

GEM STONES

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SUMMARY OUTLINE

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Retail sales of jewelry in 1939 totaled about \$307,000,000, or 10 percent above sales in 1938 (\$279,000,000) and only slightly less than those in 1937 (\$312,000,000). Diamond rings, watches, and gold jewelry were the principal items. After February sales were better each month than in 1938, and after September monthly sales showed increases over those of 1937. Improvement was progressive in 1939, and the Christmas trade in jewelry was markedly better than that for either of the past 2 years (16 percent over 1938 and 13 percent over 1937); moreover, there was some demand for higher-price articles. Sales in Oregon and Washington and, to a smaller extent, Georgia and South Carolina, made marked progress over 1938. Installment selling is increasing in the trade and is likely to show further gains.

Manufacturers' sales and those of wholesalers were respectively 25 and 20 percent greater than in 1938, and it is evident that both wholesalers and retailers increased their stocks somewhat in 1939 (retailers about 2 percent). Wholesale trade was relatively good, particularly during the last 5 months of the year, and sales of costume jewelry continued to increase.

Fashions in jewels.—Large jewels, flamboyant in color and daring in design, were the mode in 1939. Use of gold (often in two or three colors) and silver, to a smaller extent, gained at the expense of platinum. It is the opinion of many, however, that platinum sets off fine diamonds much more advantageously than gold. The motifs include geometric, classical, Victorian, Georgian, Hindoo, and ancient Egyptian. Jewelry ensembles, each piece set with similar stones, gained in popularity, as did large jewels divisible into several ornaments. Long pendant earrings, rings with large stones, clips, lapel ornaments, and necklaces were much worn. Jeweled flowers increased in popularity.

Colored gems set pavé with countless diamonds are used to a larger extent yearly. The finer gems—diamond (including an unusual number of colored diamonds), ruby, sapphire, and emerald—are most popular; however, aquamarine, moonstone, and topaz are used fre-

¹ One of the consulting engineers, Bureau of Mines. Figures on imports compiled by M. B. Price, of the Bureau of Mines, from records of the Bureau of Foreign and Domestic Commerce.

quently and many other colored stones from time to time. For men's wear, star sapphires, cat's-eye, and quartz gems predominate.

As a result of the war "mourning jewelry" is likely to be in demand (jet or black-stained onyx alone or with white stones, such as moonstone).

Domestic production.—From the 1909 peak production of gem stones valued at \$534,280, the domestic industry dwindled until in 1934 the value decreased to about \$3,000. Since then production has increased markedly and in 1939 was valued at \$235,000 to \$470,000; the first figure is a rough estimate of the amount used in jewelry and the second an estimate of the total, including that treasured by collectors or sold to tourists, mineral collectors, and rock gardeners. Almost 85 percent of the amount used in jewelry comprises stones of the agate family. Gems are produced largely by individuals or small partnerships, and as there are no official production returns exact figures are not available. The revival of the industry is due to three factors: (1) The purchase by automobile and other tourists of souvenirs, (2) the extraordinary increase in gem cutting as a hobby (particularly in Oregon and Washington), and (3) the use of an increasing variety of colored stones in jewelry.

The war has shut off, at least partly, the country's normal sources of supply of colored gems and has engendered nationalistic sentiments; consequently, gems of American origin, notably turquoise, tourmaline, kunzite, benitoite, and hiddenite, should increase in popularity. An important gem-stone industry cannot, however, arise in this country owing to the lack of gem deposits of the first order and the high cost of cutting in the United States. Unfortunately, some unscrupulous dealers sell to tourists and even to their fellow townsmen "American" gems which actually originated in foreign countries and were cut in Germany.

In the Northwest, especially in Oregon, according to correspondence with H. C. Dake, the number of mineral collectors and lapidaries, both professional and amateur, most of whom collect and cut quartz gems, continues to increase markedly. He estimates the value of the material cut in 1939 as follows: Oregon, \$300,000; Washington, \$90,000; Idaho, \$35,000; Montana, \$10,000; and Wyoming, \$8,000—a total of \$443,000. Much of the material remains in private mineral collections. In Oregon the centers of the industry are Portland and Newport. Some 14 lapidary shops in Newport employ from 2 to 10 persons each. For about 75 miles up and down the beach from Newport agate hunters (both amateur and professional) search for the rough material, particularly from February to the beginning of summer after winter storms have uncovered new sources of supply. The mineralogical societies of Lincoln County have protested against the use of local agate-bearing gravels as road material by the State highway commission. Oregon ships some uncut agates to cutters outside the State. In Washington the largest cutting centers are Seattle and Spokane; the principal stone cut is opalized wood from Miocene lake beds. In Wyoming local gem stones, mostly moss agate, are cut at Rawlins and Cheyenne. In Idaho the production was largely opalized wood from the southwestern part of the State and star garnets from Ruby Creek, Latah County.

