7,285	11,406
Illinois	650	34,000	34,650	9,282	1,174	24,194
Indiana	130	7,060	7,190	701	39	6,450
Kansas	415,000	60,000	475,000	420,607	1,079	53,314
Kentucky	71,000	2,700	73,700	71,405		2,295
Louisiana	1,246,000	350,000	1,596,000	1,293,644	216,474	85,882
Maryland	1,408		1,408	1,408		
Michigan	5,500	5,000	10,500	7,774	1,215	1,511
Mississippi	180,000	75,000	255,000	154,254	53,223	47,523
Montana	25,400	3,000	28,400	27,889	294	217
Nebraska	5,400	2,000	7,400	6,748	191	461
New Mexico	208,000	245,000	453,000	399,086	3,260	50,654
New York	2,200	200	2,400	2,347		53
North Dakota	370	5,200	5,570	498		5,072
Ohio	36,400	1,800	38,200	37,542	34	624
Oklahoma	460,000	425,000	885,000	599,955	92,136	192,909
Pennsylvania	103,800	2,500	106,300	105,558	275	467
Texas	3,835,000	1,624,000	5,459,000	4,383,158	779,054	296,788
Utah	6,870	390	7,260	7,075		185
Virginia	3,697		3,697	3,697		
West Virginia	184,000	4,000	188,000	186,477	453	1,070
Wyoming	46,500	58,400	104,900	76,262	10,272	18,366
Other States [4]	112	111	223	184		39
Total	7,095,237	3,550,561	10,645,798	8,396,916	1,438,606	810,276

[1] Marketed production plus quantities used in repressuring, vented, and wasted.
[2] Gas sold or consumed by producers (see table 1, footnote 1).
[3] Includes gas (mostly residue) blown to the air, but does not include direct waste on producing properties, except where data are available.
[4] Alabama, Florida, Missouri, South Dakota, and Tennessee.

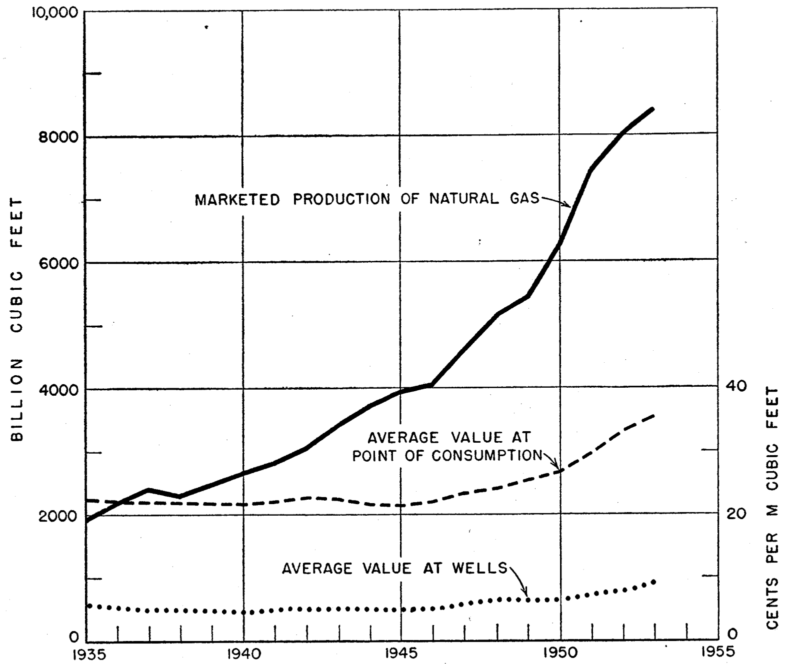

FIGURE 1.—Production and average value of natural gas in the United States, 1935–53.

STORAGE

Additions to storage in 1953 in the Appalachian states were less than in 1952. The total addition to storage for the United States was maintained at nearly the 1952 level by the initial injection of gas into a new storage project in Illinois.

There were 167 storage pools in operation at the end of 1953 according to the report of the American Gas Association Committee on

TABLE 4.—Natural gas stored underground in and withdrawn from storage fields, 1952–53 by State of location, in million cubic feet

State	1952			1953		
	Total stored	Total with-drawn	Net stored	Total stored	Total with-drawn	Net stored
Arkansas	711	462	249	1,920	416	1,504
California	16,286	16,949	−663	15,895	15,619	276
Illinois	588	749	−161	12,372	545	11,827
Indiana	2,339	333	2,006	1,350	641	709
Kansas	16,182	15,449	733	22,172	15,200	6,972
Kentucky	8,894	6,091	2,803	7,417	5,774	1,643
Michigan	59,971	32,960	27,011	57,512	39,225	18,287
Mississippi	148	7	141	266	63	203
Montana	2,563	578	1,985	4,012	1,039	2,973
New Mexico	7,751	2,155	5,596	9,835	3,554	6,281
New York	10,696	5,525	5,171	10,318	7,068	3,250
Ohio	68,585	34,694	33,891	64,395	39,788	24,607
Oklahoma	22,822	9,061	13,761	27,706	15,598	12,108
Pennsylvania	91,290	37,264	54,026	79,617	49,140	30,477
Tennessee	----	----	----	145	----	145
Texas	1,733	2,291	−558	3,985	5,849	−1,864
West Virginia	82,755	56,407	26,348	80,400	46,465	33,935
Wyoming	5,279	934	4,345	5,521	818	4,703
Total	398,593	221,909	176,684	404,838	246,802	158,036

Underground Storage, an increase of 16 during the year. Over half of these new pools were in the midwest, in Illinois, Indiana, Kansas, Michigan, and Oklahoma. Twelve new pools were under construction at the end of 1953.

MARKETED PRODUCTION

The marketed production of natural gas increased 5 percent in 1953 and was the smallest percentage and the smallest quantity gain since 1949. The mild winter weather and the general decline in the level of the Nation's economic activity in the latter half of the year contributed to the slackening expansion of gas production. Federal Power Commission authorizations for natural-gas transmission facilities in 1952 also remained low—two thirds of the 1949–50 level. As authorizations in 1 year can be expected to be completed in the following year, this meant that relatively little new pipeline capacity was available in 1953.

TABLE 5.—Marketed production of natural gas in the United States, 1949–53, by States [1]

State	Quantity (million cubic feet)					Change from 1952 (percent)	Estimated value at wells (thousand dollars)	
	1949	1950	1951	1952	1953		1952	1953
Alabama		2	1	4	41	925.0	(2)	2
Arkansas	47,788	48,047	44,656	42,325	41,510	−1.9	1,735	2,200
California	550,903	558,398	566,751	517,450	531,346	2.7	86,414	104,675
Colorado	8,490	11,168	14,128	34,260	28,509	−16.8	1,884	1,654
Florida	39	8	10	15	34	126.7	1	2
Illinois	12,391	13,285	11,425	10,183	9,282	−8.8	1,650	1,559
Indiana	334	956	845	836	701	−16.1	79	49
Kansas	294,078	364,024	417,538	412,544	420,607	2.0	34,241	36,172
Kentucky	51,851	73,316	76,097	73,427	71,405	−2.8	15,934	15,638
Louisiana	732,845	831,771	1,054,199	1,237,143	1,293,644	4.6	82,889	106,079
Maryland		373	3,422	2,372	1,408	−40.6	460	268
Michigan	14,753	11,250	11,194	9,052	7,774	−14.1	1,322	1,275
Mississippi	68,062	114,153	158,845	174,100	154,254	−11.4	10,620	12,340
Missouri	24	21	14	16	15	6.2	3	3
Montana	35,291	39,186	36,424	28,714	27,889	−2.9	1,752	1,645
Nebraska		17	3,895	5,568	6,748	21.2	740	911
New Mexico	204,961	212,909	300,169	359,377	399,086	11.0	16,414	24,344
New York	3,693	3,336	3,214	3,627	2,347	−35.3	1,059	742
North Dakota	533	608	456	369	498	35.0	23	34
Ohio	46,512	43,163	38,879	30,993	37,542	21.1	6,725	8,334
Oklahoma	435,262	482,360	538,756	554,033	599,955	8.3	29,918	41,397
Pennsylvania	84,739	91,137	128,715	108,684	105,558	−2.9	30,758	30,717
South Dakota	1		7	6	5	−16.7	(2)	(2)
Tennessee	83	132	132	107	89	−16.8	11	11
Texas	2,588,921	3,126,402	3,781,136	4,147,805	4,383,158	5.7	257,164	333,120
Utah	6,126	3,950	3,733	3,006	7,075	135.4	225	807
Virginia	65	46	64	1,133	3,697	226.3	279	954
West Virginia	181,176	189,980	191,146	180,995	186,477	3.0	35,475	44,009
Wyoming	50,815	62,062	71,508	75,313	76,262	1.3	5,874	6,025
Total	5,419,736	6,282,060	7,457,359	8,013,457	8,396,916	4.8	623,649	774,966

[1] Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases of gas in pipelines.
[2] Less than $500.

NUMBER OF WELLS

The number of gas wells completed in 1953 exceeded that of any previous year. A plentiful supply of steel during the year after several years of short supply contributed to the large number of wells drilled. The number of operating gas wells rose sharply in 1953 as abandonments, which had been high in the Appalachian area for several years declined.

TABLE 6.—Gas wells in the United States, 1952–53, by States

State	Drilled during 1952 [1]	Producing Dec. 31, 1952	Drilled during 1953 [1]	Producing Dec. 31, 1953
Arkansas	7	200	1	230
California	43	380	48	420
Colorado	29	40	63	55
Illinois	18	40	4	25
Indiana	18	600	22	450
Kansas	316	4,270	380	4,600
Kentucky	227	3,800	194	3,900
Louisiana	206	2,900	222	3,200
Michigan	30	380	19	280
Mississippi	4	220	12	220
Missouri	6	[2] 20	----------	[2] 27
Nebraska	10		12	
Montana	18	920	22	1,000
New Mexico	319	920	600	1,500
New York	----------	1,360	----------	1,300
Ohio	219	6,000	176	6,100
Oklahoma	295	3,700	339	3,900
Pennsylvania	220	16,700	254	16,700
Tennessee	----------	20	1	27
Texas	778	9,200	978	10,200
West Virginia	443	13,500	420	13,800
Wyoming	16	180	25	180
Alabama, Maryland, North Dakota, South Dakota, Utah and Virginia	33	100	14	109
Total	3,255	65,450	3,806	68,223

[1] From Oil and Gas Journal.
[2] Combined to avoid disclosure of individual company operations.

DEVELOPMENT AND PRODUCTION BY STATES [2]

California.—E. F. McNaughton, director, Utilities Division, California Public Utilities Commission, reported that three new gas fields were discovered in northern California in 1953. The most promising was the Beehive Bend field in Glenn County. Proved recoverable reserves of natural gas continued to decline in California, and the State became more dependent upon imported gas.

Colorado.—J. R. Schwabrow, Federal Geological Survey, reported that gas-well completions reached an alltime high in Colorado in 1953. Most new discoveries were in the Julesburg Basin, while most of the development drilling was in the Ignacio field in the southwestern corner of the State. Four fields in western Colorado began producing in 1953 when the Western Slope Pipeline Co. gasline to Grand Junction was completed.

Kansas.—Edwin D. Goebel, geologist, Kansas State Geological Survey, reported that the most significant new natural-gas production in Kansas was expansion of the Greenwood field in Morton County. Discovered in 1951, the field covered over 28,000 acres at the close of 1953. It produced from four different zones—the Wabaunsee, Shawnee, Lansing-Kansas City group, and Morrison series. The Hugoton field again produced 92 percent of the natural gas in the State.

By order of the Conservation Division of the Kansas Corporation Commission, effective July 1, 1953, the standard pressure base for Kansas was set at 14.65 p. s. i. a. at 60° F.

Kentucky.—C. D. Hunter, chief geologist, Kentucky-West Virginia Gas Co., reported that extension of the Big Sandy gas field into

[2] Based on latest available trade publications and reports from Federal and State agencies.

northern Letcher County continued in 1953. Nine wells producing from the Devonian shale were completed in Letcher County in 1953.

Maryland.—Joseph T. Singewald, Jr., director of the Maryland Department of Geology, Mines, and Water Resources, reported that the discovery well in the Accident field brought in late in 1952 began to produce in the fourth quarter of 1953, with production totaling 43 million cubic feet. Drilling in the Accident field was suspended during 1953 awaiting clarification of an Oil and Gas Conservation law enacted early in 1953.

Ohio.—Robert L. Alkire, chief of the Oil and Gas Section, Ohio Geological Survey, reported that successful gas-well completions during 1953 were the lowest since 1890. Several promising wildcat completions, however, offered possibilities for future development.

Two new Clinton-sand gas pools of note were developed during the year. In Lorain County, Wellington Township, 6 wells were completed with an average initial open flow of over 4 million cubic feet per day. In Knox County, Butler Township, 5 wells averaged 1.5 million cubic feet per day.

Oklahoma.—Lease prices soared, and extensive drilling resulted from finding new gas reserves in the Keyes gas district, discovery of the Northwest Eva oil pool west of the Hugoton gas field, and discovery of an unnamed gas pool in T. 1 N., R. 19 E., east of the Hugoton field. All three pools have great areal extent. Production is largely from Morrow and Keyes sands.

Nineteen hundred and fifty-three was a banner year for successful results in Oklahoma exploration. Fieldwork during the year was the heaviest in the State's history.

Pennsylvania.—J. G. Montgomery, Jr., vice president, United Gas Co., reported intensive development of the Driftwood-Benezette pool in Elk County in 1953. The discovery well was drilled in 1952 and found gas in the Oriskany sand. During 1953, 124 producing wells were completed with an average daily open flow of close to 7 million cubic feet. The developed acreage at the end of the year totaled 21,000 acres, and the limits of the pool had been only partly defined.

The Leidy pool, discovered in 1950, was nearly exhausted at the end of the year. It had produced 90 billion cubic feet of gas.

Texas.—*West Texas.*—Activity broke records, and the discovery rate was high. There was 1 discovery for every 5 wildcats in West Texas and 1 discovery for 2 wildcats in Andrews County. Emphasis was on deeper wildcat exploration (pre-Permian). Deep discoveries along the western edge of the Midland Basin to the eastern edge of the Central Basin platform dominated exploration.

A Texas Railroad Commission order shut in the Spraberry trend because over 200 million cubic feet of gas per day was being flared. On June 10, 1953, the Texas Supreme Court declared the order void, holding that such blanket action was not within the power of the commission. Production quotas were then assigned to those wells from which the gas was put to legal use.

Panhandle.—The Quinduno field (discovered in 1952) and the first major Anadarka Basin discovery in the Texas Panhandle underwent extensive development.

Discoveries in Hansford County, Tex., and adjacent Texas County, Okla., outlined a possible producing area covering 150,000 acres.

Utah.—R. M. Larsen, Federal Geological Survey, reported that the proved area of the Clear Creek field was increased from 8,400 acres to 21,600 by 5 step-out wells. This was the center of natural-gas activity in the Wasatch Plateau area extending about 85 miles south from the Price River. Well elevations running over 9,000 feet in this area are probably the highest in the world.

The Clear Creek field was placed on production in October through a gas pipeline to Orem, Utah, where it connected with the Mountain Fuel Supply Co. system.

INTERSTATE SHIPMENTS AND EXPORTS

Interstate shipments of natural gas increased 11 percent in 1953—the smallest annual increase in volume since 1949. Nearly 90 percent of the increase originated in the West South Central region, but deliveries were rather well distributed among all regions. The largest increase went to California, which received 59 billion cubic feet more gas in 1953 than in 1952.

Imports and Exports.—The only importation of natural gas into the United States was from Canada for consumption at a smelter in Montana. Exports of gas to both Canada and Mexico were slightly less than in 1952.

TABLE 7.—Interstate shipments, imports, and exports of natural gas in 1953, by sources and final destination [1] in million cubic feet

Producing region and State or country	Quantity shipped	Consuming State or country	Quantity received [2]
Middle Atlantic:			
New Jersey		Canada	169
New York	103	Connecticut	85
Pennsylvania	36,565	Delaware	20
		District of Columbia	55
		Maryland	123
		Massachusetts	254
		New Hampshire	12
		New Jersey	403
		New York	31,659
		Ohio	3,785
		Pennsylvania	72
		Rhode Island	10
		Virginia	20
		West Virginia	1
Total	36,668	Total	36,668
South Atlantic:			
Delaware		Canada	3
District of Columbia		District of Columbia	4,309
Florida		Kentucky	856
Georgia		Maryland	8,782
Maryland	653	New Jersey	3
North Carolina		New York	3,281
South Carolina		Ohio	54,487
Virginia	3,632	Pennsylvania	39,244
West Virginia	117,895	Tennessee	13
		Virginia	8,935
		West Virginia	2,267
Total	122,180	Total	122,180
East North Central:			
Illinois	1	Canada	47
Indiana	904	Connecticut	7
Michigan	47	Delaware	3
Ohio	46	District of Columbia	2

See footnotes at end of table.

TABLE 7.—Interstate shipments, imports, and exports of natural gas in 1953, by sources and final destination [1] in million cubic feet—Continued

Producing region and State or country	Quantity shipped	Consuming State or country	Quantity received [2]
East North Central—Continued			
Wisconsin		Illinois	356
		Indiana	1
		Kentucky	1
		Maryland	8
		Massachusetts	1
		New Jersey	18
		New York	45
		Ohio	327
		Pennsylvania	162
		Rhode Island	3
		Virginia	4
		West Virginia	13
Total	998	Total	998
East South Central:			
Alabama	45	Alabama	41,087
Kentucky	43,667	Arkansas	1
Mississippi	121,832	District of Columbia	853
Tennessee		Florida	4,261
		Georgia	46,617
		Indiana	1,470
		Kentucky	775
		Louisiana	1,503
		Maryland	1,888
		Mississippi	37
		New York	173
		North Carolina	9
		Ohio	55,629
		Pennsylvania	1,982
		South Carolina	150
		Tennessee	339
		Virginia	1,818
		West Virginia	6,952
Total	165,544	Total	165,544
West North Central:			
Iowa		Canada	1,450
Kansas	297,127	Colorado	30,414
Minnesota		Connecticut	3
Missouri		Delaware	4
Nebraska		District of Columbia	2
North Dakota	36	Illinois	12,809
South Dakota		Indiana	14,559
		Iowa	36,058
		Kansas	12
		Massachusetts	9
		Michigan	31,784
		Minnesota	53,202
		Missouri	48,223
		Montana	25
		Nebraska	44,791
		New Jersey	52
		New York	81
		North Dakota	5
		Ohio	16,094
		Oklahoma	1,311
		Pennsylvania	439
		Rhode Island	1
		South Dakota	5,047
		Virginia	2
		West Virginia	3
		Wisconsin	109
		Wyoming	674
Total	297,163	Total	297,163

See footnotes at end of table.

TABLE 7.—Interstate shipments, imports, and exports of natural gas in 1953, by sources and final destination [1] in million cubic feet—Continued

Producing region and State or country	Quantity shipped	Consuming State or country	Quantity received [2]
West South Central:			
Arkansas	1,443	Alabama	98,803
Lousiana	773,055	Arizona	41,748
Oklahoma	262,290	Arkansas	142,013
Texas	2,242,504	California	165,364
		Canada	4,342
		Colorado	76,464
		Connecticut	6,317
		Delaware	2,118
		District of Columbia	8,441
		Florida	15,409
		Georgia	78,176
		Illinois	350,444
		Indiana	96,796
		Iowa	73,139
		Kansas	174,508
		Kentucky	79,108
		Louisiana	79,471
		Maryland	19,633
		Massachusetts	19,181
		Mexico	20,855
		Michigan	163,601
		Minnesota	52,260
		Mississippi	85,995
		Missouri	130,804
		Nebraska	30,233
		New Hampshire	909
		New Jersey	62,374
		New Mexico	42,899
		New York	174,034
		North Carolina	6,876
		Ohio	290,919
		Oklahoma	25,552
		Pennsylvania	270,671
		Rhode Island	680
		South Carolina	8,965
		South Dakota	4,646
		Tennessee	108,671
		Texas	96,000
		Virginia	18,819
		West Virginia	110,737
		Wisconsin	39,507
		Wyoming	1,810
Total	3,279,292	Total	3,279,292
Mountain:			
Arizona	----------	Arizona	31,961
Colorado	19,434	California	191,744
Idaho	----------	Canada	3
Montana	536	Colorado	1,157
Nevada	----------	Mexico	1,453
New Mexico	233,710	Montana	6,659
Utah	10	Nebraska	2,098
Wyoming	36,033	New Mexico	9,789
		North Dakota	3,181
		South Dakota	4,270
		Texas	8,347
		Utah	28,546
		Wyoming	515
Total	289,723	Total	289,723
Foreign: Canada	9,225	Montana	9,225
Grand total	4,200,793	Grand total	4,200,793

[1] Includes exports as follows: 6,014 million cubic feet to Canada and 22,308 million cubic feet to Mexico.
[2] Includes amounts consumed, stored, and lost in transmission.

PIPELINES

In 1953 the Federal Power Commission issued certificates of necessity totaling $726 million for the construction of natural-gas facilities designed to add over 2.5 billion cubic feet daily capacity to the pipeline systems involved. These authorizations included 6,800 miles of pipeline. The previous year's authorization totaled $409 million and 4,147 miles of pipeline.

Among the larger projects authorized during the year were the following:

Tennessee Gas Transmission Co. to construct 571 miles of pipeline from southern Louisiana to Tennessee, where it connects with existing lines and supplies gas to be delivered in Pittsburgh, Pa., and Buffalo, N. Y., and for export to Canada.

Gulf Interstate Gas Co. to construct approximately 1,000 miles of pipeline from southern Louisiana to Kentucky to supply the expanding requirements of the Columbia Gas System.

Permian Basin Pipeline Co. to construct a pipeline in west Texas to gather and transport 347,000 million cubic feet of natural gas daily for delivery into the Northern Natural Gas Co. pipeline system.

El Paso Natural Gas Co. to construct approximately 1,000 miles of pipeline from West Texas to California via Gallup, N. Mex.

An agreement was worked out between Algonquin Gas Transmission Co. and Northeastern Gas Transmission Co. and approved by the Federal Power Commission on the division of the New England market between these companies.

CONSUMPTION

Consumption of natural gas in the United States increased 5 percent in 1953. Consumption in States that rely upon production outside their boundaries increases as additional pipeline capacity is completed. The division between types of consumers then depends upon demand in the area of the new deliveries. In 1953 there was very little change in consumption in the major producing States—Texas, Louisiana, Kansas, and Mississippi. Declines in field and carbon-black usage reduced consumption in these States.

The major increases took place in those States that received new supplies of gas via pipeline. These States were located in all directions from the southwest producing area and included North Carolina, South Carolina, Kentucky, Virginia, New Jersey, Massachusetts, Connecticut, Iowa, California, and Arizona. Rhode Island received natural gas for the first time.

Seasonally, consumption was low in the last quarter of 1953; this could be attributed both to the fact that the weather was warmer than normal and warmer than in 1952 and also to the decline in industrial activity in the latter half of 1953.

Residential and Commercial.—The residential consumption of natural gas increased 4 percent in 1953, a small gain compared with the 10- and 23-percent increases in the 2 previous years. The same di-

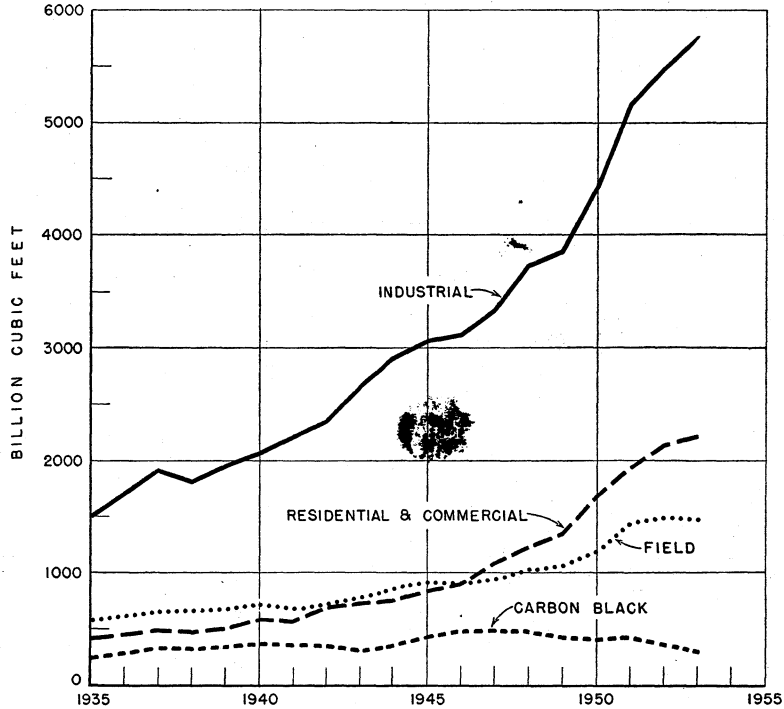

FIGURE 2.—Consumption of natural gas by use in the United States, 1935–53.

minishing rate of growth was experienced by distillate fuel oils. Mild weather was part of the cause for this small gain. Although a considerable number of new customers were added in the New England States in 1953, service to these was not begun until the latter half of the year, and their consumption for the year was therefore small. In addition, these new customers at the time of conversion did not represent a large proportion of space-heating load, and consumption per customer was low. The average consumption of straight natural gas per residential consumer for these reasons declined to 79,400 cubic feet in 1953 from 82,000 cubic feet in 1952.

Commercial consumption followed much the same pattern as residential with only a 3-percent gain compared with 11 percent in 1952.

Field.—Field use of natural gas declined 1 percent in 1953. The large declines occurred in Louisiana and Texas. For a number of years field use has been growing at a slower rate than marketed production. The actual decline in field use in 1953 reflects the growing value of gas and elimination of wasteful or inefficient field uses when a more profitable market is available.

Treated for Natural-Gas Liquids.—The volume of natural gas treated for the extraction of natural-gas liquids increased 7 percent in 1953. The large increase in the volume treated in Illinois resulted from construction of an extraction plant on a natural-gas transmission

TABLE 8.—Consumption of natural gas in the United States, 1949–53, by States [1]

State	Quantity (million cubic feet)					Change from 1952 (percent)	Estimated value at points of consumption (thousand dollars)	
	1949	1950	1951	1952	1953		1952	1953
Alabama	71, 072	92, 466	111, 030	125, 874	136, 825	8. 7	39, 711	43, 290
Arizona	44, 489	53, 419	62, 046	63, 111	71, 210	12. 8	21, 467	26, 659
Arkansas	113, 922	135, 609	155, 524	165, 603	176, 489	6. 6	28, 094	33, 425
California	619, 323	683, 924	787, 848	792, 520	862, 243	8. 8	313, 248	343, 682
Colorado	73, 664	88, 692	102, 769	101, 835	115, 922	13. 8	32, 437	35, 317
Connecticut	-------	-------	-------	1, 039	5, 833	461. 4	2, 119	13, 756
Delaware	708	1, 022	1, 679	2, 276	1, 972	−13. 4	4, 440	3, 696
District of Columbia	9, 305	10, 694	11, 904	12, 782	13, 134	2. 8	16, 328	17, 406
Florida	10, 185	12, 348	13, 044	16, 001	19, 577	22. 3	3, 272	3, 903
Georgia	58, 824	67, 894	94, 596	108, 329	122, 742	13. 3	33, 014	40, 675
Illinois	202, 546	235, 211	250, 812	344, 705	350, 980	1. 8	159, 478	176, 035
Indiana	55, 263	58, 620	69, 177	96, 124	103, 444	7. 6	62, 171	66, 310
Iowa	57, 620	66, 233	79, 640	94, 951	106, 755	12. 4	39, 781	41, 766
Kansas	206, 593	242, 603	278, 892	279, 632	283, 604	1. 4	63, 399	65, 708
Kentucky	45, 504	61, 323	74, 386	87, 006	104, 781	20. 4	35, 818	40, 556
Louisiana	450, 712	475, 500	549, 305	599, 312	594, 656	−. 8	75, 693	85, 613
Maryland	4, 821	13, 813	22, 286	26, 468	29, 470	11. 3	32, 496	36, 298
Massachusetts	-------	-------	1, 783	11, 386	17, 683	55. 3	26, 441	40, 379
Michigan	84, 315	127, 180	154, 283	163, 991	178, 307	8. 7	121, 826	145, 255
Minnesota	59, 040	67, 861	84, 205	97, 591	104, 508	7. 1	44, 680	50, 397
Mississippi	60, 987	76, 918	97, 786	119, 638	118, 617	−. 9	25, 526	28, 006
Missouri	99, 667	140, 384	156, 922	168, 992	173, 674	2. 8	73, 407	77, 779
Montana	34, 361	38, 544	37, 481	40, 771	39, 934	−2. 1	12, 958	13, 145
Nebraska	51, 911	61, 742	72, 386	78, 544	83, 384	6. 2	31, 537	34, 533
New Hampshire	-------	-------	3	316	857	171. 2	623	1, 926
New Jersey	3, 172	3, 209	30, 887	40, 409	58, 685	45. 2	58, 185	82, 564
New Mexico	127, 423	147, 509	174, 808	194, 748	200, 039	2. 7	22, 580	25, 955
New York	51, 064	65, 157	144, 920	180, 747	197, 878	9. 5	258, 599	254, 917
North Carolina	-------	-------	1, 631	2, 945	6, 172	109. 6	1, 942	4, 574
North Dakota	2, 686	3, 279	3, 408	3, 342	3, 559	6. 5	1, 925	2, 043
Ohio	246, 212	324, 594	375, 820	393, 250	420, 809	7. 0	213, 461	239, 970
Oklahoma	258, 579	286, 793	307, 887	319, 908	333, 972	4. 4	50, 730	58, 255
Pennsylvania	209, 749	263, 199	311, 937	324, 187	335, 457	3. 5	202, 985	218, 786
Rhode Island	-------	-------	-------	-------	670	-------	-------	2, 005
South Carolina	-------	-------	853	2, 896	8, 772	202. 9	1, 182	3, 605
South Dakota	8, 212	10, 001	11, 447	11, 701	13, 688	17. 0	5, 495	6, 434
Tennessee	41, 609	67, 813	88, 078	99, 817	106, 130	6. 3	31, 502	39, 936
Texas	1,658,379	1,824,553	2,130,377	2,175,100	2,194,172	. 9	254, 607	283, 468
Utah	24, 338	26, 368	29, 014	30, 929	34, 592	11. 8	12, 100	13, 455
Virginia	4, 324	7, 639	14, 853	18, 630	27, 716	48. 8	19, 465	26, 330
West Virginia	111, 802	132, 273	139, 608	146, 153	148, 017	1. 3	47, 419	52, 035
Wisconsin	1, 696	15, 380	28, 382	33, 632	36, 339	8. 0	37, 233	40, 726
Wyoming	31, 407	36, 637	38, 865	36, 287	36, 070	−. 6	7, 945	8, 423
Total United States	5,195,484	6,026,404	7,102,562	7,613,478	7,979,338	4. 8	2,527,319	2, 828, 996

[1] Includes natural gas mixed with manufactured gas.

line there. The gas treated at this plant had, in most instances, been treated at conventional natural-gasoline plants before it entered the pipeline.

The overall yield of natural-gas liquids in 1953 was 1.47 gallons per thousand cubic feet treated. The slight rise from 1952 was due to increased recovery of propane.

Carbon Black.—The use of natural gas as a raw material for the production of carbon black declined again in 1953. Total carbon-black production at the same time was higher than in the preceding year. The decline in gas consumption was the result of diminishing use of contact blacks in rubber compounding and increasing preference for furnace blacks produced from oil, a trend of recent years.

Petroleum Refineries.—The use of natural gas as refinery fuel increased in 1953 in total volume but decreased as a proportion of total refinery fuel. Aside from Texas, where natural gas is the primary refinery fuel, the increases took place in California and in eastern Pennsylvania.

Electric Utility Plants.—The use of natural gas as a fuel for generating electric power at utility plants increased 14 percent in 1953. The use of all fuels for generating electric power increased 11 percent. Oil showed a larger gain and coal a smaller gain than gas for the year. Gas accounted for 24 percent of the fuel-generated electricity. It showed large gains because of additional pipeline capacity in the Middle Atlantic, South Atlantic, and Pacific regions. The East North Central region, where a new pipeline caused the use of gas for electric generation to triple in 1952, declined 22 percent in 1953 as more profitable markets were connected to the new gas supply.

Portland-Cement Plants.—The use of natural gas as fuel at portland-cement plants increased 3 percent in 1953. Only California had a sizable increase. In 1952 California had used less gas for this purpose than previously.

Natural-Gas Pipelines.—The use of natural gas as fuel at natural-gas pipeline compressor stations represented 2.7 percent of the marketed production in 1953 compared with 2.6 percent in 1952.

Other Industrial.—"Other industrial" was the fastest growing consumption category in 1953. In those States where new supplies of gas became available, the industrial consumer absorbed gas for which residential and commercial consumers had not been connected or which was not required because of mild weather. In Illinois, where large, new supplies went to industrial consumers in 1952, industrial sales declined as this gas was sold to residential and commercial consumers.

Mixed Gas.—Settlement of the controversy over natural-gas deliveries to New England and initiation of full-scale deliveries caused a large increase in the number of consumers receiving mixed gas in Massachusetts and Connecticut. The volume of mixed gas delivered to these States, however, did not increase in the same proportion, as gas was not received until the latter half of the year.

PRICES

The 1.4-cent-per-thousand-cubic-feet increase in the average wellhead value for gas in the United States was the highest annual increase yet reported. From 1945 to 1952 the average annual increase had been 0.4 cent per thousand cubic feet.

The sharp rise in wellhead values was general throughout the producing States. Only in Kansas, of the six largest producing States, was the increase less than average. New gas-purchase contracts have been written at prices far above the average value for gas since the end of World War II. The sharp rise in the average in 1953 probably was caused both by the expiration and rewriting of contracts at current prices and by the rise in current prices themselves.

TABLE 9.—Residential and commercial consumption of natural gas in the United States in 1953, by States [1]

State	Residential				Commercial				Total			
	Number of consumers (thousand)	Quantity (million cubic feet)	Value at point of consumption		Number of consumers (thousand)	Quantity (million cubic feet)	Value at point of consumption		Number of consumers (thousand)	Quantity (million cubic feet)	Value at point of consumption	
			Total (thousand dollars)	Average (cents per M cubic feet)			Total (thousand dollars)	Average (cents per thousand feet)			Total (thousand dollars)	Average (cents per M cubic feet)
Alabama	258	19,742	16,505	83.6	23	7,156	3,955	55.3	281	26,898	20,460	76.1
Arizona	167	9,722	9,130	93.9	19	6,610	3,314	50.1	186	16,332	12,444	76.2
Arkansas	194	18,302	9,804	53.6	29	9,064	3,540	39.1	223	27,366	13,344	48.8
California	3,163	223,649	162,967	72.9	240	78,790	43,907	55.7	3,403	302,439	206,874	68.4
Colorado	230	30,279	17,127	56.6	29	16,003	7,646	47.8	259	46,282	24,773	53.5
Connecticut	282	3,588	9,800	273.1	15	821	1,754	213.6	297	4,409	11,554	262.1
Delaware, District of Columbia and Maryland	623	30,550	43,304	141.7	48	6,744	8,720	129.3	671	37,294	52,024	139.5
Florida	18	1,396	1,119	80.2	38	290	83	28.6	56	1,686	1,202	71.3
Georgia	280	24,002	16,655	69.4	27	9,942	4,121	41.5	307	33,944	20,776	61.2
Illinois	1,768	99,348	95,014	95.6	100	21,892	15,736	71.9	1,868	121,240	110,750	91.3
Indiana	616	34,022	36,021	105.9	44	8,337	7,590	91.0	660	42,359	43,611	103.0
Iowa	254	25,722	20,577	80.0	27	11,363	5,973	52.6	281	37,085	26,550	71.6
Kansas	408	50,568	24,997	49.4	47	28,686	9,032	31.5	455	79,254	34,029	42.9
Kentucky	315	33,739	20,717	61.4	32	9,879	5,187	52.5	347	43,618	25,904	59.4
Louisiana	482	31,221	19,364	62.0	43	13,926	4,562	32.8	525	45,147	23,926	53.0
Massachusetts	914	12,015	30,814	256.5	52	2,434	5,376	220.9	966	14,449	36,190	250.5
Michigan	1,157	103,883	100,902	97.1	65	14,008	12,143	86.7	1,222	117,891	113,045	95.9
Minnesota	316	37,099	28,764	77.5	18	7,216	3,844	53.3	334	44,315	32,608	73.6
Mississippi	190	14,552	10,676	73.4	26	8,669	3,667	42.3	216	23,221	14,343	61.8
Missouri	607	63,704	46,052	72.3	52	18,679	9,541	51.1	659	82,383	55,593	67.5
Montana	78	12,095	6,418	53.1	9	7,585	2,792	36.8	87	19,680	9,210	46.8
Nebraska	201	24,331	17,301	71.1	22	10,101	4,835	47.9	223	34,432	22,136	64.3
New Hampshire	25	597	1,413	236.7	1	202	434	214.9	26	799	1,847	231.1
New Jersey	1,202	26,124	57,776	221.2	80	4,653	8,657	186.1	1,282	30,777	66,433	215.9
New Mexico	105	11,586	7,855	67.8	12	9,355	3,802	40.6	117	20,941	11,657	55.7
New York	3,363	118,860	181,427	152.6	327	24,692	37,273	151.0	3,690	143,552	218,700	152.3
North Carolina	39	1,156	2,212	191.3	6	1,066	1,394	130.8	45	2,222	3,606	162.3
North Dakota and South Dakota	44	5,587	4,186	74.9	6	4,269	2,137	50.1	50	9,856	6,323	64.2
Ohio	1,686	219,365	140,801	64.2	133	50,648	30,591	60.4	1,819	270,013	171,392	63.5
Oklahoma	474	44,346	24,694	55.7	60	23,484	7,579	32.3	534	67,830	32,273	47.6
Pennsylvania	1,767	142,264	129,071	90.7	121	27,770	19,994	72.0	1,888	170,034	149,065	87.7
Rhode Island	113	482	1,580	327.8	4	101	262	259.4	117	583	1,842	316.0
South Carolina	26	561	1,003	178.8	3	281	479	170.5	29	842	1,482	176.0
Tennessee	198	17,793	14,888	83.7	26	12,741	6,925	54.4	224	30,534	21,813	71.4
Texas	1,562	104,610	72,744	69.5	172	45,429	19,018	41.9	1,734	150,039	91,762	61.2

Utah	88	8,854	5,534	62.5	12	4,361	2,181	50.0	100	13,215	7,715	58.4
Virginia	248	11,012	16,718	151.8	19	4,125	4,390	106.4	267	15,137	21,108	139.4
West Virginia	290	39,803	18,839	47.3	29	11,107	4,807	43.3	319	50,910	23,646	46.4
Wisconsin	389	21,684	29,244	134.9	20	3,935	4,647	118.1	409	25,619	33,891	132.3
Wyoming	46	7,290	3,950	54.2	6	4,236	1,587	37.5	52	11,526	5,537	48.0
Total: 1953	24,186	1,685,503	1,457,963	86.5	2,042	530,650	323,475	61.0	26,228	2,216,153	1,781,438	80.4
1952	22,569	1,621,966	1,347,171	83.1	1,855	515,669	294,187	57.0	24,424	2,137,635	1,641,358	76.8

[1] Includes natural gas mixed with manufactured gas.

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TABLE 10.—Industrial consumption of natural gas in the United States in 1953 by State and use

State	Field (drilling, pumping, and operating gasoline-recovery plants)		Carbon-black manufacture			Fuel							Total industrial			Fuel at electric utility plants [1] (million cubic feet)
				Value at point of consumption		Million cubic feet					Value at point of consumption			Value at point of consumption		
	Million cubic feet (estimated)	Value at point of consumption (thousand dollars)	Million cubic feet	Total (thousand dollars)	Average (cents per M cubic feet)	Petroleum refineries	Portland cement plants	Natural-gas pipelines	Other industrial	Total	Total (thousand dollars)	Average (cents per M cubic feet)	Million cubic feet	Total (thousand dollars)	Average (cents per M cubic feet)	
Alabama	43	2	---	---	---	(2)	13,346	7,132	[2] 89,406	109,884	22,828	20.8	109,927	22,830	20.8	22,532
Arizona	---	---	---	---	---	---	(2)	7,149	[2] 47,729	54,878	14,215	25.9	54,878	14,215	25.9	14,560
Arkansas	24,054	2,243	(3)	(3)	(3)	10,439	(2)	7,739	[2 3] 106,891	[3] 125,069	[3] 17,838	[3] 14.3	149,123	20,081	13.5	34,452
California	159,349	24,950	(3)	(3)	(3)	81,220	21,911	7,906	[3] 289,418	[3] 400,455	[3] 111,858	[3] 27.9	559,804	136,808	24.4	117,559
Colorado	7,240	364	---	---	---	1,323	5,669	811	54,597	62,400	10,180	16.3	69,640	10,544	15.1	28,915
Connecticut	---	---	---	---	---	---	---	13	1,411	1,424	2,202	154.6	1,424	2,202	154.6	---
Delaware, District of Columbia, and Maryland	4	2	---			---	---	814	6,464	7,278	5,374	73.8	7,282	5,376	73.8	---
Florida	34	3	---			---	---	---	17,857	17,857	2,698	15.1	17,891	2,701	15.1	8,921
Georgia	---	---	---	---	---	---	(2)	2,581	[2] 86,217	88,798	19,899	22.4	88,798	19,899	22.4	52,864
Illinois	13,633	1,738	---	---	---	9,416	---	7,824	198,867	216,107	63,547	29.4	229,740	65,285	28.4	66,472
Indiana	150	8	---	---	---	2,812	(2)	3,661	[2] 54,462	60,935	22,691	37.2	61,085	22,699	37.2	4,780
Iowa	---	---	---	---	---	---	7,305	7,373	54,992	69,670	15,216	21.8	69,670	15,216	21.8	34,674
Kansas	20,607	1,935	(3)	(3)	(3)	11,639	11,298	28,350	[3] 132,456	[3] 183,743	[3] 29,744	[3] 16.2	204,350	31,679	15.5	55,061
Kentucky	11,385	992	---	---	---	(2)	---	9,399	[2] 40,379	49,778	13,660	27.4	61,163	14,652	24.0	10,750
Louisiana	157,931	10,824	24,595	1,546	6.5	88,631	(2)	15,222	[2] 263,130	366,983	49,317	13.4	549,509	61,687	11.2	73,649
Massachusetts	---	---	---	---	---	---	---	39	3,195	3,234	4,189	129.5	3,234	4,189	129.5	434
Michigan	1,378	297	---	---	---	192	---	2,006	56,840	59,038	31,913	54.1	60,416	32,210	53.3	366
Minnesota	---	---	---	---	---	---	---	242	59,951	60,193	17,789	29.6	60,193	17,789	29.6	30,536
Mississippi	12,921	1,286	---	---	---	(2)	(2)	16,436	[2] 66,039	82,475	12,377	15.0	95,396	13,663	14.3	29,854
Missouri	23	4	---	---	---	(2)	(2)	5,991	[2] 85,277	91,268	22,182	24.3	91,291	22,186	24.3	23,506
Montana	2,220	188	---	---	---	2,137	(2)	140	15,757	18,034	3,747	20.9	20,254	3,935	19.4	1,244
Nebraska	870	112	---	---	---	(2)	(2)	4,534	[2] 43,548	48,082	12,285	25.6	48,952	12,397	25.3	20,517
New Hampshire	---	---	---	---	---	---	---	---	58	58	79	136.2	58	79	136.2	---
New Jersey	---	---	---	---	---	---	---	6	27,902	27,908	16,131	57.8	27,908	16,131	57.8	17,205
New Mexico	80,850	4,553	(3)	(3)	(3)	1,222	---	5,802	[3] 91,224	[3] 98,248	[3] 9,745	[3] 19.9	179,098	14,298	8.0	18,841
New York	215	102	---	---	---	20	---	592	53,499	54,111	36,115	66.7	54,326	36,217	66.7	30,564
North Carolina	---	---	---	---	---	---	---	1,974	1,976	3,950	968	24.5	3,950	968	24.5	---
North Dakota and South Dakota	126	15	---	---	---	---	---	19	7,246	7,265	2,139	29.4	7,391	2,154	29.1	4,311

Ohio	1,360	358				262		3,581	145,593	149,436	68,220	45.7	150,796	68,578	45.5	3,515
Oklahoma	153,399	9,913				32,816	(2)	9,813	[2] 70,114	112,743	16,069	14.3	266,142	25,982	9.8	51,545
Pennsylvania	2,585	1,015				17,790		6,805	138,243	162,838	68,706	42.2	165,423	69,721	42.4	9,864
Rhode Island								1	86	87	163	187.4	87	163	187.4	
South Carolina								1,043	6,887	7,930	2,123	26.8	7,930	2,123	26.8	5,518
Tennessee	880	119				(2)		7,194	67,522	74,716	18,004	24.1	75,596	18,123	24.0	7,484
Texas	777,594	55,299	201,488	11,602	5.8	288,219	26,483	48,650	701,699	1,065,051	124,805	11.7	2,044,133	191,706	9.4	251,665
Utah	432	386				437	(4)	95	20,413	20,945	5,354	25.6	21,377	5,740	26.9	509
Virginia	49	12						1,897	10,633	12,530	5,210	41.6	12,579	5,222	41.5	492
West Virginia	26,302	6,189				1,585		5,984	63,236	70,805	22,200	31.4	97,107	28,389	29.2	89
Wisconsin								709	10,011	10,720	6,835	63.8	10,720	6,835	63.8	264
Wyoming	15,451	1,429				3,759		787	4,547	9,093	1,457	16.0	24,544	2,886	11.8	760
Unclassified by States			[3] 74,859	[3] 4,520	[3] 6.0	[2] 4,776	[2] 29,027									
Total: 1953	1,471,085	124,338	300,942	17,668	5.9	558,695	115,039	230,314	[5] 3,087,110	[5] 3,991,158	[5] 905,552	[5] 22.7	5,763,185	1,047,558	18.2	1,034,272
1952	1,483,754	115,371	368,399	20,108	5.5	536,402	111,479	207,207	2,768,602	3,623,690	750,482	20.7	5,475,843	885,961	16.2	910,117

[1] Federal Power Commission. These figures include some manufactured gas and are therefore shown separately. The natural-gas component in these figures is included with "Other industrial."

[2] Gas used in petroleum refineries and/or portland-cement plants included under "Unclassified by States" for United States total and under "Other industrial" for State totals to avoid disclosing figures of individual operators.

[3] Gas used in carbon-black manufacture included under "Unclassified by States" for United States total and under "Other industrial" for State totals to avoid disclosing figures of individual operators.

[4] Less than 500,000 cubic feet.

[5] Total does not include undisclosed figures.

TABLE 11.—Natural gas treated at natural-gasoline and cycle plants in the United States, 1949–53, by States, in million cubic feet

State	1949	1950	1951	1952	1953
Arkansas	59,037	64,237	71,145	77,317	71,257
California	495,843	509,796	553,821	523,115	580,191
Colorado	5,521	7,785	11,739	(1)	(2)
Illinois	14,918	13,333	11,856	[3] 12,317	[3, 4] 73,157
Kansas	252,864	361,744	397,294	403,376	[5] 431,998
Kentucky	43,472	47,660	86,950	268,096	[4] 277,145
Louisiana	463,138	534,550	598,420	607,564	591,626
Michigan	1,487	1,173	382	(3)	(3)
Mississippi	38,365	45,145	46,468	53,050	135,935
Montana	13,876	15,017	17,000	(1)	(2)
Nebraska	----------	----------	2,662	(1)	(5)
New Mexico	174,818	185,138	242,759	279,286	324,721
New York	22	13	20	----------	----------
Ohio	18,351	20,764	23,837	9,011	(6)
Oklahoma	307,014	332,764	419,868	444,425	476,094
Pennsylvania	37,367	41,406	37,386	32,235	[6] 20,935
Texas	2,526,885	2,938,158	3,406,670	3,420,398	3,619,335
Utah	----------	----------	----------	(1)	(2)
West Virginia	170,831	183,957	229,654	215,485	160,170
Wyoming	32,333	39,164	45,139	46,848	[2] 74,718
Other States	----------	----------	----------	26,074	----------
Total	4,656,142	5,341,804	6,203,070	6,418,597	6,837,282

[1] Colorado, Montana, Nebraska, and Utah combined under "Other States" to avoid disclosure of individual State data.
[2] Colorado, Montana, and Utah included in Wyoming.
[3] Michigan included in Illinois.
[4] Includes gas from transmission lines previously treated in another State.
[5] Nebraska included in Kansas.
[6] Ohio included in Pennsylvania.

The average value of natural gas at the point of consumption increased 2.3 cents per thousand cubic feet in 1953, somewhat less than in the preceding 2 years. The average increase was held down by residential values, which rose 3 cents per thousand cubic feet in 1953 compared with 7 cents in each of the 2 previous years. Residential average values, in general, have been rising moderately but steadily. In those States where natural gas has recently been received for the

TABLE 12.—Consumption of natural gas used with manufactured gas in the United States in 1953, by States [1]

State	Residential		Commercial		Industrial	Total	
	Number of consumers (thousand)	Quantity (million cubic feet)	Number of consumers (thousand)	Quantity (million cubic feet)	Quantity (million cubic feet)	Quantity (million cubic feet)	Value at point of consumption (thousand dollars)
Connecticut	76	805	4	185	297	1,287	3,301
Delaware and Maryland	49	1,557	2	217	230	2,004	3,770
Illinois	910	36,305	42	10,471	20,874	67,650	48,379
Indiana	325	11,488	21	2,902	24,688	39,078	26,286
Massachusetts	294	963	23	494	----------	1,457	4,058
New Jersey	926	19,732	64	3,088	5,303	28,123	54,663
New York	1,337	42,166	149	7,654	4,945	54,765	73,438
Pennsylvania	943	38,943	56	4,511	8,102	51,556	71,512
Tennessee	1	7	(2)	6	----------	13	15
Virginia	1	2	(2)	4	----------	6	7
Total: 1953	4,862	151,968	361	29,532	64,439	245,939	285,429
1952	4,517	140,909	343	28,689	64,430	234,028	300,774

[1] Included in tables for the consumption of natural gas (tables 8–11).
[2] Less than 500.

TABLE 13.—Average value of natural gas in the United States, 1952–53, by States, in cents per thousand cubic feet

State	At wells (estimated)		At point of consumption	
	1952	1953	1952	1953
Alabama	4.0	5.0	31.5	31.6
Arizona			34.0	37.4
Arkansas	4.1	5.3	17.0	18.9
California	16.7	19.7	39.5	39.9
Colorado	5.5	5.8	31.9	30.5
Connecticut			203.9	235.8
Delaware			195.1	187.4
District of Columbia			127.7	132.5
Florida	6.7	6.8	20.4	19.9
Georgia			30.5	33.1
Illinois	16.2	16.8	46.3	50.2
Indiana	9.5	7.0	64.7	64.1
Iowa			41.9	39.1
Kansas	8.3	8.6	22.7	23.2
Kentucky	21.7	21.9	41.2	42.8
Louisiana	6.7	8.2	12.6	14.4
Maryland	19.4	19.0	122.8	123.2
Massachusetts			232.2	228.3
Michigan	14.6	16.4	74.3	81.5
Minnesota			45.8	48.2
Mississippi	6.1	8.0	21.3	23.6
Missouri	18.8	20.0	43.4	44.8
Montana	6.1	5.9	31.8	32.9
Nebraska	13.3	13.5	40.2	41.4
New Hampshire			197.2	224.7
New Jersey			144.0	140.7
New Mexico	4.6	6.1	11.6	13.0
New York	29.2	31.6	143.1	128.8
North Carolina			65.9	74.1
North Dakota	6.1	6.8	57.6	57.4
Ohio	21.7	22.2	54.3	57.0
Oklahoma	5.4	6.9	15.9	17.4
Pennsylvania	28.3	29.1	62.6	65.2
Rhode Island				299.2
South Carolina			40.8	41.1
South Dakota	5.0	5.0	47.0	47.0
Tennessee	10.3	12.0	31.6	37.6
Texas	6.2	7.6	11.7	12.9
Utah	7.5	11.4	39.1	39.9
Virginia	24.6	25.8	104.5	95.0
West Virginia	19.6	23.6	32.4	35.2
Wisconsin			110.7	112.1
Wyoming	7.8	7.9	21.9	23.4
Total	7.8	9.2	33.2	35.5

first time, the average values have, however shown, large and erratic changes as the utilities converted to the new gas and as new space-heating customers were added.

TECHNOLOGY

Construction was begun on equipment to liquefy natural gas in the Gulf Coast area and to transport the liquefied gas up the Mississippi River via barge. In the Chicago area the liquid is to be revaporized and sold as natural gas. The refrigeration obtained in the vaporization process will be used to provide cooling for a meat warehouse. The liquefaction of natural gas has been carried out before as a means of storing gas. This is perhaps the first instance where the gas has been liquefied to facilitate transportation.

WORLD REVIEW

Canada.—In 1953 the estimated gross production of natural gas, less field waste, was 101.5 billion cubic feet compared with 88.7 billion in 1952. Reserves were estimated at 15 trillion cubic feet at the end of 1953, an increase of 4 trillion during the year.

The Alberta Petroleum and Natural Gas Conservation Board completed its study of proposals for transmitting natural gas from Alberta to Ontario and western Quebec. It concluded that reserves were sufficient to justify such a movement.

Italy.—The production of natural gas in Italy in 1953 totaled 81.1 billion cubic feet compared with 50.7 billion in 1952.

Venezuela.—The gross production of natural gas in Venezuela was 730 billion cubic feet, slightly less than in 1952. Of this, 560 billion cubic feet was flared and wasted.

TABLE 14.—Consumption of natural gas, 1947–52, by countries, in million cubic meters

[United Nations Statistical Yearbook]

Country	1947	1948	1949	1950	1951	1952
Western Hemisphere:						
Argentina	583	606	664	799	(1)	(1)
Canada	1,491	1,659	1,712	1,921	2,250	2,712
Ecuador	87	106	109	132	152	(1)
Mexico	997	1,248	1,362	1,754	2,435	2,649
United States	129,753	145,776	153,471	177,860	211,170	226,672
Venezuela	11,402	13,319	14,066	15,776	19,113	20,874
Europe:						
Austria [2]	53	52	54	50	49	49
Czechoslovakia	(2)	(1)	(1)	(1)	(1)	(1)
Denmark	(2)	(1)	(1)	(1)	(1)	(1)
France	147	174	228	246	282	276
Germany [3]	78	67	54	68	77	96
Hungary	101	[4] 51	(1)	(1)	(1)	(1)
Italy	94	117	249	510	977	1,435
Poland	148	[5] 81	(1)	(1)	(1)	(1)
Rumania	[6] 1,176	(1)	(1)	(1)	(1)	(1)
Yugoslavia	12	9	8	15	13	14
Asia:						
Brunei	25	562	580	754	1,039	1,094
China	[7] 61	[7] 55	(1)	41	30	28
Indonesia	24	369	591	621	785	1,069
Japan	35	51	58	69	83	91
Total [8]	147,000	166,000	176,000	203,000	242,000	260,000

[1] Data not available.
[2] Vienna only.
[3] Beginning 1948, West Germany. Figures represent virtually total German production.
[4] January–July.
[5] January–June.
[6] Preliminary or estimated figures.
[7] Industries under control of the National Resources Commission.
[8] The USSR is not included in the total.

Natural-Gas Liquids

By D. S. Colby, L. V. Harvey, A. T. Coumbe, and I. F. Avery

GENERAL SUMMARY

THE OUTPUT of natural-gas liquids in 1953 increased 7 percent to 10.0 billion gallons, and demand increased 6 percent over the previous year. Both gains were smaller than those reported in 1952. The total new supply of natural-gas liquids for the year exceeded demand by 120 million gallons; all of it went into additions to stocks. More than half of the total stock increase was in LP-gas stocks.

Stocks of LP-gases increased both because of the relatively weak demand for LP-gases for use in gasoline and because new underground facilities were becoming available for storing the excess production. The low demand for natural-gas liquids for use in gasoline blending resulted from the large stocks of and weak demand for finished gasoline. Sales of LP-gases for use as fuel increased 13 percent, 1 percent more than the gain in 1952.

TABLE 1.—Salient statistics of the natural-gas-liquids industry in the United States, 1949–53, in thousands of gallons

	1949	1950	1951	1952	1953
Production:					
Natural gasoline and natural-gasoline mixtures	3, 008, 879	3, 228, 666	3, 522, 960	3, 665, 760	3, 858, 918
LP-gases	2, 430, 506	3, 035, 844	3, 627, 834	4, 285, 386	4, 692, 870
Finished gasoline and naphtha	700, 609	881, 202	968, 016	900, 312	904, 176
Other products	457, 619	496, 650	480, 858	536, 172	564, 354
Total	6, 597, 613	7, 642, 362	8, 599, 668	9, 387, 630	10, 020, 318
Receipts from outside sources (refineries)	181, 264	72, 534	67, 200	83, 916	98, 826
Shipments for use in gasoline:					
To refineries and jobbers	4, 485, 739	5, 041, 848	5, 441, 394	5, 943, 630	6, 104, 070
Exports	173, 953	51, 114	85, 218	(1)	(1)
Losses	62, 481	62, 286	46, 158	(1)	(1)
Transfers to nongasoline uses:					
LP-gases	1, 917, 243	2, 428, 734	2, 931, 642	[2] 3,347,736	[2] 3, 717,504
Other products	103, 747	122, 934	143, 262	172, 620	177, 912
Stocks at plants, terminals, and refineries:					
Natural gasoline	172, 207	175, 854	206, 178	153, 888	187, 236
LP-gases	49, 228	69, 762	64, 974	107, 142	171, 150
Other products	65, 453	63, 294	72, 660	66, 864	79, 590
Total	286, 888	308, 910	343, 812	327, 894	437, 976
Value of natural-gas liquids at plants thousands of dollars	402, 190	419, 605	508, 161	533, 160	597, 657
Average value per gallon cents	6. 1	5. 5	5. 9	5. 7	6. 0
Natural gas processed millions of cubic feet	4, 656, 142	5, 341, 804	6, 203, 070	6, 418, 597	6, 837, 282
Average yield, all light products gallons per M cubic feet	1. 42	1. 43	1. 39	1. 46	1. 47
Sales to consumers for fuel and chemical uses:					
LP-gases	1, 917, 243	2, 421, 006	2, 904, 384	3, 215, 184	3, 590, 067
LR-gases [3]	919, 356	1, 061, 550	1, 322, 874	1, 262, 184	1, 341, 942
Total	2, 836, 599	3, 482, 556	4, 227, 258	4, 477, 368	4, 932, 009
Exports of natural gasoline, LP-gases, and LR-gases	236, 650	109, 704	156, 156	[4] 168, 402	164, 557

1 Included in "Shipments for use in gasoline: To refineries and jobbers."
2 Includes ethane. Ethane is excluded from "Sales to consumers for fuel and chemical uses."
3 Liquefied-refinery gases.
4 Revised figure.

Sales of liquefied petroleum gases, including LR-gases, for all uses other than blending in gasoline increased 10 percent over 1952.

Scope of Report.—Statistics on the production of natural-gas liquids are collected on both monthly and annual questionnaires from all natural-gasoline plants, cycling plants, and fractionators handling natural-gas liquids. Reports are not received for the liquids recovered at pipeline compressor stations and at gas-dehydration plants. Reports are received on the production of field condensate where this material is not commingled with the crude oil. Field condensate delivered to a plant and fractionated into finished products is reported as output of finished products.

The monthly reports provide data on production, stocks, and the distribution of production. The annual reports provide data on type of plant, production, value of production, and gas processed.

Figures on the sales of LP-gases include propane, propylene, butanes, and butylenes produced both at natural-gasoline plants and petroleum refineries but do not include liquefied gas that is blended into gasoline motor fuel. Figures are collected on an annual questionnaire received from all producers and distributors and from 90 percent of the dealers selling over 100,000 gallons of LP-gases a year. Data on small or nonreporting dealers are indirectly included in the reporting, as the sales figures of producers or distributors will reflect the operations of these dealers.