Numerous collectors are slowly depleting the supplies of moss agate along the Yellowstone River in southeastern Montana from Huntley to northeast of Glendive, a distance of over 200 miles; however, the supply is partly replenished by the spring floods which rework the gravels. The most satisfactory collecting periods are during low water. Billings is the chief cutting center. The better moss agates are valued at \$3 to \$5 a pound in the rough.

Nevada yielded turquoise valued at about \$17,000 in 1939. The principal producers were the Smith mine, Cortez district, Lander County, the Blue Matrix mine near Tenabo, and the "Royal Blue" mine at Royston. The output of the Smith mine was 7,512 pounds in 1939. Considerable turquoise was also produced at Villagrove Colo., and a little in Mineral Park near Kingman, Ariz. Mines in Utah, some about 5 miles west of Fairfield and others about 10 miles south of Grantsville, yielded 1,000 pounds or more of variscite.

A substantial quantity of sapphire was produced in Montana (perhaps 1,000 pounds), but very little of this was gem material, most of it being of industrial grade.

In 1939 it was reported that nephrite was found in place in California and that some had been cut and was on the market. Considerable prospecting for gems was done in North Carolina in 1939, and the local lapidary trade is increasing, thanks largely to tourist demand. Kunzite crystals were discovered in Mitchell County a few years ago.

Other gem stones produced in the United States in 1939 included agatized wood (private lands surrounding Petrified National Monument, Ariz.); amethyst (Townes County, Ga.; Larimer County, Colo.; and New Hampshire); aquamarine (Black Hills, S. Dak., and Maine); kyanite (Upson County, Ga.); garnet (Washington); oligoclase moonstone (North Carolina); rock crystal (Arkansas and North Carolina); rose quartz (Black Hills, S. Dak., and Albany, Maine); ruby (Macaca County, N. C.); rutilated quartz (North Carolina); satin spar (Niagara Falls, N. Y.); topaz (Thomas Ridge, Utah; San Diego, Calif.; and New Hampshire); and tourmaline (green—San Diego, Calif., and Maine; red (rubellite)—Black Hills, S. Dak.).

For 60 years the Potter family has cut satin-spar (gypsum) beads and other souvenirs at Niagara Falls. Some of the material is of local and Canadian origin, but most of it is imported from England.

Marble similar to Mexican onyx was produced near Pelican Point on Utah Lake, Utah, by the Onyx Corporation of America and by the Jay Em Onyx & Gem Co., near Hartville, Wyo.

According to information furnished by A. H. Cornelison, the Hawaiian Islands produce a few gems and several decorative stones. Their output of olivines in 1939 was very small, as information regarding the locality of the best prospect was lost with the death of E. Mott Smith. Some clear plagioclase feldspar, locally known as "Hawaiian golden-yellow topaz," was mined, also an interestingly marked jasper and some common opal. The known deposits of "Hawaiian diamonds" (rock crystal) are almost exhausted. Possibly \$1,000 worth of local stones were sold in 1939.

Imports.—According to the Bureau of Foreign and Domestic Commerce, imports of precious and imitation stones (exclusive of

industrial diamonds) into the United States in 1939 totaled \$40,487,-877, an increase of 43 percent over 1938. Details are shown as follows:

Diamonds:		
	Carats	Value
Rough or uncut (suitable for cutting into gem stones), duty free.....	153, 982	\$7, 956, 397
Cut but unset, suitable for jewelry, dutiable:		
Less than 10 stones per carat.....	60, 332	5, 107, 173
10 or more stones per carat.....	427, 822	22, 310, 100
Emeralds:		
Rough or uncut, free.....	36, 946	17, 531
Cut but unset, dutiable.....	17, 624	361, 345
Pearls and parts, not strung or set, dutiable:		
Natural.....		249, 415
Cultured or cultivated.....		328, 250
Other precious stones:		
Rough or uncut, free.....		111, 830
Cut but unset, dutiable.....		1, 937, 479
Imitation, except opaque, dutiable.....		2, 018, 134
Imitation, opaque, including imitation pearls, dutiable.....		30, 969
Marcasites, dutiable:		
Real.....		38, 860
Imitation.....		20, 394
		40, 487, 877

Tariff regulations.—Wars in Europe and the East brought about many changes in tariffs.