TABLE 2.—Estimated proved recoverable reserves of natural-gas liquids [1] in the United States, 1952–53, in thousands of barrels

[Committee on Natural Gas Reserves, American Gas Association]

State	Reserves as of Dec. 31, 1952	Changes in reserves during 1953			Reserves as of Dec. 31, 1953			
		Extensions and revisions	Discoveries of new fields and new pools in old fields	Net production	Nonassociated with oil	Associated with oil	Dissolved in oil	Tota
Arkansas	50,871	1,001	269	2,556	28,608	6,628	14,349	49,585
California [2]	322,507	32,865	308	30,814	---------	105,936	218,930	324,866
Colorado	11,339	---------	---------	650	287	---------	10,402	10,689
Illinois	20,246	13	5	3,221	48	13	16,982	17,043
Indiana	169	1	11	36	16	13	116	145
Kansas	168,227	6,099	8,261	4,859	172,998	1,533	3,197	177,728
Kentucky	9,158	307	151	1,840	[3] 7,776	---------	---------	7,776
Louisiana [2]	713,666	128,468	15,859	44,779	656,039	108,672	48,503	813,214
Michigan	583	100	31	73	173	---------	468	641
Mississippi	50,931	6,520	577	3,294	27,957	22,715	4,062	54,734
Montana	3,129	---------	---------	221	2,908	---------	---------	2,908
Nebraska	2,716	457	62	201	2,513	367	154	3,034
New Mexico	151,543	178,299	1,801	10,986	212,734	27,618	80,305	320,657
Ohio	1,778	−417	9	11	[3] 1,359	---------	---------	1,359
Oklahoma	284,906	37,407	9,284	27,365	105,267	31,581	167,384	304,232
Pennsylvania	2,640	180	89	141	[3] 2,768	---------	---------	2,768
Texas	3,125,091	245,556	58,998	162,403	1,447,521	388,062	1,431,659	3,267,242
Utah	57	---------	---------	4	53	---------	---------	53
West Virginia	19,528	15,619	207	7,141	28,213	---------	---------	28,213
Wyoming	57,090	−4,430	---------	2,101	32,681	17,878	---------	50,559
Alabama, Florida, and North Dakota	476	2	---------	2	---------	---------	476	476
Total	4,996,651	648,047	95,922	302,698	2,729,919	711,016	1,996,987	5,437,922

[1] Comprises natural gasoline, LP-gases, and condensate.
[2] Includes offshore reserves.
[3] Not allocated by types, but occurring principally in column shown.

RESERVES

The American Gas Association Reserves Committee estimated proved recoverable reserves of natural-gas liquids on December 31, 1953, at 5.4 billion barrels, an increase of over 400 million barrels during the year. Both "Extensions and Revisions" and new discoveries were larger than in 1952. New discoveries were at the highest level since the committee began making estimates in 1946. Discovery rates in Kansas and Oklahoma were the highest in several years. The reserves estimate for New Mexico was revised upward because of the increased recovery made possible by additional plant capacity constructed there.

Reserves of natural-gas liquids do not include condensate, which is produced with and not separated from crude oil.

PRODUCTION

The production of natural-gas liquids increased 7 percent in 1953, continuing the diminishing rate of gain evident since 1950. Production, however, was still increasing at a faster rate than the output of crude oil, which increased 3 percent in 1953. Of the various natural-gas liquids, LP-gases continued to show the most rapid growth and increased 10 percent in 1953.

The monthly production in 1953 was characterized by the absence of the pronounced decline in LP-gas production during the summer months when output is normally reduced for lack of market. Large quantities of LP-gases were put into newly completed underground storage facilities during the summer.

Production increased markedly during the year in Illinois, West Texas, and New Mexico. In Illinois production increased as the result of a plant completed to extract liquids from gas being transported through the pipeline of Panhandle Eastern Pipeline Co. West Texas production increased 36 percent in 1953, despite the temporary shutdown of the Spraberry Trend Area field during the year to prevent waste of gas by flaring. Additional plant capacity completed late in the year in the San Juan Basin area of New Mexico increased output of that State.

YIELDS, PROCESSES, AND NUMBER OF PLANTS

The overall yield of natural-gas liquids recovered in 1953 per thousand cubic feet of gas processed changed only slightly from the previous year. In Illinois the average yield was reduced by the low recovery rate per cubic foot at the new plant designed to process gas being transported through the pipeline of Panhandle Eastern Pipeline Co. This gas had, in most instances, been processed before entering the pipeline. In New Mexico the average yield was reduced by the processing of a larger proportion of dry gas from the San Juan Basin instead of casinghead gas from the southeastern part of the State. The average yield of LP-gases in Texas improved because new efficient plants came on stream and because the usual decline in recovery of LP-gases during the summer months did not take place in 1953. New underground storage capacity was available for the summer production.

TABLE 3—Natural-gas liquids produced and natural gas processed in the United States, 1953, by States

State	Number of operators [2]	Production										Natural gas processed		
		Natural gasoline		LP-gases		Finished gasoline and naphtha		Other products [1]		Total		Million cubic feet	Average yield (gallons per M cubic feet)	
		Thousand gallons	Thousand dollars	Thousand gallons	Thousand dollars	Thousand gallons	Thousand dollars	Thousand gallons	Thousand dollars	Thousand gallons	Thousand dollars		Natural gas liquids except LP-gases	All natural gas liquids
Arkansas	9	52,878	3,664	55,188	2,562	2,394	239	3,150	220	113,610	6,685	71,257	0.82	1.59
California	27	811,776	77,312	397,572	21,961	------	------	98,574	8,379	1,307,922	107,652	580,191	1.57	2.25
Illinois [3]	8	27,594	2,161	142,464	7,341	------	------	------	------	170,058	9,502	[4] 73,157	.38	2.32
Kansas [5]	13	125,370	6,998	90,174	3,208	756	95	84	5	216,384	10,306	431,998	.29	.50
Kentucky	4	35,406	2,394	176,232	4,993	------	------	------	------	211,638	7,387	[4] 277,145	.13	.76
Louisiana	27	211,638	15,067	287,280	12,654	270,942	27,417	182,952	12,937	952,812	68,075	591,626	1.12	1.61
Mississippi	2	[6] 23,478	1,677	17,724	713	------	------	8,736	618	49,938	3,008	135,935	.24	.37
New Mexico	9	171,612	10,092	121,212	4,618	------	------	42	2	292,866	14,712	324,721	.53	.90
Oklahoma	33	417,606	26,448	414,036	14,886	10,206	1,276	5,838	342	847,686	42,952	476,094	.91	1.78
Pennsylvania [7]	9	5,628	424	1,008	90	------	------	------	------	6,636	514	20,935	.27	.32
Texas	98	1,868,496	123,232	2,777,880	109,131	619,038	58,661	262,836	18,586	5,528,250	309,610	3,619,335	.76	1.53
West Virginia	9	•42,882	3,073	153,090	6,743	840	102	630	70	197,442	9,988	160,170	.28	1.23
Wyoming [8]	8	64,554	4,645	59,010	2,698	------	------	1,512	106	125,076	7,449	74,718	.88	1.67
Total	188	3,858,918	277,187	4,692,870	191,598	904,176	87,790	564,354	41,265	10,020,318	597,840	6,837,282	0.78	1.47

[1] Includes condensate, kerosine, distillate fuel, etc.
[2] A producer operating in more than 1 State is counted but once in arriving at total for United States.
[3] Michigan with 1 operator, included with Illinois.
[4] Includes gas from transmission lines, previously treated in another State.
[5] Nebraska with 1 operator included in Kansas.
[6] Includes drip gasoline.
[7] Ohio with 1 operator included in Pennsylvania.
[8] Colorado and Montana with 1 operator each and Utah with production of a small amount of drip gasoline included in Wyoming.

TABLE 4.—Monthly production of natural-gas liquids in the United States, 1953, by State and district,[1] in thousands of gallons

State and district	January	February	March	April	May	June	July	August	September	October	November	December	Total
West Pennsylvania and Ohio	756	588	714	588	462	420	420	378	462	504	546	798	6,636
West Virginia	15,918	15,498	18,060	17,514	16,884	14,952	17,052	17,178	15,036	15,834	15,960	17,556	197,442
Illinois and Michigan	9,954	8,358	9,408	8,610	9,072	8,610	14,616	19,110	19,194	20,244	20,286	22,596	170,058
Kentucky	17,766	16,296	18,060	18,102	18,354	16,464	17,052	17,010	16,968	17,976	18,186	19,404	211,638
Kansas and Nebraska	24,696	19,740	20,244	17,430	15,372	13,944	13,524	14,532	14,952	17,472	21,252	23,226	216,384
Oklahoma	75,474	58,968	67,746	69,216	69,888	65,352	70,266	71,694	74,046	73,920	73,332	77,784	847,686
Texas:													
Gulf	94,206	86,520	96,306	92,736	93,534	94,878	98,616	100,464	97,020	104,454	101,430	110,796	1,170,960
East Texas	41,160	37,506	41,160	41,412	41,706	41,622	44,058	43,890	42,672	42,672	36,624	37,044	491,526
Panhandle	75,012	70,854	73,878	73,500	66,738	65,394	65,478	65,814	70,140	72,618	73,458	79,758	852,642
West Texas	115,416	103,530	121,296	119,448	130,578	138,600	141,792	147,294	141,708	137,634	125,832	125,328	1,548,456
Rest of State	136,416	119,658	127,134	119,406	119,700	115,962	120,036	119,364	117,096	122,388	119,448	128,058	1,464,666
Total Texas	462,210	418,068	459,774	446,502	452,256	456,456	469,980	476,826	468,636	479,766	456,792	480,984	5,528,250
Arkansas	9,492	8,736	9,576	9,324	8,106	9,240	9,576	10,248	9,828	10,080	9,576	9,828	113,610
Louisiana:													
Gulf	34,650	36,582	34,902	33,180	34,986	35,910	34,398	35,616	32,424	34,818	35,364	38,220	421,050
Inland	49,980	42,882	46,158	44,856	42,294	40,782	42,714	42,378	41,706	43,260	46,788	47,964	531,762
Total Louisiana	84,630	79,464	81,060	78,036	77,280	76,692	77,112	77,994	74,130	78,078	82,152	86,184	952,812
Mississippi	5,040	4,368	4,326	4,326	3,948	3,822	3,906	4,074	3,822	4,074	4,032	4,200	49,938
New Mexico	24,108	21,294	24,780	23,898	24,906	24,024	24,654	24,108	23,352	23,436	26,838	27,468	292,866
Colorado, Montana, Utah, and Wyoming	10,920	9,240	10,668	10,416	10,248	10,038	10,374	10,164	10,416	11,046	10,668	10,878	125,076
California	114,870	102,858	112,854	105,966	108,570	106,722	104,874	108,948	104,706	110,964	110,628	115,962	1,307,922
Total United States	855,834	763,476	837,270	809,928	815,346	806,736	833,406	852,264	835,548	863,394	850,248	896,868	10,020,318
Daily average	27,608	27,267	27,009	26,998	26,302	26,891	26,884	27,492	27,852	27,851	28,342	28,931	27,453

[1] West Pennsylvania separated from east part of State to allow grouping either in a Bureau of Mines refinery district or Petroleum Administration for War district. Districts shown for Texas and Louisiana are Bureau of Mines production districts.

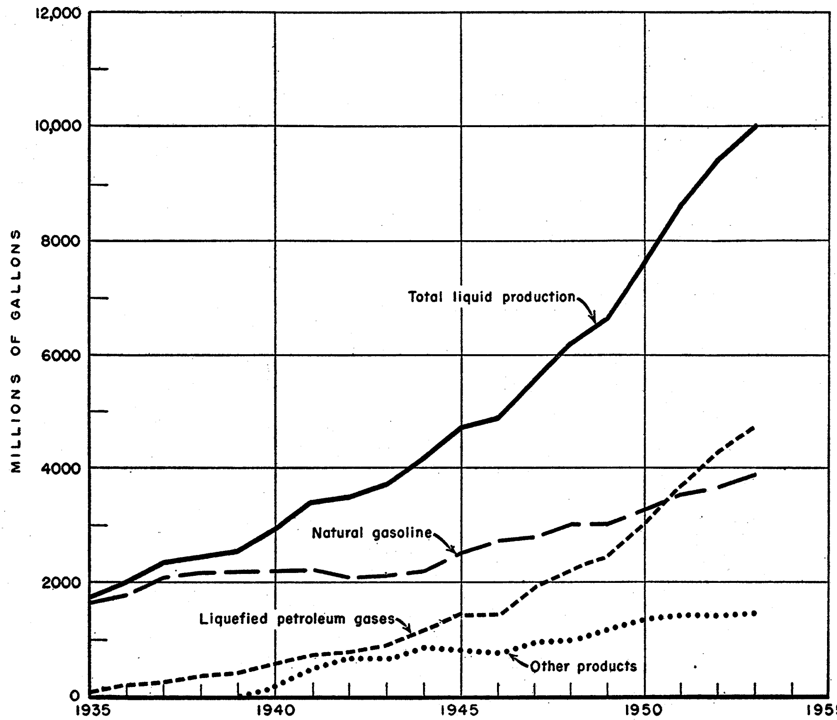

FIGURE 1.—Production of the natural-gas-liquids industry in the United States, 1935–53

The number of operating plants declined in 1953, chiefly because of the shutting down of compression plants in Kansas, Michigan, and Oklahoma. The number of operators remained unchanged at 188.

MARKET DEMAND—SHIPMENTS

Total demand for natural-gas liquids at plants and terminals in 1953 increased 6 percent compared with a 9-percent increase in 1952. Demand for LP-gases rose 9 percent and for natural gasoline 4 percent; each showed a smaller rate of gain than during the previous year.

For Motor-Fuel Use.—The use of natural-gas liquids for blending in gasoline motor fuel increased only 3 percent, although the production of motor fuel (excluding jet fuel) increased 8 percent in 1953. The natural-gas-liquids content of refinery gasoline declined 0.2 percent in 1953. (Gasoline, exclusive of jet fuel, contained 9.0 percent natural-gas-liquids content in 1953; including jet fuel, the natural-gas-liquids content was 8.8 percent.) The most significant declines occurred in the Texas Gulf and the Arkansas-Louisiana Inland areas. The excess supply of available gasoline and the refiners' consequent desire to hold down its production was the probable cause of this reduction.

For Non-Motor-Fuel Uses.—Sales of LP-gases for use as fuel increased 13 percent and represented most of the increase in sales of liquefied gases for fuel. LR-gases, on the other hand, accounted for almost all of the increase in use of liquefied gases for chemical manufacture.

TABLE 5.—Natural-gas liquids produced in the United States in 1953, by State and by method of manufacture

State	Number of plants operating at end of year				Production (thousands of gallons)			
	Compression [1]	Absorption [2]	Cycling [3]	Total	Compression	Absorption	Cycling	Total
Arkansas		7	2	9		83,496	30,114	113,610
California		77	2	79		1,108,086	199,836	1,307,922
Illinois [4]	4	6		10	42	170,016		170,058
Kansas [4]	1	15		16	(5)	(5)		216,384
Kentucky	2	3		5	131,544	80,094		211,638
Louisiana	3	35	6	44	28,770	393,120	530,922	952,812
Mississippi		1	2	3		[6] 8,736	41,202	49,938
New Mexico	1	14		15	(5)	(5)		292,866
Oklahoma	6	60	2	68	10,458	716,352	120,876	847,686
Pennsylvania [4]	5	7		12	504	6,132		6,636
Texas	15	164	31	210	112,224	4,197,438	1,218,588	5,528,250
West Virginia	28	13		41	4,326	193,116		197,442
Wyoming [7]	1	8		9	(5)	(5)		125,076
Total: 1953	66	410	45	521	299,502	7,579,278	2,141,538	10,020,318
1952	70	410	45	525	388,164	6,974,772	2,024,694	9,387,630

[1] Includes 21 plants manufacturing LP-gases; 1 refrigeration-type plant each in Kansas, Kentucky, and New Mexico; and 3 refrigeration-type plants in Texas.
[2] Includes combination of absorption with compression process. Includes 290 plants manufacturing LP-gases and 1 charcoal-type plant each in Ohio and West Virginia.
[3] Includes 42 plants manufacturing LP-gases.
[4] Michigan, with 1 compression plant, included with Illinois; Nebraska, with 1 absorption plant, included with Kansas; and Ohio, with 1 charcoal plant and 1 absorption plant, included with Pennsylvania.
[5] Included in State total production and United States total production to avoid disclosure of individual plant operation.
[6] Includes some drip gasoline.
[7] Colorado and Montana, with 1 absorption plant each, and Utah, with production of a small amount of drip gasoline, included with Wyoming.

TABLE 6.—Supply and distribution at plants and terminals [1] of natural-gas liquids in the United States, 1953, by months, in thousands of gallons

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Production:													
Natural gasoline and natural-gasoline mixtures	312,942	278,376	314,916	305,382	317,646	334,446	338,814	345,450	333,354	334,488	318,948	324,156	3,858,918
LP-gases:													
Propane	186,102	161,952	174,888	166,110	164,976	151,578	161,322	169,932	179,634	195,594	196,140	213,738	2,121,966
Butane, normal	83,622	69,594	72,114	70,854	81,018	74,676	79,044	77,028	80,976	90,888	86,562	88,326	954,702
Isobutane	24,024	23,268	24,570	23,898	24,486	22,596	23,940	24,444	24,780	25,452	25,494	27,300	294,252
Isopentane	6,468	6,384	6,342	5,964	6,468	5,880	6,552	6,468	5,880	5,922	5,124	5,040	72,492
Butane-propane mixture	76,818	74,130	84,042	87,024	70,308	72,240	74,970	78,204	66,444	60,102	63,462	72,660	880,404
Other LP-gas mixtures	35,154	31,752	33,852	29,652	29,904	27,594	31,542	31,332	28,056	29,316	29,232	31,668	369,054
Finished gasoline and naphtha	82,740	72,156	78,498	74,172	74,970	71,190	71,736	73,794	71,358	74,970	75,726	82,866	904,176
Condensate, raw	31,500	31,920	32,004	32,088	30,828	32,130	30,492	30,828	31,248	32,802	35,322	36,330	387,492
Other products	16,464	13,944	16,044	14,784	14,742	14,406	14,994	14,784	13,818	13,860	14,238	14,784	176,862
Total	855,834	763,476	837,270	809,928	815,346	806,736	833,406	852,264	835,548	863,394	850,248	896,868	10,020,318
Receipts from outside sources [2]	8,022	5,754	7,140	8,946	7,014	2,688	10,080	13,482	10,416	11,340	7,476	6,468	98,826
Total new supply	863,856	769,230	844,410	818,874	822,360	809,424	843,486	865,746	845,964	874,734	857,724	903,336	10,119,144
Stock change at plants and terminals	−6,048	7,434	26,838	10,878	41,412	16,842	8,736	27,930	32,844	29,778	−18,186	−58,800	119,658
For use in gasoline:													
Shipments to refineries:													
Natural gasoline and natural-gasoline mixtures	291,774	255,234	286,860	281,148	287,070	308,028	334,908	326,928	313,068	330,288	330,414	321,174	3,666,894
Propane	4,746	3,528	3,780	4,662	7,182	3,486	3,780	3,360	5,964	2,688	3,150	3,402	49,728
Butane, normal	32,130	28,098	26,376	26,124	29,946	28,980	26,838	31,122	35,028	42,504	36,246	32,256	375,648
Isobutane	16,422	15,330	17,766	15,750	14,364	14,952	17,976	16,926	16,548	16,968	18,102	20,706	201,810
Isopentane	5,250	5,418	5,754	6,342	6,090	6,216	6,468	6,342	5,292	5,880	5,334	6,132	70,518
Other LP-gas mixtures	9,660	8,148	9,156	6,594	7,098	4,494	5,628	5,502	4,914	6,216	4,662	1,470	73,542
Finished gasoline and naphtha	19,278	20,286	19,278	18,102	18,942	21,966	20,748	21,714	21,798	23,604	22,890	23,940	252,546
Condensate	29,862	27,972	29,106	28,224	28,854	27,678	27,258	30,534	30,114	32,340	29,988	33,978	355,908
Shipments to jobbers, exports, and losses: [3]													
Natural gasoline and natural-gasoline mixtures	24,024	20,244	23,394	19,782	17,808	21,084	24,990	25,620	16,968	18,900	17,682	17,892	248,388
LP-gases	10,710	8,694	12,096	13,608	10,248	15,414	12,138	14,532	9,744	11,802	9,870	10,122	138,978
Finished gasoline and naphtha	52,080	51,660	62,958	59,598	61,362	56,028	51,660	50,190	46,200	49,434	43,764	53,130	638,064
Condensate	2,142	3,696	4,746	3,570	3,444	3,696	1,764	1,386	1,428	1,638	1,932	2,604	32,046
Transfers to nongasoline fuel uses:													
LP-gases:													
For fuel [3]	307,146	251,496	250,908	260,232	223,734	220,038	233,646	238,728	244,818	240,660	290,850	366,366	3,128,622
For chemical manufacture	47,082	47,922	49,980	48,930	51,324	46,410	53,088	51,618	47,418	48,972	46,158	49,980	588,882
Other products	17,598	14,070	15,414	15,330	13,482	14,112	13,860	13,314	13,818	13,062	14,868	18,984	177,912
Total demand at plants and terminals	869,904	761,796	817,572	807,996	780,948	792,582	834,750	837,816	813,120	844,956	875,910	962,136	9,999,486

[1] Terminals owned by producers.
[2] Mainly straight-run gasoline from refineries.
[3] Of the total exports from plants and terminals, an estimated 74,307,000 gallons is included with shipments of LP-gases for fuel and is excluded from shipments to jobbers, exports, and losses. This portion of the exports is not separable by months.

TABLE 7.—Natural-gas liquids utilized at refineries in the United States, 1953, by Bureau of Mines refinery districts and by months, in thousands of gallons

District	January	February	March	April	May	June	July
East Coast	18,942	10,878	12,306	13,146	8,232	8,694	12,684
Appalachian	504	378	210	210		378	378
Indiana, Illinois, Kentucky, etc	45,864	42,462	43,134	38,724	43,512	41,580	38,178
Oklahoma, Kansas, Missouri	38,808	33,348	27,636	30,954	30,156	32,634	36,918
Texas:							
Gulf Coast	106,428	95,718	106,260	89,334	92,022	110,544	119,574
Inland	53,088	53,088	48,552	47,334	44,142	51,954	64,050
Total Texas	159,516	148,806	154,812	136,668	136,164	162,498	183,624
Louisiana-Arkansas:							
Louisiana Gulf Coast	16,506	16,968	20,370	18,186	14,112	17,766	17,178
Arkansas, Louisiana Inland	4,032	3,864	3,906	3,612	3,570	3,234	3,402
Total Louisiana-Arkansas	20,538	20,832	24,276	21,798	17,682	21,000	20,580
Rocky Mountain	8,400	11,130	9,870	9,114	8,442	8,316	9,450
California	97,692	84,042	102,816	89,082	102,522	100,716	97,650
Total United States	390,264	351,876	375,060	339,696	346,710	375,816	399,462

District	August	September	October	November	December	Total
East Coast	6,930	11,046	11,886	22,764	14,574	152,082
Appalachian	126	462	420	840	672	4,578
Indiana, Illinois, Kentucky, etc	36,666	48,930	50,778	55,902	55,692	541,422
Oklahoma, Kansas, Missouri	38,304	43,932	48,636	42,672	41,034	445,032
Texas:						
Gulf Coast	123,186	119,784	119,700	101,598	105,672	1,289,820
Inland	65,268	69,972	67,620	66,444	64,932	696,444
Total Texas	188,454	189,756	187,320	168,042	170,604	1,986,264
Louisiana-Arkansas:						
Louisiana Gulf Coast	18,018	19,572	22,050	24,696	22,596	228,018
Arkansas, Louisiana Inland	4,032	4,578	5,292	4,872	4,536	48,930
Total Louisiana-Arkansas	22,050	24,150	27,342	29,568	27,132	276,948
Rocky Mountain	8,610	8,274	8,148	9,534	9,534	108,822
California	97,944	93,072	101,430	96,768	95,424	1,159,158
Total United States	399,084	419,622	435,960	426,090	414,666	4,674,306

TABLE 8.—Percentage of natural-gas liquids in refinery gasoline in the United States, 1949–53, by Bureau of Mines refinery districts

Year	East Coast	Appalachian	Indiana, Illinois, Kentucky, etc.	Oklahoma, Kansas, Missouri	Texas Inland	Texas Gulf Coast	Louisiana Gulf Coast	Arkansas, Louisiana Inland	Rocky Mountain	California	Total
1949	1.5	2.0	5.3	9.5	27.6	8.5	6.0	7.5	4.5	18.4	9.1
1950	3.5	1.7	5.0	8.3	26.0	10.7	5.9	13.8	4.1	19.0	9.5
1951	2.6	1.7	5.1	8.9	23.1	11.1	5.3	12.4	4.3	16.1	9.0
1952	2.2	.7	5.2	8.4	24.3	11.1	5.3	12.2	4.7	16.8	9.0
1953 [1]	2.3	.3	5.2	8.6	25.7	10.7	5.5	9.4	5.6	16.9	9.0

[1] Refinery gasoline excludes jet fuel.

SALES OF LP-GASES [1]

Sales of LP-gases in 1953 for all uses other than gasoline production increased 10 percent overall for the group over 1952. The increase had been 6 percent in 1952.

Sales for all uses other than gas manufacturing increased, while quantities of LP-gases reported sold for distribution through mains to gas-manufacturing companies declined 14 percent, reflecting the competition from the extension of natural gas to new areas and warmer weather during 1953.

Exports of LP-gases increased 26 percent, according to the Bureau of the Census, United States Department of Commerce.

With the exception of LP-gases for internal-combustion engines and "all other uses," the increase was nominal, ranging from 5 percent for synthetic rubber to 11 percent for chemical plants. Internal-combustion-engine uses increased 35 percent and other uses (which includes stock tank heating, brooding, flame weeding, grain and hay drying, and tobacco curing) 84 percent. However, a substantial part of these indicated increases result from broader coverage of small dealers and more accurate reporting of sales.

TABLE 9.—Sales of LP-gases [1] in the United States, 1949–53, in thousands of gallons

Year	Butane	Percent of total	Propane	Percent of total	Butane-propane mixture	Percent of total	Total LP-gases	Percent	Increase, percent
1949	488,801	17.2	1,403,359	49.5	944,439	33.3	2,836,599	100.0	3.6
1950	568,038	16.3	1,938,301	55.7	976,228	28.0	3,482,567	100.0	22.8
1951	708,989	16.8	2,418,790	57.2	1,099,496	26.0	4,227,275	100.0	21.4
1952	639,282	14.3	2,513,595	56.1	1,324,502	29.6	4,477,379	100.0	5.9
1953	671,320	13.6	2,832,495	57.4	1,428,194	29.0	4,932,009	100.0	10.2

[1] Data include LR-gases.

TABLE 10.—Sales of LP-gases [1] in the United States, 1949–53, by uses, in thousands of gallons

Year	Domestic and commercial	Chemical	Synthetic rubber	Internal combustion	Industrial	Gas manufacturing	All other	Total
1949	1,627,550	544,886	177,850	77,981	162,197	239,210	6,925	2,836,599
1950	2,022,464	624,468	228,485	129,818	217,078	251,694	8,560	3,482,567
1951	2,166,813	844,507	374,864	289,991	262,102	281,692	7,306	4,227,275
1952	2,266,178	870,990	370,997	370,558	324,967	259,697	13,992	4,477,379
1953	2,479,180	967,427	390,501	498,238	348,517	222,430	25,716	4,932,009

[1] Data include LR-gases.

[1] LP-gases, as used in this section, include LR- (liquid-refinery) gases. The survey covering sales of LP-gases in the Pacific coast marketing area (district 5) was made by E. T Knudson, Chief, Petroleum Statistics Branch, Bureau of Mines, San Francisco, Calif.

TABLE 11.—Sales of LP-gases [1] in United States, 1952–53, by State and use, in [illegible]

PAW district and State	Domestic and commercial		Gas manufacturing		Industrial		Synthetic rubber		Chemical		Internal combustion		All other		Total		Percent of total	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952 [2]	1953
District 1:																		
Connecticut	17,285	19,615	14,128	7,456	12,619	17,325	126	93	------	------	671	700	1,682	2,088	46,511	47,277	5.5	5.4
Delaware	6,372	6,444	1,256	1,908	3,173	2,212	------	------	932	860	14	108	3	4	11,750	11,536	1.4	1.3
Florida	65,893	75,234	10,611	10,532	1,098	4,000	------	------	------	296	1,010	1,569	65	208	78,677	91,839	9.4	10.5
Georgia	62,094	67,972	11,284	10,040	3,346	3,822	20	------	152	113	1,338	1,886	155	518	78,389	84,351	9.3	9.6
Maine	11,655	13,724	1,011	1,688	616	1,103	------	------	------	------	81	40	54	1,658	13,417	18,213	1.6	2.1
Maryland and District of Columbia	21,038	23,372	3,542	4,894	2,554	2,522	------	------	------	------	20	44	70	75	27,224	30,907	3.2	3.5
Massachusetts	23,822	25,910	14,208	11,377	3,789	4,337	1	------	10	------	------	108	269	244	42,099	41,976	5.0	4.8
New Hampshire	10,101	10,324	1,472	1,553	1,118	1,385	------	------	------	------	------	------	25	33	12,716	13,295	1.5	1.5
New Jersey	24,202	25,880	4,871	4,653	23,498	20,663	21	21	4,084	3,530	27	38	342	397	57,045	55,182	6.8	6.3
New York	52,694	58,953	5,260	3,623	5,616	7,808	------	------	2,366	3,303	76	87	10	12	66,022	73,786	7.9	8.4
North Carolina	47,867	49,695	15,703	13,780	4,249	4,326	------	------	------	524	872	881	261	2,371	68,952	71,577	8.2	8.2
Pennsylvania	37,820	38,735	21,739	14,475	21,363	21,729	345	514	7,945	7,535	156	244	67	74	89,435	83,306	10.6	9.5
Rhode Island	4,227	5,091	158	204	670	656	------	------	------	------	------	------	------	------	5,055	5,951	.6	.7
South Carolina	31,200	34,218	4,653	4,937	4,304	4,422	------	------	------	466	179	191	49	791	40,385	45,025	4.8	5.1
Vermont	7,122	8,160	2,799	2,563	541	540	------	------	------	------	------	------	------	------	10,462	11,263	1.3	1.3
Virginia	25,289	30,898	3,782	2,901	3,317	3,048	------	------	113	201	107	129	------	39	32,608	37,216	3.9	4.2
West Virginia	6,207	6,490	654	630	3,606	3,029	------	------	[2]148,436	143,688	637	728	------	------	[2]159,540	154,565	19.0	17.6
Total	454,888	500,715	117,131	97,214	95,477	102,927	513	628	[2]164,038	160,516	5,188	6,753	3,052	8,512	[2]840,287	877,265	100.0	100.0
District 2:																		
Illinois	93,368	101,800	9,904	8,681	22,231	20,637	2,196	2,285	2,164	2,289	18,320	22,099	409	389	148,592	158,180	12.0	11.6
Indiana	50,817	57,463	12,712	12,395	10,267	11,754	418	436	[2]36,027	41,094	7,453	6,533	690	879	[2]118,384	130,554	9.5	9.6
Iowa	58,293	60,242	13,527	12,470	8,086	8,035	------	------	------	------	1,636	2,528	313	380	81,855	83,655	6.6	6.1
Kansas	93,337	106,269	109	104	8,622	8,506	------	------	------	------	12,300	15,970	162	245	114,530	131,094	9.3	9.6
Kentucky	29,269	37,642	1,375	923	1,055	2,075	1,446	1,181	52,839	53,717	1,355	1,917	20	38	87,359	97,493	7.1	7.1
Michigan	41,622	42,871	14,058	11,089	19,881	21,746	134	374	3,106	2,834	2,543	4,252	3	38	81,347	83,204	6.6	6.1
Minnesota	65,416	69,047	9,173	7,959	4,810	7,057	------	------	40	------	5,080	7,958	4	125	84,523	92,146	6.8	6.7
Missouri	81,463	92,172	3,218	3,368	4,904	5,503	------	------	------	------	4,057	5,574	167	245	93,809	106,862	7.6	7.8
Nebraska	48,808	56,038	2,328	1,796	1,470	2,091	------	------	------	------	3,162	5,698	71	139	55,839	65,762	4.5	4.8
North Dakota	20,458	24,922	1,753	1,760	162	1,175	------	------	------	10	8,536	8,906	135	147	31,044	36,920	2.5	2.7
Ohio	33,422	35,974	3,034	3,236	6,298	9,463	825	857	96	383	1,841	2,230	21	83	45,537	52,226	3.7	3.8
Oklahoma	108,227	120,007	1,552	1,225	7,336	7,698	339	397	572	864	19,911	26,420	------	132	137,937	156,743	11.2	11.5
South Dakota	33,572	37,291	3,139	2,718	1,024	1,635	------	------	16	------	2,326	2,714	292	242	40,369	44,600	3.3	3.3
Tennessee	21,738	23,739	3,312	4,059	2,338	2,422	------	------	2,289	2,319	415	758	125	207	30,217	33,504	2.4	2.4
Wisconsin	40,000	48,014	10,154	8,051	33,135	34,117	------	------	1	------	2,164	3,357	233	122	85,687	93,661	6.9	6.9
Total	819,810	913,491	89,348	79,834	131,619	143,914	5,358	5,530	[2]97,150	103,510	91,099	116,914	2,645	3,411	[2]1,237,029	1,366,604	100.0	100.0

[1] Data include LR-gases.
[2] Revised figures.

TABLE 11.—Sales of LP-gases[1] in United States, 1952-53, by State and use, in thousands of gallons—Continued

PAW district and State	Domestic and commercial		Gas manufacturing		Industrial		Synthetic rubber		Chemical		Internal combustion		All other		Total		Percent of total	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952[2]	1953
District 3:																		
Alabama	43,771	47,390	2,475	2,492	4,354	5,703	--------	--------	--------	--------	1,226	1,862	47	90	51,873	57,537	2.8	2.7
Arkansas	86,449	97,075	388	355	2,984	3,722	--------	--------	--------	--------	6,543	10,331	772	1,165	97,136	112,648	5.3	5.3
Louisiana	85,496	82,100	574	565	2,735	3,235	89,770	81,194	110,048	115,104	18,594	23,847	20	111	307,237	306,156	16.6	14.5
Mississippi	74,930	79,092	115	112	1,200	1,460	--------	--------	--------	--------	8,607	12,006	1,256	1,304	86,108	93,974	4.7	4.4
Mew Mexico	36,741	40,572	4,607	3,240	3,576	4,035	--------	--------	--------	--------	19,105	28,769	861	1,409	64,890	78,025	3.5	3.7
Texas	338,442	375,401	5,853	8,017	58,551	66,322	243,405	266,045	[2]448,863	540,943	142,837	207,488	2,269	6,815	[2]1,240,220	1,471,031	67.1	69.4
Total	665,829	721,630	14,012	14,781	73,400	84,477	333,175	347,239	[2]558,911	656,047	196,912	284,303	5,225	10,894	[2]1,847,464	2,119,371	100.0	100.0
District 4:																		
Colorado	43,028	46,024	1,051	1,028	941	1,377	--------	--------	--------	--------	4,325	4,793	155	215	49,500	53,437	46.5	44.4
Idaho	6,891	7,458	2,370	2,390	521	586	--------	--------	--------	--------	65	107	48	35	9,895	10,576	9.3	8.8
Montana	10,015	12,878	527	485	383	568	--------	--------	--------	--------	2,680	2,936	--------	--------	13,605	16,867	12.8	14.0
Utah	6,129	7,224	220	225	638	867	--------	--------	27	--------	1,551	1,757	103	106	8,668	10,179	8.2	8.4
Wyoming	20,998	22,271	--------	--------	1,073	1,178	--------	--------	--------	--------	2,613	5,885	--------	35	24,684	29,369	23.2	24.4
Total	87,061	95,855	4,168	4,128	3,556	4,576	--------	--------	27	--------	11,234	15,478	306	391	106,352	120,428	100.0	100.0
District 5:																		
Arizona	22,942	20,495	155	20	209	717	--------	--------	--------	--------	6,150	8,129	--------	100	29,456	29,461	6.6	6.6
California	164,574	173,057	6,619	4,631	14,794	6,904	31,951	37,104	50,817	47,354	58,671	65,139	2,587	2,290	330,013	336,479	74.0	75.1
Nevada	6,324	8,521	6,203	7,163	1,058	1,252	--------	--------	47	--------	128	229	20	12	13,780	17,177	3.1	3.8
Oregon	28,594	31,550	14,846	9,356	2,052	1,339	--------	--------	--------	--------	1,015	1,196	93	102	46,600	43,543	10.4	9.7
Washington	16,156	13,866	7,215	5,303	2,802	2,411	--------	--------	--------	--------	161	97	64	4	26,398	21,681	5.9	4.8
Total	238,590	247,489	35,038	26,473	20,915	12,623	31,951	37,104	50,864	47,354	66,125	74,790	2,764	2,508	446,247	448,341	100.0	100.0
Total United States	2,266,178	2,479,180	259,697	222,430	324,967	348,517	370,997	390,501	870,990	967,427	370,558	498,238	13,992	25,716	4,477,379	4,932,009	------	------

[1] Data include LR-gases.
[2] Revised figure.

TABLE 12.—Sales of LP-gases [1] in the United States, 1952–53, by PAW district and State, in thousands of gallons

PAW district and State	Butane 1952	Butane 1953	Propane 1952	Propane 1953	Mixture 1952	Mixture 1953	Total LP-gases 1952	Total LP-gases 1953	Percent change
District 1:									
Connecticut	4,268	4,558	42,122	40,957	121	1,762	46,511	47,277	1.6
Delaware	11	------	11,739	11,536	------	------	11,750	11,536	−1.8
Florida	4,445	2,655	45,861	58,481	28,371	30,703	78,677	91,839	16.7
Georgia	7,396	2,975	43,822	53,445	27,171	27,931	78,389	84,351	7.6
Maine	------	10	13,417	18,203	------	------	13,417	18,213	35.7
Maryland and District of Columbia	1,397	525	25,827	30,382	------	------	27,224	30,907	13.5
Massachusetts	7,818	5,296	34,281	36,680	------	------	42,099	41,976	−.3
New Hampshire	90	------	12,626	12,587	------	708	12,716	13,295	4.6
New Jersey	6,477	5,555	48,922	47,902	1,646	1,725	57,045	55,182	−3.3
New York	1,347	1,646	61,858	69,005	2,817	3,135	66,022	73,786	11.8
North Carolina	630	1,700	63,136	66,281	5,186	3,596	68,952	71,577	3.8
Pennsylvania	3,454	2,808	75,247	75,284	10,734	5,214	89,435	83,306	−6.9
Rhode Island	------	------	5,055	5,951	------	------	5,055	5,951	17.7
South Carolina	2,131	3,342	28,661	32,449	9,593	9,234	40,385	45,025	11.5
Vermont	27	------	10,435	11,203	------	60	10,462	11,263	7.7
Virginia	871	513	31,737	36,681	------	22	32,608	37,216	14.1
West Virginia	4,181	5,618	18,816	16,578	[2] 136,543	132,369	[2] 159,540	154,565	−3.1
Total	44,543	37,201	573,562	623,605	[2] 222,182	216,459	[2] 840,287	877,265	4.4
District 2:									
Illinois	10,122	9,606	129,971	142,962	8,499	5,612	148,592	158,180	6.5
Indiana	6,746	7,748	74,190	82,351	[2] 37,448	40,455	[2] 118,384	130,554	10.3
Iowa	5,524	4,050	75,657	77,834	674	1,771	81,855	83,655	2.2
Kansas	14,692	15,723	73,385	88,226	26,453	27,145	114,530	131,094	14.5
Kentucky	1,775	2,240	30,054	39,110	55,530	56,143	87,359	97,493	11.6
Michigan	8,969	8,436	71,508	73,877	870	891	81,347	83,204	2.3
Minnesota	3,156	2,613	77,776	84,249	3,591	5,284	84,523	92,146	9.0
Missouri	3,130	3,363	80,644	95,556	10,035	7,943	93,809	106,862	13.9
Nebraska	1,888	2,858	49,862	61,404	4,089	1,500	55,839	65,762	17.8
North Dakota	1,446	1,285	25,279	31,481	4,319	4,154	31,044	36,920	18.9
Ohio	1,656	2,622	43,881	48,446	------	1,158	45,537	52,226	14.7
Oklahoma	13,779	20,954	70,934	86,830	53,224	48,959	137,937	156,743	13.6
South Dakota	232	911	39,297	43,044	840	645	40,369	44,600	10.5
Tennessee	872	1,027	24,383	26,596	4,962	5,881	30,217	33,504	10.9
Wisconsin	20,219	20,543	62,047	67,818	3,421	5,300	85,687	93,661	9.3
Total	94,206	103,979	928,868	1,049,784	[2] 213,955	212,841	[2] 1,237,029	1,366,604	10.5
District 3:									
Alabama	2,082	1,719	23,282	28,500	26,509	27,318	51,873	57,537	10.9
Arkansas	10,004	10,923	33,680	40,169	53,452	61,556	97,136	112,648	16.0
Louisiana	98,629	89,801	140,133	139,190	68,475	77,165	307,237	306,156	−.4
Mississippi	4,100	6,119	25,798	28,439	56,210	59,416	86,108	93,974	9.1
New Mexico	8,341	9,805	39,399	43,778	17,150	24,442	64,890	78,025	20.2
Texas	325,794	346,314	383,053	513,404	[2] 531,373	611,313	[2] 1,240,220	1,471,031	18.6
Total	448,950	464,681	645,345	793,480	[2] 753,169	861,210	[2] 1,847,464	2,119,371	14.7
District 4:									
Colorado	1,165	3,134	44,176	47,527	4,159	2,776	49,500	53,437	8.0
Idaho	249	84	9,446	10,290	200	202	9,895	10,576	6.9
Montana	1,191	1,124	10,739	15,335	1,675	408	13,605	16,867	24.0
Utah	283	438	8,354	9,678	31	63	8,668	10,179	17.4
Wyoming	3,326	4,169	18,501	20,584	2,857	4,616	24,684	29,369	19.0
Total	6,214	8,949	91,216	103,414	8,922	8,065	106,352	120,428	13.2
District 5:									
Arizona	44	------	9,164	12,401	20,248	17,060	29,456	29,461	------
California	41,729	54,546	191,352	176,958	96,932	104,975	330,013	336,479	2.0
Nevada	47	------	11,145	14,604	2,588	2,573	13,780	17,177	24.7
Oregon	11	------	44,676	40,885	1,913	2,658	46,600	43,543	−6.6
Washington	3,538	1,964	18,267	17,364	4,593	2,353	26,398	21,681	−17.9
Total	45,369	56,510	274,604	262,212	126,274	129,619	446,247	448,341	0.5
Total United States	639,282	671,320	2,513,595	2,832,495	1,324,502	1,428,194	4,477,379	4,932,009	10.2
Exports [3]	------	------	------	------	------	------	99,296	124,749	25.6
Grand total	------	------	------	------	------	------	4,576,675	5,056,758	10.5

[1] Data include LR-gases.
[2] Revised figure.
[3] Not available by the different gases.

STOCKS

Stocks of natural-gas liquids at plants and terminals increased almost 120 million gallons in 1953 despite the 59-million-gallon reduction in December. Over 65 million gallons of this increase was in stocks of LP-gases. This was partly due to the rapid expansion of underground LP-gas storage facilities. LP-gas stocks at plants and terminals in 1953 increased 96 million gallons between April 1 and October 1, while in 1952 they increased only 20 million gallons in the same period.

Stocks of natural-gas liquids at refineries declined 10 million gallons and were at the lowest year-end level since 1948.

TABLE 13.—Stocks of natural-gas liquids in the United States, 1949–52 and 1953, by months, in thousands of gallons

Date	Natural gasoline		LP-gases		Other products		Total		
	At plants and terminals	At refineries	At plants and terminals	At refineries	At plants and terminals	At refineries	At plants and terminals	At refineries	Grand total
Dec. 31:									
1949	122, 605	49, 602	33, 730	15, 498	49, 325	16, 128	205, 660	81, 228	286, 888
1950	103, 341	72, 492	51, 630	18, 144	58, 673	4, 620	213, 644	95, 256	308, 900
1951	111, 426	94, 752	53, 256	11, 718	68, 166	4, 494	232, 848	110, 964	343, 812
1952	84, 462	69, 426	92, 022	15, 120	63, 924	2, 940	240, 408	87, 486	327, 894
1953									
Jan. 31	89, 628	64, 806	71, 064	13, 440	73, 668	5, 544	234, 360	83, 790	318, 150
Feb. 28	98, 280	60, 018	69, 510	14, 406	74, 004	9, 198	241, 794	83, 622	325, 416
Mar. 31	110, 082	61, 278	89, 502	11, 550	69, 048	5, 796	268, 632	78, 624	347, 256
Apr. 30	123, 480	72, 996	90, 762	14, 448	65, 268	4, 704	279, 510	92, 148	371, 658
May 31	143, 262	92, 232	117, 936	15, 918	59, 724	6, 006	320, 922	114, 156	435, 078
June 30	151, 284	102, 354	132, 510	16, 968	53, 970	7, 182	337, 764	126, 504	464, 268
July 31	140, 280	101, 598	150, 318	16, 758	55, 902	7, 770	346, 500	126, 126	472, 626
Aug. 31	146, 664	108, 402	169, 596	14, 574	58, 170	4, 872	374, 430	127, 848	502, 278
Sept. 30	160, 398	101, 598	185, 640	14, 868	61, 236	6, 972	407, 274	123, 438	530, 712
Oct. 31	157, 038	89, 754	217, 224	18, 228	62, 790	9, 072	437, 052	117, 054	554, 106
Nov. 30	135, 366	70, 938	208, 866	17, 850	74, 634	5, 712	418, 866	94, 500	513, 366
Dec. 31	126, 924	60, 312	157, 164	13, 986	75, 978	3, 612	360, 066	77, 910	437, 976

PRICES

The average posted price of grade 26–70 natural gasoline to blenders, f. o. b. group 3, was 5.79 cents per gallon in 1953, 0.43 cent per gallon below 1952. In October, when natural-gasoline prices are usually rising, the posted price dropped 0.88 cent per gallon because of the plentiful supply of natural gasoline and an oversupply of finished gasoline. Butane was preferred for volatility adjustment in some instances because less volume was required to obtain the same increase in vapor pressure.

The average value received for natural gasoline at plants declined in most States except California, where the average value increased over 2 cents per gallon to 9.5 cents per gallon. The price increased in mid-February at the same time that crude-oil prices were advanced.

The posted price of industrial propane f. o. b. refineries, New York Harbor, was 8.0 cents per gallon in January 1953. It rose to 8.75 cents per gallon on September 21 and remained at that level for the remainder of the year.

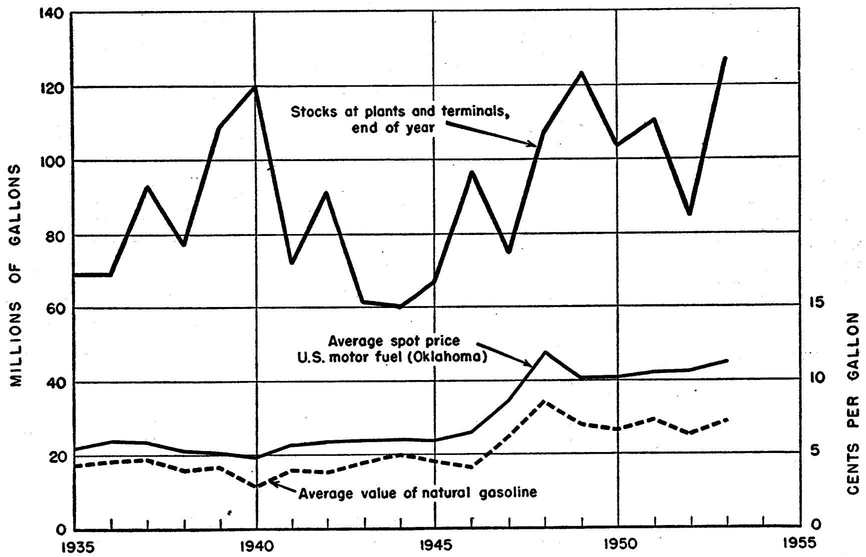

FIGURE 2.—Average value of natural gasoline, spot price of gasoline, and stocks of natural gasoline, 1935–53.

FOREIGN TRADE [2]

Exports of LP-gases continued to rise rapidly, the bulk of the shipments went to Canada and Mexico. Shipments to these 2 countries increased 27 percent in 1953. Only shipments to the Philippines declined.

Exports of natural gasoline in 1953 dropped to about half those in 1952. Exports to Canada, the only remaining importer of significant size, increased.

TABLE 14.—LP-gases [1] exported from the United States, 1944–48 (average) and 1949–53, by countries, in thousands of gallons [2]

[U. S. Department of Commerce]

Country	1944–48 (average)	1949	1950	1951	1952	1953
Argentina	4	546	54	(³)	2	(³)
Bahamas	34	90	143	163	238	290
Bermuda	161	282	322	405	417	536
Brazil	728	3,405	4,686	6,413	11,046	12,469
Canada	22,241	31,195	34,032	43,293	42,951	56,155
Cuba	69	463	1,264	2,228	3,453	4,719
France	805	(³)	639	1,266	1	13
Mexico	13,056	16,120	25,416	31,977	40,003	49,567
Philippines	217	894	751	783	528	243
Other countries	377	388	456	717	657	757
Total	37,692	53,383	67,763	87,245	99,296	124,749

[1] Data include LR-gases.
[2] 4.5 pounds=1 gallon.
[3] Less than 500 gallons.

[2] Figures on exports compiled by Mae B. Price and Elsie D. Page, of the Bureau of Mines from records of the U. S. Department of Commerce.

TABLE 15.—Natural gasoline exported from the United States, 1944–48 (average) and 1949–53, by countries, in thousands of gallons

[U. S. Department of Commerce]

Country	1944–48 (average)	1949	1950	1951	1952	1953
Australia	2,942	17,156	--------	29,843	15,472	--------
Canada	47,952	59,291	35,513	30,024	[1] 26,631	34,186
France	1,856	--------	--------	--------	--------	--------
Mexico	778	3	7	4	--------	18
Netherlands Antilles	9,266	37,029	3,870	4,285	[1] 24,049	5,604
Sweden	723	--------	--------	--------	--------	--------
United Kingdom	49,306	44,725	2,547	--------	--------	--------
Other countries	701	25,063	3	4,763	2,954	--------
Total	113,524	183,267	41,940	68,919	[1] 69,106	39,808

[1] Revised figure.

Crude Petroleum and Petroleum Products

By Alfred G. White, Albert T. Coumbe, Donald S. Colby, and Emma M. Seeley

GENERAL SUMMARY

TOTAL DEMAND [1] for petroleum and petroleum products set another record in 1953 with a 4-percent gain compared with 1952. Demand, however, was less than expected because mild weather in the first and last quarters reduced normal heating-oil requirements; and, in the last quarter, a sharp drop in industrial activity reduced fuel-oil demand. Even with cuts in crude production and runs in the last quarter, product stocks increased 47 million barrels.

Exports of oil fluctuate with the available supplies abroad, the competitive position of American companies in foreign marketing, and problems of dollar exchange.

Total exports declined 7 percent in 1953, which included a decline of 3 percent in products and 25 percent in crude oil. Product exports declined for the first year since the shutdown of the Abadan refinery in Iran in 1951. Crude exports continued to decline because of further expansion of domestic crude supplies in Canada.

The domestic demand for petroleum and petroleum products increased 5 percent in 1953. This demand varies with the demand for all fuels and the changes in the relative position of oil to other competing sources. In the 3 years 1951–53, the annual gains (daily averages) in the domestic demand for oil have been 8, 3, and 5 percent, respectively; the increases in the domestic demand for natural gas have been 18, 7, and 6 percent; while the changes in the total domestic demand for coal were a gain of 2 percent, a decline of 11 percent, and a fractional gain in 1953.

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[1] Certain terms, as utilized in this chapter, are more or less unique to the petroleum industry. Principal terms and their meaning, are as follows:

Total demand.—A derived figure representing total new supply plus decreases or minus increases in reported stocks. Because there are substantial secondary and consumers' stocks that are not reported to the Bureau of Mines, this figure varies considerably from consumption.

Domestic demand.—Total demand less exports.

New supply of all oils.—The sum of crude-oil production, plus production of natural-gas liquids, plus benzol (coke-oven) used for motor fuel plus imports of crude oil and other petroleum products.

Transfers.—Crude oil conveyed to fuel-oil stocks without processing or reclassification of products from 1 product category to another.

All oils.—Crude petroleum, natural-gas liquids, and their derivatives.

Principal products.—Gasoline, kerosine, distillate fuel oil, and residual fuel oil.

Exports.—Total shipments from continental United States, including shipments to United States Territories and possessions.

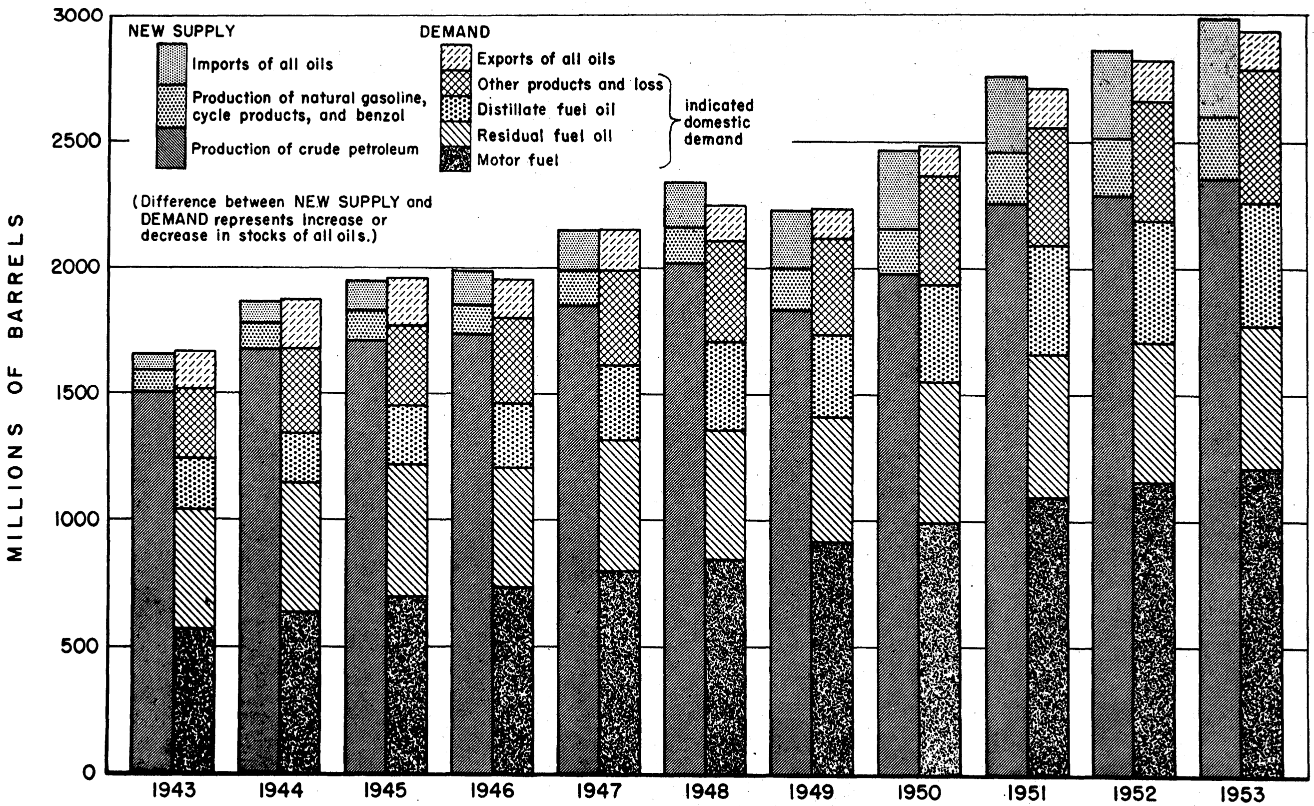

FIGURE 1.—Supply and demand of all oils in the United States, 1943–53.

Total new supply increased 4.6 percent in 1953 and was considerably above requirements indicated by an increase of 54 million barrels in total stocks of all oils. Crude production increased 3.4 percent, the production of light oils from natural gas gained 8.5 percent, crude-oil imports were up 13.2 percent, and product imports rose 5.8 percent. Total imports represented 12.2 percent of new supply in 1952 and 12.8 percent in 1953.

TABLE 1.—Salient statistics of crude petroleum, refined products, and natural gasoline in the United States, 1949–53 [1]

	1949	1950	1951	1952	1953 [2]
Crude petroleum:					
Domestic production____thousands of barrels [3]__	1, 841, 940	1, 973, 574	2, 247, 711	2, 289, 836	2, 359, 998
World production____do____	3, 404, 142	3, 802, 995	4, 286, 826	4, 508, 956	4, 771, 662
United States proportion of world production percent__	54	52	52	51	49
Imports [4]____thousands of barrels [3]__	153, 686	177, 714	179, 073	209, 591	236, 576
Exports [5]____do____	33, 069	34, 823	28, 604	26, 696	19, 931
Stocks, end of year____do____	253, 356	248, 463	255, 783	271, 928	276, 676
Runs to stills____do____	1, 944, 221	2, 094, 867	2, 370, 404	2, 441, 259	2, 554, 865
Total value of domestic production at wells thousands of dollars__	4, 674, 770	4, 963, 380	5, 690, 410	5, 785, 230	6, 334, 110
Average price per barrel at wells____	$2. 54	$2. 51	$2. 53	$2. 53	$2. 68
Total producing oil wells in the United States Dec. 31____	448, 680	465, 870	474, 990	488, 520	498, 940
Total oil wells completed in the United States during year (successful wells)____	22, 042	24, 430	23, 453	23, 466	25, 762
Refined products:					
Imports [5]____thousands of barrels [3]__	81, 873	132, 547	129, 121	138, 916	146, 581
Exports [5]____do____	86, 307	76, 483	125, 448	131, 492	126, 736
Stocks, end of year____do____	342, 932	326, 892	351, 146 [6] 370, 140	394, 019	440, 634
Output of gasoline____do____	962, 417	1, 024, 462	1, 140, 843	[7] 1, 178, 027	[7] 1, 266, 925
Yield of gasoline____percent__	43. 7	43. 0	42. 4	42. 4	43. 9
Completed refineries, end of year____	367	357	350	343	337
Daily crude oil capacity of refineries thousands of barrels [3]__	6, 696	6, 964	7, 333	7, 639	8, 007
Average dealers' net price (excluding tax) of gasoline in 50 United States cities cents per gallon [8]__	15. 05	15. 10	15. 33	15. 27	15. 95
Natural-gas liquids:					
Production____thousands of barrels [3]__	157, 086	181, 961	204, 754	223, 515	241, 891
Stocks, end of year____do____	6, 831	7, 355	8, 186	7, 807	10, 428

[1] Data, including imports and exports are for continental United States.
[2] Preliminary figures.
[3] 42 gallons per barrel.
[4] Bureau of Mines.
[5] U. S. Department of Commerce, except shipments to Alaska and Hawaii, which are Bureau of Mines data. Exports include shipments to the Territories.
[6] For comparison with 1952 due to redefinition of bulk terminals at the beginning of 1952. Stocks on a comparable basis at the beginning of 1951 were 341,300,000 barrels.
Bulk terminals were defined for reporting purposes as follows:
1. All bulk installations which receive their supplies by tankers, barges, or pipelines.
2. Any other storage point with a combined capacity of 50,000 barrels or more, regardless of the transportation means of products.
[7] Excludes jet fuel.
[8] American Petroleum Institute.

TABLE 2.—Supply and demand of all oils [1] in continental United States, 1951 (total) and 1952–53, by months

[Thousands of barrels]

	1952													1951 (total)
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
New supply:														
Domestic production:														
Crude petroleum	192,848	184,818	197,121	192,936	157,748	185,692	188,985	192,768	195,603	201,581	193,832	205,904	2,289,836	2,247,711
Natural-gas liquids	19,215	18,216	18,883	18,036	16,921	17,422	17,783	18,396	18,376	19,745	19,548	20,974	223,515	204,754
Benzol, etc	23	21	15	39	26	39	41	27	37	43	36	35	382	211
Total production	212,086	203,055	216,019	211,011	174,695	203,153	206,809	211,191	214,016	221,369	213,416	226,913	2,513,733	2,452,676
Imports:														
Crude petroleum [2]	15,123	14,228	15,817	16,170	16,903	17,434	18,519	19,596	18,459	19,948	18,709	18,685	209,591	179,073
Refined products [3]	13,647	12,875	13,425	11,484	12,442	9,953	9,109	7,196	8,282	12,244	10,922	17,337	138,916	129,121
Total new supply	240,856	230,158	245,261	238,665	204,040	230,540	234,437	237,983	240,757	253,561	243,047	262,935	2,862,240	2,760,870
Increase (+) or decrease (−) in stocks	−20,729	−7,014	+7,694	+9,583	−6,140	+17,739	+15,033	+14,488	+17,408	+3,123	+3,641	−15,181	+39,645	+36,991
Demand:														
Total demand	261,585	237,172	237,567	229,082	210,180	212,801	219,404	223,495	223,349	250,438	239,406	278,116	2,822,595	2,723,879
Exports: [3]														
Crude petroleum	2,303	2,211	2,939	3,340	1,718	2,388	1,876	1,966	1,664	1,526	1,805	2,960	26,696	28,604
Refined products	10,208	9,321	9,689	12,101	10,885	12,581	12,419	10,921	10,641	10,565	11,087	11,074	131,492	125,448
Domestic demand:														
Gasoline	87,148	82,339	87,209	98,845	101,468	99,316	105,497	103,026	100,226	103,855	91,566	96,785	1,157,280	1,089,566
Kerosine	16,619	14,632	12,949	8,143	5,428	5,264	5,908	5,980	7,156	12,223	12,478	17,945	124,725	123,241
Distillate fuel oil	62,962	54,418	49,084	33,825	27,890	25,835	23,135	25,985	28,690	39,414	47,116	60,993	479,347	447,278
Residual fuel oil	55,850	49,715	50,607	45,119	38,360	36,303	37,181	41,867	41,104	50,356	48,469	60,234	555,165	564,397
Lubricants	3,381	2,830	2,989	3,510	2,530	3,409	3,224	3,345	3,437	3,709	2,800	3,001	38,165	42,292
Miscellaneous	23,114	21,706	22,101	24,199	21,901	27,705	30,164	30,405	30,431	28,790	24,085	25,124	309,725	303,053
Total domestic demand	249,074	225,640	224,939	213,641	197,577	197,832	205,109	210,608	211,044	238,347	226,514	264,082	2,664,407	2,569,827
Stocks:														
Crude petroleum	254,007	255,900	259,126	270,679	290,813	285,964	275,951	264,368	264,723	269,776	267,852	271,928	271,928	255,783
Natural-gas liquids	7,896	8,585	9,527	9,366	9,246	10,035	10,095	9,722	8,925	8,890	8,584	7,807	7,807	8,186
Refined products	351,477	341,881	345,407	343,598	317,444	339,243	364,229	390,673	408,523	406,628	412,499	394,019	394,019	370,140
Total stocks	613,380	606,366	614,060	623,643	617,503	635,242	650,275	664,763	682,171	685,294	688,935	673,754	673,754	634,109

	1953[4]													1952 (total)
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
New Supply:														
Domestic production:														
Crude petroleum	203, 214	183, 736	202, 458	193, 389	198, 086	197, 837	204, 701	204, 059	196, 717	194, 108	188, 315	193, 378	2, 359, 998	2, 289, 836
Natural-gas liquids	20, 617	18, 408	20, 202	19, 543	19, 733	19, 439	20, 092	20, 602	20, 216	20, 837	20, 493	21, 709	241, 891	223, 515
Benzol, etc	37	25	39	41	42	45	62	55	38	33	38	50	505	382
Total production	223, 868	202, 169	222, 699	212, 973	217, 861	217, 321	224, 855	224, 716	216, 971	214, 978	208, 846	215, 137	2, 602, 394	2, 513, 733
Imports:														
Crude petroleum[2]	19, 098	16, 400	20, 320	18, 839	21, 798	21, 207	19, 513	20, 847	20, 757	19, 806	19, 444	18, 547	236, 576	209, 591
Refined products[3]	16, 078	13, 455	14, 156	11, 269	12, 170	10, 298	9, 812	8, 480	9, 642	10, 883	14, 147	16, 191	146, 581	138, 916
Total new supply	259, 044	232, 024	257, 175	243, 081	251, 829	248, 826	254, 180	254, 043	247, 370	245, 667	242, 437	249, 875	2, 985, 551	2, 862, 240
Increase (+) or decrease (−) in stocks, end of period	−8, 891	−8, 018	+1, 610	+2, 553	+24, 325	+8, 398	+20, 769	+24, 709	+10, 174	+7, 545	−1, 073	−28, 117	+53, 984	+39, 645
Demand:														
Total demand	267, 935	240, 042	255, 565	240, 528	227, 504	240, 428	233, 411	229, 334	237, 196	238, 122	243, 510	277, 992	2, 931, 567	2, 822, 595
Exports:[3]														
Crude petroleum	2, 211	2, 011	2, 171	2, 833	1, 611	1, 824	1, 232	1, 321	1, 109	1, 178	1, 052	1, 378	19, 931	26, 696
Refined products	9, 768	10, 743	11, 478	12, 326	10, 342	10, 832	10, 060	9, 484	10, 201	10, 487	10, 346	10, 669	126, 736	131, 492
Domestic demand:														
Gasoline	88, 024	84, 872	96, 772	100, 141	104, 191	112, 688	110, 961	106, 794	103, 943	103, 412	96, 740	97, 791	1, 206, 329	[5]1, 142, 987
Kerosine	16, 773	13, 407	11, 779	7, 688	5, 043	4, 798	5, 313	4, 402	7, 115	9, 184	11, 493	17, 525	114, 520	[5]121, 253
Distillate fuel oil	63, 531	52, 340	50, 339	38, 153	28, 251	29, 945	24, 626	26, 182	34, 266	34, 003	43, 846	63, 628	489, 110	[5]476, 986
Residual fuel oil	57, 557	48, 531	52, 769	47, 192	44, 729	43, 045	41, 330	41, 362	42, 697	44, 349	47, 280	54, 092	564, 933	555, 165
Lubricants	3, 032	2, 931	3, 229	3, 625	3, 444	3, 470	3, 905	3, 646	3, 563	3, 384	3, 211	3, 041	40, 481	38, 165
Miscellaneous	27, 039	25, 207	27, 028	28, 570	29, 893	33, 826	35, 984	36, 143	34, 302	32, 125	29, 542	29, 868	369, 527	[5]329, 851
Total domestic demand	255, 956	227, 288	241, 916	225, 369	215, 551	227, 772	222, 119	218, 529	225, 886	226, 457	232, 112	265, 945	2, 784, 900	2, 664, 407
Stocks, end of period:														
Crude petroleum	272, 250	273, 589	275, 665	280, 487	280, 308	283, 715	284, 976	285, 352	289, 614	287, 541	283, 021	276, 676	276, 676	271, 928
Natural-gas liquids	7, 575	7, 748	8, 268	8, 849	10, 359	11, 054	11, 253	11, 959	12, 636	13, 193	12, 223	10, 428	10, 428	7, 807
Refined products	385, 038	375, 508	374, 522	371, 672	394, 666	398, 962	418, 271	441, 898	447, 133	456, 194	460, 611	440, 634	440, 634	394, 019
Total stocks	664, 863	656, 845	658, 455	661, 008	685, 333	693, 731	714, 500	739, 209	749, 383	756, 928	755, 855	727, 738	727, 738	673, 754

[1] For definition of this and other terms used in the petroleum industry, see text footnote 1 at the beginning of this chapter.
[2] Bureau of Mines.
[3] U. S. Department of Commerce, except shipments to Alaska and Hawaii, which are Bureau of Mines data.
[4] Preliminary figures.
[5] Jet fuel shown as a separate item for the first time in 1953, is included in "Miscellaneous."

TABLE 3.—Demand for all oils [1] in continental United States, 1944–53

[Millions of barrels]

Year	Domestic demand	Exports	Total demand	Year	Domestic demand	Exports	Total demand
1944	1,671.3	207.6	1,878.9	1949	2,118.2	119.4	2,237.6
1945	1,772.7	183.0	1,955.7	1950	2,375.1	111.3	2,486.4
1946	1,792.8	153.1	1,945.9	1951	2,569.8	154.1	2,723.9
1947	1,989.8	164.5	2,154.3	1952	2,664.4	158.2	2,822.6
1948	2,113.7	134.7	2,248.4	1953 [2]	2,784.9	146.7	2,931.6

[1] See text footnote 1 at beginning of this chapter.
[2] Preliminary figures.

DEMAND BY PRODUCTS

Since over 99 percent of the indicated consumption of crude oil in the United States was converted into products at refineries, before sale to ultimate consumers, the analysis of demand trends involves consideration of each of the major products. The fuel oils (residual, distillate, and kerosine) compete directly with natural gas or coal in heating, cooking, and industrial uses. Gasoline is a major fuel in the transportation field. The other products serve a wide range of uses; some compete with other oil products and fuels, and others have special uses outside the fuel field.

Because military demand for jet fuel (a blend of low-grade gasoline, kerosine, and distillate) has increased, data for jet fuel are shown separately for the first time in 1953, and comparative figures were compiled for 1952 for both jet fuel and other products.

Gasoline.—Production includes the gasoline and naphtha produced from crude oil and other light oils and materials blended at refineries or outside. All aviation gasolines are included except that quantities used as jet-fuel constituents have been deleted in 1952 and 1953. The total demand for gasoline was 1,244 million barrels in 1953 or 42 percent of the total demand for all oils. Compared with the 1952 daily average, total demand for gasoline increased 6 percent, exports gained 5 percent, and domestic demand was 6 percent higher. The domestic demand for gasoline was 1,206 million barrels in 1953, of which 83 percent was for highway use and 6 percent for aviation use. The remaining 11 percent includes commercial naphthas, motor gasoline delivered to the armed forces, farm-tractor fuel, all other uses, and losses.

Residual Fuel Oil.—The total demand for residual fuel oil was 591 million barrels in 1953 or 20 percent of the total demand for all oils. Computed on the daily average, total demand was 2 percent higher, exports declined 5 percent, and domestic demand increased 2 percent. Of the total domestic demand in 1953, vessels took 20, gas and electric companies 15, heating 15, oil-company uses 9, military deliveries 5, railroads 5, and other industrial uses 31 percent. Railroad use continued to decline sharply, with increased use of diesel locomotives; military receipts were cut, the gain for heating was small; but there was a major increase in public utility electric use.

The domestic demand for residual fuel oil is affected more by variations in industrial activity than any other oil product. The decline in railroad use from 21 percent of domestic demand in 1946 to only 5 percent in 1953 has shifted demand to other uses and, in part, is responsible for the rapid decline in refinery yield from 25 percent to 18 in the same period.

Distillate Fuel Oil.—Total demand for distillate fuel oil (including light diesel oils) totaled 521 million barrels in 1953 or 18 percent of the total demand for all oils. Compared with 1952 daily averages, total demand increased 2 percent, exports declined 4 percent, and domestic demand increased 3 percent. In 1953 the 2 largest uses for distillate were 55 percent for heating and 15 percent for railroad use. The increase in heating use was less than 2 percent, primarily because of mild weather. Use for railroad diesel locomotives increased substantially but at a slower rate. Consumption by diesel trucks is rapidly expanding and was reported at about 21 million barrels in 1953.

Kerosine.—The total demand for kerosine represented 4 percent of the total demand for all oils in 1953. On a daily average basis, total demand decreased 5 percent, exports were reduced 8 percent, and domestic demand was 5 percent less. In 1953, 72 percent of the domestic demand was for range oil, 3 percent for tractor fuel, and 25 percent for other uses, including lighting. Range-oil use includes cooking, water heating, and small space heating. No. 1 distillate and liquefied gases can be substituted in many uses.

Other Products.—The total demand for all other oils (including crude-oil exports and losses) amounted to 453 million barrels in 1953 or 16 percent of the total demand for all oils. Compared with the daily averages for 1952, total demand increased 8 percent, exports of crude and the other products declined 18 percent, and domestic demand advanced 12 percent. The decline in exports included a 25-percent decrease for crude oil and an 11-percent decline for other products, with lubricants having the largest decline.

The total demand for liquefied gases increased 13 percent over 1952. The production of still gas, primarily used as refinery fuel, increased 8 percent. The total demand for asphalt and road oil, used mainly in road construction and building, increased 1 percent. The total demand for lubricants declined 1 percent, a gain in domestic demand being offset by a sharp decline in exports. The demand for jet fuels for military use increased 74 percent.

Shipments to United States Territories and Possessions.—Domestic demand relates to demand in continental United States only. Shipments from the United States to the Territories and possessions are considered as exports, and any foreign receipts in such areas are deleted from total imports shown. Table 4 shows the total shipments of oil into these areas both from the United States and from foreign countries.

The indicated new supply of all oils in the Territories and possessions increased from 22.0 million barrels in 1952 to 22.8 million in 1953. If reexports to foreign countries are deducted, the indicated demand in these areas was 21.6 million barrels in 1952 and 22.4 million in 1953.

TABLE 4.—Shipments of petroleum products to United States Territories and possessions, 1952–53 [1]

[Thousands of barrels]

	1952			1953 [2]		
	From continental United States	Foreign	Total	From continental United States	Foreign	Total
Gasoline	7,476	263	7,739	8,163	130	8,293
Kerosine	851	29	880	865		865
Distillate fuel oil	2,905	907	3,812	2,947	669	3,616
Residual fuel oil	5,466	3,614	9,080	6,144	3,426	9,570
Lubricants:						
Grease				4		4
Oil	195		195	205		205
Wax					1	1
Coke	42		42	49		49
Asphalt	149	39	188	142	47	189
Liquefied gases	49		49	47		47
Total	17,133	4,852	21,985	18,566	4,273	22,839

[1] Source: U. S. Department of Commerce, except for shipments to Alaska and Hawaii from continental United States, which are Bureau of Mines data.
[2] Preliminary figures.

SCOPE OF REPORT

This report deals primarily with the production, distribution, and indicated consumption of crude petroleum and refined products in continental United States. Complete coverage of production, stocks, and refinery operations was obtained by voluntary reports from the industry, supplemented by minor estimates. Statistics on imports, except for crude oil and unfinished oils, were supplied by the United States Department of Commerce. The major part of the data was collected and published monthly. Annual canvasses provided supplemental information on the value of crude petroleum at the well, the number of producing oil wells, the sales of fuel oils by uses, and refinery capacity. The table showing world production of crude oil by countries was based on monthly reports, which include additional data on refinery operations. Data on crude reserves, wells drilled, and current prices were taken from sources indicated in the footnotes.

All percentage changes over previous year figures shown in this chapter were computed on the basis of the daily average for the years stated rather than on the annual totals.

WORLD OIL SUPPLY

The relative position of the United States in world production and refining of crude petroleum has continued to decline. The United States produced 49.5 percent of the total in 1953 compared with 50.8 percent in 1952. World production, in daily averages, gained 6.1 percent in 1953, including a 3.4-percent increase for the United States and 9.0-percent for other countries.

Crude oil refined in the United States was 54.1 percent of the world total in 1953 compared with 55.2 percent in 1952. Total crude oil refined in 1953 increased 7.1 percent, including gains of 4.9 percent in the United States and 9.8 percent in other countries. The output of refineries in Western Europe increased 15 percent in 1953 compared with gains of 26 percent in 1952 and 44 percent in 1951. The expansion of refining in this area has offset the loss in product supply caused by the refinery shutdown in Iran in 1951 and has been a factor in the current downward trend in product exports from the United States.

The domestic demand in continental United States and its Territories and possessions was 2,807 million barrels in 1953. Total foreign imports into this area amounted to 387 million barrels, while total exports to foreign countries (including reexports from the Territories) were 128 million barrels, indicating a total net import of 259 million barrels in 1953. This included a net import of 217 million barrels of crude and 42 million barrels of products.

RESERVES

The Committee on Petroleum Reserves of the American Petroleum Institute estimated proved reserves of crude oil in the United States on December 31, 1953, to be 29 billion barrels. These estimates include only oil recoverable under existing economic and operating conditions.

The increase in net crude reserves in 1953 was 984 million barrels. New reserves were estimated to be 3,296 million barrels in 1953, of which 1,265 million represented upward revisions of previous estimates, 1,439 million extensions of old pools, and 592 million new reserves discovered in new fields and in new pools in old fields.

As of December 31, 1953, Texas had 52 percent of total estimated reserves, California 13 percent, Louisiana 10 percent, and Oklahoma 6 percent, or 81 percent for the 4 States combined.

The largest increases in reserves in 1953 were 214 million barrels for Wyoming, 202 million for Louisiana, 194 million for Oklahoma, and 83 million for Texas.

TABLE 5.—Estimates of proved oil reserves in the United States, on Dec. 31, 1946–53, by States [1]

[Millions of barrels]

State	1946	1947	1948	1949	1950	1951	1952	1953
Eastern States:								
Illinois	351	355	393	468	564	646	619	625
Indiana	44	46	49	50	57	51	56	62
Kentucky	59	65	59	56	56	59	56	82
Michigan	69	70	69	66	79	64	57	61
New York	76	71	67	63	59	57	53	49
Ohio	29	29	29	28	27	26	27	32
Pennsylvania	98	123	110	103	106	95	122	111
West Virginia	36	36	37	38	39	39	37	36
Total	762	795	813	872	987	1,037	1,027	1,058
Central and Southern States:								
Arkansas	267	297	300	297	342	337	352	358
Kansas	545	563	674	738	732	792	917	913
Louisiana	1,652	1,791	1,869	1,910	2,185	2,285	2,558	2,760
Mississippi	270	304	365	403	386	385	359	350
New Mexico	544	530	552	592	592	612	733	815
Oklahoma	898	953	1,250	1,330	1,397	1,476	1,558	1,752
Texas	11,647	11,777	12,484	13,510	13,582	15,315	14,916	14,999
Total	15,823	16,215	17,494	18,780	19,216	21,202	21,393	21,947
Mountain States:								
Colorado	300	382	366	345	339	325	306	319
Montana	104	115	119	112	111	108	156	209
Utah	-------	-------	1	16	22	30	42	38
Wyoming	589	679	716	692	841	973	1,065	1,279
Total	993	1,176	1,202	1,165	1,313	1,436	1,569	1,845
Pacific Coast States: California	3,294	3,295	3,764	3,823	3,734	3,761	3,854	3,920
Other States	2	7	7	9	18	32	118	175
Total United States	20,874	21,488	23,280	24,649	25,268	27,468	27,961	28,945

[1] From reports of Committee on Petroleum Reserves, American Petroleum Institute, of the amount of crude oil that may be extracted by present methods from fields completely developed or sufficiently explored to permit reasonably accurate calculations. The change in reserves during any year represents total new discoveries, extensions, and revisions, minus production. Excludes condensate.

CRUDE PETROLEUM

SUPPLY AND DEMAND

The new supply of crude petroleum in the United States averaged 7,114,000 barrels daily in 1953, including a production of 6,466,000 barrels daily and imports of 648,000 barrels daily. Total supply increased 4 percent, production was 3 percent greater, and crude imports gained 13 percent over 1952. Imports represented 9 percent of total crude supply in 1953. The supply of crude petroleum was well above requirements in 1953 as measured by the addition of about 5 million barrels to crude stocks and an increase of 47 million barrels in refined-product stocks during the year.

Total indicated demand for crude oil (new supply minus increase in stocks) amounted to 2,592 million barrels in 1953, a 5-percent increase over 1952. The major part of the crude petroleum must be converted into products before final consumption. In 1953, 99 percent of the total was run to stills at refineries and the small balance represented crude exported, transfers to direct use as fuel, and losses. The decline of approximately 25 percent in crude exports in 1953 was the result of the increase in production in Canada, our chief export market.

TABLE 6.—Supply and demand [1] for crude petroleum in continental United States, 1949–53

[Thousands of barrels]

	1949	1950	1951	1952	1953 [2]
Production	1, 841, 940	1, 973, 574	2, 247, 711	2, 289, 836	2, 359, 998
Imports [3]	153, 686	177, 714	179, 073	209, 591	236, 576
Total new supply	1, 995, 626	2, 151, 288	2, 426, 784	2, 499, 427	2, 596, 574
Increase (+) or decrease (−) in stocks, end of year	−3, 271	−4, 893	7, 320	16, 145	4, 748
Demand:					
Domestic crude	1, 844, 173	1, 979, 764	2, 237, 305	2, 276, 691	2, 358, 108
Foreign crude	154, 724	176, 417	182, 159	206, 591	233, 718
Total demand	1, 998, 897	2, 156, 181	2, 419, 464	2, 483, 282	2, 591, 826
Runs to stills:					
Domestic	1, 789, 756	1, 918, 854	2, 188, 677	2, 235, 198	2, 321, 699
Foreign	154, 465	176, 013	181, 727	206, 061	233, 166
Exports [4]	33, 069	34, 823	28, 604	26, 696	19, 931
Transfers to fuel oil:					
Distillate	2, 701	2, 537	2, 863	2, 705	1, 966
Residual	4, 750	5, 325	6, 006	6, 343	5, 617
Other fuel and losses	14, 156	18, 629	11, 587	6, 279	9, 447
Total demand	1, 998, 897	2, 156, 181	2, 419, 464	2, 483, 282	2, 591, 826

[1] For definition, see text footnote 1 at the beginning of this chapter.
[2] Preliminary figures.
[3] Bureau of Mines data.
[4] U. S. Department of Commerce.

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TABLE 7.—Supply of and demand for crude petroleum in continental United States, 1952–53, by months

[Thousands of barrels]

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
1952													
Supply: Production	192,848	184,818	197,121	192,936	157,748	185,692	188,985	192,768	195,603	201,581	193,832	205,904	2,289,836
Imports [1]	15,123	14,228	15,817	16,170	16,903	17,434	18,519	19,596	18,459	19,948	18,709	18,685	209,591
Total new supply	207,971	199,046	212,938	209,106	174,651	203,126	207,504	212,364	214,062	221,529	212,541	224,589	2,499,427
Change in stocks, end of period: Domestic	−2,949	+2,131	+2,766	+10,667	+18,859	−4,251	−10,246	−11,585	+1,685	+4,004	−1,743	+3,807	+13,145
Foreign	+1,173	−238	+460	+886	+1,275	−598	+233	+2	−1,330	+1,049	−181	+269	+3,000
Demand: Domestic	195,797	182,687	194,355	182,269	138,889	189,943	199,231	204,353	193,918	197,577	195,575	202,097	2,276,691
Foreign	13,950	14,466	15,357	15,284	15,628	18,032	18,286	19,594	19,789	18,899	18,890	18,416	206,591
Runs to stills: Domestic	191,881	179,210	190,508	177,814	136,482	186,775	196,480	201,100	190,725	194,504	192,597	197,122	2,235,198
Foreign	13,948	14,314	15,317	15,225	15,580	17,987	18,249	19,561	19,785	18,854	18,859	18,382	206,061
Exports [2]	2,303	2,211	2,939	3,340	1,718	2,388	1,876	1,966	1,664	1,526	1,805	2,960	26,696
Transfers: Distillate	259	236	257	236	135	222	229	226	218	228	225	234	2,705
Residual	633	575	573	498	538	535	389	577	489	521	523	492	6,343
Losses	723	607	118	440	64	68	294	517	826	843	456	1,323	6,279
1953 [3]													
Supply: Production	203,214	183,736	202,458	193,389	198,086	197,837	204,701	204,059	196,717	194,108	188,315	193,378	2,359,998
Imports [1]	19,098	16,400	20,320	18,839	21,798	21,207	19,513	20,847	20,757	19,806	19,444	18,547	236,576
Total new supply	222,312	200,136	222,778	212,228	219,884	219,044	224,214	224,906	217,474	213,914	207,759	211,925	2,596,574
Change in stocks, end of period: Domestic	+439	+1,423	+1,238	+4,979	−2,097	+3,133	+1,099	+656	+3,521	−1,708	−5,073	−5,720	+1,890
Foreign	−117	−84	+838	−157	+1,918	+274	+162	−280	+741	−365	+553	−625	+2,858
Demand: Domestic	202,775	182,313	201,220	188,410	200,183	194,704	203,602	203,403	193,196	195,816	193,388	199,098	2,358,108
Foreign	19,215	16,484	19,482	18,996	19,880	20,933	19,351	21,127	20,016	20,171	18,891	19,172	233,718
Runs to stills: Domestic	199,100	178,689	197,741	184,532	197,219	191,542	200,875	200,947	190,693	192,871	190,744	196,746	2,321,699
Foreign	19,188	16,444	19,332	18,893	19,855	20,891	19,322	21,101	19,993	20,146	18,855	19,146	233,166
Exports [2]	2,211	2,011	2,171	2,833	1,611	1,824	1,232	1,321	1,109	1,178	1,052	1,378	19,931
Transfers: Distillate	233	189	176	151	145	143	166	170	143	155	144	151	1,966
Residual	536	406	483	446	502	481	500	500	516	429	387	431	5,617
Losses	722	1,058	799	551	731	756	858	491	758	1,208	1,097	418	9,447

[1] Bureau of Mines.
[2] U. S. Department of Commerce, except Alaska and Hawaii, which are Bureau of Mines data.
[3] Preliminary figures.

TABLE 8.—Crude petroleum produced in the United States, 1949–53, and total, 1859–1953, by States [1]

[Thousands of barrels]

	1949	1950	1951	1952	1953 [2]	1859–1953 [2] (total)
Production:						
Alabama	462	735	1,020	1,279	1,694	6,656
Arkansas	29,986	31,108	29,798	29,440	29,681	885,021
California	332,942	327,607	354,561	359,450	364,933	9,698,542
Colorado	23,587	23,303	27,823	30,381	32,331	237,529
Florida	441	487	596	591	537	3,304
Illinois	64,501	62,028	60,243	60,089	58,886	1,685,534
Indiana	9,696	10,699	11,100	12,037	13,013	236,873
Kansas	101,868	107,586	114,522	114,807	115,259	[3] 2,470,466
Kentucky	8,803	10,381	11,622	11,918	11,618	[4] 287,404
Louisiana	190,826	208,965	232,281	243,929	255,692	3,292,918
Michigan	16,517	15,826	13,927	13,251	12,284	[5] 361,709
Mississippi	37,966	38,236	37,039	36,310	35,425	392,833
Montana	9,118	8,109	8,958	9,606	11,630	198,445
Nebraska	330	1,547	2,558	2,660	6,257	18,859
New Mexico	47,645	47,367	52,719	58,681	70,394	[6] 864,189
New York	4,425	4,143	4,254	4,242	3,800	[7] 178,897
North Dakota	----------	----------	25	1,549	5,183	6,757
Ohio	3,483	3,383	3,140	3,350	3,550	631,039
Oklahoma	151,660	164,599	186,869	190,435	202,570	[3] 6,814,983
Pennsylvania	11,374	11,859	11,345	11,233	10,669	1,168,820
Texas	744,834	829,874	1,010,270	1,022,139	1,024,780	16,780,048
Utah	637	1,228	1,305	1,737	1,807	[8] 6,730
West Virginia	2,839	2,808	2,757	2,602	3,038	449,357
Wyoming	47,890	61,631	68,929	68,074	84,918	1,137,719
Other States [9]	110	65	50	46	49	2,001
Total	1,841,940	1,973,574	2,247,711	2,289,836	2,359,998	47,816,633
Value at wells:						
Total (thousands of dollars)	4,674,770	4,963,380	5,690,410	5,785,230	6,334,110	76,100,608
Average per barrel	$2.54	$2.51	$2.53	$2.53	$2.68	$1.59

[1] For detailed figures by States, 1859–1935, see Minerals Yearbook, 1937, p. 1008.
[2] Preliminary figures.
[3] Oklahoma included with Kansas in 1905 and 1906.
[4] Includes Tennessee, 1883–1907.
[5] Figures represent 1925–53 production only; earlier years included under "Other States."
[6] Figures represent 1924–53 production only; earlier years included under "Other States."
[7] Early production in New York included with Pennsylvania.
[8] Figures represent 1948–53 production only: earlier years included under "Other States."
[9] Includes Alaska, 1912–33; Arkansas, 1920; Michigan, 1900–19; Mississippi 1933–35; Missouri, 1899–1911, 1913–16, 1919–23, 1932–53; New Mexico, 1913, 1919–23; Tennessee, 1916–53; Utah 1907–11, 1920, 1924–41; Virginia, 1943–53.

PRODUCTION

General

Production of crude petroleum set a new record of 2,360 million barrels in 1953—a 3-percent gain over 1952. Five States (Texas, California, Louisiana, Oklahoma, and Kansas) produced over 100 million barrels each and supplied 83 percent of the output in 1953 compared with 84 percent in 1952. Texas, with 52 percent of total crude reserves, produced 43 percent of the national output in 1953.

The output of 6 other States, producing over 20 million barrels each but less than 70 million, represented 13 percent of the national total in 1953 compared with 12 percent in 1952. Wyoming ranked sixth and New Mexico seventh in 1953, and both have surpassed Illinois in the last 3 years. Mississippi was ninth in importance in 1953, while Colorado took tenth place from Arkansas.

The 11 States in the above groups furnished 96 percent of the total output in 1953 compared with 97 percent in 1952. Six States—Texas, Louisiana, Oklahoma, Kansas, New Mexico, and Arkansas—issued monthly proration orders under State conservation laws to adjust production to market demand. These States produced 72 percent of the total crude oil in 1953 and 73 percent in 1952.

TABLE 9.—Production of crude petroleum in the United States in 1952–53, by State and month

[Thousands of barrels]

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
1952													
Alabama	88	74	82	81	85	83	91	97	101	139	165	193	1,279
Arkansas	2,494	2,337	2,519	2,425	2,451	2,373	2,454	2,458	2,434	2,493	2,456	2,546	29,440
California [1]	30,125	28,288	30,292	29,419	30,643	29,595	30,366	30,386	29,485	30,481	29,595	30,775	359,450
Colorado	2,560	2,353	2,570	2,606	2,179	2,441	2,562	2,633	2,571	2,630	2,574	2,702	30,381
Florida	52	50	52	52	54	50	51	45	46	47	47	45	591
Illinois	5,152	4,818	4,962	5,101	4,867	4,965	5,175	5,044	4,999	5,117	4,826	5,063	60,089
Indiana	971	872	916	920	1,034	1,023	1,075	1,052	1,042	1,066	998	1,068	12,037
Kansas	10,042	9,616	10,026	10,024	4,992	9,247	10,105	10,013	10,173	10,605	9,489	10,475	114,807
Kentucky	1,089	1,034	1,068	1,046	1,030	987	1,002	946	931	941	892	952	11,918
Louisiana	20,176	18,954	20,255	19,920	18,073	20,115	20,695	20,794	20,556	21,498	20,877	22,016	243,929
Michigan [2]	1,161	1,092	1,126	1,140	1,120	1,121	1,128	1,111	1,017	1,099	1,010	1,126	13,251
Mississippi	3,119	2,880	3,062	3,006	3,143	2,962	3,047	3,009	2,975	3,043	2,965	3,099	36,310
Montana [3]	722	752	732	699	718	682	795	881	882	910	870	963	9,606
Nebraska	198	190	210	206	137	193	209	208	232	259	234	384	2,660
New Mexico	4,802	4,654	5,141	5,007	2,715	5,153	5,120	5,101	5,112	5,296	5,120	5,460	58,681
New York	355	347	345	363	366	354	373	353	356	362	312	356	4,242
North Dakota	5	5	19	36	53	87	111	214	177	191	310	341	1,549
Ohio	271	262	271	279	270	283	295	272	289	295	263	300	3,350
Oklahoma	16,188	15,482	16,456	16,053	12,183	15,936	16,595	16,308	16,021	16,404	15,816	16,993	190,435
Pennsylvania	940	878	956	983	985	947	968	931	920	937	849	939	11,233
Texas	86,164	83,978	90,041	87,710	66,351	81,316	80,486	84,455	88,977	91,459	87,922	93,280	1,022,139
Utah	120	128	139	119	129	151	165	156	151	163	155	161	1,737
West Virginia	233	223	216	222	198	209	225	202	212	235	200	227	2,602
Wyoming	5,815	5,546	5,660	5,515	3,969	5,416	5,888	6,096	5,940	5,907	5,885	6,437	68,074
Other States	6	5	5	4	3	3	4	3	4	4	2	3	[4] 46
Total: 1952	192,848	184,818	197,121	192,936	157,748	185,692	188,985	192,768	195,603	201,581	193,832	205,904	2,289,836
1951	183,437	166,163	187,774	183,860	191,601	184,064	190,626	193,537	188,016	198,163	188,499	191,971	2,247,711
Daily average, 1952	6,221	6,373	6,359	6,431	5,089	6,190	6,096	6,218	6,520	6,503	6,461	6,642	6,256
Pennsylvania Grade (included above)	1,646	1,564	1,636	1,689	1,661	1,626	1,687	1,597	1,602	1,647	1,464	1,635	19,454
1953 [5]													
Alabama	133	132	147	146	154	146	150	146	141	134	132	133	1,694
Arkansas	2,511	2,270	2,526	2,449	2,458	2,451	2,572	2,560	2,554	2,505	2,377	2,448	29,681
California [1]	30,618	27,710	31,011	29,857	31,095	30,298	31,183	30,954	30,035	30,977	30,181	31,014	364,933
Colorado	2,502	2,251	2,566	2,478	2,665	2,675	2,883	2,984	2,871	2,826	2,742	2,888	32,331
Florida	45	42	46	44	48	43	47	48	45	40	44	45	537
Illinois	4,978	4,592	4,873	4,864	4,889	4,880	4,883	4,869	4,764	5,053	4,970	5,271	58,886
Indiana	1,089	1,014	1,130	1,110	1,161	1,109	1,128	1,112	1,057	1,078	1,002	1,023	13,013
Kansas	10,412	9,451	10,413	9,943	9,977	9,830	10,273	10,172	9,747	6,610	9,070	9,361	115,259
Kentucky	931	856	945	938	941	964	1,007	1,016	979	1,008	976	1,057	11,618
Louisiana	21,933	19,793	22,191	21,212	21,391	21,182	21,935	21,947	21,279	20,523	20,818	21,488	255,692

For footnotes, see end of table.

TABLE 9.—Production of crude petroleum in the United States in 1952–53, by State and month—Continued

[Thousands of barrels]

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Michigan [2]	1,058	971	1,032	1,033	1,011	1,023	1,048	1,018	1,006	1,040	994	1,050	12,284
Mississippi	3,062	2,837	3,092	2,974	3,015	2,904	2,981	3,012	2,869	2,886	2,855	2,938	35,425
Montana [3]	920	809	920	899	1,014	994	1,040	997	958	1,030	1,005	1,044	11,630
Nebraska	462	433	458	470	503	520	567	580	507	585	566	606	6,257
New Mexico	5,530	5,109	5,790	5,673	5,969	5,798	6,031	6,182	6,085	6,306	5,836	6,085	70,394
New York	336	308	328	324	322	324	328	309	315	308	282	316	3,800
North Dakota	439	479	432	427	440	417	431	448	391	397	434	448	5,183
Ohio	261	245	294	281	280	308	319	303	306	320	299	334	3,550
Oklahoma	17,121	15,601	17,384	16,680	17,225	17,200	17,820	17,966	17,247	16,495	15,592	16,239	202,570
Pennsylvania	903	823	919	905	892	905	919	895	899	925	826	858	10,669
Texas	90,964	81,825	88,846	83,688	85,393	86,244	89,191	88,447	84,636	84,948	79,671	80,927	1,024,780
Utah	155	153	166	163	163	148	139	152	142	144	138	144	1,807
West Virginia	214	196	221	234	245	251	270	260	279	289	287	292	3,038
Wyoming	6,633	5,833	6,724	6,594	6,831	7,219	7,551	7,678	7,601	7,677	7,214	7,363	84,918
Other States	4	3	4	3	4	4	5	4	4	4	4	6	[6] 49
Total: 1953	203,214	183,736	202,458	193,389	198,086	197,837	204,701	204,059	196,717	194,108	188,315	193,378	2,359,998
1952	192,848	184,818	197,121	192,936	157,748	185,692	188,985	192,768	195,603	201,581	193,832	205,904	2,289,836
Daily average, 1953	6,555	6,562	6,531	6,446	6,390	6,595	6,603	6,583	6,557	6,262	6,277	6,238	6,466
Pennsylvania Grade (included above)	1,556	1,423	1,579	1,572	1,558	1,593	1,634	1,570	1,597	1,634	1,495	1,581	18,792

[1] American Petroleum Institute.
[2] Department of Conservation, Michigan.
[3] Montana Oil Conservation Board.
[4] 1952 Missouri (21), Tennessee (15), and Virginia (10).
[5] Preliminary figures.
[6] 1953 Missouri (26), Tennessee (13), and Virginia (10).

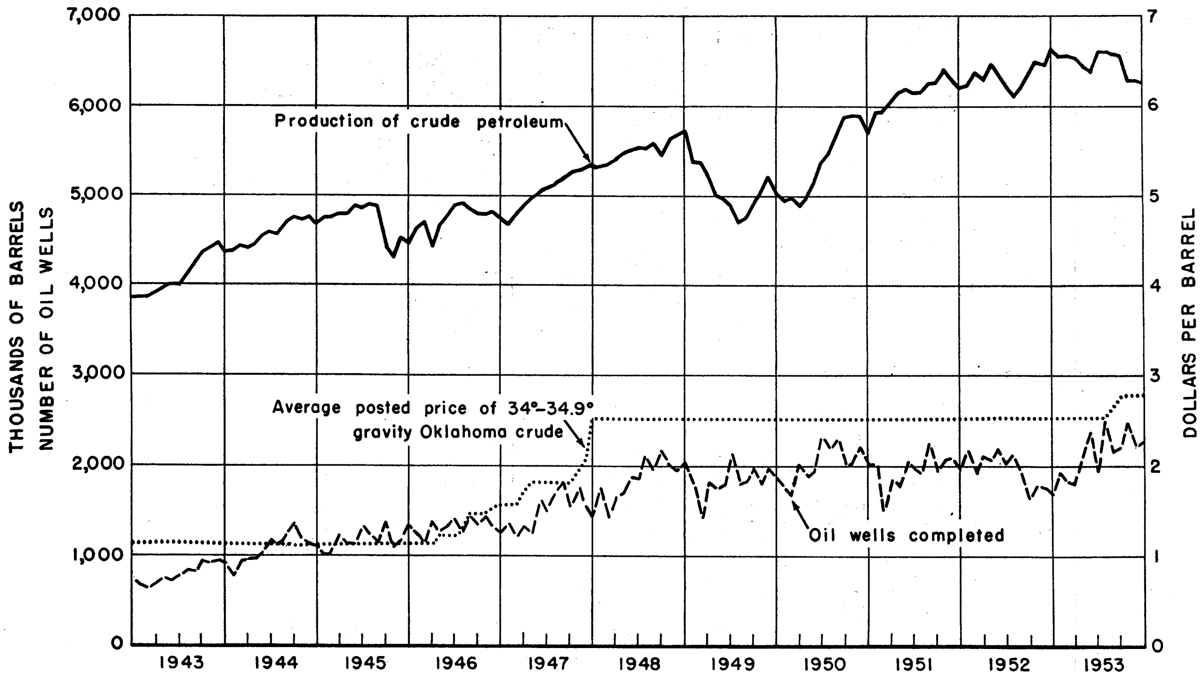

FIGURE 2.—Daily average production of crude petroleum, total number of oil wells completed, and average posted prices per barrel of a selected grade of Oklahoma crude petroleum in the United States, 1943–53, by months.

The most notable changes in State production in 1953, on a daily average basis, were gains of 25 percent for Wyoming, 20 percent for New Mexico, 7 percent for Oklahoma and Colorado, and 5 percent for Louisiana. Among the smaller producers, the largest increases were for North Dakota and Nebraska.

TABLE 10.—Percentage of total crude petroleum produced in the United States 1944–53, by States

State	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953 [1]
Texas	44.5	44.0	43.8	44.2	44.7	40.4	42.1	45.0	44.6	43.4
California	18.6	19.1	18.2	17.9	16.8	18.1	16.6	15.8	15.7	15.5
Louisiana	7.7	7.7	8.3	8.6	9.0	10.4	10.6	10.3	10.7	10.8
Oklahoma	7.4	8.1	7.8	7.6	7.7	8.2	8.3	8.3	8.3	8.6
Kansas	5.9	5.6	5.6	5.7	5.5	5.5	5.5	5.1	5.0	4.9
Illinois	4.6	4.4	4.3	3.6	3.2	3.5	3.1	2.7	2.6	2.5
Wyoming	2.0	2.1	2.2	2.4	2.7	2.6	3.1	3.1	3.0	3.6
New Mexico	2.4	2.2	2.1	2.2	2.4	2.6	2.4	2.3	2.6	3.0
Mississippi	1.0	1.1	1.4	1.9	2.3	2.1	1.9	1.7	1.6	1.5
Arkansas	1.8	1.7	1.6	1.6	1.6	1.6	1.6	1.3	1.3	1.3
Colorado	.2	.3	.7	.8	.9	1.3	1.2	1.2	1.3	1.4
Michigan	1.1	1.0	1.0	.9	.8	.9	.8	.6	.6	.5
Pennsylvania	.8	.7	.8	.7	.6	.6	.6	.5	.5	.4
Kentucky	.5	.6	.6	.5	.4	.5	.5	.5	.5	.5
Other States	1.5	1.4	1.6	1.4	1.4	1.7	1.7	1.6	1.7	2.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Preliminary figures.

TABLE 11.—Production of crude petroleum in leading fields in the United States, 1952–53, and total production since discovery, in thousands of barrels [1]

[Oil and Gas Journal]

Field	State	1952	1953	Total since discovery [2]
East Texas	Texas	96,539	90,627	3,073,779
Wilmington	California	48,073	44,334	650,286
Ventura Avenue	do	27,217	30,365	478,475
Coalinga	do	25,513	25,170	718,201
Rangely	Colorado	22,346	22,954	142,830
Huntington Beach	California	21,815	21,167	523,913
Wasson	Texas	19,941	19,160	275,358
Hawkins	do	16,044	18,754	167,233
Goldsmith	do	18,699	18,663	171,339
Velma	Oklahoma	18,634	15,533	100,304
Hastings	Texas	14,750	13,865	241,709
Slaughter	do	13,669	13,591	198,900
Cuyama-South	California	13,989	12,770	50,518
Sholem Alechem	Oklahoma	12,239	12,736	102,349
Seeligson	Texas	13,382	12,666	122,645
Webster	do	13,686	12,585	191,295
Midway-Sunset	California	12,277	12,529	785,565
Yates	Texas	12,883	12,271	410,737
Bradford-Allegany [3]	Pennsylvania-New York	13,202	12,133	638,483
Conroe and West	Texas	12,857	12,130	332,409
Levelland	do	11,783	11,410	71,860
Weeks Island	Louisiana	10,705	11,304	40,865
San Ardo	California	8,275	11,159	22,940
Keystone	Texas	11,220	10,990	122,224
Van	do	11,398	10,827	243,122
Thompson	do	11,880	10,714	188,145
Diamond M	do	13,398	10,592	40,424
T-X-L	do	12,075	10,476	114,637
Eunice-Monument	New Mexico	9,588	9,321	235,635
Cowden-North and South	Texas	9,844	9,219	139,238
Elk Basin and South	Wyoming-Montana	9,799	8,907	82,281
Buena Vista	California	9,747	8,853	431,714
Katy and North	Texas	8,589	8,751	62,466
Denton	New Mexico	4,329	8,668	14,548
Brea-Olinda	California	6,926	8,625	228,667

For footnotes, see end of table.

TABLE 11.—Production of crude petroleum in leading fields in the United States, 1952–53, and total production since discovery, in thousands of barrels [1]—Con.

[Oil and Gas Journal]

Field	State	1952	1953	Total since discovery [2]
Caillou Island	Louisiana	7,137	8,585	79,423
Dollarhide	Texas	7,311	8,259	38,943
Cogdell	do	8,118	8,171	26,828
Clay City	Illinois	6,993	8,065	155,605
Fullerton	Texas	8,748	7,862	98,690
Coles Levee	California	7,955	7,769	99,133
Kern	do	7,801	7,518	408,247
Long Beach	do	7,959	7,434	773,777
McElroy	Texas	7,431	7,250	234,326
Cat Canyon-West	California	6,609	6,971	65,669
Midland Farms	Texas	7,467	6,843	27,920
West Ranch	do	6,852	6,773	85,426
Seminole	do	5,610	6,673	76,730
Kettleman-North Dome	California	7,992	6,657	396,122
Anahuac	Texas	7,032	6,554	122,292
Elk City	Oklahoma	7,248	6,380	26,902
Ward-South	Texas	7,673	6,130	50,059
Trapp	Kansas	6,469	6,081	143,429
Old Ocean	Texas	6,241	6,048	81,683
Baxterville	Mississippi	6,242	6,035	39,917
Talco	Texas	6,429	5,947	142,075
Delta Farms	Louisiana	6,751	5,858	59,022
Venice	do	5,933	5,777	51,249
Pegasus	Texas	4,365	5,706	14,830
Coyote	California	6,073	5,654	246,594
Caddo	Louisiana	5,142	5,451	205,309
Santa Fe Springs	California	5,198	5,337	549,181
Louden	Illinois	5,587	5,249	173,966
Oklahoma City	Oklahoma	5,513	5,187	692,270
Fort Chadbourne	Texas	419	5,183	10,390
Portilla	do	4,639	5,112	14,121
Edison	California	5,471	5,094	50,467
Vealmoor and East	Texas	5,015	5,008	16,072

[1] The classification of fields and data may differ from other sources used in the State summaries.
[2] Includes revisions.
[3] Bureau of Mines data.

Crude Production by States

Alabama.—Drilling activity and production in Alabama exceeded that of any previous year as a result of the discovery of the Pollard field in Escambia County in 1952. No new fields and no significant extensions, however, were found in 1953.

California.—Exploratory drilling reached a record high in 1953; success ratios were improved from 1952, but none of the oil or gas fields discovered appeared to have real importance at year end.

New production brought in by development drilling offset the declines from established pools and the loss of production from shutting in of heavy crude.

The world's deepest producing well was completed at Coles Levee North. The well produced from the Eocene at 17,892 feet. The world record for depth of drilling was also set in California in 1953 when a deep test in the Paloma field reached 21,482 feet.

Colorado.—Exploratory drilling in eastern Colorado was 70 percent greater than in 1952. In the Denver Basin, the most active area in the State, development drilling shifted southward to the Little Beaver-Badger Creek field of Washington and Adam Counties.

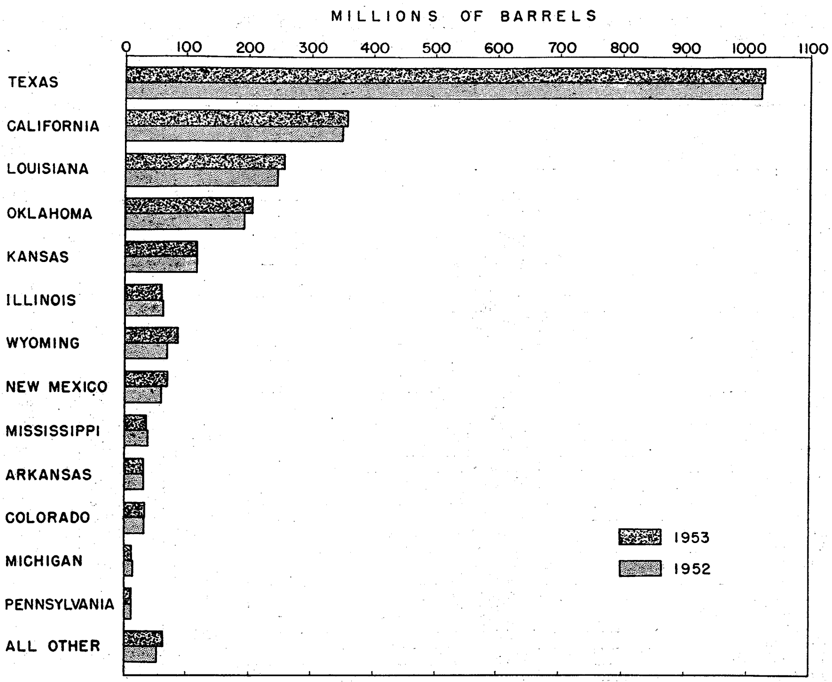

FIGURE 3.—Production of crude petroleum in the United States, 1952–53, by States.

TABLE 12.—Production of crude petroleum in Arkansas, 1949–53, by fields

[Thousands of barrels]

Field	1949	1950	1951	1952	1953 [1]
Atlanta	1,080	999	841	810	649
Buckner	778	798	719	722	645
Dorcheat-Macedonia	930	983	875	877	841
Fouke	945	894	929	1,053	1,429
McKamie	1,156	1,179	1,175	1,446	1,369
Magnolia	4,292	4,547	4,407	4,223	4,029
Midway	2,685	2,786	2,684	2,674	2,642
Schuler	3,140	2,854	2,626	2,377	2,318
Smackover	3,900	3,991	3,910	3,814	3,892
Stephens	1,611	1,774	1,476	1,308	1,223
Village	1,850	1,677	1,247	1,018	840
Wesson	3,053	3,452	3,647	3,510	3,296
Other fields [2]	4,566	5,174	5,262	5,608	6,508
Total Arkansas	29,986	31,108	29,798	29,440	29,681

[1] Preliminary figures.
[2] Includes oil consumed on leases and net change in stocks held on leases for entire State.

TABLE 13.—Production of crude petroleum in California, 1949–53, by district and field, in thousands of barrels

[American Petroleum Institute]

District and field	1949	1950	1951	1952	1953 [1]
San Joaquin Valley:					
Belridge	2,920	2,931	3,516	3,237	3,567
Buena Vista	13,907	12,032	11,168	9,753	8,881
Coalinga	33,266	31,210	31,957	30,344	28,356
Coles Levee	7,239	7,207	7,224	7,007	6,785
Cuyama-Russell Ranch	8,066	16,504	21,230	19,805	17,409
Edison	4,126	3,914	4,867	5,489	5,057
Elk Hills	3,057	2,700	2,459	2,836	5,960
Fruitvale	2,720	2,827	3,312	3,372	3,562
Gosford East	382	680	831	802	652
Greeley	4,750	4,061	4,615	4,739	4,769
Helm	979	819	728	545	540
Kern River-Kern Bluff-Kern Front	6,934	6,461	7,984	7,790	7,500
Kettleman North Dome	11,739	10,467	9,090	7,984	6,657
Lost Hills	2,383	2,019	2,084	2,161	2,317
McKittrick	6,509	5,774	6,309	7,148	8,621
Midway-Sunset	12,758	11,431	12,619	12,309	12,512
Mountain View	1,199	1,240	1,173	1,303	1,372
Mount Poso	4,216	3,809	3,451	3,276	3,100
Poso Creek	785	830	1,196	1,405	1,767
Raisin City	1,356	1,613	1,749	1,790	1,854
Rio Bravo	4,229	3,748	4,089	4,335	4,415
Riverdale	966	780	781	789	677
Round Mountain	2,438	2,167	2,056	2,015	1,915
Tejon Group	861	[2] 795	[2] 2,078	[2] 2,363	[2] 2,366
Ten Section	2,351	2,076	1,877	1,621	1,472
Other San Joaquin Valley	8,692	8,002	8,093	8,005	8,997
Total San Joaquin Valley	148,828	146,097	156,536	152,223	151,080
Coastal district:					
Aliso Canyon	1,275	1,455	1,986	2,428	2,640
Cat Canyon	5,175	4,632	6,324	6,700	6,992
Del Valle	[3] 1,235	1,261	1,677	1,229	995
Elwood	2,681	2,313	1,920	1,785	1,569
Gato Ridge	1,150	933	1,030	1,076	1,012
Lompoc	203	988	2,482	1,917	1,697
Newhall-Potrero	3,185	2,995	2,865	2,851	3,314
Orcutt	1,717	1,362	1,476	1,421	1,354
Padre Canyon [4]	2,655	2,462	2,242	1,549	1,726
Placerita	5,137	5,743	3,982	3,458	2,756
Ramona	[3] 2,048	1,757	1,505	1,287	1,047
Rincon	1,264	1,304	1,319	1,499	1,457
San Ardo	481	188	2,745	8,281	11,284
San Miguelito	2,350	2,895	4,464	4,250	3,134
Santa Maria	5,667	4,509	4,479	4,029	4,191
South Mountain	2,463	2,382	2,207	2,858	4,594
Ventura	21,040	20,985	23,301	27,241	29,901
Zaca Creek	658	556	1,648	1,537	1,653
Other Coastal	4,693	4,109	4,953	8,388	12,488
Total Coastal	65,077	62,829	72,605	83,784	93,804
Los Angeles Basin:					
Brea-Olinda	5,213	4,533	5,402	6,928	8,574
Coyote	6,450	5,717	5,895	6,075	5,655
Dominquez	4,743	4,602	4,286	3,893	3,658
Huntington Beach	21,035	20,568	22,465	21,789	21,139
Inglewood	5,064	4,879	4,951	4,984	4,950
Long Beach	8,349	8,432	8,499	7,963	7,422
Montebello	2,346	2,185	2,014	1,916	1,767
Newport	2,242	1,785	1,575	1,494	1,546
Richfield	2,347	2,364	2,425	2,412	2,628
Rosecrans [5]	2,247	1,991	1,640	1,684	1,478
Sansinena	125	531	1,038	1,928	2,800
Santa Fe Springs	5,327	5,288	5,132	5,164	5,315
Seal Beach	4,381	4,286	4,118	4,083	3,852
Torrance	2,762	2,615	2,522	2,510	2,564
Wilmington	43,509	46,234	50,806	48,121	44,328
Other Los Angeles Basin	2,897	2,671	2,652	2,499	2,373
Total Los Angeles Basin	119,037	118,681	125,420	123,443	120,049
Total California	332,942	327,607	354,561	359,450	364,933

[1] Preliminary figures.
[2] Includes Willow Springs.
[3] Ramona included in Del Valle before 1949.
[4] Includes Oak Grove area.
[5] Includes Athens.

The discovery of oil in the Permian Lyons sandstone of the Denver Basin had great potential significance. Only a few previous deep tests had been drilled into the pre-Cretaceous in the Denver Basin. This discovery improved the prospects for important Paleozoic production.

A Cretaceous sandstone producing trend developed in the Little Beaver-Badger Creek area, 30 miles southwest of the Logan County area. Sandstones here were thicker and more porous than in most of the Denver Basin.

TABLE 14.—Production of crude petroleum in Colorado, 1949–53, by fields

[Thousands of barrels]

Fields	1949	1950	1951	1952	1953 [1]
Iles	531	503	447	378	334
Little Beaver				(2)	2,400
Merino		(2)	455	391	411
Mount Hope		(2)	239	578	1,125
Powder Wash	63	91	123	257	286
Rangely	19,632	18,956	22,091	22,443	22,900
Wilson Creek	2,586	2,796	2,795	2,851	2,854
Yenter		(2)	420	962	1,374
Other fields [3]	775	957	1,253	2,521	647
Total Colorado	23,587	23,303	27,823	30,381	32,331

[1] Preliminary figures.
[2] Included in "Other fields."
[3] Includes crude oil consumed on leases and net change in stocks held on leases for entire State.

Florida.—Thirty-four exploratory tests were drilled compared with only 10 in 1952. None of these was successful. Two tests drilled in Lee County had shows of oil but were not commercial producers.

Illinois.—No important discoveries were made in Illinois in 1953, but application of hydraulic fracturing in the completion of wells resulted in commercial production for a number that otherwise could not have been operated profitably.

TABLE 15.—Production of crude petroleum in Illinois, 1949–53, by fields, in thousands of barrels

[Oil and Gas Journal]

Field	1949	1950	1951	1952	1953
Albion	979	1,187	1,231	1,134	1,162
Benton	532	436	2,205	3,056	2,441
Boyd	1,062	887	687	557	539
Bridgeport	1,943	2,012	1,936	1,996	2,531
Centralia	1,712	1,250	946	836	701
Clay City-Noble	8,347	8,142	[1] 7,031	[1] 6,993	[1] 8,065
Dale-Hoodville	1,300	1,187	2,215	[2] 2,249	[2] 2,053
East Inman	1,905	1,050	837	630	539
Johnsonville	941	829	664	678	588
Louden	6,077	7,436	6,127	5,587	5,249
Marine	988	872	787	674	517
New Harmony-Keensburg	2,783	2,376	[3] 3,504	[3] 3,215	[3] 3,491
Phillipstown	861	829	1,092	1,084	989
Robinson	1,381	1,532	1,530	1,572	2,045
Sailor Springs	2,371	1,833	1,445	1,204	1,192
Salem	4,106	3,726	3,404	3,080	2,541
Other fields	26,798	26,519	24,186	25,019	[4] 24,243
Total Illinois	64,086	62,103	59,827	59,564	[4] 58,886

[1] Clay City only.
[2] Dale only.
[3] New Harmony only.
[4] Bureau of Mines preliminary figures.

TABLE 16.—Production of crude petroleum in Kansas, 1949–53, by fields, in thousands of barrels

[Oil and Gas Journal]

Field	1949	1950	1951	1952	1953
Bemis-Shutts	4,560	4,681	4,287	3,741	3,526
Bloomer	2,492	2,716	2,782	2,344	2,067
Burnett	3,497	2,747	3,044	2,709	2,824
Burrton-Haury	1,211	1,127	1,026	909	781
Chase	3,258	3,078	2,786	[1] 7,152	[1] 6,007
El Dorado	3,084	3,019	3,202	3,454	3,939
Fairport	908	1,243	1,135	879	834
Geneseo-Edwards	2,803	2,960	3,001	3,304	3,061
Gorham	1,445	1,406	2,452	1,990	1,793
Hall-Gurney	3,433	3,159	3,637	3,954	4,640
Kraft-Prusa	5,463	5,870	6,326	5,449	4,721
Morel	1,399	1,337	2,301	2,092	1,798
Ray	1,246	1,484	1,822	1,624	1,393
Silica-Raymond	4,597	5,147	4,950	(1)	(1)
Stoltenberg	2,098	1,962	1,760	1,471	1,270
Trapp	8,905	8,645	7,686	6,469	6,081
Other fields	49,733	56,639	61,921	67,304	[2] 70,524
Total Kansas	100,132	107,220	114,118	114,845	[2] 115,259

[1] Silica included with Chase.
[2] Bureau of Mines preliminary figures.

Louisiana.—The Louisiana Gulf Coast area experienced a larger increase in drilling activity in 1953 than in any of the previous 5 years. The more important of the 41 new field discoveries were thought to be Boutte field in St. Charles Parish, Hollywood in Terrebonne Parish, and Sullivan's Lake in Iberville Parish.

As in recent years, production increased in the Gulf Coast area and declined in North Louisiana.