As soon as war was declared France decreed that licenses are required for the importation of gems and jewelry, and to conserve the country's gold, licenses doubtless will be difficult to procure. Supplies of gold for use in jewelry are controlled, and to prevent hoarding, jewelry containing an abnormal quantity of gold can no longer be manufactured.

At the outbreak of war the British Government placed an embargo on the export of diamonds to prevent industrial stones from reaching its enemies. Committees were set up in Antwerp, Amsterdam, Paris, and possibly also in New York to assist the British Board of Trade in issuing export licenses. The early delays caused by the embargo are now less exaggerated, but the embargo accounts partly for the fall in American diamond imports of uncut and industrial stones after September 1939.

Germany requires that official approval be obtained before precious and rare metals can be fabricated, and jewelers can only sell gold jewelry made of gold furnished by their clients. When Germany absorbed Czechoslovakia the duty on imitation precious stones immediately was increased 30 to 45 percent, as Czechoslovakia had a favored-nation trade agreement. France is supplying part of the shortage.

In Belgium special authorization from the Department of Economic Affairs is necessary to import or export rough diamonds for the duration of the war. In January 1940, Hungary replaced free imports by a regime of permits, and by May permits were virtually unobtainable.

In May 1939 Japan required all residents to report to the Government all gold held and after June 1 no gold articles could be displayed in shop windows. China nationalized all gold (coins, bars, and jewelry) in August, the owners being compensated at official rates.

Ceylon reduced the import duty on diamonds from 15 to 5 percent, or to that of India and Burma. Precious stones can be exported from

Brazil only by registered buyers or dealers after official appraisal. During the year Palestine removed duties on diamonds and unset precious stones.

Effect of war on jewelry trade.—When war was declared certain panicky dealers feverishly replenished their stocks; this buying, with a certain speculation by those outside the trade, raised the price of small cut diamonds 20 or 30 percent and that of large stones less. In reality the supply of diamonds is adequate, and prices should only have been raised enough to cover increased shipping and insurance costs. The price of colored stones also rose some 20 percent. Later higher cutting costs may have to be taken into consideration. Rather large stocks of costume jewelry were purchased, as the war automatically cut off some important sources of imitation and synthetic precious stones. Platinum prices rose (January 1, 1939, \$34.44; December 30, 1939, \$40 an ounce).

Hereafter jewelry probably will be more expensive, but there is no reason to fear a shortage of supply, even if the war becomes a long-drawn-out affair. Obviously the warring nations need dollar exchange.

The American diamond-cutting industry may be stimulated somewhat by the war, but even under war conditions small diamonds doubtless will continue to be cut in Europe, as American cutting costs on such goods are prohibitive.

War and destruction are synonymous, therefore war must hurt industry. Today the Russian and German markets for gem stones are almost nonexistent; France and England are throttled by high taxation; hence the industry must live on the trade of the United States, India, and South America and on such investment buying of fine gems as the citizens of belligerent countries can accomplish.

Gem publicity.—At the New York World's Fair, jewels will again be attractively exhibited in 1940. The House of Jewels will show the beautiful jewelry of five leading Fifth Avenue jewelers and gorgeous diamonds, uncut and cut, of De Beers & Associated Producing Cos. During 1939 De Beers, in a selected group of periodicals, conducted a campaign advertising the beauty, value, and rarity of the diamond.

DIAMOND

The year 1939 was surprisingly satisfactory in the diamond industry in view of the grave political crises and the two major wars. Trade was far better than in 1938, and in some respects was almost as good as in 1937, admittedly a good year. Production of rough stones, which was virtually equivalent to that in 1938, exceeded sales, and for the second successive year stocks increased. All grades of diamonds increased in price. In Europe increases were as follows: Large rough, slight, and small rough, 25 to 45 percent; large cut, 15 to 20 percent; and small cut, almost 100 percent. In America increases were less. Many stones were bought for investment, notwithstanding attempts by various governments to curtail the practice.