TABLE 17.—Production of crude petroleum in Louisiana, 1949–53, by district and field

[Thousands of barrels]

District and field	1949	1950	1951	1952	1953 [1]
Gulf Coast:					
Anse la Butte	2,160	2,194	2,442	2,373	2,160
Avery Island	2,376	2,649	3,018	3,090	3,113
Barataria	3,468	3,450	3,294	2,876	2,350
Bay de Chene	370	815	1,259	1,288	1,297
Bay Marchand	376	1,986	2,428	2,004	1,562
Bay St. Elaine	2,055	2,230	2,672	2,733	3,194
Bayou Blue	805	1,071	1,122	1,156	1,158
Bayou Mallett	711	874	1,253	1,604	1,846
Bayou Sale	4,996	4,737	5,139	5,199	4,710
Caillou Island	4,135	5,335	6,499	7,136	8,530
Charenton	1,512	1,361	1,136	1,176	1,278
Cox Bay		29	1,123	2,102	2,690
David Haas	1,084	1,170	1,128	1,117	837
Delta Farms	7,581	7,648	7,190	6,751	6,484
Dog Lake	556	901	1,320	1,276	1,530
Duck Lake	103	414	1,123	2,269	2,935
East White Lake	1,217	1,321	1,443	1,427	1,479
Egan	2,381	2,136	2,083	2,041	2,037
Erath	1,246	1,214	1,178	1,179	1,370
Garden Island	1,509	1,614	1,583	1,590	1,590
Gibson	1,717	1,539	1,460	1,498	1,404
Golden Meadows	4,156	5,020	4,864	4,546	3,909
Good Hope	2,177	2,240	2,434	2,288	2,045
Grand Bay	3,590	3,766	3,853	3,638	3,708
Gueydan	2,115	2,217	2,325	1,970	1,570
Hackberry	3,626	3,519	3,621	3,780	4,499
Horseshoe Bayou	1,178	1,246	1,346	1,303	1,394
Iowa	2,212	1,947	2,282	2,513	2,852
Jeanerette	867	947	1,067	1,084	1,137
Jennings	1,207	1,104	893	861	791
Lafitte	4,017	4,332	4,489	4,467	4,650
Lake Chicot	1,083	1,031	1,105	1,104	1,072
Lake Pelto	1,584	1,625	2,173	2,456	2,697
Lake Salvador	1,842	1,972	2,086	1,843	1,831
Leeville	1,910	2,112	2,205	2,417	3,251
Main Pass	306	1,331	2,057	2,445	4,307
New Iberia	1,577	1,462	1,470	1,275	1,241
North Crowley	1,753	1,767	1,659	1,390	1,504
Paradis	3,698	3,649	3,626	3,411	3,445
Pine Prairie	1,416	1,168	1,048	984	955
Point a-La-Hache	304	1,603	2,484	2,746	2,689
Port Barre	1,456	1,470	1,438	1,285	1,327
Quarantine Bay	3,445	3,725	3,960	3,480	3,181
Romre Pass		606	2,315	3,641	4,583
St. Gabriel	1,629	1,577	1,793	2,095	1,778
Section 28	1,103	1,296	1,117	1,343	1,244
Sunshine	152	771	1,257	979	790
Tepetate	3,977	3,788	3,321	2,647	2,189
University	2,844	2,840	2,203	1,811	1,534
Venice	4,614	5,001	5,742	5,965	5,728
Ville Platte	1,969	1,888	1,462	1,424	1,335
Vinton	3,740	3,872	3,960	3,786	3,618
Weeks Island	2,922	5,183	8,199	10,680	11,258
West Bay	2,281	2,404	2,936	3,123	3,132
West Cote Blanche	1,827	1,704	2,392	2,830	2,862
West Lake Verrett	1,393	1,472	1,782	1,966	1,757
White Castle	1,594	1,692	1,672	1,563	1,343
Other Gulf Coast [2]	30,511	36,720	46,239	52,995	63,230
Total Gulf Coast	146,433	164,755	188,768	200,019	213,990
Northern:					
Big Creek	1,664	1,443	1,468	1,432	1,277
Caddo	4,969	5,689	4,995	5,111	5,462
Delhi	7,545	6,733	6,679	6,436	5,922
Haynesville	5,339	5,444	5,480	5,008	4,422
Lake St. John	7,300	6,695	5,871	4,870	4,020
Lisbon	1,703	2,216	1,481	889	748
Nebo [3]	2,438	2,328	2,302	2,272	2,268
Olla [4]	2,625	2,490	2,294	2,203	2,090
Ora	1,896	1,085	656	480	324
Rodessa	1,302	1,186	1,043	934	835
Other Northern [2]	7,612	8,901	11,244	14,275	14,334
Total Northern	44,393	44,210	43,513	43,910	41,702
Total Louisiana	190,826	208,965	232,281	243,929	255,692

[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.

TABLE 18.—Production of crude petroleum in Michigan, 1949–53, by fields, in thousands of barrels

[Michigan Department of Conservation]

Field	1949	1950	1951	1952	1953 [1]
Beaver Creek	904	794	641	510	421
Coldwater	1,673	1,635	1,488	1,388	1,254
Deep River	2,396	2,080	2,029	1,847	1,774
East Norwich	322	331	384	470	488
Kawkawlin	755	722	631	559	480
Kimball Lake	1,119	847	569	411	288
Pentwater	1,333	1,410	718	660	383
Reed City	944	752	646	594	495
St. Helen	157	354	388	410	307
Stony Lake	861	998	881	733	659
Other fields	6,053	5,903	5,552	5,669	5,735
Total Michigan	16,517	15,826	13,927	13,251	12,284

[1] Preliminary figures.

Mississippi.—The discovery of the New Hope field in Monroe County in northeast Mississippi was the first discovery of oil in producible quantities in the Warrior Basin, where only gas had been found previously. Completion of a well in the Ordovician marked the first commercial production from beds older than Mississippian age. The leasing in northern Mississippi, which became active when the Muldon gas field was discovered in 1952, was further stimulated by this discovery.

TABLE 19.—Production of crude petroleum in Mississippi, 1949–53, by fields

[Thousands of barrels]

Field	1949	1950	1951	1952	1953 [1]
Baxterville	2,381	4,951	6,487	6,212	5,940
Brookhaven	5,241	4,714	4,237	3,905	4,211
Cranfield	5,540	4,475	3,334	2,792	2,398
Eucutta	1,941	1,994	1,746	1,670	1,542
Heidelburg	2,716	3,457	3,452	3,437	3,336
La Grange	4,603	4,370	3,666	3,277	2,701
Mallalieu	5,329	3,535	2,520	1,944	1,484
Tinsley	5,582	5,190	5,071	4,934	4,545
Yellow Creek	962	1,528	1,650	1,633	1,642
Other fields	3,671	4,022	4,876	6,506	7,626
Total Mississippi	37,966	38,236	37,039	36,310	35,425

[1] Preliminary figures.

Montana.—Of the 15 new discoveries in 1953, 10 were in the Williston Basin; 3 were especially significant. Discovery of the Northeast Poplar field in Roosevelt County established production well downdip along the north flank of Poplar Dome; a well in McCone County discovered the Northwest Rickey field and established production in a very porous fossil fragmental limestone of Silurian age; discovery of the Brorson field in Richland County established the deepest production (12,605 feet) in the Williston Basin.

New Mexico.—The most important discovery in southeastern New Mexico was the Anderson Ranch field in western Lea County. This field produced from the Devonian and the Wolfcamp.

In northwestern New Mexico the most important find was the Torrejan Entrada oil field in Sandoval County; this discovery was the first in the Entrada sandstone and was expected to encourage deeper drilling in the San Juan Basin.

TABLE 20.—Production of crude petroleum in Montana, 1949–53, by fields

[Thousands of barrels]

Field	1949	1950	1951	1952	1953 [1]
Big Wall	225	460	716	316	191
Bowes	----------	61	427	1,025	1,107
Cat Creek	459	398	325	271	213
Cut Bank	3,437	2,931	2,724	2,633	2,720
Elk Basin	2,331	1,569	1,821	1,819	1,648
Kevin-Sunburst	1,559	1,486	1,449	1,344	1,230
Pondera	515	544	792	697	754
Reagan	226	182	215	227	254
Other fields [2]	366	478	489	1,274	3,513
Total	9,118	8,109	8,958	9,606	11,630

[1] Preliminary figures.
[2] Includes crude oil consumed on leases and net change in stocks held on leases for entire State.

TABLE 21.—Production of crude petroleum in New Mexico, 1949–53, by distric and field, in thousands of barrels

[Oil and Gas Journal]

District and field	1949	1950	1951	1952	1953
Southeast:					
Arrowhead	1,289	1,059	988	809	953
Bagley	(1)	(1)	1,662	2,447	2,033
Brunson	3,015	2,143	2,515	3,511	3,007
Denton	(1)	(1)	873	4,329	8,668
Drinkard	6,742	5,538	5,037	4,007	3,454
Eunice	4,414	3,898	[2] 10,590	[2] 9,588	[2] 9,321
Grayburg-Jackson	1,763	1,750	1,545	1,353	1,162
Hare	(1)	889	1,277	2,027	2,047
Hobbs	3,732	3,924	4,380	3,902	3,663
Langlie-Mattix	1,126	1,546	1,700	1,635	1,669
Lovington and East	(1)	(1)	(1)	1,136	2,472
Maljamar	2,042	2,011	1,829	1,813	1,792
Monument	6,488	6,168	(2)	(2)	(2)
Paddock	1,568	1,378	1,178	887	770
Saunders and South	(1)	(1)	(1)	1,571	2,164
Vacuum	4,449	4,546	4,865	4,496	4,281
Other	10,714	12,134	13,963	14,648	[3] 22,183
Northwest [4]	335	331	327	566	755
Total New Mexico	47,677	47,315	52,729	58,725	[3] 70,394

[1] Included in "Other".
[2] Monument included with Eunice.
[3] Bureau of Mines preliminary figures.
[4] Bureau of Mines data.

North Dakota.—Activity was characterized by the development of fields previously discovered. Of the 270 wells drilled during the year, 179 were development wells, chiefly in the Beaver Lodge and Tioga fields. Production more than tripled compared with 1952 and was held at its year-end level by lack of outlets. All North Dakota production had come from rocks of the Mississippian age. At the end of 1953, however, a deep test in the center of the Beaver Lodge field, drilled to 14,006 feet, was being tested in the Silurian and Devonian.

Oklahoma.—Both exploratory and development drilling increased in 1953. The Ardmore Basin remained active while there was little drilling activity in the three major basin areas, McAlester, Hollis, and Anadarko. In 1953, 17 percent of the crude oil produced was obtained by secondary-recovery methods compared with 5 percent in 1952.

South Dakota.—Numerous oil showings were discovered in South Dakota. A well drilled in Harding County produced enough oil on production tests to be called the State's first commercial producer. Production was from the Ordovician Red River formation.

TABLE 22.—Production of crude petroleum in Oklahoma, 1949–53, by fields, in thousands of barrels

[Oil and Gas Journal]

Field	1949	1950	1951	1952	1953
Allen	1,317	1,359	1,447	1,336	1,456
Apache	1,749	1,337	1,470	1,331	1,025
Beebe	740	1,272	1,073	1,244	1,087
Brock-West	858	1,114	982	679	640
Burbank	2,338	2,124	2,318	3,157	3,476
Cache Creek	1,780	1,511	1,289	1,042	956
Cement	4,207	4,091	4,127	3,964	4,070
Coon Creek	1,539	1,363	1,432	1,113	805
Cumberland	3,275	3,628	3,475	3,102	2,562
Cushing	2,726	2,759	2,816	2,889	3,385
Edmond	434	392	359	383	532
Elk City	788	5,066	7,426	7,248	6,380
Eola	370	595	891	1,178	1,651
Fitts	1,076	1,026	938	909	842
Fox-Graham	414	923	3,196	5,532	5,920
Glenn	2,587	2,551	2,502	2,252	2,145
Healdton	2,527	2,382	2,267	2,183	2,288
Hewitt	[1] 2,716	4,320	3,694	3,173	2,703
Hoover-northwest	766	1,034	887	693	601
Knox	2,250	1,886	1,725	1,627	1,595
Lone Grove	1,023	834	934	709	694
Lucien	589	670	978	1,222	965
Oklahoma City	7,703	6,785	6,303	5,513	5,187
Pauls Valley	1,488	1,091	957	817	590
Ramsey	712	767	728	615	448
Ringwood	260	1,927	2,288	1,338	855
Seminole district:					
Bowlegs	1,176	1,201	1,178	1,003	1,121
Little River	1,194	1,016	945	852	826
St. Louis	1,283	1,405	1,560	1,440	1,507
Seminole City	1,441	1,164	1,207	1,077	1,211
Sholem Alechem	6,497	8,545	10,557	12,239	12,736
South Burbank	901	860	776	617	894
Tatums	3,795	3,456	3,378	3,466	3,892
Velma	10,134	10,227	16,089	18,634	15,533
West Edmond	5,478	3,914	3,482	4,471	1,887
Witcher	2,094	1,942	1,655	1,120	660
Yale-Quay	796	825	1,352	1,891	2,171
Other fields	68,982	76,481	88,185	89,464	[2] 107,274
Total Oklahoma	150,003	163,843	186,866	191,523	[2] 202,570

[1] Includes Bayou.
[2] Bureau of Mines preliminary figures.

Texas.—Production of crude oil in Texas in 1953 was held to a very small increase over 1952 by the Texas Railroad Commission through its control of allowables.

Gulf Coast.—Production declined slightly in the area in 1953, but drilling activity remained high. Most of the drilling took place in salt-dome fields or in areas where such structures were present. The most important discovery was the Bender field in Montgomery County. This field and the Kuhlman field in Harris County may be on the same structure, which would encompass an area 3 miles long and 1 mile wide.

At the end of 1953 the State of Texas placed on sale the leases for 442 offshore tracts. Over 400,000 acres were leased, leaving over 1.5 million acres still available.

North Texas.—The most important discovery in North Texas in 1953 was in Nolan County, where the discovery of Cambrian production in the White Flat field delineated a trend of pre-Cambrian highs extending from the Northwest Hylton field in the southeast corner of the county to the White Flat field in the northeast corner.

TABLE 23.—Production of crude petroleum in Texas, 1949–53, by district and field

[Thousands of barrels]

District and field [1]	1949	1950	1951	1952	1953 [2]
Gulf Coast:					
Amelia	1,080	715	1,073	1,004	1,282
Anahuac	7,103	6,801	7,727	7,032	6,453
Barbers Hill	1,964	2,110	2,038	2,132	1,862
Bay City	1,044	1,510	1,737	1,192	998
Bloomington	1,794	1,775	1,934	1,756	1,535
Bonnie View	856	832	965	890	818
Chocolate Bayou	3,529	4,272	5,166	5,028	4,531
Couroe	11,638	11,943	14,081	12,813	11,937
Dickinson-Gillock	2,368	3,493	4,090	4,105	4,235
Dyersdale	1,393	1,550	1,449	1,340	1,183
Esperson	1,220	1,508	1,496	1,474	1,365
Fairbanks	1,905	1,696	1,403	1,383	1,480
Falls City	1,048	1,101	1,341	1,232	1,059
Fannette	1,529	1,425	1,737	1,780	1,775
Fig Ridge	860	783	937	989	861
Friendswood	13,178	11,386	14,989	13,729	12,398
Goose Creek	1,766	2,451	2,873	3,148	2,692
Greta	3,053	2,858	3,512	3,269	2,871
Hastings	14,317	13,247	16,536	14,767	13,644
Heyser	1,109	1,288	1,671	1,491	1,361
High Island	1,893	2,380	2,384	2,291	2,605
Hull	1,781	3,534	4,612	[3] 3,388	3,751
Humble	1,272	1,257	1,246	1,036	958
La Rosa	812	716	827	704	673
Livingston	1,353	1,373	1,395	1,208	1,154
Lolita	1,482	1,502	1,803	1,589	1,476
Lovell's Lake	1,113	1,220	1,418	1,217	1,033
McFaddin	1,254	1,126	1,339	1,368	1,275
Manvel	2,108	2,011	2,393	2,166	2,058
Markham	1,047	1,139	1,333	1,585	1,721
Old Ocean	5,096	5,521	6,247	6,268	5,988
Oyster Bayou	2,913	2,418	3,519	3,368	3,219
Pierce Junction	1,285	1,444	1,782	1,591	1,349
Placedo	1,675	1,944	2,291	1,997	2,210
Raccoon Bend	1,785	1,657	1,874	1,966	2,225
Refugio-Fox	2,355	2,442	2,708	2,655	2,519
Silsbee	1,176	1,223	1,364	1,465	1,398
Sour Lake	1,400	1,883	2,009	1,804	1,576
South Houston	1,417	1,193	1,192	1,255	1,286
South Liberty	1,339	2,064	1,665	1,626	2,011
Stowell	2,645	2,288	2,336	2,360	1,936
Sugarland	1,186	1,059	1,380	1,294	1,193
Sugar Valley	2,079	2,056	1,943	1,468	1,364
Thompson	11,763	10,187	12,840	11,846	10,563
Tomball	2,394	2,212	2,444	2,204	2,095
Village Mills	366	2,291	3,300	3,216	3,494
West Columbia	2,654	2,619	2,331	2,297	2,252
West Ranch	5,066	5,456	7,525	6,844	6,652
Withers-Magnet	4,160	3,718	4,345	4,018	3,933
Other Gulf Coast [4]	49,969	56,586	70,807	74,949	79,398
Total Gulf Coast	189,592	199,263	239,407	231,597	227,705
East Texas:					
East Texas proper	93,951	97,825	100,695	96,526	91,073
Cayuga	1,991	1,808	1,568	1,373	1,258
Hawkins	11,464	10,439	13,638	16,261	18,405
Long Lake	1,491	1,415	1,619	1,476	1,260
Mexia-Powell	977	829	698	660	727
New Hope	1,894	1,836	2,355	2,309	2,191
Quitman	2,886	2,740	3,078	2,848	2,941
Talco	6,188	5,891	6,692	6,440	5,876
Van	8,313	7,358	9,698	11,349	10,566
Other East Texas	12,462	14,050	22,205	20,195	21,546
Total East Texas	141,617	144,191	162,246	159,437	155,843
Central Texas:					
Charlotte	2,045	2,223	2,434	1,778	1,536
Darst Creek	2,508	2,534	2,830	2,943	3,222
Luling	1,387	1,608	1,951	2,385	2,410
Other Central Texas	2,952	3,404	4,302	4,941	6,563
Total Central Texas	8,892	9,769	11,517	12,047	13,731
North Texas [5] [6]	69,543	79,998	87,985	96,513	111,269
Panhandle [7]	33,076	33,131	31,287	29,272	28,080

For footnotes, see end of table.

TABLE 23.—Production of crude petroleum in Texas, 1949–53, by district and field—Continued

[Thousands of barrels]

District and field	1949 [1]	1950	1951	1952	1953 [2]
South Texas:					
Aqua Dulce	2,082	2,094	2,232	1,945	1,736
Fulton Beach	743	1,202	1,819	1,945	2,718
Garcia	1,009	1,064	1,321	1,294	1,223
Hoffman	1,049	1,069	2,154	1,983	1,771
Kelsey	2,056	2,284	3,017	3,059	3,323
London Gin	52	974	1,330	1,192	1,054
Midway	1,449	1,652	1,582	1,298	982
Saxet-Saxet Frio	1,794	1,499	1,176	980	1,249
Stratton	3,233	3,150	3,680	3,344	2,990
Sun	1,231	1,260	1,293	1,405	1,618
Taft	1,148	1,096	1,491	1,477	1,491
White Point	2,684	2,674	3,391	3,312	3,289
Willamar and West	2,397	2,092	2,205	3,152	2,920
Other South Texas	52,627	54,716	69,858	68,587	68,898
Total South Texas	73,554	76,826	96,549	94,973	95,262
West Texas:					
Andrews	28,043	31,860	37,308	38,225	39,305
Borden		2,978	8,981	9,614	8,888
Coke	1,971	3,852	4,790	5,817	12,576
Crane-Upton	19,345	22,973	31,557	42,500	43,782
Crockett	6,931	7,078	8,574	8,725	8,532
Dawson	1,112	1,534	2,305	2,300	2,469
Ector [8]	53,814	57,096	69,576	69,516	59,779
Gaines-Yoakum	29,098	28,703	35,742	34,854	36,941
Garza	2,605	3,364	4,199	3,802	3,787
Glasscock-Howard-Mitchell-Scurry	[9] 12,455	8,977	11,598	9,597	9,655
Hockley [10]	26,503	27,597	31,338	30,263	29,832
Kent	10	3,525	7,121	6,980	7,638
King	759	863	1,090	978	806
Midland	20	873	9,598	14,885	10,753
Pecos	17,036	17,862	22,305	22,004	20,358
Reagan	2,389	2,372	2,031	3,007	3,629
Reeves	784	1,090	1,295	1,609	1,299
Runnels	860	1,063	7,703	6,052	7,026
Scurry	(9)	36,529	48,478	48,077	43,421
Terry	303	1,172	3,391	5,102	6,647
Tom Green	262	1,152	1,911	1,618	1,173
Ward	4,833	5,380	8,281	11,521	10,221
Winkler	18,506	17,961	19,228	16,653	16,111
Other West Texas [4]	921	842	2,879	4,601	8,262
Total West Texas	228,560	286,696	381,279	398,300	392,890
Total Texas	744,834	829,874	1,010,270	1,022,139	1,024,780

[1] The breakdown of Texas districts, was changed to agree with the Texas Railroad Commission divisions beginning with 1946.
[2] Preliminary figures.
[3] A new field was created out of a portion of Hull and included in "Other Gulf Coast."
[4] Includes crude oil consumed on leases and net change in stocks held on leases for entire district.
[5] Includes the fields in and between Hardeman, Wilbarger, Wichita, Clay, Montague, and Cook Counties on the north and San Saba, Lampasas, and Coryell on the south.
[6] Includes crude oil consumed on leases and net change in stocks held on leases for East (exclusive of East Texas proper), Central, North, and South Texas.
[7] Carson, Gray, Hutchinson, Moore, Sherman, and Wheeler Counties.
[8] Includes the part of Jordan pool in Crane County.
[9] Scurry County included with Glasscock-Howard-Mitchell before 1950.
[10] Includes Slaughter and Levelland fields.

West Texas.—Production and development drilling were both curtailed in 1953 by the order of the Railroad Commission of Texas which partly shut down the Spraberry trend area because of excessive gas flaring.

Utah.—Important to the exploration of the Uinta Basin was the discovery in the County pool, Duchesne County, of low-pour-point oil from the Green River formation. Previous production from this formation had been oil with a pour point exceeding 90° F., which was difficult to transport. The first discovery of oil in the Mesaverde formation in the Uinta Basin was made by a well drilled at Chapita Wells in Uinta County.

Wyoming.—The production of crude oil in 1953 increased 25 percent as the result of the completion late in 1952 of the Platte pipeline, which provided an outlet to the Midwest for Wyoming crude.

The most active development in the State took place along the Clareton-Cheyenne River-Black Thunder Creek trend in Weston County. The opening of the first Ordovician pool in Wyoming by a well drilled in the Hamilton Dome field in Hot Springs County was expected to stimulate deeper drilling on other anticlines. This was the only wildcat to reach the pre-Cambrian in the State in 1953.

TABLE 24.—Production of crude petroleum in Wyoming, 1949–53, by fields

[Thousands of barrels]

Field	1949	1950	1951	1952	1953 [1]
Big Sand Draw	2,250	2,077	2,185	2,387	2,400
Big Muddy	832	674	878	1,197	1,373
Bonanza			(2)	1,620	2,935
Byron-Garland	2,628	4,849	5,186	4,343	5,603
Cole Creek	515	837	1,317	1,820	2,271
Elk Basin	5,325	5,583	7,292	8,041	8,051
Fiddler Creek	1,246	3,696	2,126	1,321	865
Frannie	1,305	2,968	3,703	3,709	3,731
Glenrock		381	1,597	2,414	4,197
Grass Creek	899	1,317	1,816	2,395	3,583
Hamilton Dome	1,493	3,531	3,870	3,075	3,558
Lance Creek	2,862	2,669	2,385	1,895	2,176
Little Buffalo	598	1,285	1,001	951	1,142
Lost Soldier, Wertz, etc	5,322	5,362	5,225	5,299	5,900
Mush Creek	1,085	934	747	773	878
Oregon Basin	1,604	2,839	3,717	2,688	3,508
Salt Creek	3,937	4,165	4,063	4,159	4,410
Steamboat Butte	2,247	2,410	3,018	2,056	3,611
Sussex-Meadow Creek	262	2,010	3,043	2,960	4,022
Winkleman	471	828	817	811	1,255
Worland	3,076	2,173	1,643	1,421	1,105
Other fields [3]	9,933	11,043	13,300	12,739	18,344
Total	47,890	61,631	68,929	68,074	84,918

[1] Preliminary figures.
[2] Included in "Other fields."
[3] Includes crude oil consumed on leases and net change in stocks held on leases for entire State.

WELLS

The number of wells drilled in the United States, including oil and gas wells and dry holes, set a new record of 48,017 in 1953. The increase of 3,678 wells included 2,296 oil wells, 551 gas wells, and 831 dry holes. The States reporting the largest gains in the total number of wells drilled were Oklahoma, 1,832; Louisiana, 436; New Mexico, 365; Colorado, 248; Wyoming, 217.

The total number of producing oil wells in the United States rose 10,420 during 1953 and the daily average production per well increased from 13.0 to 13.1 barrels per day.

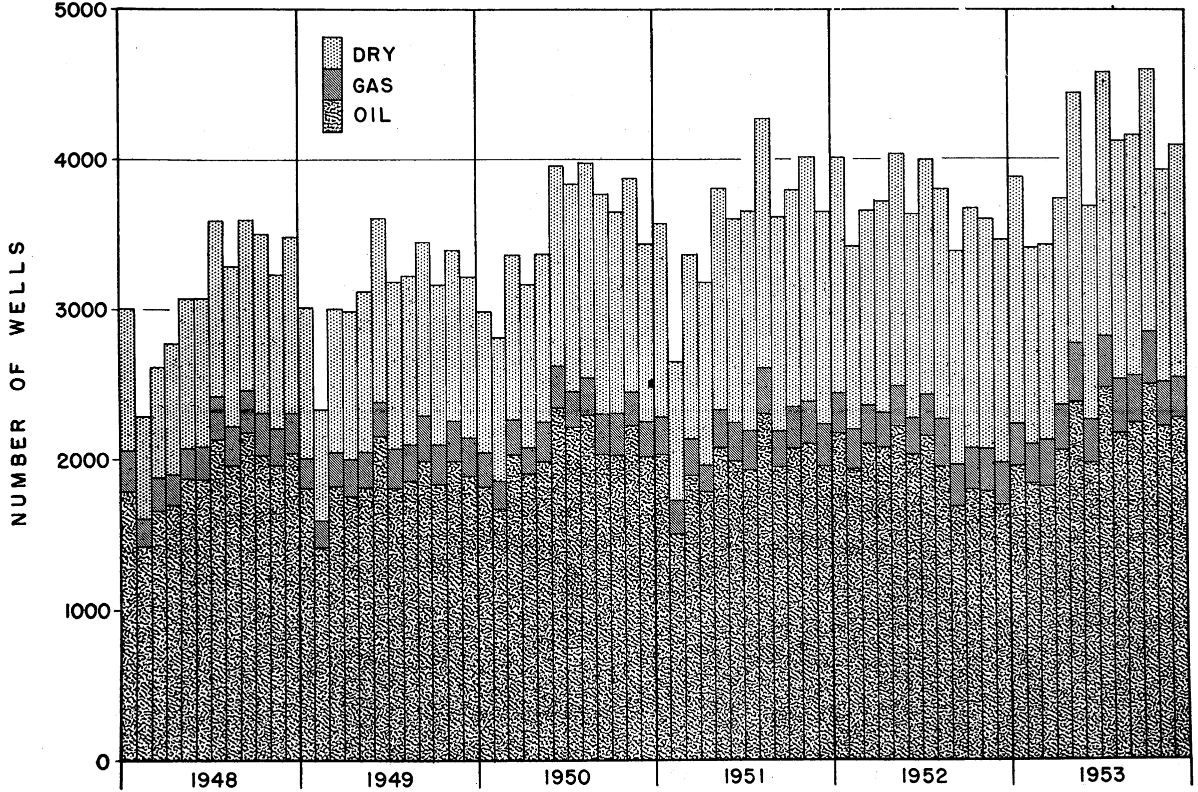

FIGURE 4.—Wells drilled in the United States, 1948–53, by months.

TABLE 25.—Wells drilled for oil and gas in the United States, 1952–53, by months

[Oil and Gas Journal]

Wells	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
													Number	Percent
1952														
Oil	2,159	1,929	2,096	2,062	2,199	2,017	2,139	1,935	1,677	1,790	1,773	1,690	23,466	52.9
Gas	283	249	259	237	282	241	287	314	271	272	285	275	3,255	7.4
Dry	1,573	1,233	1,302	1,411	1,559	1,376	1,575	1,547	1,430	1,594	1,531	1,487	17,618	39.7
Total	4,015	3,411	3,657	3,710	4,040	3,634	4,001	3,796	3,378	3,656	3,589	3,452	44,339	100.0
1953														
Oil	1,943	1,831	1,807	2,046	2,378	1,966	2,471	2,156	2,228	2,489	2,194	2,253	25,762	53.7
Gas	275	253	310	309	391	275	349	374	324	355	309	282	3,806	7.9
Dry	1,649	1,313	1,305	1,386	1,671	1,444	1,761	1,582	1,606	1,754	1,423	1,555	18,449	38.4
Total	3,867	3,397	3,422	3,741	4,440	3,685	4,581	4,112	4,158	4,598	3,926	4,090	48,017	100.0

TABLE 26.—Wells drilled for oil and gas in the United States, 1952–53, by State and district

[Oil and Gas Journal]

State and district	1952				1953			
	Oil	Gas	Dry	Total	Oil	Gas	Dry	Total
Alabama	30	1	41	72	17		86	103
Arkansas	217	7	202	426	273	1	298	572
California	1,790	43	590	2,423	1,869	48	649	2,566
Colorado	162	29	295	486	258	63	413	734
Illinois	825	18	1,299	2,142	1,070	4	1,091	2,165
Indiana	408	18	843	1,269	452	22	803	1,277
Kansas	2,194	316	2,015	4,525	2,209	380	2,126	4,715
Kentucky	406	227	661	1,294	398	194	571	1,163
Louisiana:								
Gulf Coast	603	67	410	1,080	877	103	552	1,532
Northern	683	139	476	1,298	722	119	441	1,282
Total Louisiana	1,286	206	886	2,378	1,599	222	993	2,814
Michigan	253	30	356	639	244	19	357	620
Mississippi	111	4	233	348	134	12	251	397
Montana	163	18	164	345	221	22	208	451
Nebraska, Missouri	100	16	193	309	127	12	191	330
New Mexico	525	319	209	1,053	575	600	243	1,418
Oklahoma	3,086	295	2,247	5,628	4,596	339	2,525	7,460
Pennsylvania, New York, Ohio, West Virginia	1,721	882	563	3,166	1,523	850	556	2,929
Texas:								
Gulf Coast	1,286	234	1,061	2,581	1,133	291	1,094	2,518
West Texas	3,823	28	1,093	4,944	2,664	30	1,026	3,720
East Texas	386	60	336	782	300	99	408	807
Other districts	4,187	456	3,862	8,505	5,283	558	4,062	9,903
Total Texas	9,682	778	6,352	16,812	9,380	978	6,590	16,948
Wyoming	403	16	281	700	622	25	270	917
Other States	104	32	188	324	195	15	228	438
Total United States	23,466	3,255	17,618	44,339	25,762	3,806	18,449	48,017

TABLE 27.—Producing oil wells in the United States and average production per day in 1952–53, by State and district

State and district	Producing oil wells 1952: Approximate number Dec. 31	1952: Average production per well per day (barrels)	1953[1]: Approximate number Dec. 31	1953[1]: Average production per well per day (barrels)
Arkansas	3,930	20.8	4,190	20.0
California	30,900	32.5	31,920	31.8
Colorado	1,000	90.2	1,220	79.8
Illinois	27,460	6.0	29,520	5.7
Indiana	3,840	8.8	4,020	9.1
Kansas	33,620	9.5	35,420	9.1
Kentucky	16,950	1.9	16,600	1.9
Louisiana:				
Gulf Coast	5,860	96.9	6,680	93.5
Northern	7,430	16.5	7,540	15.3
Total Louisiana	13,290	51.7	14,220	50.9
Michigan	3,980	9.3	4,000	8.4
Mississippi	1,870	54.7	1,950	50.8
Montana	3,510	7.6	3,410	9.2
Nebraska	300	26.0	350	52.7
New Mexico	6,790	24.4	7,320	27.3
New York	22,950	.5	22,730	.5
North Dakota	83	99.6	257	83.5
Ohio	17,600	.5	15,670	.6
Oklahoma	60,320	8.8	63,400	9.0
Pennsylvania	80,600	.4	79,430	.4
Texas:[2]				
Gulf Coast	19,220	33.8	20,080	31.7
West Texas	37,730	30.1	40,390	27.6
East Texas proper	21,850	11.8	21,540	11.5
Other districts	60,730	13.5	61,980	14.0
Total Texas	139,530	20.4	143,990	19.8
West Virginia	13,900	.5	13,460	.6
Wyoming	5,800	32.6	5,530	41.1
Other States[3]	297	35.3	333	35.5
Total United States	488,520	13.0	498,940	13.1

[1] Preliminary figures.
[2] The breakdown of Texas districts was changed to agree with the Texas Railroad Commission divisions.
[3] Alabama, Florida, Missouri, Tennessee, Utah, and Virginia.

DEMAND

The indicated total demand for crude petroleum set a new record of 2,592 million barrels in 1953, a 4.7-percent daily average increase over 1952. The demand for foreign crude oil increased 13 percent and was 9 percent of the total crude demand in 1953 compared with an 8-percent increase in 1952. The rapid increase in imports of crude oil relates primarily to the production by American interests abroad, the desire for dollar sales to cover amortization and dividend payments, the increasing price of domestic crude, and the relatively low import duties. The indicated demand for domestic crude oil amounted to 2,358 million barrels in 1953, a gain of about 81 million barrels or 3.9 percent daily compared with 1952.

The increase in the total demand for crude oil in 1953 was 109 million barrels, including a gain in total crude runs of 114 million, a decline of 7 million in exports, a decline of over 1 million in crude transfers for direct use as fuel, and a gain of 3 million in losses. The major demand for crude oil is for conversion to products at refineries (runs to stills), representing 98.5 percent of the total demand in 1953 and 98.3 percent in 1952. The sharp decline in crude exports resulted from the decreased demand in Canada because of an increased domestic supply in that country.

Runs to Stills.—Total crude runs to stills increased from 6,670,000 barrels daily in 1952 to 7,000,000 barrels daily in 1953, a 5-percent gain. Runs of foreign crude represented 8 percent of total runs in 1952 and 9 percent in 1953. The relative importance of the refinery districts in 1953 was indicated by the percentage of total crude runs, which showed Texas Gulf 24.3 percent, Indiana-Illinois 18.2 percent, California 15.0 percent, East Coast 14.9 percent, Oklahoma-Kansas 8.4 percent, Louisiana Gulf 7.9 percent, Texas Inland 3.7 percent, Rocky Mountain 3.6 percent, Appalachian 2.8 percent, and Arkansas-Louisiana Inland 1.2 percent.

Distribution.—The Bureau of Mines collects data relating to receipts of domestic and foreign crude petroleum at refineries in the United States. These receipts include the crude runs to stills, a small amount used as refinery fuel, and any increase in crude stocks at refineries. Classification of receipts, by States of origin, shows the amount received from local production (intrastate), from other States (interstate), and receipts of imported crude. Classification by method of transportation indicates the final receipts by boat, pipeline, tank cars, and trucks. Receipts of domestic crude by boat were, in most instances, moved by pipeline from point of production to point of shipment by boat.

Receipts of domestic and foreign crude petroleum at refineries totaled 2,564.0 million barrels in 1953 and provided for an increase of 6.5 million in crude stocks at refineries, total crude runs of 2,554.9 million, and 2.6 million for fuel or losses. Receipts of foreign crude represented 9 percent of the total, interstate receipts of domestic crude 38 percent, and intrastate receipts 53 percent.

Refinery receipts of crude oil in 1953, by methods of transportation, indicated that 74 percent was delivered by pipeline, 25 percent by boat, and 1 percent by tank cars and trucks. The initial movement of domestic crude oil is primarily by pipeline, with a considerable subsequent movement by boat. The tank-car and truck movements are largely local.

Receipts of crude oil by boat were 638 million barrels in 1953, which included 234 million of foreign crude, 231 million of interstate domestic crude, and 173 million barrels of intrastate traffic. The imports of foreign crude oil were primarily restricted to coastal refineries, which included 86 percent to the East Coast district, 12 percent to California, 1 percent to the Gulf Coast, and 1 percent to the Indiana-Illinois district (the latter movement to Minnesota, Wisconsin, and Ohio was by rail). The most important interstate receipts by boat included the East Coast from the Gulf Coast, between the Texas Gulf and Louisiana Gulf districts, and river shipments to Kentucky refineries. The major intrastate deliveries by boat are in California, Texas, the Louisiana-Gulf district, and Kentucky.

Receipts of crude oil at refineries by tank car and truck included 69 percent intrastate, and 31 percent interstate.

TABLE 28.—Runs to stills of crude petroleum in the United States in 1953, by district and month [1]

[Thousands of barrels]

District [2]	January	February	March	April	May	June	July	August	September	October	November	December	Total
East Coast:													
Domestic	15,943	13,126	15,335	13,814	15,397	15,266	17,047	15,833	14,339	14,331	14,218	15,147	179,796
Foreign	17,532	15,367	17,039	16,091	16,802	17,036	17,088	17,424	17,207	16,937	16,619	16,402	201,544
Total East Coast	33,475	28,493	32,374	29,905	32,199	32,302	34,135	33,257	31,546	31,268	30,837	31,549	381,340
Appalachian	6,438	5,715	6,347	5,520	6,128	5,950	6,194	5,958	5,764	6,008	6,096	6,180	72,298
Indiana, Illinois, Kentucky, etc.													
Domestic	40,937	35,884	38,366	34,338	37,925	37,289	40,027	41,631	37,993	38,919	39,899	40,465	463,673
Foreign	98	108	108	139	180	253	112	244	331	414	186	254	2,427
Total Indiana, Illinois, Kentucky, etc	41,035	35,992	38,474	34,477	38,105	37,542	40,139	41,875	38,324	39,333	40,085	40,719	466,100
Oklahoma, Kansas, etc	18,040	15,835	17,859	16,677	17,707	18,884	19,582	19,905	17,495	17,506	17,751	17,737	214,978
Texas Inland	8,467	7,680	7,887	7,773	8,162	7,751	8,163	8,248	7,175	7,749	6,900	7,445	93,400
Texas Gulf Coast:													
Domestic	53,788	49,146	55,046	51,589	52,711	51,002	50,255	51,132	50,556	50,737	50,748	51,297	618,007
Foreign	220	205	100	201	201	304	101	280	177	76	------	------	1,865
Total Texas Gulf Coast	54,008	49,351	55,146	51,790	52,912	51,306	50,356	51,412	50,733	50,813	50,748	51,297	619,872
Louisiana Gulf Coast:													
Domestic	16,208	14,646	16,469	16,480	17,566	17,246	17,647	16,929	16,287	16,841	16,458	16,968	199,745
Foreign	31	39	90	102	122	122	98	152	96	137	117	59	1,165
Total Louisiana Gulf Coast	16,239	14,685	16,559	16,582	17,688	17,368	17,745	17,081	16,383	16,978	16,575	17,027	200,910
Arkansas, Louisiana Inland, etc	2,667	2,450	2,434	2,591	2,670	2,624	2,582	2,666	2,586	2,773	2,632	2,563	31,238
Rocky Mountain	7,717	6,947	7,662	6,830	7,883	7,775	8,118	8,680	8,316	7,620	7,156	8,071	92,775
California:													
Domestic	28,895	27,260	30,336	28,920	31,070	27,755	31,260	29,965	30,182	30,387	28,886	30,873	355,789
Foreign	1,307	725	1,995	2,360	2,550	3,176	1,923	3,001	2,182	2,582	1,933	2,431	26,165
Total California	30,202	27,985	32,331	31,280	33,620	30,931	33,183	32,966	32,364	32,969	30,819	33,304	381,954
Total United States: Domestic	199,100	178,689	197,741	184,532	197,219	191,542	200,875	200,947	190,693	192,871	190,744	196,746	2,321,699
Foreign	19,188	16,444	19,332	18,893	19,855	20,891	19,322	21,101	19,993	20,146	18,855	19,146	233,166
Grand total: 1953	218,288	195,133	217,073	203,425	217,074	212,433	220,197	222,048	210,686	213,017	209,599	215,892	2,554,865
1952	205,829	193,524	205,825	193,039	152,062	204,762	214,729	220,661	210,510	213,358	211,456	215,504	2,441,259
Daily average 1953	7,042	6,969	7,002	6,781	7,002	7,081	7,103	7,163	7,023	6,872	6,987	6,964	7,000

[1] Preliminary figures.
[2] Where no breakdown is shown, runs were all of domestic crude.

TABLE 29.—Receipts of domestic and foreign crude petroleum at refineries in the United States, 1949–53, by method of transportation

[Millions of barrels]

Method of transportation	1949	1950	1951	1952	1953 [1]
By boat:					
Intrastate	112.2	128.6	145.9	170.0	173.1
Interstate	211.8	221.2	256.9	243.1	231.1
Foreign	154.9	177.7	178.7	208.5	234.0
Total by boat	478.9	527.5	581.5	621.6	638.2
By pipeline:					
Intrastate	938.1	998.7	1,127.0	1,113.7	1,158.0
Interstate	495.7	542.6	629.4	680.3	727.6
Foreign			.4	1.1	2.6
Total by pipeline	1,433.8	1,541.3	1,756.8	1,795.1	1,888.2
By tank car and truck:					
Intrastate	17.4	16.2	18.3	20.6	26.1
Interstate	15.4	15.4	15.4	10.1	11.5
Total by tank car and truck	32.8	31.6	33.7	30.7	37.6
Grand total	1,945.5	2,100.4	2,372.0	2,447.4	2,564.0

[1] Preliminary figures.

Demand by State of Origin.—The detailed data on receipts of crude oil at refineries permit an analysis of the distribution of domestic crude oil by refining States and districts. Where long-distance shipments are involved and various crudes may be mixed in transit and storage, identification by origin may be only approximate but will still furnish a fair indication of market trends.

The indicated total demand for domestic crude oil averaged 6,461,000 barrels daily in 1953, a 4-percent gain over 1952. Eight States had a domestic demand of over 50 million barrels each and supplied 92 percent of total demand in 1953. The only change in rank among these States was that New Mexico moved to seventh place while Illinois dropped to eighth place in 1953.

The demand for Texas crude increased 2 percent in 1953 but supplied only 43.6 percent of the total domestic demand in 1953 compared with 44.4 percent in 1952. Receipts of Texas crude at refineries were 1,039 million barrels in 1953; of this, 56 percent went to refineries within the State and 44 percent to other States. Receipts in outside districts increased only 6 million barrels, which included gains of 15 million barrels in the Indiana-Illinois district and 2 million in the Oklahoma-Kansas district and declines of 8 million in the East Coast district, 2 million in the Appalachian district, and 1 million in other districts. The demand for Texas crude oil has dropped in the East Coast district, because of an increase in foreign crude receipts there and also because of the decline in crude exports. Demand for Texas crude oil increases when the demand for domestic crude is unusually large but decreases when demand is low and requirements can be met more easily from nearby sources.

California ranked second as a source of domestic crude oil and furnished 15 percent of the total domestic demand in 1953. Demand increased 2 percent in 1953. Receipts of California crude at refineries were 355 million barrels in 1953, and all went to refineries within the State. Shipments of crude outside the State were 6 million barrels and were primarily exports to western Canada. The demand for California crude has been affected by the rapid increase in crude imports and to the increased natural-gas consumption in the State.

Louisiana, the third-ranking State, furnished 10.8 percent of the total demand for domestic crude in 1953 and 10.6 percent in 1952. Total receipts of Louisiana crude at refineries were 248 million barrels in 1953, of which 53 percent went to refineries within the States. There was no increase in shipments to refineries outside the State. The largest markets were in Texas, the East Coast district, and the Indiana-Illinois district. Receipts increased 5 million barrels in the East Coast district and 4 million in Texas but declined 8 million in the Indiana-Illinois district and 1 million in other districts.

Oklahoma, the fourth State in importance, furnished nearly 9 percent of the total demand for domestic crude oil in 1953 compared with 8 percent in 1952. Refinery receipts of Oklahoma crude totaled 182 million barrels in 1953, of which 45 percent went to refineries within the State. About 68 percent of shipments outside the State went to the Indiana-Illinois district, and the balance was distributed about equally to refineries in the Appalachian district, Texas, and other States included in the Oklahoma-Kansas district.

Kansas ranked fifth in the demand for domestic crude, with 4.9 percent of the total in 1953 and 5.1 percent in 1952. Daily average demand for Kansas crude declined 0.2 percent in 1953. Total deliveries to refineries were 116 million barrels in 1953. About 56 percent went to refineries within the State. About 70 percent of the Kansas crude received by refineries in other States went to the Indiana-Illinois district. The other principal markets were in Oklahoma, Ohio, Missouri, and western New York.

Wyoming was sixth in importance in 1953, with 4 percent of the total demand for domestic crude in 1953 and 3 percent in 1952. Demand increased almost 28 percent in 1953. Refinery receipts of Wyoming crude were 89 million barrels in 1953, of which 35 percent went to local refineries. There was a gain of 17 million barrels in the receipts of Wyoming crude by refineries outside the State, including gains of 13 million barrels in the Indiana-Illinois district and 5 million barrels in the Oklahoma-Kansas district and a decline of 1 million barrels in quantity going to other States in the Rocky Mountain district.

The demand for New Mexico crude rose from 2.6 percent of the total in 1952 to 2.9 percent in 1953 and increased 18.6 percent for the year. New Mexico displaced Illinois as the seventh State in importance. Total receipts of New Mexico crude at refineries were 63 million barrels in 1953, and the 6 million barrels used within the State was about the same as in the previous year; the gain was in shipments to outside refineries. The major markets for New Mexico crude are Texas and Illinois. Receipts in Texas increased 11 million barrels and declined 4 million in Illinois and Indiana.

Illinois ranked eighth in the demand for domestic crude oil and declined from 2.7 percent of the total in 1952 to 2.5 percent in 1953—a decrease of 4 percent in demand. About 38 percent of the deliveries of Illinois crude was refined in the State, and the out-of-State markets were primarily in the Appalachian district and in western Ohio, Michigan, and Indiana.

TABLE 30.—Receipts of domestic crude oil at refineries in the United States in 1953, by State and district

[Thousands of barrels]

Receiving State and district	Total domestic receipts	Intra-state receipts	Interstate receipts from—															
			Ark.	Colo.	Fla. & N. Y.	Ill.	Ind.	Kansas, Nebr.& N. Dak.	Ky. & Ohio	La.	Ala. & Miss.	New Mexico	Okla.	Pa.	Texas	West Va.	Wyo. & Mont.	Total
Ga.; S. C																		
Maryland	14,486				110					3,947	309				10,120			14,486
Mass.; R. I	5,134									2,566	1,407				1,161			5,134
New Jersey	72,189				449			23		17,383	2,696	647		1,563	49,428			72,189
New York: East	4,307										4,307							4,307
West	18,628	2,400				4,838		1,172					1,159	505	8,554			16,228
Pennsylvania: East	84,237									7,697		70			76,470			84,237
West	16,515	9,961			23	362			726				3,082		1,972	389		6,554
West Virginia	4,463	2,064				409			334				1,656					2,399
District 1	219,959	14,425			582	5,609		1,195	1,060	31,593	8,719	717	5,897	2,068	147,705	389		205,534
Ill.; Minn.; Wis	162,960	24,036		314			1,076	17,439		333		10,954	26,280		68,022		14,506	138,924
Indiana	141,850	1,050		480		4,277		22,918		103		99	17,724		82,292		12,907	140,800
Kans.; Nebr.; N. Dak	87,954	65,751		264				11					9,068		11,847		1,013	22,203
Ky.; Tenn	28,678	10,928	397				2,208		75	10,110	3,006				1,954			17,750
Michigan	42,939	12,880		65		5,025	48	1,244				30	5,557		12,324		5,766	30,059
Missouri	20,974							2,008					1,331		10,733		6,902	20,974
Ohio: East	32,582	2,197		730		17,849		2,189	2,182	279		223	6,060		873			30,385
West	87,666	152	623	1,104		7,269		2,538	325	1,989	217		18,120		54,900		429	87,514
Oklahoma	107,966	81,126						9,664				88			17,088			26,840
District 2	713,569	198,120	1,020	2,957		34,420	3,332	58,011	2,582	12,814	3,223	11,394	84,140		260,033		41,523	515,449
Arkansas	22,848	21,518								587					743			1,330
La.; Ala.; Miss	209,517	135,258	8,795								19,164	24			46,276			74,259
New Mexico	6,990	5,868													1,122			1,122
Texas	710,611	583,455	41							71,820	109	44,718	10,468					127,156
District 3	949,966	746,099	8,836							72,407	19,273	44,742	10,468		48,141			203,867
Colorado	7,990	3,345															4,645	4,645
Montana	19,733	7,204															12,529	12,529
Utah	26,406	1,806		23,426													1,174	24,600
Wyo.; Idaho	32,160	30,760		1,253				147										1,400
District 4	86,289	43,115		24,679				147									18,348	43,174
Calif.; Wash.; Dist. 5	357,620	355,421						635									1,564	2,199
U. S. total	2,327,403	1,357,180	9,856	27,636	582	40,029	3,332	59,988	3,642	116,814	31,215	56,853	100,505	2,068	455,879	389	61,435	970,223
Daily average	6,376	3,718	27	76	2	110	9	164	10	320	85	156	275	6	1,249	1	168	2,658

TABLE 31.—Crude runs to stills and refinery receipts of crude oil in the United States in 1953, by method of transportation and by receiving State and district

[Thousands of barrels]

Receiving State and district	Crude runs to stills	Fuel and losses [1]	Origin of domestic crude receipts	Change in refinery stocks	Total receipts by method of transportation						
					Intrastate			Interstate			Foreign boats
					Pipelines	Tank cars and trucks	Boats	Pipeline	Tank cars and trucks	Boats	
Ga.; S. C	3,399	−1	----	115	----	----	----	----	----	----	3,513
Maryland	23,151	8	----	−64	----	----	----	----	----	14,486	8,609
Mass.; R. I	10,186	−2	----	−92	----	----	----	----	----	5,134	4,958
N. J.; Fla	158,972	279	559	−258	----	----	----	2,654	----	69,535	86,804
New York: East	13,212	42	----	223	----	----	----	----	----	4,307	9,170
West	18,718	6	2,423	−96	2,400	----	----	16,228	----	----	----
Pennsylvania: East	172,420	279	----	1,095	----	----	----	1,475	----	82,762	89,557
West	16,486	−12	12,029	41	9,897	64	----	6,319	122	113	----
West Virginia	4,472	----	2,453	−9	2,018	46	----	2,399	----	----	----
District 1	421,016	599	17,464	955	14,315	110	----	29,075	122	176,337	202,611
Ill.; Minn.; Wis	165,552	9	64,065	−74	23,898	138	----	135,088	3,079	757	[2] 2,527
Indiana	142,161	2	4,382	−313	428	622	----	137,662	3,085	53	----
Kans.; Nebr.; N. Dak.; S. Dak	87,925	30	125,739	−1	64,073	1,479	199	22,120	83	----	----
Ky.; Tenn	28,700	17	13,486	−39	1,890	360	8,678	5,901	1,067	10,782	----
Michigan	42,067	679	12,880	193	12,094	786	----	29,812	247	----	----
Missouri	20,961	−1	----	14	----	----	----	20,974	----	----	----
Ohio: East	32,622	----	3,433	−40	2,147	50	----	30,385	----	----	----
West	87,620	5	----	76	140	12	----	87,514	----	----	35
Oklahoma	106,092	120	181,631	1,754	80,499	627	----	26,836	4	----	----
District 2	713,700	861	405,616	1,570	185,169	4,074	8,877	496,292	7,565	11,592	2,562
Arkansas	23,176	−27	31,374	−301	21,348	170	----	1,166	164	----	----
La.; Ala.; Miss	208,972	380	283,287	1,170	84,004	1,678	49,576	66,352	625	7,282	1,005
New Mexico	6,933	2	62,721	55	5,697	171	----	1,122	----	----	----
Texas	713,272	48	1,039,334	−843	528,310	9,426	45,719	91,278	----	35,878	1,866
District 3	952,353	403	1,416,716	81	639,359	11,445	95,295	159,918	789	43,160	2,871
Colorado	7,900	17	30,981	73	2,894	451	----	4,557	88	----	----
Montana	19,575	−1	10,516	159	5,755	1,449	----	12,483	46	----	----
Utah	26,117	−14	1,806	303	1,425	381	----	24,267	333	----	----
Wyo.; Idaho	32,250	67	88,883	−157	29,657	1,103	----	1,054	346	----	----
District 4	85,842	69	132,186	378	39,731	3,384	----	42,361	813	----	----
Calif.; Wash.; dist. 5	381,954	719	355,421	3,479	279,429	7,046	68,946	----	2,199	----	28,532
U. S. total	2,554,865	2,651	2,327,403	6,463	1,158,003	26,059	173,118	727,646	11,488	231,089	236,576
Daily average	7,000	7	6,376	18	3,173	71	474	1,994	31	633	648

[1] Negative figure represents overage. [2] Pipeline.

TABLE 32.—Daily average demand for total crude petroleum in the United States in 1952–53, by State of origin and month

[Thousands of barrels]

State	January	February	March	April	May	June	July	August	September	October	November	December	Year
1952													
Alabama	2.7	3.2	3.0	2.8	3.0	1.8	2.1	2.8	3.9	5.2	4.9	6.4	3.5
Arkansas	80.9	81.9	69.8	83.5	80.5	77.7	77.3	78.5	84.0	82.6	75.1	79.8	79.3
California	947.4	970.3	992.0	974.1	982.2	960.7	962.8	1,007.2	998.2	964.9	998.7	959.6	976.5
Colorado	84.4	81.8	85.3	77.0	64.2	90.9	85.2	89.2	84.7	78.8	98.4	88.1	84.0
Florida	.1	1.2	2.5	.1	3.7	1.0	1.8	.6	2.4	1.5	.2	2.6	1.5
Illinois	181.2	162.7	162.5	134.6	141.8	161.6	164.2	187.2	183.4	155.9	181.0	178.1	166.2
Indiana	31.6	29.9	30.5	29.8	34.7	31.6	33.5	37.2	37.8	34.0	33.3	33.1	33.1
Kansas	343.1	319.1	317.2	303.9	180.5	336.0	344.9	346.9	315.1	311.3	368.8	338.4	318.6
Kentucky	27.5	37.7	32.0	41.8	27.3	33.3	29.6	32.8	29.3	34.3	36.8	33.9	33.0
Louisiana	665.1	649.2	640.2	634.1	538.2	693.0	673.4	686.4	665.1	669.5	708.6	716.3	661.5
Michigan	37.5	39.1	36.0	35.9	33.3	35.4	32.2	36.7	33.4	37.2	37.8	35.2	35.8
Mississippi	101.1	103.4	96.1	90.8	100.9	108.5	97.4	88.2	99.9	120.0	99.8	92.3	99.8
Missouri, Tennessee, Virginia	.2	.2	2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
Montana	24.4	28.9	26.7	14.5	28.0	20.4	27.0	27.5	28.4	25.3	31.0	30.6	26.1
Nebraska	6.2	6.2	6.5	7.0	3.7	9.1	7.3	6.2	3.1	2.6	3.4	4.2	5.5
New Mexico	137.5	164.4	161.3	161.7	106.6	141.0	188.8	174.8	162.3	176.3	187.9	164.0	160.5
New York	11.8	12.3	10.3	10.3	9.7	14.8	12.7	11.0	12.8	10.8	11.7	10.8	11.6
North Dakota	--------	.1	.4	1.1	1.5	2.5	3.7	5.9	4.6	6.4	10.4	9.4	3.8
Ohio	10.3	8.9	8.2	5.5	10.3	9.0	10.8	11.1	11.6	7.7	8.4	7.3	9.1
Oklahoma	521.0	571.0	504.0	483.1	359.4	496.4	584.5	585.8	568.7	544.1	533.2	545.7	524.5
Pennsylvania	24.7	25.3	26.5	27.7	35.4	33.7	31.4	29.9	32.8	29.0	29.9	29.0	29.6
Texas	2,872.2	2,810.5	2,872.4	2,794.5	1,597.2	2,873.6	2,836.0	2,935.9	2,903.4	2,887.3	2,868.5	2,931.1	2,763.9
Utah	4.2	4.0	3.6	4.7	4.1	5.3	5.3	5.1	5.1	5.0	5.3	5.1	4.7
West Virginia	6.3	8.3	7.0	7.0	6.1	6.0	6.8	7.1	8.3	9.2	5.9	7.4	7.1
Wyoming	194.6	179.8	175.3	150.0	127.9	188.0	208.0	197.9	185.5	174.4	180.0	210.7	181.1
Total domestic crude	6,316.0	6,299.4	6,269.5	6,075.6	4,480.3	6,331.4	6,426.8	6,592.0	6,463.9	6,373.4	6,519.1	6,519.2	6,220.4
Foreign crude	450.0	498.8	495.4	509.5	504.1	601.1	589.9	632.1	659.6	609.7	629.7	594.1	564.4
Grand total 1952	6,766.0	6,798.2	6,764.9	6,585.1	4,984.4	6,932.5	7,016.7	7,224.1	7,123.5	6,983.1	7,148.8	7,113.3	6,784.8
Pennsylvania Grade (included above)	48.4	50.0	47.3	47.2	50.8	58.7	55.6	56.0	58.6	51.5	51.5	53.2	52.4
1953 [1]													
Alabama	4.1	4.6	4.8	5.5	5.5	3.0	3.8	4.7	4.5	6.1	3.0	3.4	4.4
Arkansas	86.9	84.5	84.8	82.0	84.7	85.7	75.4	82.6	75.5	77.3	78.9	84.7	81.9
California	948.3	989.7	995.6	986.5	1,020.0	951.5	1,029.8	989.1	1,029.8	998.9	971.6	1,004.6	993.0
Colorado	81.7	73.4	81.1	69.9	73.7	91.0	95.7	95.5	98.4	87.5	94.3	98.9	86.9
Florida	1.2	1.8	.8	3.5	.2	--------	1.8	1.9	1.3	2.2	.6	2.8	1.5
Illinois	200.3	147.8	156.3	117.5	159.4	131.7	155.3	173.9	146.5	165.1	169.5	185.5	159.4
Indiana	37.4	34.2	35.7	35.9	39.9	38.1	32.4	36.0	36.4	32.5	33.3	30.9	35.2
Kansas	317.7	310.2	336.2	327.2	319.6	358.2	344.4	321.2	301.8	270.8	309.5	298.7	317.9
Kentucky	29.5	27.6	29.9	29.9	21.6	34.4	35.9	29.9	31.5	34.7	35.5	37.3	31.5
Louisiana	711.8	690.1	677.7	749.0	700.9	729.1	693.4	672.8	700.4	687.7	674.2	694.9	698.4
Michigan	32.2	36.8	33.8	35.0	33.5	31.7	35.1	35.3	32.9	28.6	33.5	34.0	33.5

Mississippi	93.7	85.4	93.7	94.7	95.7	113.0	107.7	86.5	101.8	91.6	100.7	93.3	96.5
Missouri, Tennessee, Virginia	.2	.1	.1	.1	.1	.1	.1	.2	.1	.1	.1	.2	.1
Montana	27.6	29.9	29.7	23.3	36.0	35.0	31.8	33.1	35.1	24.8	36.8	33.0	31.3
Nebraska	24.7	22.3	15.1	13.9	6.4	23.4	16.7	18.3	10.3	18.9	21.4	21.1	17.7
New Mexico	157.0	171.8	168.2	208.4	179.4	215.4	201.8	230.2	191.6	189.6	210.9	161.2	190.4
New York	10.6	10.6	11.0	11.7	7.9	9.0	11.8	10.0	12.5	9.7	9.9	9.9	10.4
North Dakota	14.3	15.9	12.8	13.2	13.5	12.7	13.8	14.8	13.8	14.1	13.4	8.1	13.3
Ohio	9.1	10.2	10.0	7.9	10.3	11.0	8.3	8.6	10.5	11.8	10.0	10.7	9.9
Oklahoma	562.2	579.4	557.9	501.4	519.0	583.4	617.0	541.0	560.8	569.7	577.4	551.8	560.0
Pennsylvania	31.2	23.3	25.3	27.8	28.9	29.4	26.6	28.3	25.8	28.2	33.3	30.8	28.3
Texas	2,944.8	2,922.2	2,914.1	2,720.9	2,860.4	2,777.5	2,768.0	2,874.2	2,730.9	2,709.8	2,774.7	2,778.6	2,814.5
Utah	5.4	5.2	5.3	5.3	5.1	4.9	4.5	4.7	4.9	4.6	4.3	4.5	4.9
West Virginia	7.4	7.2	7.3	7.3	7.9	7.5	8.4	8.6	9.6	7.1	8.5	11.1	8.2
Wyoming	201.8	227.0	203.8	202.5	227.9	213.4	248.3	260.0	273.2	245.2	241.0	232.5	231.4
Total domestic crude	6,541.1	6,511.2	6,491.0	6,280.3	6,457.5	6,490.1	6,567.8	6,561.4	6,439.9	6,316.6	6,446.3	6,422.5	6,460.5
Foreign crude	619.9	588.7	628.4	633.2	641.3	697.8	624.2	681.5	667.2	650.7	629.7	618.5	640.3
Grand total 1953	7,161.0	7,099.9	7,119.4	6,913.5	7,098.8	7,187.9	7,192.0	7,242.9	7,107.1	6,967.3	7,076.0	7,041.0	7,100.8
Pennsylvania Grade (included above)	49.2	45.9	47.4	46.6	51.5	49.8	49.9	49.3	51.6	49.7	54.8	53.8	50.0

[1] Preliminary figures.