Share dealings.—The shares of diamond-mining companies listed on the London Stock Exchange had a restricted market in 1939. Prices were weak during most of the year, although there were sharp recoveries in the last half of July, owing to activity in Wall Street, and after October, owing to news of good sales by the Diamond Trading Co.,

and smaller recoveries from mid-February to mid-March, early May to mid-June, and late December. During the year five representative stocks lost 17 percent of their value and at the end of the year were 31 percent of their high (1927) and 307 percent of their low (1932). Of the 12 principal mining shares, 7 paid dividends in 1939.

Market.—In 1939 the Diamond Trading Co., which sells about 95 percent of the world output of diamonds, inaugurated a new sales policy. "Sights" are now held fortnightly; buyers, large and small, are urged to attend, and goods are sorted into standard types that will not vary from "sight" to "sight." Sales in 1939 were about £5,865,000—159 percent of those in 1938 but only 64 percent of those in 1937. First- and fourth-quarter sales were particularly satisfactory. Good-quality stones continue to be scarce.

Sales of polished diamonds, while not satisfactory, showed an appreciable gain over 1938. Small sizes were particularly in demand, fine goods being bought when available and mediocre grades at other times. Fine large stones were in demand as investments. Sales of industrial stones were excellent. The market was quiet until May, after which the improvement was progressive, and by August the market was animated. When war was declared, frantic buyers, fearing that their sources of supply would be cut off, purchased in quantity, but in October the market became normal.

Cutting in 1939.—The cutting trade was even worse in 1939 than in 1938; "masters" made little money, and the men were frequently unemployed. During the year the number of artisans decreased from approximately 27,000 to 23,000, owing largely to the shutting down of German shops at the outbreak of war. Both Antwerp and Amsterdam suffered, the first somewhat more than the second. Cutters' wages were raised 15 percent in October.

Imports.—Diamond imports into the United States in 1939, by countries, were as follows:

Diamonds imported into the United States in 1939, by countries

[Exclusive of industrial diamonds]

Country	Rough, or uncut			Cut, but not set		
	Carats	Value		Carats	Value	
		Total	Average		Total	Average
Africa:						
British East Africa.....	34	\$3,091	\$90.91			
Union of South Africa.....	148,001	7,656,408	51.73	1,488	\$187,107	\$125.74
Belgium.....				399,806	21,733,478	54.36
Brazil.....	5,846	292,854	50.09			
France.....				4,719	699,239	148.18
Germany.....				7	419	59.86
Guiana, British.....	101	4,044	40.04			
Netherlands.....				77,422	4,454,205	57.53
Palestine.....				36	2,299	63.86
Switzerland.....				1,392	69,926	50.23
United Kingdom.....				3,284	270,600	82.40
	153,982	7,956,397	51.67	488,154	27,417,273	56.17

World production.—World production of diamonds (gem and industrial) in 1939 approximated 11,330,000 carats (2.266 metric tons) worth about \$39,270,000. Compared to 1938 this is a decrease of 2

percent (readjusted figure, 11,620,000 carats worth \$40,750,000) by weight and 4 percent by value. Of the South African pipe mines only Dutoitspan and Bulfontein operated; world alluvial mines yielded 91 percent of the output by weight and 77 percent by value. The British Empire produced 26 percent by weight and 60 percent by value of the total production; less than one-fifth by weight were gem stones.

The following table gives, as accurately as available statistics permit, world production for the past 5 years.

World production of diamonds, 1935-39, by countries, in metric carats

[Including industrial diamonds]