TABLE 33.—Demand for total crude petroleum in the United States, 1952–53, by State of origin and month

[Thousands of barrels]

State	January	February	March	April	May	June	July	August	September	October	November	December	Year
1952													
Alabama	84	93	94	85	94	54	64	88	116	161	147	198	1,278
Arkansas	2,509	2,375	2,164	2,506	2,496	2,331	2,395	2,433	2,521	2,560	2,253	2,475	29,018
California	29,369	28,140	30,753	29,222	30,447	28,821	29,847	31,224	29,948	29,911	29,963	29,749	357,394
Colorado	2,616	2,372	2,643	2,309	1,991	2,728	2,640	2,766	2,542	2,443	2,952	2,730	30,732
Florida	4	34	76	1	114	30	57	18	71	46	6	80	537
Illinois	5,619	4,719	5,039	4,039	4,395	4,848	5,092	5,802	5,504	4,834	5,431	5,522	60,844
Indiana	980	866	945	895	1,076	947	1,038	1,153	1,134	1,053	999	1,026	12,112
Kansas	10,635	9,255	9,832	9,116	5,597	10,081	10,692	10,753	9,453	9,650	11,064	10,491	116,619
Kentucky	852	1,093	991	1,255	846	998	919	1,018	879	1,062	1,103	1,051	12,067
Louisiana	20,617	18,826	19,846	19,024	16,683	20,790	20,876	21,278	19,952	20,754	21,259	22,205	242,110
Michigan	1,163	1,135	1,115	1,076	1,031	1,062	997	1,137	1,003	1,154	1,133	1,092	13,098
Mississippi	3,134	3,000	2,980	2,725	3,128	3,254	3,019	2,734	2,998	3,720	2,995	2,863	36,550
Missouri, Tennessee, Virginia	6	5	5	4	3	3	4	3	4	4	2	3	[1] 46
Montana	757	837	828	436	869	613	836	852	852	784	929	950	9,543
Nebraska	192	181	200	211	115	272	227	192	92	82	102	130	1,996
New Mexico	4,261	4,769	5,000	4,852	3,306	4,231	5,854	5,420	4,868	5,465	5,636	5,085	58,747
New York	366	356	320	309	299	444	394	341	384	336	351	335	4,235
North Dakota	------	4	14	33	45	74	115	182	138	198	313	290	1,406
Ohio	318	257	254	164	319	270	336	343	347	239	251	225	3,323
Oklahoma	16,150	16,561	15,624	14,493	11,143	14,892	18,119	18,161	17,060	16,867	15,996	16,917	191,983
Pennsylvania	767	733	821	831	1,099	1,012	973	928	983	900	896	898	10,841
Texas	89,041	81,505	89,046	83,835	49,513	86,210	87,916	91,014	87,102	89,506	86,057	90,864	1,011,609
Utah	129	116	112	141	127	158	163	158	152	155	160	159	1,730
West Virginia	194	241	218	208	189	180	211	219	250	285	176	228	2,599
Wyoming	6,034	5,214	5,435	4,499	3,964	5,640	6,447	6,136	5,565	5,408	5,401	6,531	66,274
Total domestic crude	195,797	182,687	194,355	182,269	138,889	189,943	199,231	204,353	193,918	197,577	195,575	202,097	2,276,691
Foreign crude	13,950	14,466	15,357	15,284	15,628	18,032	18,286	19,594	19,789	18,899	18,890	18,416	206,591
Grand total 1952	209,747	197,153	209,712	197,553	154,517	207,975	217,517	223,947	213,707	216,476	214,465	220,513	2,483,282
Daily average:													
Domestic crude	6,316	6,300	6,270	6,076	4,480	6,331	6,427	6,592	6,464	6,373	6,519	6,519	6,220
Domestic and foreign crude	6,766	6,798	6,765	6,585	4,984	6,933	7,017	7,224	7,124	6,983	7,149	7,113	6,785
Pennsylvania Grade (included above)	1,501	1,449	1,466	1,416	1,576	1,760	1,725	1,737	1,758	1,597	1,545	1,648	19,178
1953 [2]													
Alabama	127	128	150	165	171	91	117	146	134	190	91	107	1,617
Arkansas	2,694	2,366	2,627	2,459	2,627	2,571	2,339	2,560	2,266	2,397	2,366	2,625	29,897
California	29,399	27,711	30,862	29,595	31,617	28,545	31,923	30,662	30,894	30,967	29,147	31,141	362,463
Colorado	2,534	2,055	2,514	2,097	2,284	2,729	2,968	2,960	2,953	2,713	2,828	3,065	31,700
Florida	38	50	25	105	6	1	55	59	39	70	19	88	555
Illinois	6,211	4,137	4,847	3,525	4,943	3,951	4,813	5,391	4,396	5,117	5,086	5,752	58,169
Indiana	1,160	958	1,106	1,078	1,237	1,142	1,003	1,116	1,091	1,006	999	958	12,854

Kansas	9,848	8,686	10,423	9,816	9,907	10,747	10,675	9,956	9,054	8,394	9,286	9,259	116,051
Kentucky	916	774	928	898	671	1,031	1,113	928	945	1,077	1,067	1,157	11,505
Louisiana	22,067	19,323	21,010	22,469	21,728	21,874	21,497	20,857	21,012	21,319	20,226	21,541	254,923
Michigan	997	1,030	1,047	1,049	1,038	952	1,089	1,093	986	886	1,005	1,054	12,226
Mississippi	2,904	2,392	2,903	2,842	2,967	3,388	3,338	2,680	3,054	2,839	3,022	2,894	35,223
Missouri, Tennessee, Virginia	4	3	4	3	4	4	5	4	4	4	4	6	[3] 49
Montana	855	837	920	698	1,118	1,051	986	1,025	1,053	768	1,105	1,024	11,440
Nebraska	766	625	467	418	198	701	519	567	309	587	641	655	6,453
New Mexico	4,866	4,809	5,213	6,253	5,560	6,462	6,256	7,137	5,748	5,878	6,328	4,997	69,507
New York	329	298	342	350	245	271	365	311	374	300	295	306	3,786
North Dakota	442	444	397	398	418	381	429	460	413	436	401	252	4,871
Ohio	281	285	311	236	319	331	258	267	315	366	299	330	3,598
Oklahoma	17,429	16,223	17,294	15,041	16,089	17,502	19,126	16,772	16,825	17,662	17,321	17,105	204,389
Pennsylvania	966	654	783	835	895	881	826	878	774	874	1,000	955	10,321
Texas	91,290	81,822	90,338	81,627	88,672	83,327	85,807	89,101	81,926	84,002	83,239	86,136	1,027,287
Utah	167	146	164	160	157	146	138	146	147	143	130	138	1,782
West Virginia	230	201	225	219	246	224	261	266	287	219	254	344	2,976
Wyoming	6,255	6,356	6,320	6,074	7,066	6,401	7,696	8,061	8,197	7,602	7,229	7,209	84,466
Total domestic crude	202,775	182,313	201,220	188,410	200,183	194,704	203,602	203,403	193,196	195,816	193,388	199,098	2,358,108
Foreign crude	19,215	16,484	19,482	18,996	19,880	20,933	19,351	21,127	20,016	20,171	18,891	19,172	233,718
Grand total 1953	221,990	198,797	220,702	207,406	220,063	215,637	222,953	224,530	213,212	215,987	212,279	218,270	2,591,826
Daily average:													
Domestic crude	6,541	6,511	6,491	6,280	6,458	6,490	6,568	6,561	6,440	6,317	6,446	6,423	6,461
Domestic and foreign crude	7,161	7,100	7,119	6,914	7,099	7,188	7,192	7,243	7,107	6,967	7,076	7,041	7,101
Pennsylvania Grade (included above)	1,525	1,285	1,468	1,399	1,596	1,493	1,546	1,527	1,547	1,540	1,643	1,669	18,238

[1] Missouri (21), Tennessee (15), and Virginia (10).
[2] Preliminary figures.
[3] Missouri (26), Tennessee (13), and Virginia (10).

STOCKS

The total stocks of all oils increased 54.0 million barrels in 1953, which included gains of 4.8 million barrels in crude stocks, 2.6 million in natural gasoline and light liquids derived from natural gas, and 46.6 million in refined product stocks.

The total increase in crude stocks included gains of 2.9 million barrels in foreign crude stocks and 1.9 million in domestic crude stocks. Total crude stocks increased 17.7 million barrels in the first 9 months of the year but declined 12.9 million barrels in the last quarter.

To compare the indicated demand for crude oil with actual requirements, the change in product stocks must be considered. The abnormal increase of 46.6 million barrels in product stocks in 1953 indicated an estimated excess of at least 1 percent in crude demand in excess of requirements. This excess resulted from an unexpected drop in the demand for fuel oils in the last quarter, the result of mild weather and reduced industrial requirements. In spite of a sharp cut in crude runs to stills, the reduction in product stocks was only 6.5 million barrels in the last quarter.

TABLE 34.—Year-end stocks of crude petroleum, natural-gas liquids, and refined products in continental United States, 1949–53

[Thousands of barrels]

Product	1949	1950	1951	1952	1953 [1]
Crude petroleum:					
At refineries	60,405	63,328	62,311	66,275	72,738
Pipeline and tank-farm	177,049	167,941	175,481	187,852	185,165
Producers	15,902	17,194	17,991	17,801	18,773
Total crude petroleum	253,356	248,463	255,783	271,928	276,676
Natural-gas liquids	6,831	7,355	8,186	7,807	10,428
Refined products	342,932	326,892	351,146 [2] 370,140	394,019	440,634
Grand total	603,119	582,710	615,115 [2] 634,109	673,754	727,738

[1] Preliminary figures.
[2] New basis, for comparison with subsequent years.

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TABLE 35.—Stocks of crude petroleum in continental United States in 1953, by State of origin and month[1]

[Thousands of barrels]

State of origin	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Alabama	89	95	99	96	77	60	115	148	148	155	99	140	166
Arkansas	3,027	2,844	2,748	2,647	2,637	2,468	2,348	2,581	2,581	2,869	2,977	2,988	2,811
California[2]	31,672	32,891	32,890	33,039	33,301	32,779	34,532	33,792	34,084	33,225	33,235	34,269	34,142
Colorado	1,587	1,555	1,751	1,803	2,184	2,565	2,511	2,426	2,450	2,368	2,481	2,395	2,218
Florida	105	112	104	125	64	106	148	140	129	135	105	130	87
Illinois	10,601	9,368	9,823	9,849	11,188	11,134	12,063	12,133	11,611	11,979	11,915	11,799	11,318
Indiana	344	273	329	353	385	309	276	401	397	363	435	438	503
Kansas	8,756	9,320	10,085	10,075	10,202	10,272	9,355	8,953	9,169	9,862	8,078	7,862	7,964
Kentucky	1,518	1,533	1,615	1,632	1,672	1,942	1,875	1,769	1,857	1,891	1,822	1,731	1,631
Louisiana	16,709	16,575	17,045	18,226	16,969	16,632	15,940	16,378	17,468	17,735	16,939	17,531	17,478
Michigan	923	984	925	910	894	867	938	897	822	842	996	985	981
Mississippi	3,102	3,260	3,705	3,894	4,026	4,074	3,590	3,233	3,565	3,380	3,427	3,260	3,304
Montana	1,012	1,077	1,049	1,049	1,250	1,146	1,089	1,143	1,115	1,020	1,282	1,182	1,202
Nebraska	930	626	434	425	477	782	601	649	662	860	858	783	734
New Mexico	6,895	7,559	7,859	8,436	7,856	8,265	7,601	7,376	6,421	6,758	7,186	6,694	7,782
New York	140	147	157	143	117	194	247	210	208	149	157	144	154
North Dakota	145	142	177	212	241	263	299	301	289	267	228	261	457
Ohio	667	647	607	590	635	596	573	634	670	661	615	615	619
Oklahoma	27,688	27,380	26,758	26,848	28,487	29,623	29,321	28,015	29,209	29,631	28,464	26,735	25,869
Pennsylvania	1,428	1,365	1,534	1,670	1,740	1,737	1,761	1,854	1,871	1,996	2,047	1,873	1,776
Texas	132,545	132,219	132,222	130,730	132,791	129,512	132,429	135,813	135,159	137,869	138,815	135,247	130,038
Utah	43	31	38	40	43	49	51	52	58	53	54	62	68
West Virginia	438	422	417	413	428	427	454	463	457	449	519	552	500
Wyoming	13,261	13,639	13,116	13,520	14,040	13,805	14,623	14,478	14,095	13,499	13,574	13,559	13,713
Total domestic crude	263,625	264,064	265,487	266,725	271,704	269,607	272,740	273,839	274,495	278,016	276,308	271,235	265,515
Foreign crude[2]	8,303	8,186	8,102	8,940	8,783	10,701	10,975	11,137	10,857	11,598	11,233	11,786	11,161
Grand total	271,928	272,250	273,589	275,665	280,487	280,308	283,715	284,976	285,352	289,614	287,541	283,021	276,676
Pennsylvania Grade (included above)	2,133	2,164	2,302	2,413	2,586	2,548	2,648	2,736	2,779	2,829	2,923	2,775	2,687

[1] Preliminary figures.
[2] Includes foreign crude petroleum held in California: December 1952, 451,000; January 109,000; February 62,000; March 702,000; April 1,209,000; May 2,035,000; June 2,386,000; July 2,820,000; August 3,126,000; September 3,283,000; October 3,090,000; November 3,733,000 and December 2,819,000 barrels.

TABLE 36.—Stocks of crude petroleum in continental United States in 1953, by location and month [1]

[Thousands of barrels]

State	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Arkansas	2,626	2,449	2,154	2,250	2,223	2,069	2,007	2,160	2,262	2,488	2,530	2,344	2,316
California, Washington	32,202	33,079	33,040	33,823	34,577	34,873	37,001	36,706	37,298	36,516	36,325	38,002	36,961
Colorado	740	728	712	858	801	928	967	950	900	804	649	869	801
Georgia, Florida, South Carolina	261	454	442	467	302	384	269	322	406	523	373	381	358
Illinois, Minnesota, Wisconsin	18,186	17,127	18,147	18,193	19,020	19,301	19,343	20,222	19,853	20,246	19,304	18,663	18,335
Indiana	4,058	3,938	3,868	4,533	4,452	4,191	4,301	3,972	4,098	4,198	4,069	4,040	3,586
Kansas, Nebraska	11,347	11,558	11,972	12,179	12,124	12,230	12,212	11,519	11,648	12,314	11,134	11,257	11,621
Kentucky, Tennessee	3,311	3,191	3,405	3,476	3,669	3,790	3,543	3,628	3,673	3,673	3,255	3,336	3,309
Louisiana, Alabama	14,421	15,245	15,759	15,170	15,386	13,882	13,483	13,408	14,946	15,390	15,333	15,289	15,072
Maryland	1,431	1,268	1,417	1,383	1,253	1,407	1,109	1,170	1,464	1,689	1,121	1,104	1,367
Massachusetts, Rhode Island	724	539	729	420	523	600	543	728	894	690	585	504	632
Michigan	1,638	1,630	1,563	1,363	1,416	1,444	1,484	1,374	1,375	1,415	1,499	1,361	1,456
Mississippi	1,700	1,688	1,716	1,892	1,851	1,761	1,716	1,606	1,647	1,781	1,734	1,720	1,771
Missouri, Iowa	7,402	7,602	7,289	7,060	6,935	6,806	6,828	6,812	6,999	7,138	6,989	6,699	6,821
Montana	1,369	1,274	1,271	1,233	1,410	1,366	1,283	1,336	1,209	1,300	1,545	1,559	1,549
New Jersey	6,719	6,529	6,852	7,115	7,398	8,105	7,776	7,135	6,981	6,919	6,242	6,738	6,581
New Mexico	1,891	1,953	2,061	2,012	1,947	2,255	2,229	2,042	2,416	2,148	2,246	2,199	2,134
New York	1,172	1,141	1,064	1,207	1,141	1,524	1,515	1,413	1,375	1,192	1,179	1,147	1,263
North Dakota	83	80	159	122	153	158	208	203	217	199	193	242	430
Ohio	7,406	6,809	6,597	7,025	8,027	8,637	8,537	8,062	7,881	8,571	8,515	7,697	7,301
Oklahoma	31,654	32,431	32,295	33,189	33,724	33,187	31,833	31,638	31,373	32,222	31,429	29,428	27,640
Pennsylvania	8,514	8,104	7,869	8,366	8,115	8,541	9,475	9,760	9,325	9,114	9,398	8,642	9,523
Texas	101,592	102,120	102,267	101,660	102,775	101,480	103,960	106,911	105,695	108,286	111,021	108,823	105,173
Utah	468	424	494	512	539	606	697	759	757	715	615	831	765
West Virginia	698	678	645	597	692	622	627	644	655	660	639	697	697
Wyoming, Idaho	10,315	10,211	9,802	9,560	10,034	10,161	10,769	10,496	10,005	9,423	9,619	9,449	9,214
Total	271,928	272,250	273,589	275,665	280,487	280,308	283,715	284,976	285,352	289,614	287,541	283,021	276,676

[1] Preliminary figures.

TABLE 37.—Stocks of crude petroleum in continental United States in 1953, by classification and location [1]

[Thousands of barrels]

Classification and location	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
At refineries:													
Arkansas	727	654	439	625	523	394	335	403	471	558	577	426	426
California, Washington	11, 146	10, 772	11, 044	11, 477	12, 484	12, 160	13, 822	13, 567	14, 467	13, 587	13, 673	14, 671	14, 625
Colorado	165	203	223	295	217	297	335	297	263	207	268	243	238
Georgia, South Carolina	156	415	363	342	244	278	235	241	277	463	268	339	271
Illinois, Minnesota, Wisconsin	4, 294	3, 899	4, 362	4, 165	4, 527	4, 545	4, 707	5, 052	4, 993	5, 157	4, 683	4, 676	4, 220
Indiana	1, 860	1, 855	1, 828	2, 040	1, 965	1, 727	1, 755	1, 472	1, 565	1, 753	1, 722	1, 742	1, 547
Kansas, Nebraska	1, 619	1, 648	1, 682	1, 638	1, 556	1, 998	1, 763	1, 611	1, 481	1, 623	1, 535	1, 476	1, 551
Kentucky, Tennessee	1, 374	1, 296	1, 296	1, 365	1, 566	1, 519	1, 303	1, 633	1, 543	1, 593	1, 080	1, 327	1, 335
Louisiana, Alabama	4, 143	4, 761	4, 506	5, 161	5, 077	4, 089	4, 365	4, 350	5, 186	5, 398	5, 613	5, 332	5, 308
Maryland	1, 431	1, 268	1, 417	1, 383	1, 253	1, 407	1, 109	1, 170	1, 464	1, 689	1, 121	1, 104	1, 367
Massachusetts, Rhode Island	724	539	729	420	523	600	543	728	894	690	585	504	632
Michigan	429	429	471	434	507	533	534	548	469	468	442	507	622
Mississippi	14	14	26	15	23	23	19	23	18	21	23	20	19
Missouri	299	427	389	340	411	337	306	306	320	290	266	308	313
Montana	531	555	610	548	648	663	593	642	532	559	719	693	690
New Jersey	6, 464	6, 135	6, 567	6, 722	6, 937	7, 624	7, 400	6, 745	6, 644	6, 473	5, 764	6, 279	6, 206
New Mexico	108	93	104	179	150	159	129	120	124	191	159	148	163
New York	959	945	830	945	912	1, 266	1, 298	1, 247	1, 133	959	946	968	1, 086
North Dakota	----	----	----	----	----	----	----	----	----	----	----	----	67
Ohio	1, 200	1, 295	1, 109	1, 393	1, 289	1, 249	1, 378	1, 414	1, 170	1, 238	1, 526	1, 163	1, 236
Oklahoma	3, 530	3, 358	4, 066	4, 637	5, 298	5, 848	5, 513	5, 237	5, 209	5, 646	5, 156	5, 180	5, 284
Pennsylvania	6, 702	6, 436	6, 058	6, 595	6, 319	6, 655	7, 688	7, 856	7, 402	7, 219	7, 457	6, 787	7, 838
Texas	17, 158	17, 778	17, 197	17, 199	17, 280	16, 259	16, 870	18, 110	16, 881	16, 800	17, 945	16, 223	16, 315
Utah	307	262	343	362	390	483	545	579	593	566	467	658	610
West Virginia	57	69	59	53	60	52	52	58	48	45	48	54	48
Wyoming, Idaho	878	796	733	744	1, 022	846	930	860	835	798	916	806	721
Total at refineries	66, 275	65, 902	66, 451	69, 077	71, 181	71, 011	73, 527	74, 269	73, 982	73, 991	72, 959	71, 634	72, 738
Pipeline and tank-farm stocks:													
Arkansas	1, 524	1, 420	1, 335	1, 245	1, 325	1, 300	1, 297	1, 377	1, 411	1, 555	1, 578	1, 538	1, 515
California	16, 692	17, 840	17, 669	18, 000	17, 732	18, 206	18, 800	18, 540	17, 858	18, 259	17, 933	18, 631	17, 612
Colorado	420	375	339	408	444	486	477	498	467	427	226	451	378
Illinois	13, 322	12, 653	13, 210	13, 463	13, 928	14, 156	14, 056	14, 610	14, 290	14, 524	14, 061	13, 412	13, 540
Indiana	2, 128	2, 013	1, 970	2, 418	2, 417	2, 394	2, 476	2, 430	2, 463	2, 380	2, 282	2, 228	1, 954
Kansas, Nebraska	8, 698	8, 900	9, 315	9, 526	9, 528	9, 252	9, 499	8, 873	9, 152	9, 671	8, 559	8, 656	8, 900
Kentucky, Tennessee	1, 867	1, 825	2, 034	2, 041	2, 033	2, 196	2, 170	1, 920	2, 055	2, 010	2, 105	1, 934	1, 899
Louisiana, Alabama	8, 796	9, 041	9, 728	8, 497	8, 771	8, 233	7, 597	7, 602	8, 238	8, 522	8, 212	8, 448	8, 205
Michigan	1, 034	1, 026	917	754	744	736	780	661	736	777	892	679	664
Mississippi	1, 311	1, 264	1, 290	1, 497	1, 428	1, 333	1, 317	1, 198	1, 229	1, 370	1, 296	1, 290	1, 352
Missouri, Iowa	7, 103	7, 175	6, 900	6, 720	6, 524	6, 469	6, 522	6, 506	6, 679	6, 848	6, 723	6, 391	6, 508
Montana	623	504	441	475	547	478	465	469	452	521	606	641	634
New Jersey, Florida	348	424	356	511	506	572	395	459	453	493	572	489	449
New Mexico	1, 138	1, 220	1, 302	1, 178	1, 137	1, 396	1, 400	1, 227	1, 602	1, 267	1, 382	1, 361	1, 276

For footnote, see end of table.

TABLE 37.—Stocks of crude petroleum in continental United States in 1953, by classification and location [1]—Continued

[Thousands of barrels]

Classification and location	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Pipeline and tank-farm stocks—Con.													
New York	183	166	204	232	199	228	187	136	212	203	203	149	147
North Dakota	21	22	22	23	21	22	36	38	44	46	68	88	200
Ohio	6, 126	5, 434	5, 408	5, 552	6, 658	7, 313	7, 084	6, 568	6, 631	7, 253	6, 909	6, 454	5, 985
Oklahoma	26, 794	27, 678	26, 829	27, 142	27, 031	25, 944	24, 890	24, 996	24, 724	25, 131	24, 803	22, 723	20, 906
Pennsylvania	1, 647	1, 508	1, 651	1, 606	1, 636	1, 721	1, 627	1, 749	1, 763	1, 740	1, 786	1, 695	1, 535
Texas	78, 499	78, 512	79, 100	78, 736	79, 855	79, 816	80, 970	82, 891	82, 674	85, 531	87, 071	86, 640	82, 953
Utah	140	146	133	133	131	105	135	165	146	132	131	156	136
West Virginia	476	444	421	379	467	405	410	421	437	450	426	473	484
Wyoming	8, 962	8, 890	8, 589	8, 361	8, 432	8, 795	9, 289	9, 116	8, 650	8, 065	8, 148	8, 058	7, 933
Total pipeline and tank-farm stocks	187, 852	188, 480	189, 163	188, 897	191, 494	191, 556	191, 879	192, 450	192, 366	197, 175	195, 972	192, 585	185, 165
Producers' stocks	17, 801	17, 868	17, 975	17, 691	17, 812	17, 741	18, 309	18, 257	19, 004	18, 448	18, 610	18, 802	18, 773
Grand total: 1953	271, 928	272, 250	273, 589	275, 665	280, 487	280, 308	283, 715	284, 976	285, 352	289, 614	287, 541	283, 021	276, 676
1952	255, 783	254, 007	255, 900	259, 126	270, 679	290, 813	285, 964	275, 951	264, 368	264, 723	269, 776	267, 852	271, 928

[1] Preliminary figures.

PRICE AND VALUE

The average value of crude petroleum at the well rose from $2.53 per barrel in 1952 to $2.68 in 1953, and the total value increased from $5.8 billion in 1952 to $6.3 billion in 1953. The increase in total value was the result of a 70-million-barrel gain in production and an increase of 15 cents per barrel in value.

The posted prices of all representative grades of crude petroleum shown, except for Pennsylvania Grade, rose during the year. The price of California grades was increased on February 16 and for other grades on June 15.

TABLE 38.—Value of crude petroleum at wells in the United States, 1951–52, by States

	1952		1953 [1]	
	Total (thousands of dollars)	Average per barrel	Total (thousands of dollars)	Average per barrel
Arkansas	72,420	$2.46	77,170	$2.60
California	801,570	2.23	908,680	2.49
Colorado	77,470	2.55	87,620	2.71
Illinois	165,850	2.76	170,180	2.89
Indiana	33,100	2.75	38,130	2.93
Kansas	293,910	2.56	310,050	2.69
Kentucky	32,890	2.76	33,810	2.91
Louisiana:				
Gulf Coast	530,050	2.65	603,450	2.82
Northern	115,040	2.62	115,100	2.76
Total Louisiana	645,090	2.64	718,550	2.81
Michigan	35,250	2.66	35,870	2.92
Mississippi	80,970	2.23	83,600	2.36
Montana	21,610	2.25	25,120	2.16
Nebraska	6,490	2.44	16,960	2.71
New Mexico	144,940	2.47	185,140	2.63
New York	17,940	4.23	16,260	4.28
North Dakota	3,100	2.00	10,370	2.00
Ohio	10,020	2.99	9,550	2.69
Oklahoma	487,510	2.56	546,940	2.70
Pennsylvania	47,740	4.25	45,770	4.29
Texas:				
Gulf Coast	632,260	2.73	658,070	2.89
West Texas	999,730	2.51	1,037,230	2.64
East Texas proper	255,790	2.65	252,270	2.77
Other districts	754,080	2.55	845,400	2.70
Total Texas	2,641,860	2.58	2,792,970	2.73
West Virginia	9,780	3.76	11,570	3.81
Wyoming	148,400	2.18	201,260	2.37
Alabama, Florida, Missouri, Tennessee, Utah, Virginia	7,320	2.00	8,540	2.09
Grand total	5,785,230	2.53	6,334,110	2.68

[1] Preliminary figures.

TABLE 39.—Posted price per barrel of petroleum at wells in the United States in 1953, by grades, with dates of change

Date	Pennsylvania Grade		Corning Grade in Buckeye Pipe Line Co.[3]	Western Kentucky[3]	Illinois Basin[4]	Midland, Mich.[5]	Oklahoma-Kansas[6]	
	Bradford and Allegany districts[1]	In Southwest Pennsylvania pipelines[2]					34°–34.9°	36°–36.9°
Jan. 1	$4.25	$3.82	$2.70	$2.77	$2.77	$2.80	$2.53	$2.57
Feb. 16	4.40	3.97	-----	-----	-----	-----	-----	-----
Apr. 1	-----	-----	2.62	-----	-----	-----	-----	-----
June 15	-----	-----	2.72	3.02	3.02	3.10	2.78	2.82
Aug. 15	4.55	4.11	-----	-----	-----	-----	-----	-----
Sept. 22	4.05	3.61	-----	-----	-----	-----	-----	-----

Date	Panhandle Texas (Carson, Gray, Hutchinson, and Wheeler Counties) 35°–35.9°[7]	West Texas, 30°–30.9°[7]	Lea County, N. Mex., 30°–30.9°[7]	South Texas, Duval-Mirando, 24°–24.9°[7]	East Texas[7]	Gulf Coast			
						Conroe, Tex.[8]	Texas, 30°–30.9°[8]	Texas, 20°–20.9°[8]	Louisiana, 30°–30.9°[8]
Jan. 1	$2.55	$2.38	$2.38	$2.53	$2.65	$2.83	$2.60	$2.40	$2.55
June 15	2.80	2.63	2.63	2.88	2.90	3.13	2.90	2.70	2.85

Date	Rodessa, La., 36°–36.9°[9]	Smackover, Ark.[10]	Elk Basin, Wyo., 30°–30.9°[11]	Salt Creek, Wyo. 36°–36.9°[11]	California[12]			
					Coalinga, 32°–32.9°	Kettleman, 37°–37.9°	Midway-Sunset, 19°–19.9°	Wilmington, 24°–24.9°
Jan. 1	$2.57	$2.08	$2.14	$2.57	$2.61	$2.80	$2.00	$2.33
Feb. 16	-----	-----	-----	-----	3.05	3.30	2.20	2.62
June 15	2.82	2.33	2.39	2.82	-----	-----	-----	-----

[1] The Tide Water Associated Oil Co.
[2] The South Penn Oil Co.
[3] Sohio Corp.
[4] The Ohio Oil Co.
[5] The Pure Oil Co.
[6] Standard Oil Co. (Indiana).
[7] Humble Oil & Refining Co.
[8] The Texas Co.
[9] Esso Standard Oil Co.
[10] Arkansas Fuel Oil Co.
[11] Stanolind Oil & Gas Co.
[12] Standard Oil Co. of California.

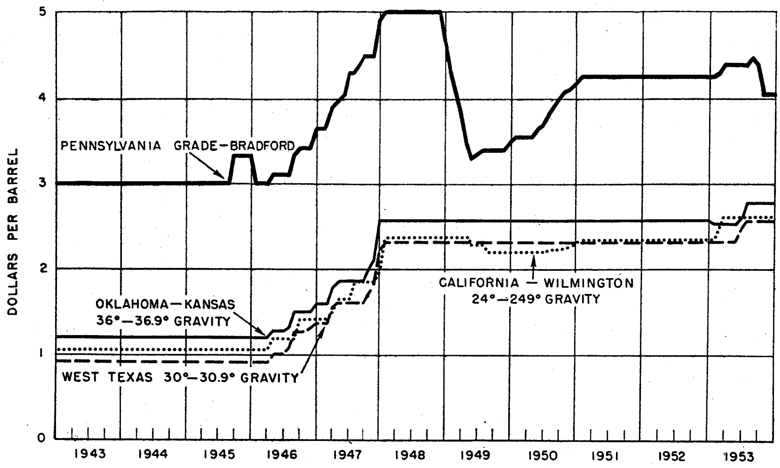

FIGURE 5.—Posted prices of selected grades of crude petroleum in the United States, 1943–53, by months.

REFINED PRODUCTS

GENERAL REVIEW

Petroleum reaches consumers in a variety of finished products that must be considered individually relative to their competitive uses with each other and with other sources of fuel and power.

Gasoline is predominantly related to highway transport, aviation, and farm-tractor use. The demand for kerosine (a product defined as meeting lamp-oil specifications for color and flash point) has been adversely affected by the increase in electric lighting and by competition with natural gas and liquefied gases for cooking, water heating, and small space heating. Distillate fuel oil, including light diesel oils, is used for space heating and as fuel for diesel locomotives; it is replacing residual fuel oil and coal in railroad use. Residual fuel oil, a product that usually sells for less than the cost of crude oil at refineries, competes directly with natural gas and coal for heavy fuel uses. Since it cannot be moved by pipeline, distribution depends primarily on cheap water transport and limited tank-car movements that are too costly for competition in coal-producing areas, except for special uses.

The record total demand for petroleum and refined products averaged 8,032,000 barrels daily in 1953, a gain of 320,000 barrels daily or 4.1 percent.

The downward trend in exports of refined products was interrupted in 1951 by a 64-percent increase with a further gain of 5 percent in 1952 and a decline of 3 percent in 1953, representing adjustments in foreign markets after the refinery shutdown in Iran in the middle of 1951 and subsequent expansion of refinery output in western Europe.

The domestic demand for oil products has been affected by the faster relative increase in the consumption of natural gas that has taken part of the potential increase in the demand for oil as well as replacing coal. The rearmament program and the Korean hostilities expanded the industrial and military demands for oil. The combined deliveries of aviation gasoline, jet fuel, distillate fuel, and residual fuel to the armed forces in continental United States was 118.4 million barrels in 1953 compared with 104.6 million barrels in 1952. No data were available for motor gasoline or other products.

Although the domestic demand for oil products increased 5 percent in 1953, the increase was considerably less than had been anticipated because of reduced heating-oil requirements caused by abnormally mild weather in the first and last quarters of the year and because industrial fuel demand was off in the last quarter.

The domestic demand for the major products in 1953 indicated increases of 6 percent for gasoline, 2 percent for residual fuel, and 3 percent for distillate fuel and a decline of 5 percent for kerosine. All other products increased 12 percent over 1952.

TABLE 40.—Salient statistics of the major refined petroleum products in continental United States, 1949–53

[Thousands of barrels]

Product	1949	1950	1951 [1]	1951 [2]	1952 [3]	1952 [4]	1953 [5]
Gasoline (finished and natural):							
Production	962,417	1,024,462	1,140,843	1,140,843	1,192,097	1,178,027	1,266,925
Imports	----	156	463	463	1,761	1,761	459
Exports	39,347	24,721	40,136	40,136	36,285	36,285	37,920
Stocks, end of year	110,417	116,024	125,243	135,306	135,599	134,737	157,872
Domestic demand	913,713	994,290	1,091,951	1,089,566	1,157,280	1,142,987	1,206,329
Kerosine:							
Production	102,152	118,512	135,742	135,742	132,300	128,767	123,200
Imports	----	245	----	----	----	----	----
Exports	2,533	2,078	6,843	6,843	7,821	7,821	7,212
Stocks, end of year	20,888	19,723	24,928	27,088	26,842	26,529	[6] 28,684
Domestic demand	102,672	117,844	123,694	123,241	124,725	121,253	114,520
Distillate fuel oil:							
Production	340,825	398,912	475,801	475,801	520,378	517,920	528,111
Transfers from crude	2,701	2,537	2,863	2,863	2,705	2,705	1,966
Imports	1,825	2,602	1,767	1,767	2,742	2,742	4,355
Exports	12,295	12,653	22,555	22,555	33,515	33,515	32,269
Stocks, end of year	[7] 75,435	71,948	80,722	86,619	99,582	99,375	[6] 111,741
Domestic demand	329,278	394,885	449,102	447,278	479,347	476,986	489,110
Residual fuel oil:							
Production	424,909	425,217	469,377	469,377	453,897	453,897	449,979
Transfers from crude	4,750	5,325	6,006	6,006	6,343	6,343	5,617
Imports	75,175	120,036	119,166	119,166	128,479	128,479	136,209
Exports	12,641	16,228	28,999	28,999	27,701	27,701	26,208
Stocks, end of year	60,193	40,750	41,979	42,853	48,706	48,706	49,370
Domestic demand	496,021	553,793	564,321	564,397	555,165	555,165	564,933
Jet fuel:							
Production	----	----	----	----	----	20,929	35,747
From gasoline	----	----	----	----	----	14,938	25,086
From kerosine	----	----	----	----	----	3,533	6,551
From distillate	----	----	----	----	----	2,458	4,110
Exports	----	----	----	----	----	----	409
Stocks, end of year	----	----	----	----	----	[8] 1,811	2,666
Domestic demand	----	----	----	----	----	[9] 20,126	34,483
Lubricants:							
Production	45,389	51,735	61,489	61,489	55,600	55,600	52,545
Imports	----	----	----	----	----	----	----
Exports: Grease	392	383	447	447	451	451	327
Exports: Oil	12,520	13,869	16,982	16,982	15,580	15,580	12,688
Stocks, end of year	9,219	7,849	9,617	9,617	11,021	11,021	10,070
Domestic demand	33,101	38,853	42,292	42,292	38,165	38,165	40,481

See footnotes at end of table.

TABLE 40.—Salient statistics of the major refined petroleum products in continental United States, 1949–53—Continued

[Thousands of barrels]

Product	1949	1950	1951 [1]	1951 [2]	1952 [3]	1952 [4]	1953 [5]
Wax (1 barrel=280 pounds):							
Production	3,208	4,462	4,814	4,814	4,331	4,331	4,978
Imports	------	------	------	------	------	------	------
Exports	1,031	1,193	1,349	1,349	1,036	1,036	1,127
Stocks, end of year	473	504	723	723	575	575	538
Domestic demand	2,255	3,238	3,246	3,246	3,443	3,443	3,888
Coke (5 barrels=1 short ton):							
Production	16,959	17,224	18,977	18,977	18,123	18,123	21,607
Exports	2,480	2,493	4,385	4,385	4,205	4,205	3,663
Stocks, end of year	698	408	519	519	513	513	860
Domestic demand	14,427	15,021	14,481	14,481	13,924	13,924	17,597
Asphalt (5.5 barrels=1 short ton):							
Production	49,007	58,240	66,302	66,302	70,312	70,312	72,409
Imports	1,185	1,795	2,462	2,462	2,697	2,697	2,387
Exports	1,569	983	1,258	1,258	2,301	2,301	1,667
Stocks, end of year	4,918	5,293	6,620	6,620	6,321	6,321	7,314
Domestic demand	49,362	58,677	66,179	66,179	71,007	71,007	72,136
Road oil:							
Production	7,691	6,928	6,100	6,100	6,998	6,998	6,594
Stocks, end of year	366	397	402	402	453	453	437
Domestic demand	7,826	6,897	6,095	6,095	6,947	6,947	6,610
Still gas (1 barrel=3,600 cubic feet): Production	82,621	83,743	96,294	96,294	95,275	95,275	102,243
Liquefied gases:							
Production [10]	23,469	29,083	33,045	33,045	30,968	30,968	33,306
Transfers of liquefied gas [11] from natural gasoline plants	45,982	58,184	70,341	70,341	79,708	79,708	91,275
Exports	1,279	1,632	2,121	2,121	2,402	2,402	3,002
Stocks, end of year	527	657	668	668	638	638	792
Domestic demand	68,238	85,505	101,254	101,254	108,304	108,304	121,425
Miscellaneous:							
Production	4,236	4,717	7,201	7,201	7,258	7,258	9,091
Exports	220	250	373	373	195	195	244
Stocks, end of year	735	808	1,071	1,071	1,036	1,036	1,001
Domestic demand	3,995	4,394	6,565	6,565	7,098	7,098	8,882
Unfinished gasoline:							
Rerun (net)	418	[12] 243	353	353	[12] 489	(13)	(13)
Stocks, end of year	7,857	8,100	7,747	7,747	8,236	(13)	(13)
Other unfinished oils:							
Rerun (net)	10,006	6,891	11,367	11,367	4,136	4,136	422
Transfers of other products from gasoline plants	2,470	2,927	3,411	3,411	4,110	4,110	4,236
Imports	3,688	7,713	5,263	5,263	3,237	3,237	3,171
Stocks, end of year	58,037	61,786	59,093	59,093	62,304	62,304	69,289
Shortage (or overage)	585	(712)	(2,648)	(2,648)	(2,552)	(2,552)	(7,184)

[1] Figures are on 1950 basis and comparable with preceding years.
[2] Figures on stocks and demand are on new basis because of a redefinition of bulk terminals. Stock figures as of January 1, 1951, are as follows: motor fuel, 123,702,000 barrels; kerosine, 21,430,000; distillate fuel oil, 76,021,000; residual fuel oil, 41,700,000.
[3] Figures are on comparable basis with 1951.
[4] Figures on 1953 basis because figures are shown separately for jet fuel, and unfinished gasoline is included with gasoline; total as of January 1, 1952, 134,221,000 barrels; kerosine, 26,836,000; distillate fuel oil, 86,509,000 barrels.
[5] Preliminary figures.
[6] Stock figure as of January 1, 1953, were revised to 27,216,000 barrels for kerosine and 98,688,000 barrels for distillate fuel oil, new basis, because one company reported incorrectly.
[7] Figure on new basis because of additional terminal storage reported in the East coast. Figure on 1948 basis 75,207,000 barrels.
[8] Stock figure on January 1, 1952, was 1,008,000 barrels. Previously included with gasoline, kerosine, and distillate fuel oil on December 31, 1951.
[9] Includes exports of 42,526 barrels not included in total United States exports for the year.
[10] Liquefied refinery gases.
[11] Liquefied petroleum gases.
[12] Negative quantity; represents net excess of unfinished oils produced over unfinished oils rerun.
[13] Included with gasoline (finished and natural).

The new supply of refined products comprises the refinery output from crude oil, the recovery of light oils from natural gas, a small amount of motor benzol, and the imports of products. The quantity of crude oil refined (runs to stills) increased 5 percent in 1953, whereas the production of light oils increased 8.6 percent, and the import of products rose 6 percent.

The light oils from natural gas, which included a small amount of coke-oven benzol blended with gasoline at refineries, contributed to the supply of other finished products. In 1953 about 60 percent of the total was used for gasoline blending or export; about 38 percent was used for liquefied gases, for fuel or chemical uses, to supplement the similar output derived from still gas at refineries; and the remaining 2 percent represented distillate fuel and kerosine, added to the refinery output of those products by transfer as unfinished oils.

TABLE 41.—Input and output of petroleum products at refineries in the United States, 1949–53

[Thousands of barrels]

	1949	1950	1951	1952	1952 [1]	1953 [2]
Input:						
Crude petroleum:						
Domestic	1,789,756	1,918,854	2,188,677	2,235,198	2,235,198	2,321,699
Foreign	154,465	176,013	181,727	206,061	206,061	233,166
Total crude petroleum	1,944,221	2,094,867	2,370,404	2,441,259	2,441,259	2,554,865
Natural gas-liquids	85,457	94,639	99,250	103,898	103,898	111,293
Total input	2,029,678	2,189,506	2,469,654	2,545,157	2,545,157	2,666,158
Output:						
Gasoline	939,051	998,093	1,108,880	1,155,916	[3] 1,141,467	1,233,954
Kerosine	102,152	118,512	135,742	132,300	128,767	123,200
Distillate fuel oil	340,825	398,912	475,801	520,378	517,920	528,111
Residual fuel oil	424,909	425,217	469,377	453,897	453,897	449,979
Jet fuel				(4)	20,929	35,747
Lubricants	45,389	51,735	61,489	55,600	55,600	52,545
Wax [5]	3,208	4,462	4,814	4,331	4,331	4,978
Coke [5]	16,959	17,224	18,977	18,123	18,123	21,607
Asphalt [5]	49,007	58,240	66,302	70,312	70,312	72,409
Road oil	7,691	6,928	6,100	6,998	6,998	6,594
Still gas [5]	82,621	83,743	96,294	95,275	95,275	102,243
Liquefied gases	23,469	29,083	33,045	30,968	30,968	33,306
Other finished products	4,236	4,717	7,201	7,258	7,258	9,091
Unfinished gasoline (net)	[6] 418	243	[6] 353	489	(3)	(3)
Other unfinished oils (net)	[6] 10,006	[6] 6,891	[6] 11,367	[6] 4,136	[6] 4,136	[6] 422
Shortage (or overage) [7]	585	(712)	(2,648)	(2,552)	(2,552)	(7,184)
Total output	2,029,678	2,189,506	2,469,654	2,545,157	2,545,157	2,666,158

[1] On 1953 basis; jet fuel not shown with its components.
[2] Preliminary figures.
[3] Unfinished gasoline included with gasoline.
[4] Jet fuel included with gasoline, kerosine, and distillate fuel.
[5] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton; 3,600 cubic feet of still gas to the barrel.
[6] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.
[7] Includes losses or gains in volume during processing.

The total imports of products amounted to 146.6 million barrels in 1953, a gain of 6 percent. About 93 percent of the total was residual fuel oil coming from Caribbean refineries to the East Coast district, where it is used for bunkering ships and as fuel for large electric and industrial plants on the seaboard. Total product imports into continental United States exceeded product exports in 1953 by about 20 million barrels.

Total stocks of refined products showed an abnormal increase of 46.6 million barrels in 1953 and included a gain of 19.9 million barrels in the California district and 26.7 million barrels in all other districts. The main increases by products were 23.1 million barrels for finished and unfinished gasoline stocks, 13.0 million for distillate-fuel stocks, and 7.0 million barrels for stocks of unfinished oils.

TABLE 42.—Percentage yields of refined petroleum products in the United States, 1944–53

Product	1944	1945	1946	1947	1948	1948[1]	1949	1950	1951	1952	1952[2]	1953[3]
Finished products:												
Gasoline:												
Cracked	23.2	23.3	22.5	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Straight run	16.2	17.6	17.1	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Total gasoline	39.4	40.9	39.6	40.2	40.3	40.1	43.7	43.0	42.4	43.0	42.4	43.9
Kerosine	4.7	4.7	6.0	6.0	6.0	6.0	5.2	5.6	5.7	5.4	5.3	4.8
Distillate fuel oil	14.4	14.5	16.6	16.8	18.7	18.5	17.5	19.0	20.0	21.3	21.2	20.7
Residual fuel oil	27.7	27.3	24.9	24.1	23.0	23.5	21.7	20.2	19.7	18.5	18.5	17.6
Jet fuel	------	------	------	------	------	------	------	------	------	(5)	.8	1.4
Lubricating oil	2.5	2.4	2.7	2.8	2.5	2.5	2.3	2.5	2.6	2.3	2.3	2.1
Wax	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2
Coke	.5	.6	.6	.7	.7	.7	.9	.8	.8	.7	.7	.8
Asphalt	2.3	2.3	2.6	2.7	2.6	2.5	2.5	2.8	2.8	2.9	2.9	2.8
Road oil	.1	.2	.4	.4	.4	.4	.4	.3	.3	.3	.3	.3
Still gas	6.1	6.0	5.1	4.6	4.0	4.0	4.2	4.0	4.1	3.9	3.9	4.0
Liquefied gases	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	1.3	1.3	1.3
Other	1.1	1.1	1.3	1.3	1.5	1.5	1.4	1.6	1.7	.3	.3	.4
Unfinished products (net):												
Gasoline	.1	[8].3	(7 8)	(9)	(9)	(9)	(9)	(9)	(9)	(9)	(9)	(9)
Other	.1	[8].3	[8].1	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(11)
Shortage	.8	.4	.1	.2	.1	.1	------	------	[8].3	[8].1	[8].1	[8].3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1 Includes California data on a new basis to compare with succeeding years.
2 Yields computed on the 1953 basis to show jet fuel as a separate item.
3 Preliminary figures.
4 Not separated after 1946.
5 Included in statistics of gasoline, kerosine, and distillate fuel oil.
6 Included in "Other."
7 Less than 0.05 percent.
8 Negative percentage; represents excess rerun over produced.
9 Added to finished gasoline production in computing yields after 1946.
10 Added to crude in computing yields after 1946.
11 Included in gasoline.

The yields of the various products from crude oil indicate the trend in demand for products over a number of years. The yield of gasoline (naphtha included) increased from 42.4 percent in 1952 to 43.9 percent in 1953; the yield of kerosine declined from 5.3 percent to 4.8 percent; the yield of distillate fuel oil declined from 21.2 percent to 20.7 percent; and the yield of residual fuel oil declined from 18.5 percent in 1952 to 17.6 percent in 1953. The decline in the yield of distillate fuel oil reflected abnormally mild weather which reduced heating oil demand; the lower kerosine yield was the result of mild weather and a longer term substitution of distillate in small heating installations and ranges; and the continued sharp decline in residual yield was due to a greater relative demand for the more valuable products and a trend of larger residual imports.

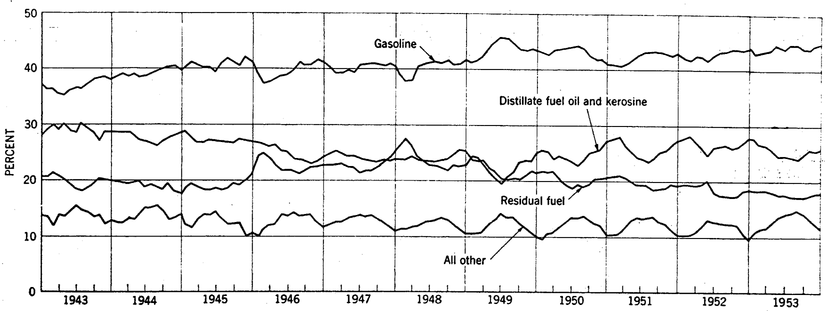

FIGURE 6.—Yields of principal products from crude run to stills in the United States, 1944–53, by months.

TABLE 43.—Stocks of refined petroleum products in continental United States, 1952–53, by months

[Thousands of barrels]

Product	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
1952												
Gasoline	136,161	143,910	152,556	143,512	116,039	112,232	108,708	110,750	113,698	111,770	121,645	[1] 127,792
Kerosine	22,679	18,530	16,817	18,955	19,614	23,061	27,387	32,401	35,021	33,289	32,199	[1] 26,842
Distillate fuel oil	66,969	55,369	48,750	51,634	51,648	65,911	85,775	104,257	117,252	120,721	116,096	[1] 99,582
Residual fuel oil	39,523	38,295	37,971	38,561	38,821	45,688	52,245	54,061	56,200	53,052	53,069	48,706
Lubricating oil	9,856	10,049	10,169	10,154	9,610	9,694	9,775	9,620	9,745	9,869	10,561	11,021
Wax	693	680	712	691	640	642	606	620	600	566	559	575
Coke	670	710	818	797	788	612	517	490	484	435	482	513
Asphalt	7,323	8,400	9,424	9,644	9,133	7,898	6,419	5,321	4,157	3,797	5,007	6,321
Road oil	490	572	676	812	830	890	799	630	396	345	389	453
LR-gases	786	735	732	771	753	666	616	618	677	699	709	638
Miscellaneous	994	977	1,055	1,111	1,267	1,170	1,180	1,144	1,116	1,109	1,087	1,036
Unfinished gasoline	8,178	8,002	8,133	8,378	7,617	7,934	7,858	7,842	7,293	8,292	7,864	8,236
Other unfinished oils	57,155	55,652	57,594	58,578	60,684	62,845	62,344	62,919	61,884	62,684	62,832	62,304
Total 1952	351,477	341,881	345,407	343,598	317,444	339,243	364,229	390,673	408,523	406,628	412,499	394,019
1953												
Gasoline [2]	149,297	156,659	161,346	156,824	154,790	144,882	142,068	144,238	141,902	142,419	148,589	157,872
Kerosine	23,166	20,209	18,325	19,919	23,728	27,155	30,721	35,131	36,776	37,690	35,655	28,684
Distillate fuel oil	80,448	66,740	59,492	61,122	73,414	84,007	102,168	119,220	126,361	135,255	133,061	111,741
Residual fuel oil	45,910	44,178	41,600	39,572	41,795	43,801	47,966	50,007	50,516	50,820	51,267	49,370
Jet fuel	1,749	1,900	2,067	1,851	2,496	2,315	2,496	2,714	3,134	2,701	3,094	2,666
Lubricating oil	11,250	11,224	11,134	10,801	10,873	10,611	9,879	9,684	9,700	9,726	9,846	10,070
Wax	573	537	530	503	510	506	503	524	510	530	558	538
Coke	555	649	700	769	948	775	705	769	781	603	686	860
Asphalt	7,525	8,687	9,732	10,473	10,834	9,586	8,429	7,094	5,709	5,541	6,244	7,314
Road oil	497	534	637	754	897	872	666	609	508	406	395	437
LR-gases	630	580	640	714	881	820	771	825	752	804	930	792
Miscellaneous	928	941	988	1,018	1,101	1,024	883	917	861	915	901	1,001
Unfinished gasoline [2]												
Other unfinished oils	62,510	62,670	67,331	67,352	72,399	72,608	71,016	70,166	69,623	68,784	69,385	69,289
Total 1953	385,038	375,508	374,522	371,672	394,666	398,962	418,271	441,898	447,133	456,194	460,611	440,634

[1] Figure on new basis for 1953. Stocks on January 1, 1953, were gasoline and unfinished gasoline 134,737,000 barrels; kerosine 27,216,000; distillate fuel oil 98,688,000; and jet fuel 1,811,000.
[2] Unfinished gasoline included with gasoline.

TABLE 44.—Input and output of petroleum products at refineries in the United States, 1952–53, by months

[Thousands of barrels]

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1952													
Input:													
Crude petroleum	205,829	193,524	205,825	193,039	152,062	204,762	214,729	220,661	210,510	213,358	211,456	215,504	2,441,259
Natural-gas liquids	8,459	8,113	8,038	8,041	7,398	8,437	8,761	8,938	9,186	9,759	9,317	9,451	103,898
Total input	214,288	201,637	213,863	201,080	159,460	213,199	223,490	229,599	219,696	223,117	220,773	224,955	2,545,157
Output:													
Gasoline	95,905	90,165	95,134	89,860	71,150	95,075	102,134	104,680	102,849	102,323	102,465	104,176	1,155,916
Kerosine	13,040	10,742	11,964	10,978	7,084	9,519	11,083	11,620	10,498	10,919	11,792	13,061	132,300
Distillate fuel oil	44,931	44,238	43,348	39,353	30,432	43,657	45,568	46,712	44,890	45,153	45,328	46,768	520,378
Residual fuel oil	41,272	38,276	39,427	37,602	30,336	36,845	38,171	38,600	36,724	37,290	39,003	40,351	453,897
Lubricating oil	4,963	4,456	4,921	4,831	3,492	4,855	4,668	4,857	4,694	4,940	4,507	4,416	55,600
Wax [1]	351	358	341	337	287	346	331	415	375	404	381	405	4,331
Coke [1]	1,657	1,551	1,604	1,479	1,003	1,335	1,529	1,583	1,616	1,568	1,553	1,645	18,123
Asphalt [1]	3,331	3,956	4,066	5,076	5,552	7,044	7,610	8,214	8,113	7,739	5,493	4,118	70,312
Road oil	175	167	212	373	609	1,083	1,404	1,141	826	522	278	208	6,998
Still gas [1]	7,455	7,296	7,821	7,796	5,743	8,364	9,171	9,051	8,635	8,151	7,757	8,035	95,275
LR-gases	3,402	2,708	2,795	2,716	1,968	2,155	2,231	2,347	2,467	2,688	2,656	2,835	30,968
Other miscellaneous	580	573	607	646	703	605	609	545	554	643	494	699	7,258
Unfinished gasoline (net)	431	[2] 176	131	245	[2] 761	317	[2] 76	[2] 16	[2] 549	999	[2] 428	372	489
Other unfinished oils (net)	[2] 2,723	[2] 2,315	1,323	27	1,499	1,483	[2] 977	154	[2] 1,471	313	[2] 286	[2] 1,163	[2] 4,136
Shortage or overage	(482)	(358)	169	(239)	363	516	34	(304)	(525)	(535)	(220)	(971)	(2,552)
Total output	214,288	201,637	213,863	201,080	159,460	213,199	223,490	229,599	219,696	223,117	220,773	224,955	2,545,157
1953 [3]													
Input:													
Crude petroleum	218,288	195,133	217,073	203,425	217,074	212,433	220,197	222,048	210,686	213,017	209,599	215,892	2,554,865
Natural gas liquids	9,292	8,378	8,930	8,088	8,255	8,948	9,511	9,502	9,991	10,380	10,145	9,873	111,293
Total input	227,580	203,511	226,003	211,513	225,329	221,381	229,708	231,550	220,677	223,397	219,744	225,765	2,666,158

Output:													
Gasoline [4]	103,361	93,020	101,336	96,721	102,202	102,295	108,541	109,041	102,950	104,127	103,315	107,045	1,233,954
Kerosine	13,133	10,898	10,709	10,213	9,409	9,201	9,358	9,239	9,286	10,499	10,025	11,230	123,200
Distillate fuel oil	47,132	41,721	45,840	42,433	43,005	43,211	44,439	44,190	43,076	45,149	43,520	44,395	528,111
Residual fuel oil	40,515	35,704	38,931	36,572	37,120	37,151	37,942	37,894	36,098	36,716	36,684	38,652	449,979
Jet fuel [5]	2,088	2,426	2,300	2,635	3,255	2,947	3,363	3,344	3,653	3,109	3,532	3,095	35,747
Lubricating oil	4,210	3,596	4,321	4,271	4,572	4,293	4,321	4,627	4,562	4,647	4,553	4,572	52,545
Wax [1]	378	356	435	424	439	441	398	397	420	436	434	420	4,978
Coke [1]	1,683	1,622	1,668	1,707	1,850	1,752	1,869	1,920	1,885	1,821	1,900	1,930	21,607
Asphalt [1]	3,890	3,921	4,689	5,330	6,451	7,680	8,243	8,366	7,689	7,081	5,181	3,888	72,409
Road oil	190	175	243	333	588	990	1,171	1,215	820	410	256	203	6,594
Still gas [1]	8,109	7,348	8,210	8,325	9,004	9,095	9,529	9,453	8,766	8,337	8,080	7,987	102,243
LR-gases	3,062	2,738	2,775	2,770	2,795	2,625	2,750	2,958	2,602	2,636	2,784	2,811	33,306
Other miscellaneous	709	722	814	808	902	675	710	779	735	745	730	762	9,091
Other unfinished oils (net)	[2] 283	[2] 341	3,965	[2] 528	4,444	[2] 298	[2] 2,095	[2] 1,435	[2] 1,139	[2] 1,490	[2] 301	[2] 921	[2] 422
Shortage or overage	(597)	(395)	(233)	(501)	(707)	(677)	(831)	(438)	(726)	(826)	(949)	(304)	(7,184)
Total output	227,580	203,511	226,003	211,513	225,329	221,381	229,708	231,550	220,677	223,397	219,744	225,765	2,666,158

[1] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton; 3,600 cubic feet of still gas to the barrel.
[2] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.
[3] Preliminary figures.
[4] Includes unfinished gasoline (net).
[5] Included in gasoline, kerosine, and distillate fuel oil in former years.

TABLE 45.—Input and output of petroleum products at refineries in the United States, 1952–53, by districts

[Thousands of barrels]

	East Coast	Appalachian	Indiana, Illinois, Kentucky, etc.	Oklahoma, Kansas, etc.	Texas inland	Texas Gulf Coast	Louisiana Gulf Coast	Arkansas-Louisiana Inland, etc.	Rocky Mountain	California	Total
1952											
Input:											
Crude petroleum	376,769	66,880	449,171	199,141	93,888	585,258	191,072	29,122	88,030	361,928	2,441,259
Natural-gas liquids	3,252	215	12,313	9,422	15,577	29,170	4,749	1,454	1,983	25,763	103,898
Total input	380,021	67,095	461,484	208,563	109,465	614,428	195,821	30,576	90,013	387,691	2,545,157
Output:											
Gasoline	150,849	30,734	236,899	112,514	64,166	263,968	89,215	11,911	42,645	153,015	1,155,916
Kerosine	16,189	3,553	27,760	5,266	4,695	47,184	20,512	2,542	2,513	2,086	132,300
Distillate fuel oil	89,972	10,620	81,830	47,012	15,135	144,005	48,729	7,138	17,193	58,744	520,378
Residual fuel oil	85,514	9,997	61,161	21,435	14,239	90,322	20,882	2,413	17,306	130,628	453,897
Lubricating oil	10,771	4,970	5,220	4,258	133	17,944	5,555	1,965	200	4,584	55,600
Wax [1]	1,396	378	247	503	33	816	576	-----	84	298	4,331
Coke [1]	1,439	257	8,503	1,490	347	1,432	1,023	675	818	2,139	18,123
Asphalt [1]	17,556	2,157	12,248	7,118	3,803	4,788	3,818	3,683	3,390	11,751	70,312
Road oil	101	-----	1,426	891	-----	8	3	5	1,985	2,579	6,998
Still gas [1]	12,890	3,893	21,791	6,998	4,234	23,022	4,637	1,058	3,393	13,359	95,275
LR-gases	4,162	124	3,769	1,510	1,618	8,025	6,153	473	207	4,927	30,968
Other miscellaneous	500	225	1,079	525	1,382	673	952	479	13	1,430	7,258
Unfinished gasoline (net)	[2] 1,351	[2] 54	500	[2] 15	791	1,037	[2] 467	4	[2] 30	74	489
Other unfinished oils (net)	[2] 9,263	[2] 42	1,402	[2] 1,923	[2] 2,911	10,430	[2] 3,104	[2] 1,620	[2] 261	3,156	[2] 4,136
Shortage or overage	(704)	283	(2,351)	981	1,800	774	(2,663)	(150)	557	(1,079)	(2,552)
Total output	380,021	67,095	461,484	208,563	109,465	614,428	195,821	30,576	90,013	387,691	2,545,157
1953 [3]											
Input:											
Crude petroleum	381,340	72,298	466,100	214,978	93,400	619,872	200,910	31,238	92,775	381,954	2,554,865
Natural-gas liquids	3,621	109	12,891	10,596	16,582	30,710	5,429	1,165	2,591	27,599	111,293
Total input	384,961	72,407	478,991	225,574	109,982	650,582	206,339	32,403	95,366	409,553	2,666,158

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Output:											
Gasoline	154, 989	33, 610	249, 861	123, 183	64, 589	287, 543	98, 739	12, 425	46, 089	162, 926	1. 233, 954
Kerosine	13, 856	4, 208	28, 665	5, 264	4, 049	42, 993	17, 937	2, 788	1, 380	2, 060	123, 200
Distillate fuel oil	91, 647	12, 102	80, 955	49, 005	15, 687	145, 650	50, 351	7, 083	19, 810	55, 821	528, 111
Residual fuel oil	84, 650	9, 931	63, 244	18, 774	12, 243	88, 874	18, 677	2, 514	16, 288	134, 784	449, 979
Jet fuel	1, 422	413	3, 672	2, 641	1, 206	17, 721	3, 152	176	332	5, 012	35, 747
Lubricating oil	9, 424	4, 872	4, 917	3, 564	145	17, 941	4, 939	1, 930	199	4, 614	52, 545
Wax [1]	1, 641	415	218	472	94	1, 029	698	-------	69	342	4, 978
Coke [1]	1, 515	285	9, 267	2, 508	339	1, 788	1, 681	874	1, 165	2, 185	21, 607
Asphalt [1]	16, 800	2, 764	12, 103	8, 031	4, 198	5, 677	4, 077	3, 649	3, 854	11, 256	72, 409
Road oil	40	5	1, 278	1, 063	43	9	2	1	1, 609	2, 544	6, 594
Still gas [1]	13, 057	4, 204	22, 753	6, 887	4, 848	26, 133	5, 729	1, 115	3, 648	13, 869	102, 243
LR-gases	4, 996	183	3, 872	2, 141	1, 489	8, 362	6, 545	542	348	4, 828	33, 306
Other miscellaneous	665	256	1, 115	579	1, 678	823	1, 257	755	37	1, 926	9, 091
Unfinished gasoline (net)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Other unfinished oils (net)	[2] 9, 841	[2] 566	441	999	[2] 2, 334	6, 817	[2] 3, 776	[2] 1, 329	89	9, 078	[2] 422
Shortage or overage	100	(275)	(3, 370)	463	1, 708	(778)	(3, 669)	(120)	449	(1, 692)	(7, 184)
Total output	384, 961	72, 407	478, 991	225, 574	109, 982	650, 582	206, 339	32, 403	95, 366	409, 553	2, 666, 158

[1] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton; 3,600 cubic feet of still gas to the barrel.
[2] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.
[3] Preliminary figures.
[4] Included with gasoline.

The average prices of representative refinery products in specified markets indicate the general trends. The average price of Regular-Grade gasoline at Oklahoma refineries rose from 10.60 cents per gallon in 1952 to 11.02 cents in 1953. The tankwagon price of kerosine at Chicago rose from 15.80 cents per gallon to 16.06 cents. The price of a selected bright stock at Oklahoma refineries declined from 27.34 cents per gallon in 1952 to 20.84 cents. Bunker "C" oil at New York declined from \$2.31 per barrel in 1952 to \$2.16, and No. 2 distillate heating oil at New York rose from 9.45 cents per gallon to 9.68 cents.

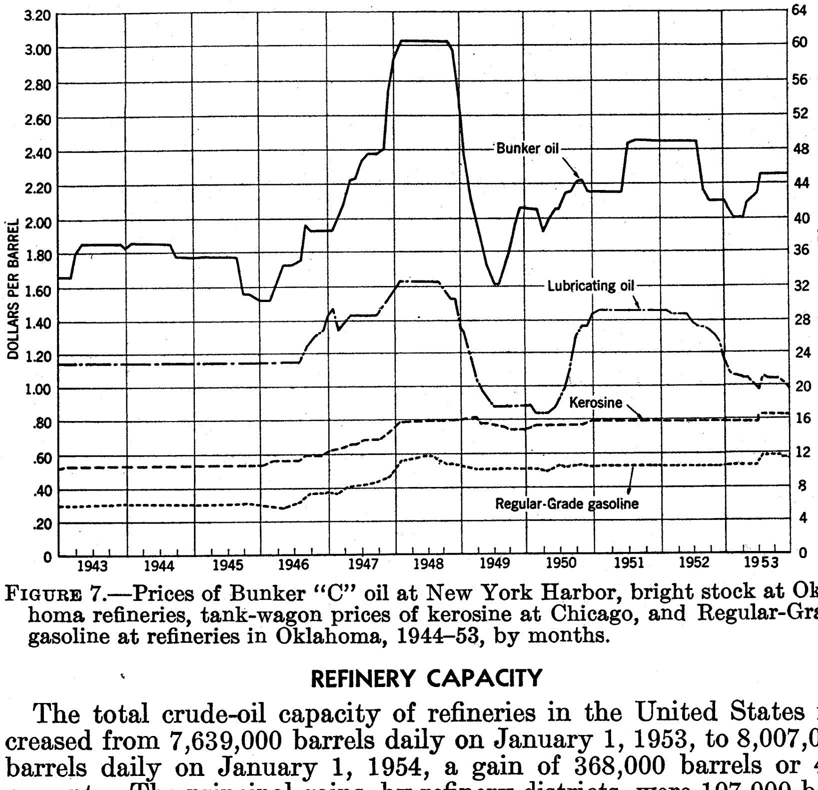

FIGURE 7.—Prices of Bunker "C" oil at New York Harbor, bright stock at Oklahoma refineries, tank-wagon prices of kerosine at Chicago, and Regular-Grade gasoline at refineries in Oklahoma, 1944–53, by months.

REFINERY CAPACITY

The total crude-oil capacity of refineries in the United States increased from 7,639,000 barrels daily on January 1, 1953, to 8,007,000 barrels daily on January 1, 1954, a gain of 368,000 barrels or 4.8 percent. The principal gains, by refinery districts, were 107,000 barrels daily in the Louisiana Gulf district, 79,000 in the Oklahoma-Kansas district, 76,000 in the Indiana-Illinois district, and 42,000 in the East Coast district. The total capacity under construction on January 1, 1954, was 398,000 barrels daily, including 103,000 in the East Coast district and 100,000 in the California district. Total refinery capacity increased 1,043,000 barrels daily from January 1, 1951, to January 1, 1954, or 15 percent.

AVIATION GASOLINE

The total demand for aviation grades of gasoline increased from 77.0 million barrels in 1952 to 86.6 million in 1953, or 13 percent on a daily average basis. The increase included 0.5 million barrels exported, 3.2 million for civilian demand, and 5.9 million in military shipments. About 87 percent of the total demand was for grades of 100-octane and above.

All data for aviation gasoline are included in total gasoline figures. "Transfers out" represents rejected material returned to regular grades of gasoline. Data on aviation gasoline do not include all fuel used for aviation purposes. The production of jet fuels, blended from low-grade gasoline, kerosine, and distillate fuel oil, has increased rapidly. A considerable number of small planes use automotive types of gasoline.

TABLE 46.—Petroleum-refinery capacity in the United States, Jan. 1, 1949–54

Year	Number of refineries				Capacity (barrels per day)			
	Operating	Shut down	Total	Building	Operating	Shut down	Total	Building
1949	336	39	375	3	6,230,505	208,490	6,438,995	341,500
1950	320	47	367	2	6,222,998	473,302	6,696,300	145,600
1951	325	32	357	1	6,701,815	261,829	6,963,644	160,100
1952	327	23	350		7,161,366	171,519	7,332,885	282,680
1953	315	28	343	4	7,481,701	[1] 156,960	7,638,661	509,721
1954	308	29	337	7	7,782,103	[1] 224,794	8,006,897	397,500

[1] Includes 18,941 in 1953 and 22,920 in 1954 reported as inoperable without reconditioning.

GASOLINE

The total demand for gasoline set another new record in 1953, a 5.8-percent daily average gain. Exports increased about 5 percent and domestic demand 6 percent. Low-grade gasoline blended for jet fuel has been deleted from gasoline production, stocks, and demand, since that product is now being reported separately. All figures for aviation gasoline are included under total gasoline. Gasoline includes the production and demand for naphthas.

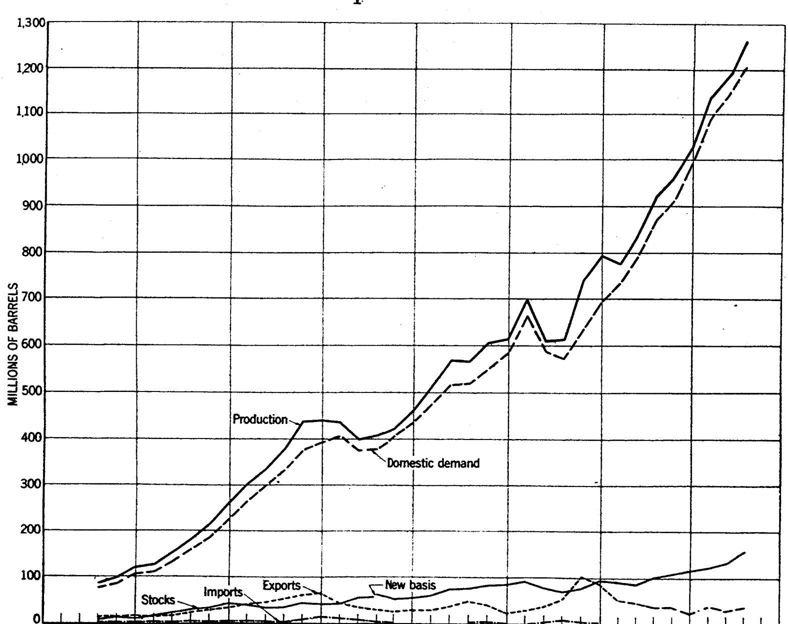

FIGURE 8.—Production, domestic demand, exports, imports, and stocks of gasoline in the United States, 1918–53.

TABLE 47.—Salient statistics of aviation gasoline in the United States, 1951 (total), and in 1952, by months

[Thousands of barrels]

	1952													1951
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
Production:														
100-octane and above	5,480	5,002	5,873	5,195	4,358	5,147	5,584	6,104	5,549	6,458	5,973	6,050	66,773	57,210
Other grades	1,031	1,204	1,123	990	805	919	1,141	1,133	1,452	984	1,369	1,426	13,577	14,958
Transfers out [1]	245	237	181	275	173	206	234	122	108	255	194	120	2,350	5,894
Exports	1,318	1,300	1,143	1,256	395	1,162	1,609	1,254	1,353	1,250	1,604	1,353	14,997	12,266
Stocks:														
100-octane and above	4,483	4,421	4,507	3,761	4,422	3,863	3,920	4,496	4,280	4,827	4,611	4,851	4,851	4,356
Other grades	4,018	4,126	4,115	3,915	3,539	3,555	3,507	3,522	3,987	3,731	3,983	4,432	4,432	3,921
Domestic demand: All grades	4,724	4,623	5,597	5,600	4,310	5,241	4,873	5,270	5,291	5,646	5,508	5,314	61,997	52,951
Total demand,[2] by grades:														
100-octane and above	5,358	5,060	5,797	5,947	3,687	5,707	5,516	5,513	5,758	5,945	6,185	5,811	66,284	55,091
Other finished	596	751	768	840	805	666	815	839	764	839	819	759	9,261	8,866
Components	88	112	175	69	213	30	151	172	122	112	108	97	1,449	1,260
Production by districts:														
100-octane and above:														
District 1	547	511	441	549	673	620	489	505	524	498	464	490	6,311	5,817
District 2	689	578	734	498	373	608	558	585	557	538	521	577	6,816	6,130
District 3	3,096	2,982	3,544	3,127	2,226	2,628	3,275	3,644	3,327	4,290	3,795	3,714	39,648	30,815
District 4	60	51	74	50	14	71	86	85	87	76	62	69	785	810
District 5	1,088	880	1,080	971	1,072	1,220	1,176	1,285	1,054	1,056	1,131	1,200	13,213	13,638
Total	5,480	5,002	5,873	5,195	4,358	5,147	5,584	6,104	5,549	6,458	5,973	6,050	66,773	57,210
Other grades:														
District 1	−55	−64	61	16	27	−83	90	149	38	−2	−15	7	169	1,299
District 2	48	268	38	141	1	204	151	75	176	214	165	259	1,740	2,069
District 3	749	725	839	670	526	652	688	640	1,005	506	968	1,023	8,991	8,550
District 4	30	18	−9	12	11	30	7	22	15	18	29	15	198	129
District 5	259	257	194	151	240	116	205	247	218	248	222	122	2,479	2,911
Total	1,031	1,204	1,123	990	805	919	1,141	1,133	1,452	984	1,369	1,426	13,577	14,958
Stocks, by districts, end of period:														
100-octane and above:														
District 1	412	447	336	379	466	283	371	361	353	457	467	401	401	562
District 2	645	603	615	543	541	632	505	612	677	603	753	921	921	622
District 3	2,256	2,317	2,446	1,965	2,349	2,083	2,135	2,568	2,417	2,992	2,449	2,505	2,505	2,243
District 4	35	21	24	16	21	17	16	19	17	13	18	22	22	28
District 5	1,135	1,033	1,086	858	1,045	848	893	936	816	762	924	1,002	1,002	901
Total	4,483	4,421	4,507	3,761	4,422	3,863	3,920	4,496	4,280	4,827	4,611	4,851	4,851	4,356

Other grades:														
District 1	463	393	450	437	446	363	354	425	478	465	455	452	452	583
District 2	758	876	752	758	655	720	728	584	646	654	613	727	727	792
District 3	1,991	2,017	2,082	1,998	1,688	1,784	1,745	1,785	2,117	1,811	2,054	2,400	2,400	1,817
District 4	49	53	32	29	26	41	30	33	32	30	44	44	44	30
District 5	757	787	799	693	724	647	650	695	714	771	817	809	809	699
Total	4,018	4,126	4,115	3,915	3,539	3,555	3,507	3,522	3,987	3,731	3,983	4,432	4,432	3,921
Total demand,[2] by districts:														
District 1	474	476	556	534	599	796	479	584	507	401	448	562	6,416	5,492
District 2	758	768	880	692	477	652	825	695	602	819	556	552	8,276	7,896
District 3	3,801	3,497	4,092	4,242	2,586	3,340	3,811	3,754	4,124	4,363	4,956	4,271	46,837	35,564
District 4	64	79	83	70	23	90	105	101	105	100	72	80	972	939
District 5	945	1,103	1,129	1,318	1,020	1,525	1,262	1,390	1,306	1,213	1,080	1,202	14,493	15,326
Total	6,042	5,923	6,740	6,856	4,705	6,403	6,482	6,524	6,644	6,896	7,112	6,667	76,994	65,217

[1] Reject material used as automotive gasoline.
[2] Includes exports.

TABLE 48.—Salient statistics of aviation gasoline in the United States, 1952 (total) and 1953, by months

[Thousands of barrels]

	1953 [1]													1952
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
Production.														
100-octane and above	5,992	5,815	5,942	6,065	6,748	6,830	6,568	7,013	6,655	5,994	6,120	6,230	75,972	66,773
Other grades	975	782	1,399	1,198	1,159	981	1,225	1,140	1,239	1,343	954	1,446	13,841	13,577
Transfers out [2]	153	92	276	96	225	191	163	227	92	168	405	240	2,328	2,350
Exports	1,003	1,135	1,228	1,611	1,167	1,396	1,191	1,497	1,606	1,120	1,576	1,016	15,546	14,997
Stocks:														
100-octane and above	5,241	4,887	5,168	4,910	5,348	4,900	5,253	5,700	5,640	5,965	5,856	5,498	5,498	4,851
Other grades	4,586	4,538	4,714	4,691	4,480	4,263	4,263	4,241	4,459	4,713	4,306	4,674	4,674	4,432
Domestic demand: All grades	5,267	5,772	5,380	5,837	6,288	6,889	6,086	6,004	6,038	5,470	5,609	6,410	71,050	61,997
Total demand,[3] by grades:														
100-octane and above	5,598	6,173	5,504	6,315	6,287	7,278	6,216	6,537	6,718	5,655	6,223	6,591	75,095	66,284
Other finished	647	680	920	1,020	1,079	946	973	862	900	858	810	634	10,329	9,261
Components	25	54	184	113	89	61	88	102	26	77	152	201	1,172	1,449
Production, by districts:														
100-octane and above:														
District 1	490	465	449	307	396	524	550	544	497	518	414	482	5,636	6,311
District 2	599	602	579	581	714	774	704	740	739	666	788	544	8,030	6,816
District 3	3,680	3,570	3,468	4,116	4,249	3,897	3,893	4,353	3,967	3,554	3,712	3,790	46,249	39,648
District 4	63	95	92	84	93	82	106	106	89	87	77	77	1,051	785
District 5	1,160	1,083	1,354	977	1,296	1,553	1,315	1,270	1,363	1,169	1,129	1,337	15,006	13,213
Total	5,992	5,815	5,942	6,065	6,748	6,830	6,568	7,013	6,655	5,994	6,120	6,230	75,972	66,773
Other grades:														
District 1	50	−1	−62	54	105	−3	33	52	−50	36	−19	−19	176	169
District 2	337	70	443	238	155	147	150	253	152	246	156	527	2,874	1,740
District 3	330	563	976	645	587	687	830	606	902	891	558	833	8,408	8,991
District 4	29	5	7	23	32	−12	20	10	24	14	13	15	180	198
District 5	229	145	35	238	280	162	192	219	211	156	246	90	2,203	2,479
Total	975	782	1,399	1,198	1,159	981	1,225	1,140	1,239	1,343	954	1,446	13,841	13,577
Stocks, by districts, end of period:														
100-octane and above:														
District 1	422	432	334	351	317	281	383	388	352	394	378	324	324	401
District 2	936	786	762	888	881	967	868	972	984	1,018	1,095	1,045	1,045	921
District 3	2,645	2,470	2,759	2,675	3,104	2,583	2,965	3,223	3,000	3,303	3,327	3,112	3,112	2,505
District 4	21	31	28	40	37	11	22	25	26	31	33	45	45	22
District 5	1,217	1,168	1,285	956	1,009	1,058	1,015	1,092	1,278	1,219	1,023	972	972	1,002
Total	5,241	4,887	5,168	4,910	5,348	4,900	5,253	5,700	5,640	5,965	5,856	5,498	5,498	4,851

Other grades:														
District 1	496	497	440	474	504	428	422	463	375	422	392	358	358	452
District 2	962	899	1, 062	1, 147	1, 103	1, 016	988	1, 004	959	1, 037	945	1, 212	1, 212	727
District 3	2, 198	2, 225	2, 434	2, 230	1, 978	2, 005	2, 095	2, 062	2, 367	2, 572	2, 236	2, 480	2, 480	2, 400
District 4	62	54	45	52	66	32	30	21	31	31	32	34	34	44
District 5	868	863	733	788	829	782	728	691	727	651	701	590	590	809
Total	4, 586	4, 538	4, 714	4, 691	4, 480	4, 263	4, 263	4, 241	4, 459	4, 713	4, 306	4, 674	4, 674	4, 432
Total demand,[3] by districts:														
District 1	475	453	542	297	501	633	487	545	569	461	439	549	5, 951	6, 416
District 2	675	882	841	605	883	882	976	823	923	794	941	818	10, 043	8, 276
District 3	4, 018	4, 266	3, 772	5, 042	4, 565	5, 007	4, 207	4, 681	4, 763	3, 896	4, 295	4, 470	52, 982	46, 837
District 4	75	98	111	87	114	128	117	122	102	96	87	78	1, 215	972
District 5	1, 027	1, 208	1, 342	1, 417	1, 392	1, 635	1, 490	1, 330	1, 287	1, 343	1, 423	1, 511	16, 405	14, 493
Total	6, 270	6, 907	6, 608	7, 448	7, 455	8, 285	7, 277	7, 501	7, 644	6, 590	7, 185	7, 426	86, 596	76, 994

[1] Preliminary figures. [2] Reject material used as automotive gasoline. [3] Includes exports.

TABLE 49.—Salient statistics of gasoline in the United States, 1952 [1] by months

[Thousands of barrels]

	Jan.	Feb.	Mar.	Apr.	May	June	July
Production:							
Finished gasoline and naphtha from crude oil	86,715	81,374	86,173	80,763	62,831	85,618	92,276
Unfinished gasoline production (net)	431	−176	131	245	−761	317	−76
Natural-gas liquids used at refineries	8,459	8,113	8,038	8,041	7,398	8,437	8,761
Sold to jobbers	3,306	2,473	3,214	2,991	3,582	2,596	2,952
Total production	98,911	91,784	97,556	92,040	73,050	96,968	103,913
Daily average	3,191	3,165	3,147	3,068	2,356	3,232	3,352
Imports	89	70	4	2	819	308	277
Exports	3,111	2,620	2,497	3,052	1,556	2,470	3,390
Daily average	100	90	81	102	50	82	109
Stocks, end of period:							
Finished gasoline	135,427	143,223	151,956	142,913	115,384	111,594	108,050
Unfinished gasoline	8,178	8,002	8,133	8,378	7,617	7,934	7,858
Total stocks	143,605	151,225	160,089	151,291	123,001	119,528	115,908
Domestic demand	86,505	81,614	86,199	97,788	100,603	98,279	104,420
Daily average	2,790	2,814	2,781	3,260	3,245	3,276	3,368

	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Production:						
Finished gasoline and naphtha from crude oil	94,063	92,105	90,457	91,194	93,511	1,037,080
Unfinished-gasoline production (net)	−16	−549	999	−428	372	498
Natural-gas liquids used at refineries	8,938	9,186	9,759	9,317	9,451	103,898
Sold to jobbers	3,270	3,101	2,787	2,959	3,329	36,560
Total production	106,255	103,843	104,002	103,042	106,663	1,178,027
Daily average	3,428	3,461	3,355	3,435	3,441	3,219
Imports	149	9	11	13	10	1,761
Exports	3,031	2,785	3,194	3,996	4,583	36,285
Daily average	98	93	103	133	148	99
Stocks, end of period:						
Finished gasoline	109,687	112,585	110,420	120,354	126,501	126,501
Unfinished gasoline	7,842	7,293	8,292	7,864	8,236	8,236
Total stocks	117,529	119,878	118,712	128,218	134,737	134,737
Domestic demand	101,752	98,718	101,985	89,553	95,571	1,142,987
Daily average	3,282	3,291	3,290	2,985	3,083	3,123

[1] To compare with 1953 (excluding jet fuel). Does not compare with 1951 which includes jet fuel and uses finished and natural gasoline stocks in computing production, rather than finished and unfinished stocks and net amounts of natural-gas liquids.

Production.—The new supply of gasoline reached 1,267.4 million barrels in 1953, including 1,122.7 million barrels of gasoline and naphtha produced from crude oil at a yield of 43.9 percent; 111.3 million barrels of 8 oils derived from natural gas and motor benzol blended at refineries; an additional 33.0 million barrels of these light oils blended outside refineries, including exports and losses; and a minor import of 0.4 million barrels imported. Stocks of finished and and unfinished gasoline increased 23.1 million barrels during the year resulting in an indicated total demand for gasoline of 1,244.3 million barrels.

TABLE 50.—Salient statistics of gasoline in the United States, 1952 (total) and 1953, by months

[Thousands of barrels]

	1953 [1]						
	Jan.	Feb.	Mar.	Apr.	May	June	July
Production:							
Finished gasoline and naphtha from crude oil	93,533	84,610	91,794	88,941	94,011	94,058	99,171
Unfinished-gasoline production (net)	536	32	612	−308	−64	−711	−141
Natural-gas liquids used at refineries	9,292	8,378	8,930	8,088	8,255	8,948	9,511
Sold to jobbers	2,512	2,197	3,004	2,942	2,897	2,944	3,049
Total production	105,873	95,217	104,340	99,663	105,099	105,239	111,590
Daily average	3,415	3,401	3,366	3,322	3,390	3,508	3,600
Imports	4	8	141	9	7	142	4
Exports	3,293	2,991	3,022	4,053	2,949	2,601	3,447
Daily average	106	107	97	135	95	87	111
Stocks, end of period:							
Finished gasoline	140,525	147,855	151,930	147,716	145,746	136,549	133,876
Unfinished gasoline	8,772	8,804	9,416	9,108	9,044	8,333	8,192
Total stocks	149,297	156,659	161,346	156,824	154,790	144,882	142,068
Domestic demand	88,024	84,872	96,772	100,141	104,191	112,688	110,961
Daily average	2,839	3,031	3,122	3,338	3,361	3,756	3,579

	1953 [1]—Continued						1952 (total)
	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
Production:							
Finished gasoline and naphtha from crude oil	99,653	93,045	93,642	92,992	96,627	1,122,077	1,037,080
Unfinished-gasoline production (net)	−114	−86	105	178	545	584	489
Natural-gas liquids used at refineries	9,502	9,991	10,380	10,145	9,873	111,293	103,898
Sold to jobbers	2,986	2,094	2,515	2,756	3,075	32,971	36,560
Total production	112,027	105,044	106,642	106,071	110,120	1,266,925	1,178,027
Daily average	3,614	3,501	3,440	3,536	3,552	3,471	3,219
Imports	2	2	3	135	2	459	1,761
Exports	3,065	3,439	2,716	3,296	3,048	37,920	36,285
Daily average	99	115	88	110	98	104	99
Stocks, end of period:							
Finished gasoline	136,160	133,910	134,322	140,314	149,052	149,052	126,501
Unfinished gasoline	8,078	7,992	8,097	8,275	8,820	8,820	8,236
Total stocks	144,238	141,902	142,419	148,589	157,872	157,872	134,737
Domestic demand	106,794	103,943	103,412	96,740	97,791	1,206,329	1,142,987
Daily average	3,445	3,465	3,336	3,225	3,154	3,305	3,123

[1] Preliminary figures.

Yields.—The average yield of gasoline and naphtha from crude oil increased from 42.4 percent in 1952 to 43.9 percent in 1953. The flexibility of modern refinery equipment permits considerable variation in the yields of the more desirable products that usually vary with the relative gains in demand for them. Most of the gain in gasoline yield in 1953 can be attributed to the unusual increase in gasoline stocks contrasted with the small increase in 1952.

TABLE 51.—Production of gasoline in the United States in 1953, by district and month [1]

[Thousands of barrels]

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Gasoline from crude oil (including unfinished):													
East Coast	13,390	11,320	11,823	11,091	12,493	12,213	13,568	13,187	12,153	12,762	12,301	13,181	149,482
Appalachian	2,938	2,514	2,737	2,516	2,683	2,666	2,937	2,856	2,743	2,770	2,817	2,879	33,056
Indiana, Illinois, Kentucky, etc	19,714	17,794	18,743	17,264	18,159	18,719	20,688	21,442	19,739	19,980	20,277	20,495	233,014
Oklahoma, Kansas, etc	9,089	8,191	9,494	8,415	8,693	9,666	10,287	9,993	9,292	8,772	9,252	9,733	110,877
Texas Inland	4,334	3,967	3,774	3,958	4,165	3,799	4,211	4,176	3,623	3,878	3,644	3,940	47,469
Texas Gulf Coast	20,232	18,506	20,530	20,835	21,705	20,749	21,068	20,935	20,299	20,654	20,706	20,793	247,012
Louisiana Gulf Coast	6,729	6,558	7,727	7,369	7,789	7,969	8,338	8,049	7,378	7,436	7,334	7,888	90,564
Arkansas, Louisiana Inland, etc	975	832	861	914	884	841	916	884	923	1,015	977	965	10,987
Rocky Mountain	3,791	3,303	3,351	3,213	3,588	3,545	3,710	3,976	3,860	3,578	3,503	3,874	43,292
California and Washington	10,767	9,907	11,317	10,937	11,516	10,866	11,402	11,934	11,082	10,644	10,505	11,344	132,221
Total gasoline	91,959	82,892	90,357	86,512	91,675	91,033	97,125	97,432	91,092	91,489	91,316	95,092	1,097,974
Naphtha													
East Coast	116	142	189	152	141	161	177	164	139	161	140	204	1,886
Appalachian	28	33	37	52	41	36	42	32	49	35	31	29	445
Indiana, Illinois, Kentucky, etc	324	263	331	330	354	355	372	347	332	371	297	280	3,956
Oklahoma, Kansas, etc	143	128	131	165	171	148	153	142	129	140	145	115	1,710
Texas Inland	55	53	57	51	39	45	43	34	33	48	39	41	538
Texas Gulf Coast	851	683	869	828	883	961	659	797	733	936	745	876	9,821
Louisiana Gulf Coast	294	168	139	224	249	317	219	256	148	274	206	252	2,746
Arkansas, Louisiana Inland, etc	26	19	23	24	27	20	25	27	18	19	22	23	273
Rocky Mountain	10	9	19	19	16	27	16	17	23	22	12	16	206
California and Washington	263	252	254	276	351	244	199	291	263	252	217	244	3,106
Total naphtha	2,110	1,750	2,049	2,121	2,272	2,314	1,905	2,107	1,867	2,258	1,854	2,080	24,687
Total gasoline and naphtha from crude	94,069	84,642	92,406	88,633	93,947	93,347	99,030	99,539	92,959	93,747	93,170	97,172	1,122,661
Percent yield of gasoline and naphtha [2]	43.0	43.3	43.4	43.5	44.2	43.9	44.6	44.5	43.9	43.7	44.4	44.8	43.9
Natural-gas liquids blended at refineries	9,292	8,378	8,930	8,088	8,255	8,948	9,511	9,502	9,991	10,380	10,145	9,873	111,293
Total refinery production:													
East Coast	13,957	11,721	12,305	11,556	12,830	12,581	14,047	13,516	12,555	13,206	12,983	13,732	154,989
Appalachian	2,978	2,556	2,779	2,573	2,724	2,711	2,988	2,891	2,803	2,815	2,868	2,924	33,610
Indiana, Illinois, Kentucky, etc	21,130	19,068	20,101	18,516	19,549	20,064	21,969	22,662	21,236	21,560	21,905	22,101	249,861
Oklahoma, Kansas, etc	10,156	9,113	10,283	9,317	9,582	10,591	11,319	11,047	10,467	10,070	10,413	10,825	123,183
Texas Inland	5,653	5,284	4,987	5,136	5,255	5,081	5,779	5,764	5,322	5,536	5,265	5,527	64,589
Texas Gulf Coast	23,617	21,468	23,929	23,790	24,779	24,342	24,574	24,665	23,884	24,440	23,870	24,185	287,543
Louisiana Gulf Coast	7,416	7,130	8,351	8,026	8,374	8,709	8,966	8,734	7,992	8,235	8,128	8,678	98,739
Arkansas, Louisiana Inland, etc	1,097	943	977	1,024	996	938	1,022	1,007	1,050	1,160	1,115	1,096	12,425
Rocky Mountain	4,001	3,577	3,605	3,449	3,805	3,770	3,951	4,198	4,080	3,794	3,742	4,117	46,089
California and Washington	13,356	12,160	14,019	13,334	14,308	13,508	13,926	14,557	13,561	13,311	13,026	13,860	162,926
Total 1953	103,361	93,020	101,336	96,721	102,202	102,295	108,541	109,041	102,950	104,127	103,315	107,045	1,233,954
Natural-gas liquids sold to jobbers	2,512	2,197	3,004	2,942	2,897	2,944	3,049	2,986	2,094	2,515	2,756	3,075	32,971
Total gasoline production	105,873	95,217	104,340	99,663	105,099	105,239	111,590	112,027	105,044	106,642	106,071	110,120	1,266,925

[1] Preliminary figures.

[2] Based on crude runs to stills adjusted for net change in stocks of unfinished oils.

Exports.—Exports of gasoline increased 5 percent in 1953 after a sharp decline of 10 percent in 1952. The gain of 1.6 million barrels in exports represented an increase of 0.5 million for aviation gasoline and a gain of 1.1 million for other grades. Shipments to the Territories and possessions outside of continental United States increased 0.7 million and to foreign countries 0.9 million barrels.

Domestic Demand.—The domestic demand for gasoline and naphtha increased 63.3 million barrels in 1953. Highway usage, according to the Bureau of Public Roads, increased 48.8 million barrels from 947.1 million barrels in 1952 to 995.9 million in 1953, after deducting the total of fuels other than gasoline used by trucks. Highway use represented 82.9 percent of total domestic demand in 1952 and 82.6 percent in 1953. The domestic demand for aviation gasoline, military and civilian, increased 9.1 million barrels from 62.0 million in 1952 to 71.1 million in 1953. Aviation gasoline represented 4.4 percent of total domestic demand in 1952 and 5.9 percent in 1953.

Production and Consumption by States.—Table 52, which shows gasoline production and consumption by States, provides an approximate basis on which to indicate areas of surplus production and deficit supply. The refinery production data were compiled by the Bureau of Mines and do not include the light oils recovered from natural gas which were blended with gasoline outside refineries. Data on consumption by States were compiled by the American Petroleum Institute and do not include commercial naphthas. These omissions roughly offset each other.

District 1 (Atlantic Coast States) produced 172 million barrels and consumed 382 million in 1953, a deficit of 210 million barrels. Known receipts were 224 million barrels, including 189 million by boat and 31 million by pipeline from district 3 and about 4 million by barge from district 2. The excess receipts provided for an increase of 3 million barrels in stocks, the delivery of 1.5 million by pipeline to district 2, and some exports and military deliveries.

Consumption in district 2, including the Indiana-Illinois and Oklahoma-Kansas refinery districts, amounted to 428 million barrels or 38 million in excess of production. The largest receipt was 30 million barrels by pipeline from district 3, with additional receipts by barge and rail.

District 3 (Texas, Louisiana, Arkansas, Mississippi, Alabama, and New Mexico) produced 468 million barrels of gasoline and consumed only 175 million—a surplus of 293 million barrels. Shipments included 189 million by boat to district 1 and pipeline movements of 31 million barrels to district 1, 30 million to district 2, and 3 million to district 4. Other shipments outside the district included rail and barge movements and substantial exports.

District 4 (Rocky Mountain States except New Mexico) produced 42 million barrels in 1953 and consumed 34 million, a surplus of about 8 million barrels which included shipments to other districts and stock changes.

District 5 (California, Oregon, Washington, Nevada, and Arizona) had a gasoline production of 163 million barrels in 1953 and a consumption of 159 million barrels, a net surplus of 4 million barrels. Total gasoline receipts from outside the district were about 9 million barrels in 1953, and total shipmentsout side the district, including exports, were 11 million barrels.

This review indicates that the major surplus of gasoline is in district 3 and the major deficit in district 1.

TABLE 52.—Production (refinery output) and consumption of gasoline in the United States, 1951–53, by States

[Thousands of barrels]

State	1951		1952		1953 [1]	
	Production	Consumption [2]	Production [3]	Consumption [2]	Production [4]	Consumption [2]
Alabama	(5)	15,363	(5)	16,321	(5)	17,288
Arizona	----	7,485	----	7,485	----	7,652
Arkansas	9,004	10,119	9,329	10,672	9,847	11,025
California	[6] 151,209	104,527	[6] 153,015	106,836	[6] 162,926	116,061
Colorado	4,210	11,736	4,253	12,516	4,346	12,868
Connecticut	----	12,903	----	13,664	----	14,523
Delaware	----	2,591	----	2,793	----	3,034
District of Columbia	----	4,911	----	4,943	----	4,863
Florida	----	22,955	----	25,185	----	27,118
Georgia	[7] 8,104	20,326	[7] 8,580	22,075	[7] 8,112	23,163
Idaho	(8)	5,005	(8)	5,250	(8)	5,551
Illinois	[9] 87,124	56,564	[9] 91,720	58,219	[9] 97,666	60,595
Indiana	66,514	31,179	65,246	33,168	72,239	35,648
Iowa	----	23,237	----	23,959	----	24,482
Kansas	[10] 46,466	18,723	[10] 51,646	19,798	[10] 59,386	21,004
Kentucky	[11] 13,504	14,648	[11] 14,711	15,623	[11] 13,197	16,344
Louisiana	[5] 88,210	14,302	[5] 91,797	15,510	[5] 101,317	16,742
Maine	----	5,718	----	6,014	----	6,303
Maryland	(7)	13,966	(7)	15,351	(7)	16,142
Massachusetts	[12] 1,762	24,366	[12] 1,509	24,823	[12] 2,432	25,488
Michigan	15,931	49,535	16,929	50,704	16,942	54,898
Minnesota	(9)	22,529	(9)	23,904	(9)	24,866
Mississippi	(5)	11,241	(5)	11,873	(5)	12,403
Missouri	(10)	30,138	(10)	32,377	(10)	33,378
Montana	7,732	5,533	8,158	5,944	8,926	6,127
Nebraska	(10)	11,650	(10)	12,222	(10)	12,659
Nevada	----	2,182	----	2,284	----	2,519
New Hampshire	----	3,303	----	3,425	----	3,653
New Jersey	58,262	33,255	61,131	35,409	63,576	37,809
New Mexico	3,143	5,973	4,101	6,721	4,362	7,234
New York	9,871	66,373	12,111	70,035	12,471	74,631
North Carolina	----	24,125	----	25,825	----	27,251
North Dakota	----	6,434	----	6,647	----	6,936
Ohio	58,059	55,978	62,464	58,646	66,541	62,364
Oklahoma	55,333	17,692	60,868	18,891	63,797	19,328
Oregon	----	13,021	----	13,530	----	13,631
Pennsylvania	80,299	56,451	81,957	59,056	83,082	62,005
Rhode Island	(12)	4,349	(12)	4,494	(12)	4,789
South Carolina	(7)	12,399	(7)	13,834	(7)	14,010
South Dakota	----	6,842	----	7,059	----	7,353
Tennessee	(11)	18,327	(11)	19,767	(11)	20,920
Texas	316,877	83,668	328,134	93,663	352,132	109,848
Utah	10,302	5,375	11,226	5,696	13,077	6,132
Vermont	----	2,396	----	2,545	----	2,671
Virginia	----	21,891	----	23,746	----	24,933
Washington	(6)	17,414	(6)	18,081	(6)	18,943
West Virginia	2,194	9,369	2,124	9,704	2,202	9,934
Wisconsin	(9)	24,648	(9)	25,815	(9)	26,971
Wyoming	[8] 14,770	3,358	[8] 14,907	3,541	[8] 15,378	3,698
Total	1,108,880	1,046,073	1,155,916	1,105,643	1,233,954	1,177,788

[1] Preliminary figures.
[2] American Petroleum Institute.
[3] Includes 14,938,000 barrels of jet fuel.
[4] Excludes jet fuel.
[5] Alabama and Mississippi included with Louisiana.
[6] Washington included with California.
[7] Maryland and South Carolina included with Georgia.
[8] Idaho included with Wyoming.
[9] Minnesota and Wisconsin included with Illinois.
[10] Missouri and Nebraska included with Kansas.
[11] Tennessee included with Kentucky.
[12] Rhode Island included with Massachusetts.

TABLE 53.—Transportation of petroleum products by pipelines in 1952–53, by months

[Thousands of barrels]

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1952													
Turned into lines: [1]													
Gasoline	27,748	28,411	31,040	31,139	30,308	31,357	34,554	34,630	33,124	33,796	31,886	31,154	379,147
Kerosine	3,461	2,799	2,375	1,606	1,143	1,379	955	1,197	1,696	2,796	3,041	3,368	25,816
Distillate fuel oil	12,474	9,896	7,723	6,701	5,177	6,953	7,914	7,611	7,029	9,693	9,534	13,015	103,720
LP-gases	230	206	245	168	134	147	143	123	196	298	345	332	2,567
Delivered from lines: [1]													
Gasoline	27,157	27,078	29,811	32,065	33,166	32,219	34,271	34,273	32,896	34,668	30,350	30,733	378,687
Kerosine	3,677	2,898	2,463	1,718	982	1,113	906	975	1,545	2,617	3,111	3,506	25,511
Distillate fuel oil	12,801	11,057	9,594	7,077	4,829	5,290	5,884	5,957	6,561	9,052	9,727	13,759	101,588
LP-gases	239	203	203	181	118	96	113	114	173	237	264	352	2,293
Shortage (or overage): [2]													
Gasoline	32	59	53	41	79	55	119	66	139	148	143	(68)	866
Kerosine	65	47	52	43	27	29	30	54	17	38	18	59	479
Distillate fuel oil	(2)	9	(9)	24	--------	2	(9)	67	(9)	18	16	22	129
LP-gases	16	14	10	12	12	18	13	27	18	21	34	30	225
Stocks in lines and working tanks at end of month:													
Gasoline	15,593	16,867	18,043	17,076	14,139	13,222	13,386	13,677	13,766	12,746	14,139	14,628	14,628
Kerosine	1,521	1,375	1,235	1,080	1,214	1,451	1,470	1,638	1,772	1,913	1,825	1,628	[3] 1,628
Distillate fuel oil	7,012	5,842	3,980	3,580	3,928	5,589	7,628	9,251	9,692	10,315	10,106	9,340	[3] 9,340
LP-gases	142	131	163	138	142	175	192	174	179	219	6	216	216
1953													
Turned into lines: [1]													
Gasoline	32,971	29,278	34,131	34,205	36,710	36,066	38,352	36,235	35,552	37,160	36,252	35,411	422,323
Kerosine	3,779	2,903	2,420	1,765	1,723	1,427	1,543	1,998	2,188	2,807	2,924	3,751	29,228
Distillate fuel oil	12,664	9,409	9,092	7,183	7,388	7,782	8,118	8,401	8,832	9,270	10,562	13,838	112,539
LP-gases	438	325	306	279	278	320	379	338	314	227	486	375	4,065
Delivered from lines: [1]													
Gasoline	30,232	27,789	33,236	35,329	36,959	37,025	37,199	37,394	35,696	36,911	35,895	35,421	419,086
Kerosine	3,730	3,120	2,622	1,854	1,445	1,143	1,349	1,608	1,771	2,814	3,107	3,863	28,426
Distillate fuel oil	14,249	11,377	9,850	7,744	6,294	6,520	6,631	6,997	7,798	9,340	10,701	15,082	112,583
LP-gases	386	306	242	298	261	280	230	254	285	229	390	441	3,602
Shortage (or overage): [2]													
Gasoline	1	47	58	56	47	75	122	116	107	80	11	88	808
Kerosine	81	51	42	38	46	41	36	31	41	53	49	78	587
Distillate fuel oil	(44)	7	(10)	(6)	(5)	--------	(6)	17	13	25	71	(44)	18
LP-gases	31	29	18	26	21	17	23	18	11	33	25	35	287
Stocks in lines and working tanks at end of month:													
Gasoline	17,366	18,808	19,645	18,465	18,169	17,135	18,166	16,891	16,640	16,809	17,155	17,057	17,057
Kerosine	1,660	1,392	1,148	1,021	1,253	1,496	1,654	2,013	2,389	2,329	2,097	1,907	1,907
Distillate fuel oil	7,735	5,760	5,012	4,457	5,556	6,818	8,311	9,698	10,719	10,624	10,414	9,214	9,214
LP-gases	237	227	273	228	224	247	373	439	457	422	493	392	392

[1] The quantities "Turned into lines" and "Delivered from lines" are on a net basis, eliminating intersystem transfers, and are not comparable with data published for previous years.
[2] Figures in parentheses represent overage.
[3] Figures on new basis for comparison with 1953 are as follows: Kerosine, 1,692,000 barrels; distillate fuel oil, 9,276,000 barrels.

TABLE 54.—Transportation of petroleum products by pipelines between PAW districts in the United States in 1952–53, by months

[Thousands of barrels]

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1952													
From district 1 to district 2:													
Gasoline	32	57	63	122	83	157	34	131	56	200	218	192	1,345
Kerosine	8	----	----	----	----	10	----	----	----	----	12	----	30
Distillate fuel oil	6	----	----	----	----	6	17	15	----	----	12	----	56
From district 3 to district 1:													
Gasoline	1,775	2,182	2,278	2,021	2,066	1,908	2,234	2,483	2,312	2,531	2,353	2,297	26,440
Kerosine	848	527	611	406	239	136	221	216	416	909	912	948	6,389
Distillate fuel oil	672	595	540	525	267	202	487	536	490	608	492	821	6,235
From district 3 to district 2:													
Gasoline	1,490	1,652	2,008	2,506	2,812	2,232	2,752	2,568	2,703	2,369	2,556	1,949	27,597
Kerosine	193	159	152	95	28	68	13	49	51	102	184	146	1,240
Distillate fuel oil	790	423	497	303	215	418	254	436	314	578	548	929	5,705
From district 3 to district 4:													
Gasoline	220	107	157	229	288	205	249	249	252	257	130	126	2,469
Kerosine	14	24	23	1	1	4	----	6	5	2	8	23	111
Distillate fuel oil	27	11	17	24	11	16	10	8	13	22	9	9	177
1953													
From district 1 to district 2:													
Gasoline	20	103	82	135	88	165	232	125	96	85	168	178	1,477
Kerosine	----	----	----	----	----	5	----	10	----	----	----	12	27
Distillate fuel oil	18	1	11	----	----	11	----	22	11	13	----	----	87
From district 3 to district 1:													
Gasoline	2,637	2,398	2,402	2,479	2,627	2,516	2,795	2,537	2,506	2,558	2,427	2,650	30,532
Kerosine	880	843	560	304	297	141	309	307	442	857	839	1,038	6,817
Distillate fuel oil	957	732	668	560	460	575	533	589	536	892	749	964	8,215
From district 3 to district 2:													
Gasoline	2,142	1,824	2,125	2,416	2,653	2,730	3,268	2,932	2,281	2,463	2,400	2,387	29,621
Kerosine	133	108	138	83	113	25	66	56	89	165	152	179	1,307
Distillate fuel oil	798	728	681	267	261	368	301	470	188	452	501	803	5,818
From district 3 to district 4:													
Gasoline	157	145	178	184	187	217	287	301	223	248	190	231	2,548
Kerosine	18	18	15	5	14	9	4	----	3	8	10	22	126
Distillate fuel oil	10	7	7	5	10	8	29	18	15	17	18	13	157

Methods of Distribution.—Product pipelines were originally constructed to provide less expensive transportation of gasoline to inland markets in the upper middle west and the southern half of the Atlantic Coast area. Total products delivered by pipeline, exclusive of liquefied gas, rose from 506 million barrels in 1952 to 560 million in 1953. Total products moved in both years were approximately 75 percent gasoline, 20 percent distillate fuel, and 5 percent kerosine. Gasoline moved by pipeline in 1953 was 419 million barrels compared with 379 million in 1952. About 85 percent of all shipments in 1953 was northward among States in district 2, while most of the interdistrict movement was eastward from district 3 to district 1 and north from district 3 to district 2. The major water-borne movement of gasoline was 189 million barrels transported from the Gulf Coast to the East Coast district.

Stocks.—Stocks of finished gasoline, as reported, include stocks held at refineries and bulk terminals and by pipelines but do not include stocks held by secondary distributors, consumers, or in military custody. There are definite normal seasonal variations in gasoline storage because of a summer peak and a winter low in gasoline demand. These stocks build up in winter, even with lower refinery yields, and are reduced sharply during the summer. This variation in quantities in storage prevents too great a fluctuation in seasonal yields of gasoline from crude oil. The yields and stocks of distillate fuel oil are the reverse of this pattern, as demand is high in the winter and low in the summer season.

Stocks of finished gasoline increased 22.5 million barrels in 1953, stocks of unfinished gasoline rose 0.6 million, and stocks of natural gasoline gained 2.6 million barrels. This abnormal increase in gasoline stocks was the result of the very small reduction of stocks in the third quarter and a large relative increase in the fourth quarter.

Prices.—The average posted dealer tank-wagon price for Regular-Grade gasoline (exclusive of sales taxes) in 50 representative cities in the United States provides an index of wholesale gasoline prices. This average price increased from 15.27 cents per gallon in 1952 to 15.95 cents in 1953. The average service-station price (exclusive of all taxes) increased from 20.24 cents in 1952 to 21.28 cents in 1953, an increase in the dealers' margin from 4.97 cents in 1952 to 5.33 cents in 1953. The addition of local, State, and Federal taxes raised the service-station price to the consumer from 27.56 cents per gallon in 1952 to 28.69 cents in 1953. Total taxes rose from 7.32 cents per gallon in 1952 to 7.41 cents in 1953. The average local tax of 0.09 cent per gallon remained the same; the average State tax rose from 5.23 cents to 5.32 cents, and there was no change in the Federal tax of 2 cents.

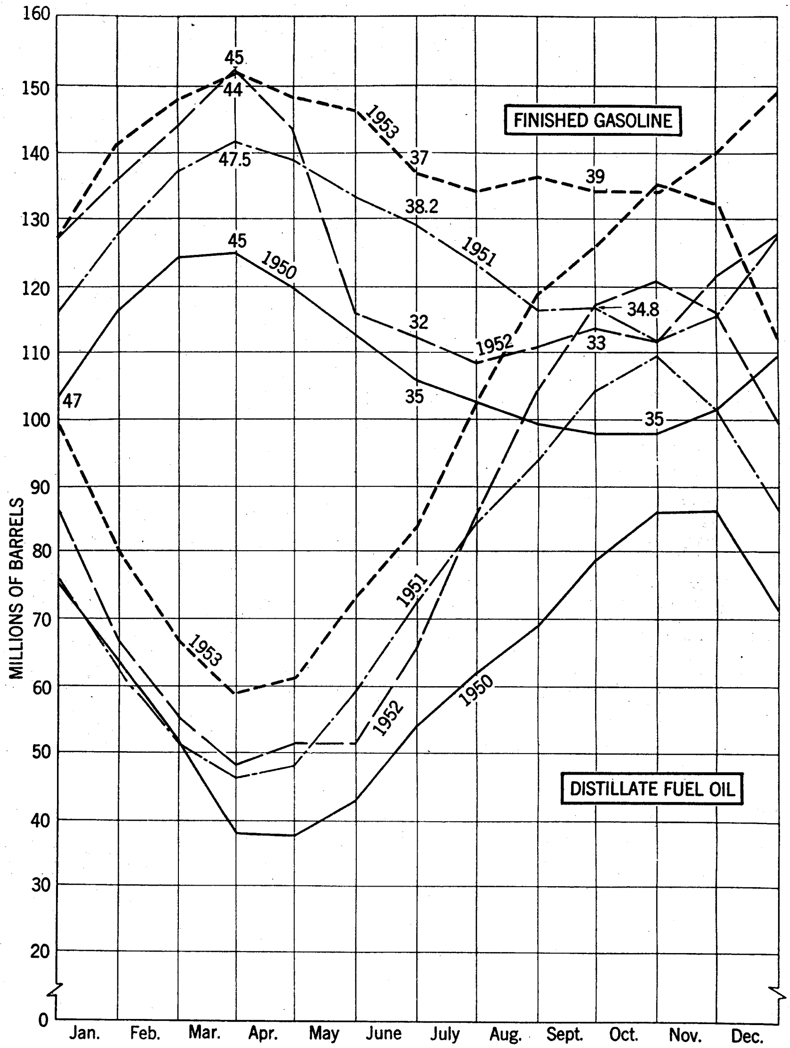

FIGURE 9.—Stocks of finished gasoline in the United States, 1950–53, by months, with data on days' supply at certain periods; also stocks of distillate fuel oil, 1950–53, by months.

34805—56——28

TABLE 55.—Stocks of gasoline in the United States in 1953, by district and month

[Thousands of barrels]

District	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Finished gasoline: [1]												
East Coast	32,360	33,198	33,018	33,473	33,589	32,049	31,709	32,394	31,515	32,669	32,974	33,065
Appalachian	5,982	5,787	5,713	5,393	5,216	4,833	4,811	5,058	5,284	5,123	5,750	5,827
Indiana, Illinois, Kentucky, etc	30,857	33,860	34,530	32,300	30,234	28,010	27,377	28,076	26,828	26,140	28,192	31,541
Oklahoma, Kansas, etc	16,880	17,242	18,647	18,049	17,182	15,067	15,164	15,087	14,828	14,316	15,411	16,731
Texas Inland	5,422	6,125	6,031	6,037	5,976	5,641	5,267	5,121	5,221	5,339	5,324	5,638
Texas Gulf Coast	16,476	17,965	18,615	17,319	16,948	16,914	15,377	15,996	16,127	16,605	17,430	18,271
Louisiana Gulf Coast	7,633	7,433	7,343	6,805	7,376	6,703	7,419	7,613	7,413	7,253	7,941	9,168
Arkansas, Louisiana Inland, etc	3,779	3,914	3,935	3,495	3,224	2,772	3,137	3,051	3,345	3,738	3,737	4,001
Rocky Mountain	6,047	6,911	7,170	6,972	6,920	6,106	5,182	4,629	4,574	4,580	5,085	6,083
California	15,089	15,420	16,928	17,873	19,081	18,454	18,433	19,135	18,775	18,559	18,470	18,727
Total finished gasoline	140,525	147,855	151,930	147,716	145,746	136,549	133,876	136,160	133,910	134,322	140,314	149,052
Unfinished gasoline:												
East Coast	1,260	1,186	1,538	1,456	1,349	1,111	1,233	1,340	1,161	1,211	1,125	1,248
Appalachian	336	342	359	356	316	313	315	320	332	305	304	327
Indiana, Illinois, Kentucky, etc	1,476	1,569	1,402	1,090	1,070	941	1,040	914	821	869	1,020	1,145
Oklahoma, Kansas, etc	145	149	122	135	139	101	105	107	140	167	146	163
Texas Inland	332	328	384	373	365	344	313	328	367	442	475	359
Texas Gulf Coast	3,401	3,401	3,629	3,751	3,740	3,396	3,310	3,089	3,143	3,116	3,265	3,569
Louisiana Gulf Coast	378	337	424	500	426	403	381	437	429	388	442	400
Arkansas, Louisiana Inland, etc	6	3		1	6	7	2	4	3	3	3	4
Rocky Mountain	104	131	157	144	110	136	127	130	107	107	128	138
California	1,334	1,358	1,401	1,302	1,523	1,581	1,366	1,409	1,489	1,489	1,367	1,467
Total unfinished gasoline	8,772	8,804	9,416	9,108	9,044	8,333	8,192	8,078	7,992	8,097	8,275	8,820
Total finished and unfinished gasoline:												
East Coast	33,620	34,384	34,556	34,929	34,938	33,160	32,942	33,734	32,676	33,880	34,099	34,313
Appalachian	6,318	6,129	6,072	5,749	5,532	5,146	5,126	5,378	5,616	5,428	6,054	6,154
Indiana, Illinois, Kentucky, etc	32,333	35,429	35,932	33,390	31,304	28,951	28,417	28,990	27,649	27,009	29,212	32,686
Oklahoma, Kansas, etc	17,025	17,391	18,769	18,184	17,321	15,168	15,269	15,194	14,968	14,483	15,557	16,894
Texas Inland	5,754	6,453	6,415	6,410	6,341	5,985	5,580	5,449	5,588	5,781	5,799	5,997
Texas Gulf Coast	19,877	21,366	22,244	21,070	20,688	20,310	18,687	19,085	19,270	19,721	20,695	21,840
Louisiana Gulf Coast	8,011	7,770	7,767	7,305	7,802	7,106	7,800	8,050	7,842	7,641	8,383	9,568
Arkansas, Louisiana Inland, etc	3,785	3,917	3,935	3,496	3,230	2,779	3,139	3,055	3,348	3,741	3,740	4,005
Rocky Mountain	6,151	7,042	7,327	7,116	7,030	6,242	5,309	4,759	4,681	4,687	5,213	6,221
California	16,423	16,778	18,329	19,175	20,604	20,035	19,799	20,544	20,264	20,048	19,837	20,194
Total: 1953	149,297	156,659	161,346	156,824	154,790	144,882	142,068	144,238	141,902	142,419	148,589	157,872
1952	143,605	151,225	160,089	151,291	123,001	119,528	115,908	117,529	119,878	118,712	128,025	134,737

[1] Includes stocks of finished gasoline at refineries and bulk terminals, and in pipelines (excluding jet fuel).

TABLE 56.—Days' supply of gasoline on hand in the United States at end of month, 1951–52 [1]

	1951			1952			1953 [2]		
	Finished gasoline	Natural gasoline	Total gasoline	Finished gasoline [3]	Natural gasoline	Total gasoline	Finished gasoline [3]	Natural gasoline	Total gasoline
January	48.4	2.8	51.2	46.6	2.8	49.4	46.3	2.9	49.2
February	47.9	2.7	50.6	50.0	2.8	52.8	45.9	2.8	48.7
March	47.4	2.7	50.1	45.2	2.4	47.6	43.8	2.7	46.5
April	42.1	2.6	44.7	43.4	2.5	45.9	42.8	2.6	45.4
May	40.2	2.8	43.0	34.3	2.3	36.6	37.9	2.4	40.3
June	38.2	3.0	41.2	32.1	2.3	34.4	37.0	2.3	39.3
July	36.1	2.9	39.0	32.0	2.3	34.3	37.8	2.3	40.1
August	36.4	3.1	39.5	32.4	2.3	34.7	38.0	2.3	40.3
September	34.7	2.9	37.6	33.2	2.1	35.3	39.1	2.3	41.4
October	36.2	2.9	39.1	35.4	2.7	38.1	40.3	2.4	42.7
November	40.3	2.9	43.2	37.3	2.4	39.7	43.2	2.5	45.7
December	43.9	2.8	46.7	43.0	2.8	45.8	49.9	3.0	52.9

[1] Stocks divided by the daily average total demand (domestic demand plus exports) for succeeding month.
[2] Preliminary figures.
[3] Excluding jet fuel.

TABLES 57.—Average monthly prices of gasoline in the United States, 1952–53, in cents per gallon

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year
1952													
Monthly average at refineries in Oklahoma, regular, 82 octane [1]	10.50	10.50	10.45	10.34	10.49	10.64	10.69	10.69	10.69	10.69	10.69	10.69	10.60
Average of 50 cities on 1st of month: [2]													
Dealer's net (excl. tax)	15.33	15.14	15.13	15.27	15.24	15.34	15.37	15.31	15.31	15.30	15.24	15.23	15.27
Service station (including State, local, and Federal taxes)	27.58	27.36	27.25	27.46	27.50	27.83	27.83	27.78	27.57	27.70	27.49	27.38	27.56
1953													
Monthly average at refineries in Oklahoma, regular, 82 octane [1]	10.50	10.50	10.50	10.50	10.50	10.93	11.50	11.50	11.50	11.50	11.47	11.36	11.02
Average of 50 cities on 1st of month: [2]													
Dealer's net (excl. tax)	15.22	15.24	15.43	15.44	15.45	15.44	16.55	16.59	16.56	16.54	16.53	16.46	15.95
Service station (including State, local, and Federal taxes)	27.63	27.64	27.97	28.12	27.93	28.03	29.51	29.61	29.48	29.47	29.25	29.57	28.69

[1] National Petroleum News.
[2] American Petroleum Institute; compiled by The Texas Co.

KEROSINE

The salient statistics for kerosine, as well as for distillate fuel oils, were put on a new basis in 1953 to eliminate quantities blended into jet fuel. The comparative totals for 1952 were also adjusted accordingly. The breakdowns by refinery districts for the production total and the year-end stocks are not available, therefore comparisons with the corresponding 1953 items cannot be made.

There was a 6-percent decline in the market for kerosine in 1953. Although production declined 4 percent in 1953, the output was sufficient to supply smaller domestic and export demands, and a minor surplus was diverted to storage. In 1952 a small quantity was taken from stocks to satisfy overall requirements.

The decline in kerosine production in 1953 was the result of a smaller percentage yield, as crude runs at petroleum refineries increased. Similar conditions prevailed in 1952 and also resulted in a smaller kerosine output.

Over a third of the kerosine produced in 1953 came from petroleum refineries operating in the Texas Gulf Coast area, while about a quarter of the total was credited to the Indiana-Illinois-Kentucky district. Other important producing districts were the Louisiana Gulf Coast, with 15 percent of the total, and the East Coast, with 11 percent. Similar proportions of the kerosine output in 1952 were produced by these same districts.

A 6-percent drop in the domestic demand for kersosine in 1953 was definitely the result of the warmer weather prevailing. During the first 3 months of 1953, when average temperatures were warmer than in the similar period of 1952, domestic requirements for kerosine declined 4 percent. The second and third quarters of 1953, however, were cooler than in 1952, and as there was virtually no heating load in these periods, the domestic market continued to decline by 4 percent and 7 percent, respectively. The final 3 months of 1953 were unusually warm; consequently, the domestic demand was 8 percent lower than in the same months of 1952.

Exports of kerosine declined 8 percent in 1953 in contrast to an increase of 14 percent in 1952. Canada, Egypt, and India, three important markets, received approximately the same quantities as in 1952. However, the quantity exported to the United Kingdom declined sharply from 1.2 million barrels in 1952 to 190,000 in 1953. Official statistics released by the United Kingdom show that imports of kerosine declined 12 percent in 1953 and that of all its principal sources of supply were affected by the curtailment of demand.

Year-end stocks of kerosine in 1953 represented a 49-day supply at the January 1954 daily rate of domestic demand, compared with a 50-day reserve at the close of 1952.

Kerosine sales declined 7 percent in 1953 over 1952. The pronounced shrinkage in the kerosine market was evidently partly the result of the warmer weather, as well as the expanding demand for liquefied petroleum gas, a competitive fuel. Kerosine sold for range burner fuel, which represented 72 percent of total sales, dropped 5 percent in 1953, whereas the quantity indicated for tractor fuel (3 percent of the total) was 10 percent lower in 1953. Distributors reported a 12-percent decline in sales of kerosine for "all other uses" in 1953, a sharp decline from the small 1-percent decrease of 1952.

Sales of range oil, constituting mostly kerosine and a small quantity of No. 1 fuel oil, declined 4 percent in 1953. The kerosine proportion was 5 percent lower while No. 1 fuel oil delivered for range fuel declined 2 percent in the same period.

TABLE 58.—Salient statistics of kerosine in the United States, 1952–53, by month and district

[Thousands of barrels]

Month and district	Production		Yield (percent)		Exports		Domestic demand		Stocks, end of period	
	1952	1953 [1]	1952	1953 [1]	1952	1953 [1]	1952	1953 [1]	1952	1953 [1]
By month:										
January	12,879	13,133	6.2	6.0	830	410	16,447	16,773	22,438	23,166
February	10,600	10,898	5.4	5.6	259	448	14,438	13,407	18,341	20,209
March	11,746	10,709	5.7	5.0	728	814	12,704	11,779	16,655	18,325
April	10,737	10,213	5.6	5.0	697	931	7,926	7,688	18,769	19,919
May	6,858	9,409	4.6	4.4	997	557	5,223	5,043	19,407	23,728
June	9,295	9,201	4.6	4.3	808	976	5,018	4,798	22,876	27,155
July	10,820	9,358	5.0	4.2	849	479	5,675	5,313	27,172	30,721
August	11,243	9,239	5.1	4.1	626	427	5,666	4,402	32,123	35,131
September	10,139	9,286	4.8	4.4	722	526	6,784	7,115	34,756	36,776
October	10,398	10,499	4.9	4.8	428	401	11,784	9,184	32,942	37,690
November	11,297	10,025	5.3	4.8	404	567	12,075	11,493	31,760	35,655
December	12,755	11,230	5.9	5.2	473	676	17,513	17,525	[2] 26,529	28,684
Total	128,767	123,200	5.3	4.8	7,821	7,212	121,253	114,520	26,529	28,684
By district:										
East Coast		13,856		3.5						13,119
Appalachian		4,208		5.8						1,176
Indiana, Illinois, Kentucky, etc		28,665		6.2						7,548
Oklahoma, Kansas, etc		5,264		2.5						1,464
Texas Inland		4,049		4.2						356
Texas Gulf Coast	(3)	42,993	(3)	7.0	(3)	(3)	(3)	(3)	(3)	2,408
Louisiana Gulf Coast		17,937		8.8						1,537
Arkansas, Louisiana Inland, etc		2,788		8.6						455
Rocky Mountain		1,380		1.5						249
California		2,060		.6						372
Total	128,767	123,200	5.3	4.8	7,821	7,212	121,253	114,520	26,529	28,684

[1] Preliminary figures.
[2] 27,216,000 barrels on new basis to compare with 1953.
[3] Figures not available.

There were only minor changes in representative kerosine price postings in 1953 compared with 1952. The quotation for 41°–43° gravity, water-white kerosine at refineries in Oklahoma intended for shipments out of the State to northern destinations declined from 8.88 cents a gallon in January 1953 to 8.56 cents on March 4. Several changes in June brought the price up to 9.06 cents a gallon, which held to the end of the year. Kerosine and/or No. 1 fuel oil at New York Harbor was priced at 10.75 cents a gallon until late April 1953, when it dropped to 10.5 cents. Later fluctuations resulted in an increase to 10.9 cents in October, and to 10.5 cents again at the year's end. The tank-wagon price for kerosine at Chicago advanced from 15.8 cents a gallon to 16.3 cents on June 22, while the tank-wagon price in Manhattan and Queens of the New York City area fluctuated from 14.4 cents a gallon to a "low" of 14.1 cents on May 1. The quotation was increased to 15 cents on October 1 and then down to 14.5 cents in late November.

Rail and truck shipments of kerosine from the California marketing area (district 5) to other Western States declined from 22,000 barrels in 1952 to 16,000 in 1953. Receipts of kerosine, including imports, in the West Coast district were reported to be 2,000 barrels in both 1952 and 1953.

TABLE 59.—Sales of kerosine in the United States, 1952–53, by district, State, and use

[Thousands of barrels]

District [1] and State	Sold as range oil		Tractor fuel		All other uses		Total	
	1952	1953	1952	1953	1952	1953	1952	1953
District 1:								
Connecticut	4,851	4,527	12	16	171	137	5,034	4,680
Delaware	529	489	6	6	45	44	580	539
District of Columbia	234	200	4	3	121	94	359	297
Florida	1,682	1,604	102	107	867	703	2,651	2,414
Georgia	1,826	1,747	141	137	659	566	2,626	2,450
Maine	2,872	2,792	41	28	295	202	3,208	3,022
Maryland	1,482	1,340	110	98	594	519	2,186	1,957
Massachusetts	11,983	11,420	6	45	793	697	12,782	12,162
New Hampshire	1,340	1,262	4	12	42	32	1,386	1,306
New Jersey	4,046	3,742	11	41	1,551	1,397	5,608	5,180
New York	8,140	7,868	65	135	943	757	9,148	8,760
North Carolina	7,484	7,294	97	80	2,999	2,880	10,580	10,254
Pennsylvania	2,335	2,208	46	107	1,309	1,118	3,690	3,433
Rhode Island	2,661	2,459	51	46	127	72	2,839	2,577
South Carolina	3,203	3,167	42	34	1,411	1,191	4,656	4,392
Vermont	604	541	8	12	63	52	675	605
Virginia	1,995	2,033	16	20	946	887	2,957	2,940
West Virginia	257	199	4	3	145	127	406	329
Total	57,524	54,892	766	930	13,081	11,475	71,371	67,297
District 2:								
Illinois	3,483	3,298	315	287	1,381	1,272	5,179	4,857
Indiana	2,465	2,350	117	94	1,617	1,512	4,199	3,956
Iowa	1,709	1,631	350	254	881	755	2,940	2,640
Kansas	737	708	190	110	363	282	1,290	1,100
Kentucky	772	783	67	67	595	525	1,434	1,375
Michigan	3,550	3,430	124	113	1,856	1,566	5,530	5,109
Minnesota	1,634	1,419	60	19	777	645	2,471	2,083
Missouri	1,601	1,477	43	37	660	639	2,304	2,153
Nebraska	698	672	79	65	197	166	974	903
North Dakota	676	663	75	60	191	142	942	865
Ohio	1,665	1,542	54	80	653	532	2,372	2,154
Oklahoma	829	750	150	135	782	703	1,761	1,588
South Dakota	612	597	76	66	92	69	780	732
Tennessee	1,529	1,540	77	62	891	728	2,497	2,330
Wisconsin	1,674	1,580	116	74	850	762	2,640	2,416
Total	23,634	22,440	1,893	1,523	11,786	10,298	37,313	34,261
District 3:								
Alabama	798	905	85	72	853	686	1,736	1,663
Arkansas	954	787	127	76	655	527	1,736	1,390
Louisiana	685	589	162	151	725	685	1,572	1,425
Mississippi	538	522	132	115	613	588	1,283	1,225
New Mexico	202	174	18	13	75	69	295	256
Texas	1,881	1,770	317	310	2,604	2,328	4,802	4,408
Total	5,058	4,747	841	737	5,525	4,883	11,424	10,367
District 4:								
Colorado	243	214	39	14	48	43	330	271
Idaho	35	26	2	1	25	24	62	51
Montana	186	171	22	15	69	66	277	252
Utah	19	11	2	2	10	13	31	26
Wyoming	81	78	4	4	135	123	220	205
Total	564	500	69	36	287	269	920	805
District 5:								
Arizona	4	9			48	84	52	93
California	67	71			1,074	1,212	1,141	1,283
Nevada	1	1			11	11	12	12
Oregon	9	6			146	90	155	96
Washington	5	5			236	178	241	183
Total	86	92			1,515	1,575	1,601	1,667
Total United States	86,866	82,671	3,569	3,226	32,194	28,500	122,629	114,397

[1] States are grouped according to petroleum-marketing districts rather than to conventional geographic regions.

TABLE 60.—Sales of range oil [1] in the United States, 1951–53, by States

[Thousands of barrels]

State	1951	1952	1953	
			Total	Percent of U. S. total
Massachusetts	13,479	12,744	12,107	12.3
New York	10,489	8,732	8,467	8.6
North Carolina	4,458	7,589	7,512	7.6
Illinois	6,936	6,555	6,160	6.3
Michigan	4,667	5,335	5,516	5.6
Connecticut	5,251	5,131	4,795	4.9
New Jersey	5,481	4,527	4,140	4.2
South Carolina	2,075	3,258	3,234	3.3
Indiana	3,397	3,330	3,138	3.2
Wisconsin	3,319	3,210	3,069	3.1
Maine	3,112	3,090	3,005	3.1
Rhode Island	3,028	2,782	2,562	2.6
Minnesota	2,666	2,724	2,510	2.6
Pennsylvania	2,937	2,652	2,469	2.5
Iowa	2,502	2,377	2,276	2.3
Missouri	2,448	2,389	2,245	2.3
Texas	2,826	2,386	2,205	2.2
Ohio	2,126	2,246	2,139	2.2
Virginia	1,926	2,091	2,119	2.2
Georgia	1,898	1,917	1,836	1.9
Florida	1,800	1,751	1,672	1.7
Tennessee	1,568	1,594	1,615	1.6
Maryland	1,489	1,541	1,401	1.4
New Hampshire	1,525	1,443	1,360	1.4
Kentucky	913	1,066	1,073	1.1
All other	10,531	10,353	9,648	9.8
Total	102,847	102,813	98,273	100.0

[1] Includes mostly kerosine but also a small quantity of No. 1 fuel oil.

Tanker and barge shipments of kerosine from the Gulf coast to Atlantic ports continued a downward trend, evident since 1951, and declined from 41.8 million barrels in 1952 to 38.9 million in 1953. Quantities originating in Texas dropped from 32.3 million barrels in 1952 to 30.3 million in 1953, while the kerosine from Louisiana totaled 9.5 million barrels in 1952 and 8.7 million in 1953.

Barge shipments of kerosine from the Gulf coast and Arkansas to points on the Mississippi River and its tributaries declined 20 percent to 5.1 million barrels in 1953. The quantities originating in Texas dropped 26 percent in 1953, while those from Louisiana were off 22 percent. Shipments, usually small, credited to Arkansas and Mississippi changed little from 1952. River-barge shipments of kerosine to district 2 were off 17.4 percent. Only 42,000 barrels were shipped to district 1 in 1953 and no kerosine was discharged in district 3 in 1953.

There were numerous changes in the tanker rate for kerosine shipped from Gulf coast ports to New York; however, the average of 31 cents a barrel for 1953 was well below the 1952 average of 65.1 cents. Freight charges per barrel fluctuated from 41.6 cents a barrel on January 1 to 44.1 cents on January 20, 1953, and to 23.5 cents on March 24. Subsequent changes resulted in a "high" of 44.9 cents a barrel for the year on June 17 and a "low" of 21.8 cents on September 29. A rate of 32.3 cents, effective December 4, remained unchanged during the rest of the year.

TABLE 61.—Monthly average prices of kerosine in the United States, 1952–53

[Platt's Oil Price Handbook]

Year and grade	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
1952													
41°–43° gravity, water-white kerosine at refineries, Oklahoma cents per gallon	(1)	(1)	9.07	8.93	8.88	8.88	8.88	8.88	8.88	8.88	8.88	8.88	9.02
Kerosine (and/or No. 1 fuel oil) at New York Harbor cents per gallon	10.15	10.15	10.15	10.15	10.15	10.15	10.77	10.77	10.75	10.75	10.75	10.75	10.45
Kerosine, tank-wagon at Chicago do	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80
Kerosine, tank-wagon at New York City [2] do	13.60	13.60	13.60	13.60	13.60	13.60	14.40	14.40	14.40	14.40	14.40	14.40	14.00
1953													
41°–43° gravity, water-white kerosine at refineries, Oklahoma cents per gallon	8.88	8.78	8.57	8.56	8.56	8.86	9.06	9.06	9.06	9.06	9.06	9.06	8.88
Kerosine (and/or No. 1 fuel oil) at New York Harbor) cents per gallon	10.75	10.75	10.75	10.73	10.50	10.59	10.68	10.63	10.63	10.90	10.83	10.50	10.68
Kerosine, tank-wagon at Chicago do	15.80	15.80	15.80	15.80	15.80	15.95	16.30	16.30	16.30	16.30	16.30	16.30	16.06
Kerosine, tank-wagon at New York City [2]	14.40	14.40	14.40	14.40	14.10	14.26	14.57	14.50	14.50	15.00	14.83	14.50	14.49

[1] Not available.
[2] Manhattan and Queens.

DISTILLATE FUEL OIL

The supply and demand pattern for distillate fuel oil in 1953 differed little from that prevailing in 1952. Production increased 2 percent in 1953 and represented 99 percent of the total supply, as in 1952. "Transfers" from crude petroleum, which are unimportant as a supply item, declined 27 percent in 1953; however, this loss was more than offset by a 59-percent increase in imports. About 91 percent of the available distillate fuel oil was distributed in the domestic market, approximately the same proportion as in 1952. Exports declined 4 percent in 1953 and represented about 6 percent of the total supply. An oversupply of about 3 percent was added to storage in both years.

The small gain of 2 percent in the domestic market for distillate fuel oils in 1953 was largely the result of considerably warmer weather. The increased use of domestic oil burners was not an important factor, as the net gain in the number of installations was about 11 percent in both years. Weather reports show that temperatures were somewhat warmer in the United States in the first quarter of 1953; consequently, the domestic demand for distillate fuel oil was virtually the same as in 1952, although a greater number of oil burners was in use. Because average temperatures in 1953 were much lower during April and September than in 1952, requirements for distillate grades of fuel oil increased 10 percent and 9 percent, respectively, in the second and third quarters. However, temperatures were unusually high in the last quarter of 1953, especially during October and November, resulting in a decline of 4 percent in the market demand for distillates over the same period of 1952.

Fuel-oil distributors reported only a nominal gain of 2 percent in their sales of distillate fuel oils in 1953. There was a decline for all principal uses except railroad consumption, space heating, and miscellaneous uses. The continued increasing use of diesel fuel by railroads explained the 11-percent gain in shipments to that industry. The minor gain of less than 2 percent in the heating-oil market in 1953 can be largely attributed to the warmer weather prevailing during the year. Distillate fuel oil sold for various miscellaneous uses (heavy equipment fuel, dust control, sprays, orchard heating) increased less than 3 percent in 1953.

Sales of distillate fuel oils to gas and electric power utilities were 18 percent lower in 1953 than in 1952, reflecting greater use of heavy grades of fuel oil, coal, and natural gas by these industries. The consumption of light fuel oils by electric power companies dropped from 5.1 million barrels in 1952 to 4.8 million in 1953, according to the Federal Power Commission, while manufactured-gas companies used 2.7 million barrels in 1952 and 1.9 million in 1953, as reported by the American Gas Association. Purchases of distillate grades of fuel oils by smelters, mines, and manufacturing industries declined approximately 1 percent in 1953.

TABLE 62.—Salient statistics of distillate fuel oil in the United States, 1952–53, by month and district

[Thousands of barrels]

Month and district	Production		Yield (percent)		Transfers, east of California [1]		Imports		Exports		Domestic demand		Stocks, end of period	
	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]
By month:														
January	44,806	47,132	21.5	21.6	259	233	203	285	2,081	2,359	62,845	63,531	66,851	80,448
February	44,116	41,721	22.5	21.3	236	189	255	513	1,911	3,791	54,294	52,340	55,253	66,740
March	43,188	45,840	21.1	21.5	257	176	321	397	1,461	3,322	48,907	50,339	48,651	59,492
April	39,166	42,433	20.3	20.8	236	151	160	322	3,040	3,123	33,639	38,153	51,534	61,122
May	30,278	43,005	20.1	20.2	135	145	252	321	2,915	2,928	27,746	28,251	51,538	73,414
June	43,485	43,211	21.4	20.3	222	143	74	183	3,855	2,999	25,660	29,945	65,804	84,007
July	45,388	44,439	21.0	20.0	229	166	404	576	3,202	2,394	22,953	24,626	85,670	102,168
August	46,433	44,190	21.1	19.8	226	170	86	493	2,557	1,619	25,770	26,182	104,088	119,220
September	44,635	43,076	21.1	20.3	218	143	33	340	3,456	2,152	28,450	34,266	117,068	126,361
October	44,821	45,149	21.0	21.0	228	155	536	189	3,034	2,596	39,111	34,003	120,508	135,255
November	45,025	43,520	21.3	20.7	225	144	170	297	3,232	2,309	46,883	43,846	115,813	133,061
December	46,579	44,395	21.5	20.5	234	151	248	439	2,771	2,677	60,728	63,628	[3] 99,375	111,741
Total	517,920	528,111	21.2	20.7	2,705	1,966	2,742	4,355	33,515	32,269	476,986	489,110	99,375	111,741
By district:														
East Coast		91,647		23.4	-------	-------								42,795
Appalachian		12,102		16.6	-------	-------								2,347
Indiana, Illinois, Kentucky, etc		80,955		17.4	379	343								19,006
Oklahoma, Kansas, etc		49,005		22.9	357	321								11,101
Texas Inland	(4)	15,687	(4)	16.4	1,187	773	(4)	(4)	(4)	(4)	(4)	(4)	(4)	2,104
Texas Gulf Coast		145,650		23.8	439	240								12,346
Louisiana Gulf Coast		50,351		24.6	80	54								5,558
Arkansas, Louisiana Inland, etc		7,083		21.8	81	59								938
Rocky Mountain		19,810		21.4	182	176								2,378
California		55,821		15.0	-------	-------								13,168
Total	517,920	528,111	21.2	20.7	2,705	1,966	2,742	4,355	33,515	32,269	476,986	489,110	99,375	111,741

[1] Figures represent crude oil used as fuel on pipelines, which is considered part of the demand for distillate. No transfers reported from California district for 1952 and 1953.
[2] Preliminary figures.
[3] 98,688,000 barrels on new basis comparable with 1953.
[4] Figures not available.

TABLE 63.—Sales of distillate fuel oil[1] in the United States, 1949–53, by uses

[Thousands of barrels]

Use	1949	1950	1951	1952	1953
Railroads	38,604	48,703	59,962	68,002	75,246
Vessels (including tankers)	13,121	12,872	14,393	17,213	16,898
Gas and electric power plants	12,550	13,207	9,612	8,350	6,825
Smelters, mines, and manufacturing industries	26,424	37,121	42,567	42,760	42,384
Heating oils	190,387	220,947	249,758	263,379	267,498
Fuel oil (No. 1) sold as range oil	12,279	14,793	16,224	15,947	15,602
U. S. Army, Navy, Air Force, and Coast Guard	6,109	6,553	8,430	9,644	9,569
Oil company fuel	4,151	5,692	7,811	7,976	7,755
Miscellaneous uses	25,571	35,418	40,151	45,939	47,067
Total United States	329,196	395,306	448,908	479,210	488,844
Exports and shipments to U. S. Territories and possessions	12,295	12,653	22,555	[2] 33,515	32,269
Total	341,491	407,959	471,463	[2] 512,725	521,113

[1] Includes diesel fuel.
[2] Revised.

Distributors reported a decline of 2 percent in sales of distillate fuel oils, mostly diesel grades, for bunkering vessels in 1953 in contrast to a 20-percent gain in 1952. Data compiled by the Bureau of the Census, United States Department of Commerce, show that the quantity of diesel fuel oil sold to vessels engaged in foreign trade declined from 10.3 million barrels in 1952 to 9.5 million in 1953. Distillate fuel oils delivered to vessels using coastal and inland waterways increased from 6.9 million barrels in 1952 to 7.4 million in 1953.

The large increase in sales of distillate fuel oils reported for military uses for 1952 was not repeated in 1953, and sales declined about 1 percent in volume, largely because of the ending of hostilities in Korea. Distillate fuel oil used as oil-company fuel, relatively unimportant in quantity, declined 3 percent in 1953.

With the world supply sources of distillate fuel more stable in 1953 than in the 2 previous years, exports to foreign countries and shipments to noncontinguous Territories declined 4 percent compared with very large gains in the 2 previous years. During 1953 significant quantities were shipped to Canada, 9.9 million barrels; the Netherlands Antilles, 5.0 million; Sweden, 1.4 million; and the United Kingdom, 5.7 million.

Crude runs at petroleum refineries were up approximately 5 percent in 1953; however, the production of distillate fuel oils was about 2 percent lower because of the lower yield—20.7 percent in 1953 compared with 21.2 in 1952. The larger amounts of distillate fuel oil in 1953, as in 1952, were produced in the following refinery districts and in the order shown: Texas Gulf Coast, East Coast, Indiana-Illinois-Kentucky, California, Louisiana Gulf Coast, and Oklahoma-Kansas-Missouri.

"Transfers" or light crude petroleums used as fuel by pipeline companies are considered part of the distillate-fuel-oil supply; however, the quantities involved represent only about 0.5 percent of the total. Crude petroleum transferred to distillate fuel oil declined 27 percent in 1953 over 1952.

Imports of distillate fuel oil increased 59 percent in 1953. The quantities imported, however, represented less than 1 percent of the overall supply. Netherland Antilles and Venezuela were the major sources, while important quantities also came from Saudi Arabia and Bahrein.

TABLE 64.—Sales of distillate fuel oil [1] in the United States, 1949–53, by district and State

[Thousands of barrels]

District [2] and State	1949	1950	1951	1952	1953
District 1:					
Connecticut	9,510	11,067	11,777	12,286	12,520
Delaware	1,013	1,285	1,556	1,702	1,861
District of Columbia	2,246	2,433	2,982	3,368	3,458
Florida	3,824	4,648	5,343	6,863	7,176
Georgia	2,604	3,202	3,962	4,262	4,119
Maine	2,576	3,496	3,935	4,276	4,514
Maryland	7,691	8,981	10,898	11,189	11,731
Massachusetts	19,741	22,769	27,261	28,064	27,925
New Hampshire	1,945	2,765	3,102	3,442	3,370
New Jersey	26,993	30,521	32,298	33,028	33,124
New York	45,252	52,173	56,334	59,373	59,604
North Carolina	3,491	4,354	5,490	6,360	7,381
Pennsylvania	20,849	28,266	34,585	35,827	36,513
Rhode Island	3,408	4,116	4,260	4,343	4,482
South Carolina	1,630	1,854	2,202	2,491	3,004
Vermont	1,054	1,117	1,166	1,212	1,321
Virginia	5,380	7,855	9,156	9,800	9,442
West Virginia	554	651	1,229	1,188	1,331
Total	159,761	191,553	217,536	229,074	232,876
District 2:					
Illinois	19,582	26,320	28,517	29,061	29,021
Indiana	8,080	10,776	13,205	13,968	15,166
Iowa	7,610	8,925	9,791	10,204	10,488
Kansas	3,185	4,527	5,552	5,695	5,938
Kentucky	1,956	2,274	2,753	3,250	3,359
Michigan	14,562	18,493	20,334	22,268	22,351
Minnesota	10,094	12,448	14,560	15,478	15,784
Missouri	6,822	7,815	8,684	10,224	10,854
Nebraska	3,386	3,707	3,829	4,071	4,378
North Dakota	1,616	1,939	2,026	2,456	2,425
Ohio	9,442	12,059	14,474	15,953	16,542
Oklahoma	1,929	1,928	2,223	2,192	2,436
South Dakota	1,510	1,893	2,133	2,399	2,626
Tennessee	2,125	3,062	3,428	3,487	3,628
Wisconsin	8,279	10,285	11,437	11,803	11,877
Total	100,178	126,451	142,946	152,509	156,873
District 3:					
Alabama	2,340	2,692	2,846	3,073	3,186
Arkansas	2,162	2,414	2,244	2,325	2,222
Louisiana	4,021	4,619	5,224	5,840	6,212
Mississippi	1,010	1,271	1,507	1,502	1,774
New Mexico	715	950	972	1,224	1,309
Texas	9,238	12,790	16,183	19,022	19,046
Total	19,486	24,736	28,976	32,986	33,749
District 4:					
Colorado	1,683	1,831	2,036	2,503	2,732
Idaho	1,562	1,770	2,291	2,457	2,595
Montana	1,965	2,478	2,851	3,063	3,553
Utah	1,474	2,001	2,334	3,263	3,542
Wyoming	1,504	1,732	1,893	2,103	2,294
Total	8,188	9,812	11,405	13,389	14,716
District 5:					
Arizona	1,021	1,020	1,233	1,341	1,329
California	21,232	19,212	22,031	23,875	24,063
Nevada	1,772	1,843	2,102	2,158	2,281
Oregon	6,343	7,725	8,534	8,974	8,680
Washington	11,215	12,954	14,145	14,904	14,277
Total	41,583	42,754	48,045	51,252	50,630
Total United States	329,196	395,306	448,908	479,210	488,844

[1] Includes diesel fuel oil.
[2] States are grouped according to petroleum-marketing districts rather than to conventional geographic regions.

Stocks of distillate fuel oil held at the close of 1953 represented a 46-day supply at the January 1954 daily rate of demand compared with a 48-day reserve at the end of 1952.

Rail and truck shipments of distillate fuel oils from California to other Western States declined from 548,000 barrels in 1952 to 456,000 in 1953. Tanker shipments of light fuel oils from California to the Atlantic seaboard have declined to negligible quantities in recent years and totaled only 6,000 barrels both in 1952 and 1953. Receipts of distillate fuel oils, including imports, in the West Coast marketing area were 2.9 million barrels in 1953 and comprised less than 5 percent of the total available supply.

Tanker shipments of distillate fuel oils from the Gulf area to the east coast, which have increased steadily in recent years, declined 6 million barrels in 1953. The quantity credited to Texas declined 3.7 million barrels from 1952, while that from Louisiana dropped 2.2 million barrels from 1952.

Barge shipments of distillate fuel oils from Texas, Louisiana, Mississippi, and Arkansas to ports on the Mississippi River and its tributaries according to records compiled by the Oil and Gas Division, United States Department of the Interior, increased from 7.1 million barrels in 1952 to 7.7 million in 1953. Quantities loaded at Texas ports declined 0.3 million barrels to 1.4 million in 1953, whereas shipments from Louisiana increased 1 million barrels to 4.7 million in 1953. Shippers in Arkansas and Mississippi were credited with 1.6 million barrels in 1953. The larger share, 7.4 million barrels, of the barge shipments was unloaded in district 2. District 3 received none by barge, but district 1 received 273,000 barrels in 1953.

Tanker rates for No. 2 distillate fuel oil shipped from Gulf ports to New York Harbor fluctuated considerably as reported in Platt's Oil Price Handbook. Posted at 43.7 cents a barrel at the end of 1952, the 1953 top rate of 47.5 cents a barrel was reached on June 17, and the "low" of 22.7 cents was posted on September 29 and reached 34.4 cents a barrel by the end of the year. The 1953 average was 32.6 cents a barrel compared with 68.9 cents for 1952.

Most of the representative distillate-fuel-oil prices were higher in 1953 than those prevailing in 1952; however, the quotation for No. 2 intended for shipment at refineries in Oklahoma to northern destinations was an exception, as it declined. Several minor changes in February and March reduced the March average to 7.57 cents a gallon. Slightly higher quotations posted in June set the price at 8.13 cents a gallon for the second half of the year. The average price for 1953 was 7.91 cents a gallon compared with 8.10 cents for 1952. The posting for No. 2 distillate at New York Harbor reached a "low" of 9.5 cents a gallon on April 28 and a "high" of 10 cents on October 15. The 1953 average was 9.68 cents a gallon, which was slightly higher than the 1952 average of 9.45 cents. A price of 10.2 cents a gallon for diesel fuel at shore plants at New York Harbor, dating from July 1952, remained in force until June 1953, when it was increased to 10.27 cents. Subsequent changes resulted in a quotation of 9.9 cents a gallon, dating from November 23, and an average of 10.22 cents for the year compared with 9.87 cents a gallon for 1952. The charge for diesel oil for ships at the larger harbors, New York, New Orleans, and San Pedro was slightly higher in 1953 than in 1952.

TABLE 65.—Monthly average prices of distillate fuel oil and diesel fuel in the United States, 1952–53

[Platt's Oil Price Handbook]

Year and grade	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
1952													
No. 2 Straw fuel oil at refineries, Oklahoma cents per gallon	(1)	(1)	8.26	8.20	8.19	8.09	7.88	7.71	7.81	7.84	7.88	7.88	8.10
No. 2 fuel oil at New York Harbor do	9.15	9.15	9.15	9.15	9.15	9.15	9.77	9.77	9.75	9.75	9.75	9.75	9.45
Diesel oil, shore plants, New York Harbor do	9.55	9.55	9.55	9.55	9.55	9.55	10.17	10.20	10.20	10.20	10.20	10.20	9.87
Diesel oil for ships:													
New York dollars per barrel	3.90	3.90	3.90	3.90	3.90	3.90	4.20	4.24	4.24	4.24	4.24	4.24	4.07
New Orleans do	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49
San Pedro do	3.44	3.44	3.44	3.44	3.44	3.44	3.44	3.44	3.44	3.44	3.44	3.44	3.44
1953													
No. 2 Straw fuel oil at refineries, Oklahoma cents per gallon	7.88	7.74	7.57	7.57	7.57	7.80	8.13	8.13	8.13	8.13	8.13	8.13	7.91
No. 2 fuel oil at New York Harbor do	9.75	9.75	9.75	9.73	9.50	9.59	9.68	9.63	9.63	9.90	9.83	9.50	9.68
Diesel oil, shore plants, New York Harbor do	10.20	10.20	10.20	10.20	10.20	10.27	10.32	10.28	10.28	10.34	10.24	9.90	10.22
Diesel oil for ships:													
New York dollars per barrel	4.24	4.24	4.24	4.24	4.24	4.29	4.36	4.34	4.34	4.34	4.27	4.13	4.27
New Orleans do	3.49	3.49	3.49	3.49	3.49	3.56	3.74	3.74	3.74	3.74	3.74	3.74	3.62
San Pedro do	3.44	3.67	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.09

[1] Not available.

TABLE 66.—Salient statistics of residual fuel oil in the United States, 1952–53, by month and district

[Thousands of barrels]

Month and district	Production		Yield (percent)		Transfers [1]				Imports		Exports		Domestic demand		Stocks, end of period	
					East of California		California									
	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]
By month:																
January	41,272	40,515	19.8	18.5	446	372	187	164	12,739	15,549	2,124	1,839	55,850	57,557	39,523	45,910
February	38,276	35,704	19.6	18.3	401	275	174	131	11,855	12,642	2,219	1,953	49,715	48,531	38,295	44,178
March	39,427	38,931	19.3	18.3	372	298	201	185	12,691	13,127	2,408	2,350	50,607	52,769	37,971	41,600
April	37,602	36,572	19.5	17.9	365	296	133	150	10,473	10,519	2,864	2,373	45,119	47,192	38,561	39,572
May	30,336	37,120	20.2	17.5	328	317	210	185	10,849	11,394	3,103	2,064	38,360	44,729	38,821	41,795
June	36,845	37,151	18.1	17.5	345	304	190	177	8,929	9,543	3,139	2,124	36,303	43,045	45,688	43,801
July	38,171	37,942	17.7	17.1	259	292	130	208	7,997	8,818	2,819	1,765	37,181	41,330	52,245	47,966
August	38,600	37,894	17.6	17.0	277	302	300	198	6,656	7,394	2,150	2,385	41,867	41,362	54,061	50,007
September	36,724	36,098	17.4	17.0	247	274	242	242	7,790	8,846	1,760	2,254	41,104	42,697	56,200	50,516
October	37,290	36,716	17.5	17.1	271	257	250	172	11,323	10,286	1,926	2,778	50,356	44,349	53,052	50,820
November	39,003	36,684	18.4	17.5	332	316	191	71	10,582	12,997	1,622	2,341	48,469	47,280	53,069	51,267
December	40,351	38,652	18.6	17.8	328	290	164	141	16,595	15,094	1,567	1,982	60,234	54,092	48,706	49,370
Total	453,897	449,979	18.6	17.6	3,971	3,593	2,372	2,024	128,479	136,209	27,701	26,208	555,165	564,933	48,706	49,370
By district:																
East Coast	85,514	84,650	22.2	21.6	-----	-----	-----	-----							12,298	11,530
Appalachian	9,997	9,931	14.9	13.6	-----	-----	-----	-----							787	1,103
Indiana, Illinois, Kentucky, etc	61,161	63,244	13.7	13.6	736	734	-----	-----							4,976	4,439
Oklahoma, Kansas, etc	21,435	18,774	10.7	8.8	236	326	-----	-----							1,491	1,157
Texas Inland	14,239	12,243	14.7	12.8	600	545	-----	-----	(3)	(3)	(3)	(3)	(3)	(3)	1,173	1,422
Texas Gulf Coast	90,322	88,874	15.7	14.5	255	282	-----	-----							6,895	6,221
Louisiana Gulf Coast	20,882	18,677	10.8	9.1	669	664	-----	-----							1,861	1,537
Arkansas, Louisiana Inland, etc	2,413	2,514	7.8	7.7	424	278	-----	-----							161	177
Rocky Mountain	17,306	16,288	19.6	17.6	1,051	764	-----	-----							1,135	735
California	130,628	134,784	36.4	36.1	-----	-----	2,372	2,024							17,929	21,049
Total	453,897	449,979	18.6	17.6	3,971	3,593	2,372	2,024	128,479	136,209	27,701	26,208	555,165	564,933	48,706	49,370

[1] Represents crude oil used as fuel on leases and for general industrial purposes.
[2] Preliminary figures.
[3] Figures not available.

RESIDUAL FUEL OIL

The production of residual fuel oils continued the downward trend of recent years, however, the 1953 output was only 1 percent less than in 1952. Decreased production in 1953 and a smaller quantity of "transfers" from crude were partly offset by a 6-percent increase in imports; thus the overall supply was fractionally (0.5 percent) higher than in 1952. Domestic demand was 2 percent greater in 1953, whereas exports declined 5 percent. Only 664,000 barrels of residual fuel oils were diverted to storage in 1953 compared with 5.9 million in 1952.

Domestic requirements for residual grades of fuel oil increased in the first 3 quarters of 1953, but a pronounced decline in the final 3 months resulted in a net gain of 2 percent for the year. The 8-percent decline in the fourth quarter was largely the result of curtailed purchases of heavy fuel oil by railroads, which were off 40 percent from the same quarter of 1952. Bunker loadings on vessels engaged in foreign trade were also off 3 percent, and electric power companies consumed 9 percent less residual fuel oil in the last quarter of 1953 than in the last quarter of 1952. Also the final quarter of 1953 was unusually warm, and a smaller quantity of heavy fuel oil was needed for space heating.

TABLE 67.—Sales of residual fuel oil [1] in the United States, 1949–53, by uses

[Thousands of barrels]

Use	1949	1950	1951	1952	1953
Railroads	63,467	60,878	54,998	[2] 40,489	28,477
Vessels (including tankers)	89,362	92,947	107,007	110,412	114,324
Gas and electric power plants	80,092	93,062	70,550	70,497	85,352
Smelters, mines, and manufacturing industries	122,633	148,111	157,279	158,373	166,748
Heating oils	60,414	72,716	76,164	79,151	81,824
U. S. Army, Navy, Air Force, and Coast Guard	22,724	28,333	38,054	37,185	30,435
Oil company fuel	51,667	53,263	54,056	54,421	51,243
Miscellaneous uses	4,574	4,898	5,280	5,745	6,326
Total United States	494,933	554,208	563,388	[2] 556,273	564,729
Exports and shipments to U. S. Territories and possessions	12,641	16,228	28,999	[2] 27,701	26,208
Total	507,574	570,436	592,387	[2] 583,974	590,937

[1] Includes Navy Grade and crude oil burned as fuel.
[2] Revised.

Deliveries of residual fuel oils to railroads declined 30 percent during the year, as the railroads continued to convert to diesel equipment. Military uses of heavy fuel oil were also 18 percent lower in the same period, while oil companies consumed 6 percent less in 1953. Sales for oil-company use declined because of a strong shift to competitive fuels, such as natural gas, refinery gas, and purchased electricity by the refinery branch of the petroleum industry.

Purchases of heavy fuel oils for bunkering of vessels increased 4 percent in 1953. Vessels engaged in foreign trade were reported to have consumed 2.9 million barrels more than in 1952 and vessels using coastal and inland waters 1.0 million barrels more.

Sales of residual fuel oils to gas and electric power plants increased 21 percent in 1953 over 1952 a result of much larger consumption by electric power plants, which increased 25 percent from 1952. Sales to manufactured-gas plants declined from 8.7 million barrels in 1952 to 7.0 million in 1953.

TABLE 68.—Sales of residual fuel oil [1] in the United States, 1949–53, by district and State

[Thousands of barrels]

District [2] and State	1949	1950	1951	1952	1953
District 1:					
Connecticut	14,515	16,845	14,888	13,475	14,377
Delaware	1,921	2,373	1,888	2,501	2,558
District of Columbia	1,427	1,188	1,688	1,915	2,035
Florida	15,671	17,009	20,322	24,789	27,343
Georgia	4,227	4,733	5,619	5,816	6,573
Maine	2,704	3,550	3,178	4,032	4,228
Maryland	13,521	14,168	15,814	14,852	15,323
Massachusetts	23,476	30,715	29,883	30,003	32,763
New Hampshire	1,175	1,873	2,326	2,295	2,467
New Jersey	37,973	49,092	44,775	44,153	47,667
New York	49,168	61,829	52,684	50,966	53,437
North Carolina	560	990	1,109	1,257	1,439
Pennsylvania	35,391	41,110	42,614	42,491	42,951
Rhode Island	8,508	10,891	10,030	9,756	10,993
South Carolina	2,610	3,652	4,145	5,230	5,332
Vermont	281	382	300	300	475
Virginia	12,200	12,883	18,037	20,294	15,523
West Virginia	1,366	1,587	1,464	1,337	1,526
Total	226,694	274,870	270,764	275,462	287,010
District 2:					
Illinois	15,570	19,517	20,257	20,455	20,823
Indiana	13,343	15,841	16,850	17,230	17,679
Iowa	1,176	1,321	1,365	1,217	1,051
Kansas	8,226	5,893	7,110	6,071	5,247
Kentucky	1,679	1,260	1,007	738	913
Michigan	11,403	12,708	13,743	14,153	14,809
Minnesota	1,467	2,432	2,431	2,430	2,370
Missouri	5,260	5,389	5,379	5,146	5,140
Nebraska	422	550	467	334	351
North Dakota	358	297	224	120	124
Ohio	16,779	18,004	18,017	17,670	18,698
Oklahoma	5,438	4,783	3,890	3,011	2,351
South Dakota	262	294	231	239	232
Tennessee	919	1,398	1,331	1,097	1,257
Wisconsin	1,515	1,712	1,861	2,042	2,118
Total	83,817	91,399	94,163	91,953	93,163
District 3:					
Alabama	1,891	2,271	2,417	2,677	3,873
Arkansas	1,833	2,273	2,051	1,497	1,006
Louisiana	15,220	11,221	10,953	10,422	9,929
Mississippi	314	348	257	173	163
New Mexico	460	696	532	831	696
Texas	48,481	48,560	50,464	46,508	41,978
Total	68,199	65,369	66,674	62,108	57,645
District 4:					
Colorado	783	1,050	1,068	1,203	1,124
Idaho	480	629	945	1,029	1,067
Montana	3,702	4,222	4,958	4,220	3,276
Utah	3,639	4,767	4,979	[3] 5,351	5,044
Wyoming	2,959	3,024	3,252	2,819	2,762
Total	11,563	13,692	15,202	[3] 14,622	13,273
District 5:					
Arizona	1,087	1,448	1,157	542	206
California	77,171	78,397	85,884	79,127	85,870
Nevada	1,514	2,889	2,685	2,266	2,048
Oregon	12,845	12,429	12,215	13,168	11,186
Washington	12,043	13,715	14,644	17,025	14,328
Total	104,660	108,878	116,585	112,128	113,638
Total United States	[3] 494,933	554,208	563,388	[3] 556,273	564,729

[1] Includes some crude oil burned as fuel.
[2] States are grouped according to petroleum-marketing districts rather than to conventional geographic regions.
[3] Revised.

Sales of residual fuel oils to smelters, mines, and manufacturing plants, which represent about 30 percent of the total market demand, increased 5 percent, and sales for space heating were up 3 percent in 1953.

Exports and shipments of residual fuel oils to the noncontiguous Territories of the United States, which represent about 5 percent of the overall demand, declined 5 percent in 1953. The larger quantities were credited to Canada, 5.8 million barrels; Mexico, 2.7 million; Cuba, 1.3 million; Chile, 1.1 million; and Japan, 7.7 million.

There was a 1-percent decline in the production of residual fuel oils in 1953 because of the lower percentage yield, which was 17.6 percent in 1953 compared with 18.6 percent in 1952, although crude runs at refineries increased 4 percent in 1953. All refinery districts reported lower production of residual fuel oils in 1953, except California, which supplies about 30 percent of the total and reported a 3-percent gain in 1953 over 1952; Indiana-Illinois-Kentucky, which represented 14-percent of the total reported a 3-percent increase in output in 1953; and Arkansas-Louisiana Inland which had a 4-percent gain. Production from the east coast, which furnishes about 19 percent of the residual fuel oils, dropped 1 percent in 1953, while in the Texas Gulf area, credited with a fifth of the total output, the decline was 2 percent.

Some heavy crude petroleums are used as fuel in the oil fields and for general industrial purposes and are considered "transfers" for accounting purposes. "Transfers" represent about 1 percent of the total supply and were 11 percent less than in 1952. Transfers for the California refinery district declined 15 percent in 1953, and in the other refinery areas the decline was 10 percent.

Imports of residual fuel oils in 1953 continued to increase and were 6 percent greater than in 1952. Imports of fuel oils represented 23 percent of the available supply in 1953 and came from 12 countries; however, the Netherland Antilles and Venezuela were the more important sources, as in 1952.

Residual-fuel-oil stocks held at the end of 1953 were only 1 percent above those for 1952. The California refinery district, where about 43 percent of the heavy fuel oils was held at the end of 1953, reported a 17-percent increase during the year, while quantities held in other refinery areas declined. Nearly a quarter of the stocks were in the East Coast district, where inventories dropped 6 percent during 1953. Heavy-fuel-oil stocks in the Indiana-Illinois-Kentucky district, about 9 percent of the total, were 11 percent lower at year's-end, while those held in the Texas Gulf Coast, which represented 13 percent of the national total, declined 10 percent.

Residual fuel oil year-end stocks held at petroleum refineries declined to 37.4 million barrels, a decrease of 300,000 barrels from 1952. An 8-percent increase was reported for quantities held at bulk plants and in pipelines.

Year-end stocks of heavy fuel oils represented a 28-day supply at the January 1954 daily rate of demand, compared with a 26-day supply on December 31, 1952.

Oil companies operating in the Pacific Coast area shipped 21.3 million barrels of residual fuel oils out of the area in 1953, 2.2 million barrels more than in 1952. Exports represented the larger share of these shipments and increased by 1.5 million barrels to 14.9 million in 1953. Shipments to Alaska and Hawaii also increased to 6.1 million barrels in 1953, while those conveyed by rail and by truck, small in volume, declined to 204,000 barrels in 1953. There were no tanker shipments of heavy fuel oils from California to the east coast in either 1952 or 1953. Imports and other shipments of residual grades of fuel oil into the West Coast marketing area declined from 1.7 million barrels in 1952 to 766,000 barrels in 1953.

Water movements of residual fuel oils from Gulf ports to Atlantic coast terminals increased 8 percent from 59.1 million barrels in 1952 to 63.9 million in 1953. Shipments from Texas increased 14 percent, whereas those from Louisiana declined 24 percent from 1952.

Barge shipments of heavy fuel oils from Gulf ports and Arkansas to terminals on the Mississippi River and its tributaries have fluctuated sharply from 6.1 million barrels in 1951 down to 2.8 million in 1952 and then up to 4.1 million in 1953. Texas shippers were credited with 3.2 million barrels of the total barge shipments in 1953 compared with 2 million barrels in 1952, and those from Louisiana increased from 786,000 barrels in 1952 to 913,000 in 1953. The quantity of residual fuel oils shipped by barge from Mississippi and Arkansas declined from 25,000 barrels in 1952 to 6,000 in 1953. There was little change in the quantity unloaded in district 1, whereas quantities unloaded in district 2 rose sharply from 656,000 barrels in 1952 to 1.9 million in 1953. One thousand barrels was reported for district 3 in 1952 but none in 1953.

There were numerous changes in 1953 in the tanker rate for Bunker "C" fuel oil shipped from Gulf coast ports to New York, with a sharp downward trend for the year. The rate of 43.8 cents a barrel on December 31, 1952, was reduced to 41.7 cents on January 7, 1953, and was the "high" for the year. The "low" of the year (22 cents a barrel) was posted on September 21, followed by an upward trend to 30.8 cents at the end of the year. The average rate for the year was 31.5 cents a barrel compared with 74.7 cents for 1952.

There were some nominal changes in representative residual-fuel-oil prices during 1953 compared with those prevailing in 1952. An average price of $1.03 a barrel dating from July 1952 for No. 6 fuel oil intended for shipments to northern destinations at refineries in Oklahoma was reduced to $1.00 on February 16, 1953. An upward trend started during June, and by the end of the year the rate quoted averaged $1.55 a barrel. The average for 1953 was $1.15 a barrel compared with $1.20 in 1952. No. 5 grade at New York Harbor dropped to $2.55 a barrel on January 16, 1953 for the "low" of the year, but subsequent changes in April and June increased it to $2.77, which held for the rest of the year. The quotation for Bunker "C" at New York Harbor followed a similar pattern, increasing from a "low" of $2.00 a barrel posted on January 19, 1953, to $2.25 on June 26, where it remained to the years-end. Bunker "C" at New Orleans was quoted at $1.60 a barrel from August 1952 to early April 1953, when it was increased to $1.70. Two price changes in June increased the rate to $1.95 a barrel for the second half of 1953. A posting of $1.70 a barrel for Bunker "C" at San Pedro, Calif., dating from January 1952 was changed to an average of $1.75 and then to $1.80 in February 1953, and this quotation was maintained until the year end.

TABLE 69.—Monthly average prices of residual fuel oil in the United States, 1952–53

[Platt's Oil Price Handbook]

Year and grade	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
1952													
No. 6 fuel oil at refineries, Oklahoma....dollars per barrel..	(1)	(1)	1.52	1.44	1.40	1.28	1.08	1.03	1.03	1.03	1.03	1.03	1.20
No. 5 fuel oil at New York Harbor.................do....	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.63	2.61	2.61	2.61	2.61	2.76
Bunker "C" for ships:													
New York.................................do....	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.16	2.10	2.10	2.10	2.10	2.31
New Orleans..............................do....	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.64	1.60	1.60	1.60	1.60	1.75
San Pedro................................do....	1.73	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
1953													
No. 6 fuel oil at refineries, Oklahoma....dollars per barrel..	1.03	1.01	1.00	1.00	1.00	1.10	1.19	1.20	1.21	1.26	1.37	1.49	1.15
No. 5 fuel oil at New York Harbor.................do....	2.58	2.55	2.55	2.61	2.62	2.67	2.77	2.77	2.77	2.77	2.77	2.77	2.68
Bunker "C" for ships:													
New York.................................do....	2.05	2.00	2.00	2.08	2.10	2.14	2.25	2.25	2.25	2.25	2.25	2.25	2.16
New Orleans..............................do....	1.60	1.60	1.60	1.68	1.70	1.77	1.95	1.95	1.95	1.95	1.95	1.95	1.80
San Pedro................................do....	1.70	1.73	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.79

[1] Not available.

LUBRICANTS

The total demand for lubricating oils and greases has shown great variation from year to year. The quantity for automotive use has been affected by the improvement of quality, so that less frequent changes are necessary, and by the increasing practice of reclaiming lubricating oil for reuse. Industrial uses may vary with changes in total industrial activity. No figures are available on the relative demand by uses.

Total demand declined from 54.2 million barrels in 1952 to 53.5 million in 1953, with a drop of 3.0 million barrels in exports more than offsetting a gain of 2.3 million in domestic demand. The daily average increase in domestic demand was 6.3 percent in 1953 compared with a 10.0 percent decline in 1952.

TABLE 70.—Salient statistics of lubricants in the United States, 1952–53, by month and district

Month and district	Production (thousands of barrels)		Yield (percent)		Domestic demand (thousands of barrels)		Stocks, end of period (thousands of barrels)	
	1952	1953 [1]	1952	1953 [1]	1952	1953 [1]	1952	1953 [1]
By month:								
January	4,963	4,210	2.4	1.9	3,381	3,032	9,856	11,250
February	4,456	3,596	2.3	1.8	2,830	2,931	10,049	11,224
March	4,921	4,321	2.4	2.0	2,989	3,229	10,169	11,134
April	4,831	4,271	2.5	2.1	3,510	3,625	10,154	10,801
May	3,492	4,572	2.3	2.2	2,530	3,444	9,610	10,873
June	4,855	4,293	2.4	2.0	3,409	3,470	9,694	10,611
July	4,668	4,321	2.2	1.9	3,224	3,905	9,775	9,879
August	4,857	4,627	2.2	2.1	3,345	3,646	9,620	9,684
September	4,694	4,562	2.2	2.2	3,437	3,563	9,745	9,700
October	4,940	4,647	2.3	2.2	3,709	3,384	9,869	9,726
November	4,507	4,553	2.1	2.2	2,800	3,211	10,561	9,846
December	4,416	4,572	2.0	2.1	3,001	3,041	11,021	10,070
Total	55,600	52,545	2.3	2.1	38,165	40,481	11,021	10,070
By district:								
East Coast	10,771	9,424	2.8	2.4			3,142	2,763
Appalachian	4,970	4,872	7.4	6.7			870	1,136
Indiana, Illinois, Kentucky, etc	5,220	4,917	1.2	1.1			1,180	1,145
Oklahoma, Kansas, etc	4,258	3,564	2.1	1.7			690	517
Texas Inland	133	145	.1	.2	[2]	[2]	7	18
Texas Gulf Coast	17,944	17,941	3.1	2.9			3,322	2,980
Louisiana Gulf Coast	5,555	4,939	2.9	2.4			805	475
Arkansas, Louisiana Inland, etc	1,965	1,930	6.4	5.9			138	202
Rocky Mountain	200	199	.2	.2			112	97
California	4,584	4,614	1.3	1.2			755	737
Total	55,600	52,545	2.3	2.1	38,165	40,481	11,021	10,070

[1] Preliminary figures.
[2] Figures not available.

Production of lubricants has become less concentrated geographically, so that the production by refinery districts is of special interest. The most important producing districts in 1953 were the Texas Gulf with 34.1 percent of the total, the East Coast with 17.9 percent, the Louisiana Gulf and the Indiana-Illinois with 9.4 percent each, the Appalachian district with 9.3 percent, and California with 8.8 percent of the total. The large percentage in the coastal districts is the result of the large export trade in lubricants that may be affected by new installations in foreign refineries.

TABLE 71.—Average monthly refinery prices of five selected grades of lubricating oil in the United States, 1952–53, in cents per gallon

[National Petroleum News]

Year and grade	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year
1952													
Oklahoma:													
200 viscosity, No. 3 color, neutral	18.00	17.05	16.81	16.50	16.50	15.55	15.00	15.00	14.81	14.50	14.45	13.19	15.61
150–160 viscosity at 210°, bright stock, 10–25 pour test	29.25	28.77	28.75	28.75	28.75	27.80	27.25	27.25	26.87	26.25	25.36	23.09	27.34
Pennsylvania:													
200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test	29.50	29.50	29.50	29.50	29.50	29.50	29.40	28.75	28.55	28.50	28.50	28.11	29.07
600 steam-refined, cylinder stock, filterable	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
South Texas: 500 viscosity, No. 2½–3½ color, neutral	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
1953													
Oklahoma:													
200 viscosity, No. 3 color, neutral	12.74	12.63	12.63	12.63	12.78	13.00	14.63	14.50	14.50	14.50	14.43	14.25	13.60
150–160 viscosity at 210°, bright stock, 10–25 pour test	22.22	21.46	21.24	21.00	20.48	19.75	21.14	20.77	20.75	20.75	20.62	19.88	20.84
Pennsylvania:													
200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test	27.58	26.00	26.00	26.00	25.77	25.17	25.00	25.00	25.00	23.26	22.80	22.50	25.00
600 steam-refined, cylinder stock, filterable	24.26	20.61	19.94	19.50	18.66	18.50	18.50	18.50	18.38	15.82	15.00	13.93	18.47
South Texas: 500 viscosity, No. 2½–3½ color, neutral	15.00	14.64	14.50	14.50	14.50	14.28	15.61	15.75	15.75	15.75	15.75	15.45	15.12

LIQUEFIED GASES

The sale of liquefied gases for fuel, chemical, motor-fuel, and industrial uses has expanded rapidly, and these gases now rank after kerosine in total demand. Liquefied gases are derived from two sources, production from liquids recovered from natural gas at natural gasoline and allied plants and at refineries from the treatment of still gas. The products are identical. The new supply consisted of 27 percent produced at oil refineries and 73 percent produced from natural gas.

The total demand for liquefied gases amounted to 124.4 million barrels in 1953, including exports of 3 million and a domestic demand of 121.4 million barrels, an increase of over 12 percent. In 1953 about 50 percent of the domestic sales was for domestic and commercial fuel uses, 20 percent for chemical uses, 10 percent for use in internal-combustion engines, and 8 percent for the production of synthetic rubber.

TABLE 72.—Salient statistics of wax in the United States, 1952–53, by type, month, and district

[Thousands of barrels] [1]

Month and district	Production						Domestic demand (all types)		Exports (all types)		Stocks, end of period					
	1952			1953 [2]							1952			1953 [2]		
	Micro-crys-taline	Fully refined	Other	Micro-crys-taline	Fully refined	Other	1952	1953 [2]	1952	1953 [2]	Micro-crys-taline	Fully refined	Other	Micro-crys-taline	Fully refined	Other
By month:																
January	27	167	157	50	178	150	298	301	83	79	85	225	383	90	199	284
February	32	172	154	34	185	137	266	298	105	94	82	215	383	86	197	254
March	24	184	133	65	198	172	225	334	84	108	93	232	387	86	182	262
April	26	173	138	47	234	143	283	363	75	88	86	228	377	86	192	225
May	24	141	122	44	227	168	267	329	71	103	82	212	336	89	206	215
June	27	184	135	51	236	154	267	354	77	91	97	229	316	98	188	220
July	26	160	145	41	192	165	280	304	87	97	99	208	299	92	199	212
August	29	202	184	45	197	155	301	296	100	80	95	205	320	93	210	221
September	27	196	152	42	188	190	302	332	93	102	88	201	311	85	199	226
October	43	205	156	53	197	186	350	320	88	96	86	192	288	95	198	237
November	41	186	154	55	216	163	296	316	92	90	87	197	275	108	198	252
December	30	195	180	58	203	159	308	341	81	99	81	200	294	105	172	261
Total	356	2,165	1,810	585	2,451	1,942	3,443	3,888	1,036	1,127	81	200	294	105	172	261
By district:																
East Coast	160	786	450	227	967	447					18	58	39	24	49	58
Appalachian	8	80	290	15	77	323					17	23	21	12	27	26
Indiana, Illinois, Kentucky, etc	5	208	34	9	206	3					1	10	77	2	8	37
Oklahoma, Kansas, etc	92	47	364	114	58	300					21	7	19	23	3	13
Texas Inland	4	-------	29	94	-------	-------	[3]	[3]	[3]	[3]	-------	-------	-------	18	-------	-------
Texas Gulf Coast	54	526	236	99	603	327					22	21	69	25	23	53
Louisiana Gulf Coast	23	155	398	22	143	533					1	7	32	1	6	33
Rocky Mountain	10	65	9	5	55	9					1	13	37	-------	10	41
California	-------	298	-------	-------	342	-------					-------	61	-------	-------	46	-------
Total	356	2,165	1,810	585	2,451	1,942	3,443	3,888	1,036	1,127	81	200	294	105	172	261

[1] Conversion factor: 280 pounds to the barrel.
[2] Preliminary figures.
[3] Figures not available.

JET FUELS

Data on jet fuels were first collected in 1952. At present, production is primarily for military aviation use and for a small export. Jet fuels are blended from various amounts of low-grade gasoline, distillate fuel, and kerosine at the refineries. In 1953 the average blend consisted of 70.2 percent gasoline, 18.3 percent kerosine, and 11.5 percent distillate fuel. The average percentages for 1952 were 71.4 percent gasoline, 16.9 percent kerosine, and 11.7 percent distillate fuel.

Total demand for jet fuels increased from 20.1 million barrels in 1952 to 34.9 million in 1953, a daily average gain of 74 percent. Exports were negligible in 1952 and 0.4 million barrels in 1953. Before 1952 jet-fuel data were included in the production, stocks, and demand of the products from which it was blended.

OTHER PRODUCTS

Wax.—Wax is used primarily for waterproofing containers and paper and for candles. In 1953 the total demand for wax was 5 million barrels, including exports of 1.1 million and a domestic demand of 3.9 million (converted at the rate of 280 pounds to the barrel).

Coke.—Petroleum coke is a residue of cracking operations and is used for electrodes, for refinery fuel, and as a domestic furnace fuel. Total demand was 21.3 million barrels in 1953, which included exports of 3.7 million barrels and a domestic demand of 17.6 million barrels (converted at the rate of 5 barrels to the short ton). About 43 percent of the total production was in the Indiana-Illinois refinery district, where intensive cracking operations produce a high percentage of gasoline and distillate fuel.

TABLE 73.—Average monthly refinery price of 124°–126° white crude scale wax at Pennsylvania refineries, 1949–53, in cents per pound

[National Petroleum News]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year
1949	5.38	5.23	5.28	5.25	4.97	4.95	4.92	4.90	4.18	3.98	4.60	4.63	4.85
1950	4.24	3.63	3.63	3.63	3.59	3.50	3.51	3.80	4.35	4.94	5.52	6.58	4.24
1951	6.64	6.63	6.63	6.55	6.30	6.10	5.75	5.47	5.31	5.26	5.24	5.13	5.92
1952	4.83	4.73	4.40	4.38	4.35	4.25	4.14	4.12	3.93	3.88	3.82	3.81	4.22
1953	3.81	3.81	3.90	4.34	4.56	4.85	5.00	5.00	5.00	5.00	5.00	5.00	4.61

Still Gas.—The production of still gas increased from 95.3 million barrels in 1952 to 102.2 million in 1953 or from 343 billion cubic feet to 480 billion. The conversion from cubic feet, as reported, to barrels is in terms of the crude-oil equivalent to balance the refinery input and output and not on the basis of actual heating value. Most of the still gas is consumed as refinery fuel.

TABLE 74.—Salient statistics of petroleum coke in the United States, 1952–53, by month and district [1]

Month and district	Production (thousands of barrels)		Yield (percent)		Domestic demand (thousands of barrels)		Stocks, end of period (thousands of barrels)	
	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]	1952	1953 [2]
By month:								
January	1,657	1,683	0.8	0.8	1,203	1,284	670	555
February	1,551	1,622	.8	.8	1,076	1,205	710	649
March	1,604	1,668	.8	.8	1,241	1,342	818	700
April	1,479	1,707	.8	.8	888	1,406	797	769
May	1,003	1,850	.7	.9	700	1,404	788	948
June	1,335	1,752	.7	.8	1,060	1,523	612	775
July	1,529	1,869	.7	.8	1,310	1,666	517	705
August	1,583	1,920	.7	.9	1,206	1,492	490	769
September	1,616	1,885	.8	.9	1,343	1,593	484	781
October	1,568	1,821	.7	.8	1,303	1,666	435	603
November	1,553	1,900	.7	.9	1,198	1,622	482	686
December	1,645	1,930	.8	.9	1,395	1,394	513	860
Total	18,123	21,607	.7	.8	13,923	17,597	513	860
By district:								
East Coast	1,439	1,515	.4	.4	(3)	(3)	-------	-------
Appalachian	257	285	.4	.4			1	3
Indiana, Illinois, Kentucky, etc.	8,503	9,267	1.9	2.0			167	541
Oklahoma, Kansas, etc.	1,490	2,508	.7	1.2			48	121
Texas Inland	347	339	.4	.4			37	29
Texas Gulf Coast	1,432	1,788	.2	.3			2	2
Louisiana Gulf Coast	1,023	1,681	.5	.8			-------	13
Arkansas, Louisiana Inland	675	874	2.2	2.7			60	54
Rocky Mountain	818	1,165	.9	1.3			17	61
California	2,139	2,185	.6	.6			181	36
Total	18,123	21,607	.7	.8	13,923	17,597	513	860

[1] Conversion factor: 5.0 barrels to the short ton.
[2] Preliminary figures.
[3] Figures not available.

TABLE 75.—Production of still gas in the United States, 1951–53, by districts

District	1951		1952		1953 [1]	
	Millions of cubic feet	Equivalent, in thousands of barrels	Millions of cubic feet	Equivalent, in thousands of barrels	Millions of cubic feet	Equivalent, in thousands of barrels
East Coast	44,388	12,330	46,404	12,890	56,733	13,057
Appalachian	13,914	3,865	14,015	3,893	15,803	4,204
Indiana, Illinois, Kentucky, etc.	79,103	21,973	78,448	21,791	94,354	22,753
Oklahoma, Kansas, etc.	26,327	7,313	25,193	6,998	30,730	6,887
Texas Inland	12,193	3,387	15,242	4,234	21,928	4,848
Texas Gulf Coast	88,672	24,631	82,879	23,022	131,875	26,133
Louisiana Gulf Coast	19,076	5,299	16,693	4,637	32,709	5,729
Arkansas, Louisiana Inland, etc.	4,770	1,325	3,809	1,058	5,448	1,115
Rocky Mountain	11,361	3,156	12,215	3,393	15,707	3,648
California	46,854	13,015	48,092	13,359	74,358	13,869
Total	346,658	96,294	342,990	95,275	479,645	102,243

[1] Preliminary figures.

Asphalt and Road Oil.—These products are used primarily in building materials and in road construction. In 1953 total demand for asphalt amounted to 73.8 million barrels, including exports of 1.7 million and a domestic demand of 72.1 million barrels (converted at the rate of 5.5 barrels to the short ton). The domestic demand for road oil was 6.6 million barrels. Sales of asphalt and types of products are contained in the Asphalt chapter of the Minerals Yearbook.

Miscellaneous Oils.—The production of miscellaneous oils rose from 7.3 million barrels in 1952 to 9.1 million in 1953.

TABLE 76.—Production of miscellaneous finished oils in the United States in 1953, by district and class

[Thousands of barrels]

District	Petrolatum [1]	Absorption oil	Medicinal oil	Specialties	Solvents	Other	Total
East Coast	62		32	454	116	1	665
Appalachian	181		23	52			256
Indiana, Illinois, Kentucky, etc	137			767		211	1,115
Oklahoma, Kansas, etc	246	187		82		64	579
Texas Inland		1,365		8		305	1,678
Texas Gulf Coast	110	180		240		293	823
Louisiana Gulf Coast	5	114		1,138			1,257
Arkansas, Louisiana Inland, etc	58	661		3	33		755
Rocky Mountain	1					36	37
California		20	44	583	255	1,024	1,926
Total	800	2,527	99	3,327	404	1,934	9,091

[1] Conversion factor: 300 pounds to the barrel.

INTERCOASTAL SHIPMENTS

The major intercoastal shipment of crude oil and products was from Gulf-coast ports to east-coast ports. In the past considerable quantities have moved from the west coast to the east coast, but in 1953 totaled only 0.7 million barrels.

Total Gulf–east-coast shipments amounted to 620.9 million barrels in 1953, a gain of 6.7 million over 1952. Crude-oil shipments totaled 176.8 million barrels, a decline of 2.9 million, while product shipments totaled 444.1 million barrels in 1953, a gain of 9.6 million. The principal changes by products were increases of 11.2 million barrels for gasoline and 4.8 million for residual oil and decreases of 5.9 million for distillate fuel and 2.9 million barrels for kerosine. The continued decline in crude shipments is related to the increase in imports. The increased gasoline shipments reflected the strong market for that product in 1953, whereas the declines in distillate fuel and kerosine were evidence of the relatively weak demand for heating oils in 1953.

FOREIGN TRADE [1]

Foreign trade statistics in this section are as reported by the United States Department of Commerce and may differ slightly from those in other sections of this chapter. Bureau of Mines petroleum import data pertain to continental United States only, while export statistics include not only foreign countries, but also shipments to the Territories. Crude-petroleum imports shown elsewhere are obtained by the Bureau of Mines from petroleum companies in order to balance refinery reports and do not provide a country of origin and country of destination breakdown, as do Department of Commerce statistics.

[1] By F. X. Jordan, Oil and Gas Division, U. S. Department of the Interior.

TABLE 77.—Mineral oils, crude and refined, shipped commercially from Gulf coast to east coast ports of the United States, 1952–53, by classes [1]

[Thousands of barrels]

Year and class	January	February	March	April	May	June	July	August	September	October	November	December	Total
1952													
Crude petroleum	15,179	14,209	13,245	14,387	16,079	15,889	14,341	15,385	15,912	14,296	14,435	16,361	179,718
Gasoline	12,386	13,384	17,270	16,585	9,910	15,055	15,762	17,223	15,230	15,630	14,829	14,534	177,798
Kerosine	4,858	4,221	4,269	3,468	1,636	2,700	3,471	3,074	2,431	3,241	4,021	4,393	41,783
Distillate fuel oil	14,456	16,448	14,553	11,735	6,915	9,429	10,053	10,438	7,177	8,513	11,651	16,286	137,654
Residual fuel oil	5,283	4,398	4,953	6,592	1,989	3,735	4,022	5,577	5,114	5,926	5,505	6,028	59,122
Lubricating oils	539	606	1,097	593	472	888	522	565	598	725	381	769	7,755
Miscellaneous oils	496	497	407	642	444	1,151	1,024	1,320	1,239	1,224	1,127	846	10,417
Total	53,197	53,763	55,794	54,002	37,445	48,847	49,195	53,582	47,701	49,555	51,949	59,217	614,247
1953													
Crude petroleum	14,988	12,588	15,251	14,096	15,678	15,457	16,899	15,066	13,905	13,534	13,493	15,836	176,791
Gasoline	14,524	13,555	14,208	16,543	16,618	16,573	17,226	17,183	16,047	16,868	15,012	14,662	189,019
Kerosine	4,716	3,709	3,868	2,206	2,573	2,180	3,289	2,706	2,266	3,462	3,489	4,466	38,930
Distillate fuel oil	17,440	10,814	10,976	10,087	9,350	8,277	8,399	9,318	9,922	10,239	11,418	15,493	131,733
Residual fuel oil	5,204	5,440	5,119	5,075	6,804	5,277	4,500	5,670	5,241	4,429	4,872	6,245	63,876
Lubricating oils	577	714	668	589	727	593	642	721	735	638	465	834	7,903
Miscellaneous oils	1,338	1,200	1,213	901	1,017	1,093	953	832	712	1,259	1,035	1,112	12,665
Total	58,787	48,020	51,303	49,497	52,767	49,450	51,908	51,496	48,828	50,429	49,784	58,648	620,917

[1] Oil and Gas Division, U. S. Department of the Interior.

Imports.—According to Bureau of Mines data, total imports of crude petroleum and petroleum products into continental United States in 1953 averaged 1,050,000 barrels daily, an increase of 10 percent over the previous year. Crude petroleum and residual fuel oil together comprised 97 percent of the total mineral-oil imports in both years. Crude petroleum alone represented 62 percent of the total imports in 1953 compared with 60 percent in 1952. Imported mineral oils constituted 12.8 percent of the total new supply of mineral oils in continental United States in 1953 compared with 12.2 percent in 1952. Total imports of mineral oils exceeded total exports, including shipments to the Territories, by 161 percent in 1953 compared with 120 percent in 1952.

According to United States Department of Commerce data, in 1953 crude-petroleum imports rose 13 percent above 1952. Venezuela continued to be the principal supplier of crude petroleum to the United States, but the Venezuelan share of the total decreased from 58 percent in 1952 to 50 percent in 1953, as imports from that source dropped 3.3 million barrels. Crude imports from Mexico decreased nearly one-half from the previous year. Canadian receipts continued to rise and again were more than twice the volume of the previous year. Crude-petroleum imports from the countries of the Middle East increased 41 percent. Receipts from Qatar were almost 8 times as large as in 1952, from Kuwait 45 percent higher, from Saudi Arabia 26 percent higher, and from Iraq 124 percent higher. There were no imports of Iranian crude oil. Receipts of crude petroleum from Sumatra, Indonesia, rose from 3.6 million barrels to 14.4 million barrels in 1953; as a result, there were no imports of crude petroleum from British Borneo (transshipped from British Malaya), as in 1952.

Residual-fuel-oil imports into continental United States and the Territories increased 6 percent in 1953. The Netherland Antilles and Venezuela supplied 92 percent of the total in 1953 compared with 98 percent in 1952. Receipts from the Netherland Antilles were almost 13 million barrels lower than in 1952, but offsetting was the 12-million-barrel gain in receipts from Venezuela. Residual-fuel-oil imports from Mexico were significantly higher in 1953 than in 1952. Comparatively minor volumes of residual fuel oil were received from both France and Italy in 1953.

Imports of distillate fuel oil increased 1.4 million barrels, and the Netherland Antilles and Venezuela continued to supply the bulk of this product; the Middle East countries of Bahrain and Saudi Arabia supplied virtually all of the balance.

Unfinished-oil imports as reported by the United States Department of Commerce decreased 38 percent from 1952. Receipts from Mexico dropped 1.9 million barrels and those from Venezuela almost 1 million barrels; however, Trinidad, which had shipped no unfinished oils to the United States in 1952, shipped 1.6 million barrels of these oils during 1953.

TABLE 78.—Mineral oils, crude and refined, imported into continental United States, 1952–53,[1] by months

[Thousands of barrels]

Year and class	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1952													
Crude petroleum	15,123	14,228	15,817	16,170	16,903	17,434	18,519	19,596	18,459	19,948	18,709	18,685	209,591
Refined products:													
Gasoline	89	70	4	2	819	308	277	149	9	11	13	10	1,761
Distillate fuel oil	203	255	321	160	252	74	404	86	33	536	170	248	2,742
Residual fuel oil	12,739	11,855	12,691	10,473	10,849	8,929	7,997	6,656	7,790	11,323	10,582	16,595	128,479
Asphalt	199	238	134	183	224	236	248	197	380	262	100	296	2,697
Unfinished oils	417	457	275	666	298	406	183	108	70	112	57	188	3,237
Tota	28,770	27,103	29,242	27,654	29,345	27,387	27,628	26,792	26,741	32,192	29,631	36,022	348,507
1953 [2]													
Crude petroleum	19,098	16,400	20,320	18,839	21,798	21,207	19,513	20,847	20,757	19,806	19,444	18,547	236,576
Refined products:													
Gasoline	4	8	141	9	7	142	4	2	2	3	135	2	459
Distillate fuel oil	285	513	397	322	321	183	576	493	340	189	297	439	4,355
Residual fuel oil	15,549	12,642	13,127	10,519	11,394	9,543	8,818	7,394	8,846	10,286	12,997	15,094	136,209
Asphalt	170	126	162	235	166	259	241	323	187	65	170	283	2,387
Unfinished oils	70	166	329	184	282	171	173	268	267	340	548	373	3,171
Tota	35,176	29,855	34,476	30,108	33,968	31,505	29,325	29,327	30,399	30,689	33,591	34,738	383,157

[1] Imports of crude reported to Bureau of Mines; imports of refined products compiled from records of U. S. Department of Commerce; figures may differ slightly from those used in other sections of this chapter.

[2] Preliminary figures.

TABLE 79.—Crude petroleum and petroleum products imported for consumption into continental United States, 1952–53, by countries, in thousands of barrels [1]

[U. S. Department of Commerce]

Country	Crude petroleum	Gasoline [2]	Kerosine	Distillate oil [3]	Residual oil [4]	Asphalt	Unfinished oil	Miscellaneous oils	Total
1952									
North America:									
Canada	[5] 1,113	[5] 999	(6)	14	48	(6)	[5] 145	1	2,320
Canal Zone				4	4				8
Dominican Republic						(6)			(6)
Jamaica					5				5
Mexico	8,344				1,168		1,852		11,364
Netherlands Antilles		605	20	[5] 1,915	[5] 98,461	2,641	3		103,645
Trinidad and Tobago		101	9	23	[5] 1,615	29			1,777
Total	[5] 9,457	[5] 1,705	29	[5] 1,956	[5] 101,301	2,670	[5] 2,000	1	119,119
South America:									
Argentina					(6)				(6)
Brazil	(6)								(6)
Chile				1					1
Colombia	16,234								16,234
Ecuador	(6)								(6)
Venezuela	119,325	[5] 271		[5] 599	[5] 30,641	65	1,237		152,138
Total	135,559	[5] 271		[5] 600	[5] 30,641	65	1,237		168,373
Europe:									
Belgium-Luxembourg								(6)	(6)
France				(6)	1			(6)	1
Germany, West					(6)	(6)		(6)	(6)
Italy								(6)	(6)
Netherlands						(6)		(6)	(6)
Norway				(6)	(6)				(6)
Switzerland		(6)						(6)	(6)
Trieste					1				1
United Kingdom	(6)					(6)	(6)	(6)	(6)
Total	(6)	(6)		(5 6)	2	(6)	(6)	(6)	2
Asia:									
Bahrain				442	36				478
British Malaya	1,605			1	6				1,612
India					5				5
Indonesia	3,648				162				3,810
Iraq	706								706
Japan					33				33
Kuwait	26,652								26,652
Qatar	[7] 404				2				406
Saudi Arabia	[5] 29,461	49		552	2				30,064
Total	62,476	49		995	246				63,766
Africa: Spanish					2				2
Grand total	[5] 207,492	[5] 2,025	29	[5] 3,551	[5] 132,192	2,735	[5] 3,237	1	351,262
Imports into United States Territories and possessions from foreign countries:									
Alaska		1							1
Hawaii		49		[5] 746	[5] 709				1,504
Puerto Rico		[5] 316	29	[5] 50	[5] 2,939	41			3,375
Total		[5] 366	29	[5] 796	[5] 3,648	41			4,880
Total net imports into continental United States	[5] 207,492	[5] 1,659		[5] 2,755	[5] 128,544	2,694	[5] 3,237	1	346,382

For footnotes, see end of table.

TABLE 79.—Crude petroleum and petroleum products imported for consumption into continental United States, 1952–53, by countries, in thousands of barrels[1]—Continued

[U. S. Department of Commerce]

Country	Crude petroleum	Gasoline[2]	Kerosine	Distillate oil[3]	Residual oil[4]	Asphalt	Unfinished oil	Miscellaneous oils	Total
1953									
North America:									
Canada	2,650	58	(6)	3	147	(6)	150	1	3,009
Leeward and Windward Islands					33				33
Mexico	4,342			8	7,422				11,772
Netherlands Antilles		440		2,348	85,539	2,490	2		90,819
Trinidad and Tobago				1	2,380	13	1,569		3,963
Total	6,992	498	(6)	2,360	95,521	2,503	1,721	1	109,596
South America:									
Colombia	15,200				434				15,634
Ecuador	90								90
Venezuela	116,059			1,567	42,613	45	291		160,575
Total	131,349			1,567	43,047	45	291		176,299
Europe:									
France					488			(6)	488
Germany, West						(6)		(6)	(6)
Italy					208				208
Netherlands						2		(6)	2
Switzerland		(6)						(6)	(6)
United Kingdom		(6)	(6)		(6)	(6)		(6)	(6)
Total		(6)	(6)		696	2		(6)	698
Asia:									
Bahrain		5		246					251
Indonesia	14,426								14,426
Iraq	1,576								1,576
Japan					9				9
Kuwait	38,569								38,569
Qatar	[7] 3,150								3,150
Saudi Arabia	37,150	84		826	256				38,316
Total	94,871	89		1,072	265				96,297
Oceania: Australia								(6)	(6)
Grand total	233,212	587	(6)	4,999	139,529	2,550	2,012	1	382,890
Imports into United States Territories and possessions from foreign countries:									
Alaska		5							5
Hawaii		89		646	106				841
Puerto Rico		35		24	3,323	46			3,428
Total		129		670	3,429	46			4,274
Total net imports into continental United States	233,212	458	(6)	4,329	136,100	2,504	2,012	1	378,616

[1] Compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of U. S. Department of Commerce.
[2] Includes naphtha but excludes benzol (thousand barrels: 1952—1,041; 1953—490).
[3] Includes quantities imported free of duty for supplies of vessels and aircraft.
[4] Includes quantities imported free for manufactures in bond and export, and for supplies of vessels and aircraft.
[5] Revised figure.
[6] Less than 1,000 barrels.
[7] Assumed source; classified in import statistics under "Arabia Peninsular States, N. E. C."

TABLE 80.—Mineral oils, crude and refined, shipped from continental United States, including shipments to Territories and possessions, 1952–53, by class and month [1]

[Thousands of barrels]

Year and class	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1952													
Crude petroleum	2,303	2,211	2,939	3,340	1,718	2,388	1,876	1,966	1,664	1,526	1,805	2,960	26,696
Refined products:													
Gasoline [2]	3,111	2,620	2,497	3,052	1,556	2,470	3,390	3,031	2,785	3,194	3,996	4,583	36,285
Kerosine	830	259	728	697	997	808	849	626	722	428	404	473	7,821
Distillate fuel oil	2,081	1,911	1,461	3,040	2,915	3,855	3,202	2,557	3,456	3,034	3,232	2,771	33,515
Residual fuel oil	2,124	2,219	2,408	2,864	3,103	3,139	2,819	2,150	1,760	1,926	1,622	1,567	27,701
Lubricants	1,344	1,433	1,812	1,336	1,506	1,362	1,363	1,667	1,131	1,107	1,015	955	16,031
Paraffin wax	82	105	84	75	71	77	87	100	94	88	92	81	1,036
Coke	301	435	255	613	312	451	314	404	279	315	307	219	4,205
Asphalt	131	131	215	197	220	246	195	178	161	244	203	180	2,301
Liquefied gases	187	188	208	210	188	163	183	193	240	214	204	224	2,402
Miscellaneous oils	17	20	21	17	17	10	17	15	13	15	12	21	195
Total refined	10,208	9,321	9,689	12,101	10,885	12,581	12,419	10,921	10,641	10,565	11,087	11,074	131,492
Total crude and refined	12,511	11,532	12,628	15,441	12,603	14,969	14,295	12,887	12,305	12,091	12,892	14,034	158,188
1953 [3]													
Crude petroleum	2,211	2,011	2,171	2,833	1,611	1,824	1,232	1,321	1,109	1,178	1,052	1,378	19,931
Refined products:													
Gasoline [2]	3,293	2,991	3,022	4,053	2,949	2,601	3,447	3,065	3,439	2,716	3,296	3,048	37,920
Kerosine	410	448	814	931	557	976	479	427	526	401	567	676	7,212
Distillate fuel oil	2,359	3,791	3,322	3,123	2,928	2,999	2,394	1,619	2,152	2,596	2,309	2,677	32,269
Residual fuel oil	1,839	1,953	2,350	2,373	2,064	2,124	1,765	2,385	2,254	2,778	2,341	1,982	26,208
Jet fuel	13	----	----	44	----	139	93	----	119	1	----	----	409
Lubricants	949	691	1,182	979	1,056	1,085	1,148	1,176	983	1,237	1,222	1,307	13,015
Paraffin wax	79	94	108	88	103	91	97	80	102	96	90	99	1,127
Coke	357	323	275	232	267	402	273	364	280	333	195	362	3,663
Asphalt	228	197	157	231	129	149	113	57	70	94	80	162	1,667
Liquefied gases	224	243	228	251	267	242	229	290	258	217	222	331	3,002
Miscellaneous oils	17	12	20	21	22	24	22	21	18	18	24	25	244
Total refined	9,768	10,743	11,478	12,326	10,342	10,832	10,060	9,484	10,201	10,487	10,346	10,669	126,736
Total crude and refined	11,979	12,754	13,649	15,159	11,953	12,656	11,292	10,805	11,310	11,665	11,398	12,047	146,667

[1] Compiled from records of the U. S. Department of Commerce, except Alaska and Hawaii, which are Bureau of Mines data; figures may differ slightly from those used in other sections of this chapter.
[2] Includes benzol, naphtha, natural gasoline, and antiknock compounds.
[3] Preliminary figures.

TABLE 81.—Crude petroleum and petroleum products exported from continental United States, 1952–53, by countries of destination, and shipments to and exports from Territories and possessions, in thousands of barrels [1]

[U. S. Department of Commerce]

Country	Crude petroleum	Gasoline [2,3]	Kerosine	Distillate oil	Residual oil	Lubricating oil [2]	Asphalt	Liquefied petroleum gases	Wax	Coke	Petrolatum	Miscellaneous products [2]	Total
1952													
North America:													
Canada	[4] 20,172	[4] 4,400	[4] 788	[4] 9,499	[4] 7,016	620	17	1,017	125	1,669	11	49	45,383
Canal Zone	----------	127	----------	427	326	5	30	1	(5)	----------	(5)	(5)	916
Costa Rica	----------	35	8	21	6	7	29	(5)	6	----------	(5)	1	113
Cuba	2,513	1,213	(5)	[4] 234	[4] 1,766	85	4	82	20	----------	1	17	5,935
Mexico	----------	2,785	119	373	[4] 2,140	290	161	947	278	(5)	4	33	7,130
Netherland Antilles	----------	[4] 1,183	----------	[4] 6,626	364	43	1	(5)	----------	----------	1	(5)	8,218
Other North America	----------	58	56	219	544	61	11	26	41	----------	5	13	1,034
Total	[4] 22,685	[4] 9,801	[4] 971	[4] 17,399	[4] 12,162	1,111	253	2,073	470	1,669	22	113	68,729
South America:													
Argentina	[4] 1,789	(5)	276	336	----------	336	1	(5)	----------	----------	(5)	(5)	2,738
Brazil	----------	132	54	30	----------	450	16	262	25	6	3	19	997
Chile	----------	5	(5)	49	1,327	64	14	(5)	5	----------	1	8	1,473
Colombia	----------	1	(5)	(5)	----------	28	54	(5)	135	----------	2	6	226
Uruguay	----------	134	120	----------	----------	18	1	(5)	(5)	----------	1	4	278
Venezuela	----------	4	----------	----------	----------	45	1	(5)	40	----------	2	22	114
Other South America	----------	5	2	138	----------	36	12	(5)	53	(5)	1	11	258
Total	[4] 1,789	281	452	553	1,327	977	99	262	258	6	10	70	6,084
Europe:													
Belgium-Luxembourg	----------	212	1	443	46	568	9	(5)	13	----------	6	7	1,305
Denmark	----------	8	48	28	----------	75	----------	----------	1	----------	(5)	1	161
France	685	2	----------	----------	(5)	207	170	(5)	30	238	6	6	1,344
Germany, West	----------	419	----------	207	----------	70	----------	----------	1	15	3	2	717
Italy	185	63	(5)	(5)	----------	217	1	(5)	55	107	4	18	650
Netherlands	106	(5)	1	593	----------	307	(5)	(5)	6	----------	5	11	1,029
Norway	----------	338	16	1,180	469	42	(5)	----------	5	216	1	4	2,271
Sweden	----------	188	8	1,131	289	126	(5)	(5)	4	23	1	6	1,776
Switzerland	----------	(5)	(5)	53	----------	22	5	(5)	5	98	1	3	187
Turkey	----------	53	80	22	----------	205	15	----------	2	----------	(5)	25	402
United Kingdom	499	[4] 1,282	[4] 1,161	[4] 4,500	1,039	[4] 1,815	----------	(5)	43	1	48	(5)	10,388
Other Europe	----------	9	(5)	(5)	61	366	26	(5)	46	74	7	11	600
Total	1,475	[4] 2,574	[4] 1,315	[4] 8,157	1,904	[4] 4,020	226	(5)	211	772	82	94	20,830

Asia:													
Aden	----	----	----	[4]1,446	323	2	----	----	----	----	(5)	(5)	1,771
India	----	[4]558	[4]1,938	703	51	776	306	----	2	----	7	12	4,353
Indochina	----	1	----	----	----	51	281	----	(5)	----	4	10	347
Indonesia	----	1	----	----	----	60	131	(5)	1	----	9	9	211
Japan	748	568	----	505	4,493	130	3	(5)	28	1,480	9	70	8,034
Pakistan	----	74	217	115	150	133	167	----	(5)	----	3	4	863
Philippines	----	6	1	----	68	116	84	13	17	----	2	12	319
Other Asia	----	13	86	66	336	399	393	(5)	33	237	15	36	1,614
Total	748	[4]1,221	[4]2,242	[4]2,835	5,421	1,667	1,365	13	81	1,717	49	153	17,512
Africa:													
Belgian Congo	----	11	2	----	[4]15	48	32	----	(5)	(5)	1	7	116
Egypt	----	(5)	1,930	572	102	[4]263	----	----	(5)	----	4	4	2,875
French West Africa	----	10	29	24	51	27	2	----	(5)	----	(5)	7	150
Mozambique	----	173	(5)	62		18	6	(5)	(5)	----	(5)	2	261
Union of South Africa	----	564	(5)	290	----	279	106	2	12	(5)	15	40	1,308
Other Africa	----	146	40	544	118	278	7	(5)	1	----	4	48	1,186
Total	----	904	2,001	1,492	[4]286	[4]913	153	2	13	(5)	24	108	5,896
Oceania:													
Australia	----	[4]1,066	1	315	686	460	(5)	(5)	2	----	5	3	2,538
New Zealand	----	307	1	143	433	101	38	2	1	----	2	1	1,029
Other Oceania	----	13	5	33	24	3	3	(5)	----	----	(5)	(5)	81
Total	----	[4]1,386	7	491	1,143	564	41	2	3	----	7	4	3,648
Grand total	[4]26,697	[4]28,772	[4]6,988	[4]30,927	[4]22,243	[4]15,300	2,137	2,352	1,036	4,164	194	584	141,394
Shipments from continental United States to Territories and possessions:													
Alaska and Hawaii [6]	(7)	4,716	167	2,581	5,466	123	127	49	(7)	40	(7)	----	13,269
Puerto Rico	(7)	[8]2,358	656	229	(7)	[8]57	43	----	(7)	(7)	(7)	5	3,348
Wake	(7)	[8]488	(5)	20	(7)	(8)	17	----	(7)	(7)	(7)	(5	525
Other	(7)	[8]67	21	35	(7)	[8]4	(5)	----	(7)	(7)	(7)	(5)	127
Total	(7)	[8]7,629	844	2,865	5,466	[8]184	187	49	(7)	40	(7)	5	17,269
Exports from noncontiguous Territories and possessions to foreign countries:													
Alaska	----	117	9	203	[4]8	(5)	----	----	----	----	----	(5)	337
Other	----	1	----	[4]74	----	(4 5)	----	----	(5)	----	(5)	(5)	75
Total	----	118	9	[4]277	[4]8	(5)	----	----	(5)	----	(5)	(5)	412
Total net shipments from continental United States	[4]26,697	[4]36,283	[4]7,823	[4]33,515	[4]27,701	[4]15,484	2,324	2,401	1,036	4,204	194	589	158,251

TABLE 81.—Crude petroleum and petroleum products exported from continental United States, 1952–53, by countries of destination, and shipments to and exports from Territories and possessions, in thousands of barrels [1]—Continued

[U. S. Department of Commerce]

Country	Crude petroleum	Gasoline [2] [3]	Kerosine	Distillate oil	Residual oil	Lubricating oil [2]	Asphalt	Liquefied petroleum gases	Wax	Coke	Petrolatum	Miscellaneous products [2]	Total
1953													
North America:													
Canada	14,025	6,366	776	9,915	5,798	748	70	1,330	118	1,752	12	54	40,964
Canal Zone	----	221	27	140	110	3	15	(5)	(5)	----	(5)	(5)	516
Costa Rica	----	57	9	19	9	6	6	(5)	6	----	(5)	1	113
Cuba	2,620	1,645	(5)	407	1,342	59	2	112	23	----	2	8	6,220
Mexico	(5)	3,119	116	421	2,692	293	112	1,174	321	(5)	6	27	8,281
Netherland Antilles	----	256	----	5,037	----	25	1	(5)	----	----	(5)	(5)	5,319
Other North America	(5)	66	26	151	450	44	21	31	44	----	5	13	851
Total	16,645	11,730	954	16,090	10,401	1,178	227	2,647	512	1,752	25	103	62,264
South America:													
Argentina	1,081	(5)	----	191	----	266	(5)	(5)	(5)	----	----	(5)	1,538
Brazil	----	138	75	50	----	466	93	295	22	18	2	7	1,166
Chile	----	101	(5)	48	1,005	58	25	(5)	42	----	1	6	1,286
Colombia	----	18	5	10	----	31	61	(5)	170	----	2	6	303
Uruguay	----	4	----	----	----	14	----	(5)	(5)	----	1	2	21
Venezuela	----	5	----	----	----	40	5	(5)	29	----	2	24	105
Other South America	----	2	3	25	48	37	8	(5)	41	----	2	11	177
Total	1,081	268	83	324	1,053	912	192	295	304	18	10	56	4,596
Europe:													
Belgium-Luxembourg	----	240	1	853	32	479	1	(5)	13	----	6	7	1,632
Denmark	----	26	(5)	51	----	94	(5)	(5)	1	(5)	1	1	174
France	498	(5)	(5)	(5)	2	81	(5)	(5)	52	211	9	4	857
Germany, West	----	4	1	578	----	148	1	(5)	4	----	9	6	751
Italy	314	64	(5)	(5)	----	172	1	(5)	47	152	10	9	769
Netherlands	----	(5)	1	292	----	249	(5)	(5)	8	----	4	12	566
Norway	----	45	32	659	----	49	(5)	(5)	2	219	1	4	1,011
Sweden	----	188	16	1,374	38	166	(5)	----	3	37	1	5	1,828
Switzerland	----	80	1	24	----	42	5	----	6	3	2	3	166
Turkey	----	13	18	----	----	151	9	----	----	----	2	7	200
United Kingdom	418	837	190	5,701	402	1,963	(5)	(5)	38	(5)	69	1	9,619
Other Europe	114	55	34	145	----	285	2	(5)	31	97	8	10	781
Total	1,344	1,552	294	9,677	474	3,879	19	(5)	205	719	122	69	18,354

Asia:													
Aden	----------	----------	----------	751	----------	1	----------	----------	----------	----------	----------	[5]	752
India	----------	161	2,692	388	----------	341	66	[5]	[5]	[5]	4	4	3,656
Indochina	----------	4	----------	----------	----------	50	116	----------	[5]	----------	2	5	177
Indonesia	----------	[5]	[5]	[5]	----------	31	120	[5]	2	----------	14	5	172
Japan	862	757	[5]	627	7,715	75	14	[5]	24	1,033	22	241	11,370
Pakistan	----------	[5]	93	83	----------	20	158	----------	----------	----------	1	1	356
Philippines	----------	130	1	4	----------	129	145	6	39	----------	4	11	469
Other Asia	----------	10	185	----------	38	228	163	[5]	29	44	11	25	733
Total	862	1,062	2,971	1,853	7,753	875	782	6	94	1,077	58	292	17,685
Africa:													
Belgian Congo	----------	82	32	31	14	40	50	----------	[5]	----------	[5]	5	254
Egypt	----------	[5]	1,929	394	----------	75	----------	----------	[5]	----------	2	3	2,403
French West Africa	----------	2	11	18	25	17	1	----------	[5]	----------	[5]	5	79
Mozambique	----------	287	----------	----------	----------	8	10	[5]	[5]	----------	1	1	307
Union of South Africa	----------	397	[5]	290	----------	172	106	4	8	[5]	18	20	1,015
Other Africa	----------	142	134	364	74	121	127	[5]	2	----------	[5]	21	985
Total	----------	910	2,106	1,097	113	433	294	4	10	[5]	21	55	5,043
Oceania:													
Australia	----------	790	1	400	----------	184	[5]	----------	1	46	7	1	1,430
New Zealand	----------	647	[5]	204	----------	43	11	2	1	----------	1	[5]	909
Other Oceania	----------	42	9	16	16	2	[5]	1	----------	----------	----------	[5]	86
Total	----------	1,479	10	620	16	229	11	3	2	46	8	1	2,425
Grand total	19,932	29,867	6,418	29,661	19,810	12,258	1,525	2,955	1,127	3,612	244	986	128,395
Shipments from continental United States to Territories and possessions:													
Alaska and Hawaii [6]	[7]	4,727	167	2,640	6,144	140	86	47	[7]	49	[7]	----------	14,000
Puerto Rico	[7]	2,756	674	281	[5]	60	91	[7]	[7]	[7]	[7]	4	3,866
Wake	[7]	425	[5]	21	[5]	[5]	[5]	[7]	[7]	[7]	[7]	[5]	446
Other	[7]	81	14	42	[5]	5	6	[7]	[7]	[7]	[7]	[5]	148
Total	[7]	7,989	855	2,984	6,144	205	183	47	[7]	49	[7]	4	18,460
Exports from noncontiguous Territories and possessions to foreign countries:													
Alaska	----------	111	7	235	6	1	----------	----------	----------	----------	----------	[5]	360
Other	----------	1	2	82	----------	[5]	----------	----------	[5]	----------	----------	[5]	85
Total	----------	112	9	317	6	1	----------	----------	[5]	----------	----------	[5]	445
Total net shipments from continental United States	19,932	37,744	7,264	32,328	25,948	12,462	1,708	3,002	1,127	3,661	244	990	146,410

[1] Compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of U. S. Department of Commerce.

[2] Country and continent totals excluded, but grand totals include: 1952—12,605; 1953—12,866 thousand barrels of gasoline; 1952—6,048; 1953—4,752 thousand barrels of lubricating oils, and 1952—42; 1953—410 thousand barrels of jet fuel for which country breakdown may not be published for security reasons.

[3] Includes naphtha but excludes benzol (thousand barrels); 1952—5; 1953—30.

[4] Revised figure.

[5] Less than 500 barrels.

[6] Figures represent shipments from refining companies for export to Alaska and Hawaii through Pacific coast ports as reported to Bureau of Mines by shippers.

[7] Not separately classified.

[8] Because of changes in items included in classification, data are not strictly comparable to exports shown above.

Exports.—Exports of crude petroleum and refined petroleum products (including shipments to the Territories) decreased 7 percent from 1952. Crude-petroleum exports were 25 percent lower and total refined-product exports 3 percent lower. Exports of gasoline, liquefied gases, wax, and miscellaneous oils were higher in 1953, while exports of other refined products were less than for the previous year.

Continental United States continued to be a net importer of mineral oils, as the excess of all petroleum imports over exports, including shipments to the Territories, rose from 190 million barrels in 1952 to 237 million in 1953. The excess of crude-petroleum imports over exports increased from 183 million barrels to 217 million, and the excess of residual fuel oil rose from 101 million barrels to 110 million in 1953. Exports of all other refined products exceeded imports of those products by 90 million barrels compared with 93 million in 1952.

Crude-petroleum exports were 25 percent lower than in 1952, almost entirely the result of the 6.1-million-barrel drop in shipments to Canada. Exports to Argentina and to Europe were also lower in 1953. Slightly higher shipments to Cuba and Japan were reported. None was shipped to the Territories.

United States Department of Commerce statistics show that exports and Territorial shipments of gasoline increased 1.5 million barrels. Country destinations of certain grades of aviation gasoline may not be published for security reasons, but the quantities are included in the grand total. The limited country breakdown available indicates that larger shipments to North America, especially Canada, accounted for most of the gain over 1952. Exports to refining centers in the Netherland Antilles were 0.9 million barrels less than in 1952 because of lower blending needs in that petroleum-refining area. Exports, including aviation gasoline, to Europe, were 39 percent lower than in the previous year, with substantially lower shipments to the United Kingdom, West Germany, and Norway. Exports to Asia were slightly under the 1952 totals. Shipments to Oceania increased slightly, as the larger volume to New Zealand was partly offset by reduced deliveries to Australia. Territory shipments were 5 percent higher than in 1952.

United States Department of Commerce statistics show that outgoing shipments of kerosine were 7 percent less, due primarily to exportation of smaller quantities to the United Kingdom, Argentina, Uruguay, and Pakistan. Notably higher shipments of kerosine went to India in 1953.

Distillate-fuel-oil exports decreased 3 percent in 1953. The largest decreases were in shipments to the Netherland Antilles for blending purposes and to the bunkering port of Aden. Exports to Europe increased 1.5 million barrels and those to Canada 0.4 million. Shipments to Cuba, Japan, and Oceania were also larger.

Exports (including shipments to the Territories) of residual fuel oil, according to U. S. Department of Commerce data, declined 6 percent. Principal decreases were: Europe, 1.4 million barrels; Canada, 1.2; and Oceania, 1.1 million. Exports to Japan increased 3.2 million barrels, to Alaska and Hawaii 0.7 million, and to Mexico 0.6 million.

Lubricating-oil exports dropped 3.0 million barrels from 1952. Destinations of certain grades of lubricating oil are not available for security reasons, but the quantities are included in the grand totals.

The limited breakdown available indicates that shipments declined to all major geographical areas except North America and the Territories. Exports to countries in Asia, Africa, and Oceania decreased 48, 53, and 59 percent, respectively. The largest volume declines were in shipments to India, Japan, Egypt, Union of South Africa, Australia, and New Zealand. Europe, our largest export market area, took 4 percent less than in 1952, with lower shipments to France, Netherlands, Turkey, and Italy, partly offset by larger shipments to the United Kingdom, West Germany, and Sweden. Shipments to Canada rose 21 percent.

Among the other refined products, exports of asphalt were 26 percent lower because of reduced shipments to Asia, and shipments of petroleum coke were 13 percent lower; the largest decrease was in shipments to Japan. Exports of liquefied gases, confined almost entirely to Western Hemisphere countries, rose 25 percent. Shipments of wax and petrolatum increased 9 and 25 percent, respectively. Miscellaneous oils (including jet fuel and grease) were up 68 percent over the previous year. Country destinations for jet-fuel exports are not available for security reasons, but the quantities are included in the grand totals.

WORLD PRODUCTION [1]

World crude-petroleum production increased 6 percent in 1953 to total 4.8 billion barrels (13,073,000 barrels daily). The largest gains over 1952 were for the United States, 70.2 million barrels; Iraq, 69.2 million; Kuwait, 41.2 million; the U. S. S. R., an estimated 40.6 million; Canada, 19.7 million; and Indonesia, 12.7 million. Because of weakness in the export market for heavy crude petroleum, production in Venezuela and in Mexico decreased 16.0 million and 4.8 million barrels, respectively. The United States furnished 49.5 percent of the world production in 1953 compared with 50.8 percent the previous year. The countries of the Middle East (Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, Turkey, and Egypt) increased their share of the world total from 17.3 percent to 18.9, even though Iranian production was still limited to small local requirements. Venezuela, the world's second largest producing country, supplied 13.5 percent in 1953 compared with 14.6 percent in 1952.

In June 1953 there was a general price increase for crude petroleum in the United States. The price of 36° gravity Mid-Continent crude, which had remained fairly steady at $2.57 per barrel since late 1947, was increased $0.25. This increase was reflected in the Caribbean postings; later, Middle East crude-oil prices were generally increased $0.22 in the Persian Gulf and $0.10 at eastern Mediterranean loading ports.

Canadian crude-petroleum production increased 32 percent, with the Province of Alberta supplying 95 percent of the total. At the end of the year 60 areas in Alberta, were officially defined as fields. Redwater and Leduc-Woodbend fields continued to be the main sources of oil production. The former furnished 30 percent of the Province total and the latter 27 percent compared with 41 and 30 percent, respectively, reported in 1952. The 718-mile, 24-inch-diameter, Transmountain crude-oil pipeline from Edmonton, Alberta, to Vancouver, British Columbia, was brought into operation in the latter

[1] By F. X. Jordan, Oil and Gas Division, U. S. Department of the Interior.

half of the year. In addition, the Interprovincial crude-oil line, from Edmonton to Superior, Wis., was extended 643 miles to Sarnia, Ontario, using 30-inch-diameter pipe, making this 1,765-mile line the world's longest oil pipeline. In value of production, crude petroleum became Canada's leading mineral, replacing gold, which had held this position over 20 years.

South American production was 1.2 percent less than in 1952 as a result of the 16-million-barrel decrease in Venezuelan output. The largest increases in output in this area, were made by Argentina, which increased production 3.7 million barrels, and by Colombia where output increased 0.7 million barrels.

All countries in Western Europe increased crude-petroleum production in 1953. Production in Germany continued its steady upward trend. Output in the Netherlands increased 15 percent, and during the year the first oil discovery in the western part of the Netherlands was made at Rijswijk near The Hague. No reliable data are available for countries in eastern Europe, and estimates based on meager data must be used. It is estimated that the U. S. S. R. (including Sakhalin) increased production 13 percent in 1953. Production in Rumania and Austria is estimated to have increased 16 and 4 percent, respectively.

Crude-oil production in Africa changed little from 1952, except in Algeria, where output almost doubled. Exploration activity continued in Angola, Belgian Congo, Ethiopia, Libya, Nigeria, and Tanganyika, among others.

The Middle East area again increased crude-oil production significantly. Kuwait increased production 15 percent and replaced Saudi Arabia as the largest producer in the Middle East. Of the Middle East countries, Iraq had both the largest volumetric and the largest percentage increase. Because of full-year operations of pipelines completed in 1952 from Kirkuk field to Banias, Syria.

A 24-inch pipeline 65 miles long from the Zubair field in Iraq to the tanker-loading terminal at Fao was completed to replace a 12-inch pipeline previously used. Exploration during 1953 indicated that Saudi Arabia had the largest oil pool in the world in the Ghawar area, in which production now extends through an area 73 miles long and 17 miles wide. The discovery at Huiya indicated that the whole En Nala anticline from Ain Dar to Haradh may become 1 continuous field with a total length of approximately 105 miles. The Wafra field, in the Kuwait Neutral Zone between Saudi Arabia and Kuwait, was discovered in the spring of 1953, with commercial production scheduled for export early in 1954. Iran's crude-petroleum production remained limited to local requirements in 1953 as the petroleum dispute remained unsolved.

In the Far East, the United States of Indonesia with the Minas field in Central Sumatra producing for its first full year, increased production 20 percent. British Borneo's output, however, declined 4 percent. Both India and Pakistan showed marked percentage increases over 1952. Australia reported discovery of crude petroleum in commercial quantities near Exmouth Gulf in western Australia, but commercial production had not yet begun.

TABLE 82.—World production of crude petroleum, by countries, 1949–53, in thousands of barrels [1]

[Compiled by Berenice B. Mitchell]

Country	1949	1950	1951	1952	1953 [2]
North America:					
Canada	21,305	29,044	47,615	61,237	80,902
Cuba [3] [4]	206	156	128	36	17
Mexico	60,910	72,443	77,312	77,275	72,440
Trinidad	20,617	20,632	20,843	21,258	22,346
United States	1,841,940	1,973,574	2,247,711	2,289,836	2,359,998
Total North America	1,944,978	2,095,849	2,393,609	2,449,642	2,535,703
South America:					
Argentina	22,589	23,353	24,465	24,825	28,501
Bolivia	678	616	523	526	601
Brazil	109	339	691	761	915
Chile	----------	629	759	906	1,264
Colombia	29,722	34,060	38,398	38,683	39,434
Ecuador	2,617	2,632	2,708	2,839	2,967
Peru	14,796	15,012	16,110	16,403	16,061
Venezuela	482,316	546,783	622,216	660,254	644,243
Total South America	552,827	623,424	705,870	745,197	733,986
Europe:					
Albania [4]	2,188	2,800	1,200	1,100	1,400
Austria [4]	6,100	10,200	15,477	20,400	21,100
Czechoslovakia [4]	292	292	644	740	900
France	411	909	2,036	2,377	2,561
Germany, West	5,947	8,107	9,681	12,435	15,504
Hungary [4]	3,791	3,700	3,500	3,500	3,800
Italy	71	63	135	487	656
Netherlands	4,314	4,897	4,942	4,975	5,688
Poland [4]	1,125	1,205	1,502	1,700	1,800
Rumania [4]	33,700	32,000	31,000	45,000	52,000
U. S. S. R. [4] [5]	237,700	266,200	285,000	322,400	363,000
United Kingdom	338	340	335	407	410
Yugoslavia	470	780	1,092	1,067	[4] 1,204
Total Europe [4] [5]	296,447	331,493	356,544	416,588	470,023
Asia:					
Bahrain	10,985	11,016	10,994	11,004	10,978
Burma	248	532	858	942	1,061
China [4]	730	800	900	1,000	1,000
India	1,906	1,867	1,949	1,900	2,215
Indonesia	43,206	48,400	55,453	62,495	75,148
Iran	204,712	242,475	[4] 127,600	[4] 10,100	[4] 9,800
Iraq	30,957	49,726	65,122	141,100	210,268
Japan	1,353	2,048	2,337	2,100	2,101
Kuwait	90,000	125,722	204,910	273,433	314,592
Pakistan	941	1,281	1,348	1,580	1,762
Qatar	750	12,268	18,009	25,255	31,025
Sarawak and Brunei	25,108	30,958	37,506	38,300	36,848
Saudi Arabia	174,008	199,547	277,963	301,861	308,294
Taiwan (Formosa)	22	23	21	18	17
Turkey	95	108	133	146	179
U. S. S. R.: Sakhalin [4]	7,000	7,000	7,000	7,000	7,000
Total Asia [5]	592,021	733,771	812,103	878,234	1,012,288
Africa:					
Algeria	2	24	49	348	641
Egypt	15,997	16,373	16,311	16,464	16,501
French Morocco	136	305	587	749	761
Total Africa	16,135	16,702	16,947	17,561	17,903
Oceania:					
Australia (Victoria)	1	1	2	----------	----------
New Guinea	1,726	1,748	1,746	1,725	1,751
New Zealand	7	7	5	9	8
Total Oceania	1,734	1,756	1,753	1,734	1,759
Grand total	3,404,142	3,802,995	4,286,826	4,508,956	4,771,662

[1] This table incorporates a number of revisions of data published in previous Petroleum chapters.
[2] Preliminary figures.
[3] Natural naphtha and gas oil.
[4] Estimate.
[5] U. S. S. R. in Asia (except Sakhalin) included with U. S. S. R. in Europe.

C. Helium

Helium

By H. P. Wheeler, Jr., and H. S. Kennedy

GENERAL SUMMARY

RESPONSIBILITY for conserving, producing, and selling helium gas is placed with the Secretary of the Interior, through the Bureau of Mines (Public Law 411, 75th Congress, approved September 1, 1937). To carry out its responsibilities, the Bureau of Mines operates four Government-owned helium plants and related gas fields and other facilities at Amarillo and Exell, Tex.; Otis, Kans.; and Navajo (Shiprock), N. Mex.

Helium is not known to be produced in quantity by any other agency or private concern in the world. All of the data presented herein originated in the Bureau of Mines.

PRODUCTION

The Bureau of Mines operated all 4 of the plants in 1953 to produce 161,603,800 cubic feet of helium, a new all-time record, which exceeded by 11.8 percent the production of 144,556,141 cubic feet in 1952. An additional 1,427,981 cubic feet of helium conserved in previous years by injection into the Government-owned Cliffside gas field near Amarillo was withdrawn and repurified to enable the Bureau to meet short-term peaks in demand that exceeded the plants' current capacity to produce. Thus, 163,031,781 cubic feet of helium in all was made available for shipment and use.

SHIPMENTS

The 4 helium plants shipped 157,652,134 cubic feet of helium in 1953, of which 99,735,108 cubic feet went directly to Federal agencies and 57,917,026 cubic feet to non-Federal customers. The total shipped comprised 592 tank-car, 41 trailer, and 160,421 cylinder deliveries.

A shortage of tank cars developed at the helium plants in September when the cars were not returned as rapidly as shipments were made. Consequently, spot shortages of helium occurred at some points of consumption, and it was necessary for the Bureau of Mines, in cooperation with other Federal agencies and the principal private distributors of helium, to allocate helium to various customers on an informal and voluntary basis for about 3 months. Action was taken at the same time to improve the utilization of the cars in transportation service, and a serious shortage was averted. The availability of cars and the need for them continued to be extremely close throughout the year, however, and occasional shipments were delayed for a short time because cars were not available at the plants.

TABLE 1.—Helium production in the United States, 1921–53

Year	Active plants	Production (cubic feet)
1921–January 1929 [1]	Fort Worth, Tex., plant	46,088,787
1929 (April)–1942	Amarillo, Tex., plant	[2] 164,867,140
1943	Amarillo and Exell, Tex., plants	[2] 116,307,432
1944	Amarillo and Exell, Tex., Otis and Cunningham, Kans., and Navajo (Shiprock), N. Mex., plants.	126,933,130
1945	Amarillo and Exell, Tex., Otis and Cunningham, Kans., plants.	94,733,744
1946	do	58,236,385
1947	Amarillo and Exell, Tex., plants	70,297,700
1948	Exell, Tex., plant	63,143,513
1949	do	55,165,482
1950	do	81,394,416
1951	Amarillo and Exell, Tex., and Otis, Kans., plants	[2] 112,009,180
1952	do	144,556,141
1953	Amarillo and Exell, Tex., Otis, Kans., and Navajo, N. Mex., plants.	[3] 161,603,800
Total		[4] 1,295,336,850

[1] No helium was produced at Government helium plants in February or March 1929. The Fort Worth plant was shut down on January 10, 1929, and the Amarillo plant was not put into operation until April.
[2] Revised figure.
[3] Does not include 1,427,981 cubic feet of helium previously conserved by injection into the Cliffside field, which was withdrawn and repurified in 1953.
[4] Includes 86,980,419 cubic feet extracted at the Exell plant and injected into the Government-owned Cliffside gas field for conservation, in excess of that subsequently withdrawn (see footnote 3).

CONSUMPTION AND USES

About 63 percent of the helium shipped in 1953 went directly to Federal agencies, and at least 22 percent was used by private industry on Government contracts. Thus, at least 85 percent of the total consumption was for the benefit of the Government.

The Department of the Navy continued to be the largest Federal user of helium, followed by the Atomic Energy Commission, the Air Force, and the Weather Bureau, in that order. Other Federal agencies that use moderate quantities of helium are the Department of the Army, the National Advisory Committee for Aeronautics, the Bureau of Mines, and the Bureau of Standards.

Helium is used directly by the Government in airships, meteorological balloons, Atomic Energy Commission and guided-missile operations, shielded-arc welding, titanium production, and many different fields of research. The principal private uses are helium-shielded arc welding, leak detection, titanium production, as a fill gas in electronic equipment, as a diluent with oxygen to make breathing easier for persons suffering from asthma and other respiratory ailments, mixed with flammable anaesthetic gases to reduce explosive hazards, and in medical and industrial research. A relatively small quantity is used to inflate toy balloons and for advertising purposes.

Private industry uses helium in the production of such widely variant items as airplanes, jet engines, electronic devices, farm tractors, water heaters, refrigerators, and beer barrels.

PRICES

The Helium Act provides that Federal agencies may requisition helium from the Bureau of Mines by paying proportionate shares of the expenses incident to the administration, operation, and maintenance of the Government's helium plants and properties. In the fiscal year ended June 30, 1953, the price for Federal agencies was

$12.64 per thousand cubic feet. The price for Federal agencies in the fiscal year ended June 30, 1954, was $14.65 per thousand cubic feet.

The price to non-Federal purchasers throughout the 1953 calendar year was $13.50 per thousand cubic feet, but an increase to $19 per thousand cubic feet in the price was initiated in 1953 and subsequently became effective on March 13, 1954, by an amendment to the Regulations Governing the Production and Sale of Helium (30 CFR 1). An additional charge of $2 per thousand cubic feet is applicable to non-Federal sales if the helium is compressed into standard cylinders.

RESERVES

Helium is a constituent of the atmosphere estimated at 1 part in 185,000 to 200,000 parts of air at the earth's surface. It also is found in small quantities in radioactive rocks and in gases from some mineral springs, volcanoes, and fumeroles; but the only known occurrence from which helium can be extracted economically in large quantities is helium-bearing natural gas. All natural gases do not contain significant amounts of helium; usually the gases of higher helium content are found in fields that overlie buried granite ridges, such as the buried Amarillo Mountains of the Texas Panhandle, and in fields closely associated with igneous intrusions, such as the Rattlesnake field of San Juan County, N. Mex.

Government Helium Reserves.—The Government owns or otherwise controls 4 helium-bearing natural-gas deposits that are estimated to contain about 3.4 billion cubic feet of recoverable helium. Two of these deposits—Helium Reserve No. 1, Woodside Structure, Utah, and Helium Reserve No. 2, Harley Dome, Utah—are on lands of the public domain. These two reserves are relatively small and have not been used for the production of helium.

The other two Government reserves contain larger quantities of helium but are being utilized in the production of helium to meet current demands. The Government-owned Cliffside gas field, which supplies helium-bearing gas to the Amarillo, Tex., helium plant, produced about 36 million cubic feet in 1953 to meet current demands. The Government-leased Rattlesnake gas field, which supplies helium-bearing gas to the Navajo (Shiprock), N. Mex., helium plant, produced about 13 million cubic feet in 1953.

Other Sources of Helium-Bearing Natural Gas.—The Bureau is extracting helium in its Exell, Tex., and Otis, Kans., plants from natural gas produced by private companies primarily for sale in fuel markets. As this natural gas is produced and consumed as fuel whether the helium is removed or not, extracting the helium is conservation in its truest sense.

The recoverable helium estimated to be available to the Exell and Otis plants in gas produced for fuel markets is estimated to be about 7 billion cubic feet, mostly in the Channing area of the Texas Panhandle gas field, which serves the Exell plant. The helium-bearing gas available to the Otis plant has been depleted at a much faster rate but is still important because the plant facility for its recovery already exists.

In addition to the privately owned natural gas processed for helium at the Exell and Otis plants, several other areas are known from which relatively high helium content gas is produced for fuel markets and could be made available for helium extraction. In general, the percentage of helium in gas from these areas is less than that in gas processed by the helium plants, but the additional cost incurred in processing the leaner gas could be partly offset by the economies inherent in larger scale operations. Unfortunately, from a conservation viewpoint, these fuel gases are in production now, and much of the helium contained therein will be lost before the helium demand becomes large enough to justify its extraction. Thus, the only helium reserves that the Nation can depend upon for the future are those controlled by the Government.

Conservation.—Whenever possible, the Bureau prefers to produce helium from the helium-bearing gas available to the Exell and Otis plants rather than from the reserves in the Cliffside and Rattlesnake fields serving the Amarillo and Navajo plants. Before 1950 the Bureau also was able to recover more helium at Exell than was required to meet current demands and to conserve the excess by injection into the nearby Government-owned Cliffside field.

To meet the growing demand for helium, the Bureau had to resume operations at the Amarillo plant in 1950 and the Navajo plant in 1953, and the Government-owned reserves serving those plants are being reduced accordingly. Also, in 1953, it was necessary to withdraw from the Cliffside field 1,427,981 cubic feet of the helium that had been conserved previously by excess production at Exell.

Consequently, the Bureau of Mines is reducing rather than augmenting its reserves for the future, which from the standpoint of conservation is not desirable, and has recommended that additional helium facilities be provided to extract more helium from gas going to fuel markets in order that the production of helium from the Government reserves can be curtailed or stopped.

FOREIGN TRADE

Helium is not known to be produced in commercial quantities outside the United States. Relatively small quantities of helium are exported annually but only upon application to the Secretary of State and upon issuance by him of a license authorizing such exportation.

TECHNOLOGY

The Bureau produces grade A helium with a purity exceeding 99.995 percent at all 4 of its plants. The output of the plants is monitored continuously with equipment developed by the Bureau of Mines, capable of detecting hydrogen impurity amounting to 0.001 percent. Hydrogen is the most difficult contaminant to remove in the final purification stage, utilizing charcoal absorption at the temperature of liquid nitrogen, and there is no other known contamination after the hydrogen is removed.

PART III. APPENDIX

Tables of Measurement

Volumetric measures

	U. S. gallons	Imperial gallons	Cubic feet	Barrels	Cubic centimeters	Liters	Cubic meters
1 U. S. gallon [1]	1	0. 83268	0. 13368	0. 02381	3, 785. 4	3. 7853	0. 0037854
1 imperial gallon [2]	1. 201	1	. 16054	. 028594	4, 546. 04	4. 5460	. 004546
1 cubic foot	7. 4805	6. 22888	1	. 17811	28, 317. 01	28. 316	. 028317
1 barrel [3]	42	34. 972	5. 6146	1	158, 987. 55	158. 98	. 15899
1 cubic centimeter	. 00026417	. 00021996	. 000035314	. 0000062895	1	. 00099997	. 000001
1 liter	. 26418	. 219976	. 035316	. 0062899	1, 000. 027	1	. 001000027
1 cubic meter	264. 17	219. 97	35. 314	6. 2898	1, 000, 000.	999. 97	1

[1] 1 U. S. gallon = the volume occupied by 231 cubic inches.
[2] 1 imperial gallon = the volume occupied by 10 pounds of water at 62° F. when weighed against brass in air at 30″ barometric pressure.
[3] 1 Barrel = 42 U. S. gallons.

Weight measures

	Pounds	Kilograms	Short or net tons	Metric tons	Long ton
1 pound	1	0. 45359	0. 0005	0. 00045359	0. 00044643
1 short or net hundredweight	100. 0	45. 359	. 05	. 04536	. 04464
1 gross or long hundredweight	112. 0	50. 802	. 056	. 05080	. 05
1 kilogram	2. 2046	1	. 0011023	. 001	. 0009842
1 short or net ton	2, 000	907. 185	1	. 90718	. 89286
1 metric ton	2, 204. 6	1, 000	1. 1023	1	. 98421
1 long ton	2, 240	1, 016. 06	1. 12	1. 01606	1

NOTE.—1 English water ton = the volume occupied by 1 long ton of water at 60° F.

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