Country	1935	1936	1937	1938	1939
Africa:					
Angola.....	481, 615	577, 531	626, 424	651, 265	¹ 682, 000
Belgian Congo.....	3, 812, 023	4, 634, 266	4, 925, 228	7, 205, 620	¹ 7, 201, 000
French Equatorial Africa.....	138	1, 550	5, 588	16, 013	¹ 16, 000
French West Africa.....		18, 897	57, 687	61, 928	56, 314
Gold Coast (exports).....	1, 349, 847	1, 414, 677	1, 577, 661	1, 296, 763	1, 087, 652
Sierra Leone.....	295, 483	616, 200	913, 401	689, 621	¹ 600, 000
South West Africa.....	128, 464	184, 917	196, 803	154, 856	35, 470
Tanganyika.....	1, 446	2, 704	3, 234	3, 576	² 3, 445
Union of South Africa:					
Mines.....	274, 317	339, 719	820, 284	979, 460	¹ 1, 062, 670
Alluvial.....	402, 405	284, 204	207, 359	259, 148	¹ 184, 000
Total Union of South Africa.....	676, 722	623, 923	³ 1, 030, 434	1, 238, 608	¹ 1, 246, 670
Brazil.....	39, 100	136, 462	238, 606	¹ 235, 000	¹ 350, 000
British Guiana.....	47, 785	41, 067	35, 958	32, 522	32, 491
Other countries ⁴	5, 800	6, 000	6, 000	34, 200	19, 000
	6, 838, 400	8, 253, 200	9, 617, 000	11, 620, 000	11, 330, 000

¹ Estimated.

² Exports.

³ Includes 2,791 metric carats recovered from re-treatment of tailings.

⁴ 1935: Borneo, India, Nigeria, and Venezuela; 1936: Borneo, India, New South Wales, Rhodesia, United States (California), and Venezuela; 1937: Borneo, India, Liberia, New South Wales, Rhodesia, and Venezuela; 1938-39: Borneo, India, New South Wales, U. S. S. R., and Venezuela.

In South Africa the output of pipe mines increased, whereas that of alluvial mines continued its decline. Production in Brazil and the new fields of the French African colonies increased, but in Southwest Africa and the Gold Coast it was drastically curtailed. As usual, the Belgian Congo contributed 64 percent, by weight, of the world output, largely industrial stones. New discoveries are reported in the U. S. S. R., Kenya, and Uganda.

Tropical hygiene and diamond production.—Diamond output, more than that of any other mineral product, comes from tropical countries—in the past from India, Borneo, and Brazil; today from Central Africa and to a smaller extent Brazil and British Guiana. The richness of the tropics in gems is a matter of chance, but the scientists of the Middle Ages believed that the hot tropical sun ripened the gems. A century ago 100 percent of the production came from the tropics; in those days tropical diseases decimated the workmen, and jewel buyers felt they were risking their lives in visiting the diamond fields. Of the present world output, approximately 88 percent by weight and 51 percent by value are produced in tropical countries, but today the personnel of the larger companies enjoys a health record comparable to that of mining companies operating in temperate climates. The different records of the two centuries “spotlights” the advance of tropical hygiene.

Malaria no longer saps the vitality of the staff and workmen; the dreaded sleeping sickness is being conquered, and dysentery has become rare. Turn-over in the staff is no longer a detriment to efficient operation. The staff lives in modern camps with proper water supply, sewerage systems, electric lights, and golf courses. Many bring their families, and schools are provided for the children. The villages of native laborers serve as models to be imitated by the bush natives. The Forminière Co., operating in the Belgian Congo, realizing that its future labor supply was menaced by the sleeping-sickness plague for some years, has had a large, mobile medical staff examining the natives of the countryside and giving treatment to infected natives. In 1938 the medical staff examined 129,348 natives for the disease. The scourge is now under control. Throughout the Belgian Congo the number of cases of the dread disease has decreased from 11 per 1,000 in 1908-10 to 2.9 per 1,000.

It may be stated safely that if it were not for tropical medical research and present-day knowledge of sanitation, the diamond production of the world would be at least one-third less than it is.

Industrial diamonds.—In 1939 more industrial diamonds were employed than ever before; larger factory use in the United States and munition-plant use in Europe more than offset decreased use of the diamond drill in Canadian prospecting. Striking features of the 1939 advance were the rapid expansion in use of diamond-impregnated wheels and other abrasive tools (particularly those with a powdered-metal bond), the increased use of very small bort in drilling, and the gain of mechanically set over hand-set diamond-drill bits. Diamond drills are now employed extensively, particularly in Canada, for blast-hole work.

The demand for industrial stones was strong throughout 1939. As it has been for 3 years, the scarcity of fine stones required the use of mediocre grades. Prices of all grades registered marked advances.

Imports of industrial diamonds into the United States during the past 5 years were as follows.

Industrial diamonds (glaziers', engravers', and miners') imported into the United States, 1935-39

Year	Carats	Value		Year	Carats	Value	
		Total	Average			Total	Average
1935.....	954, 589	\$4, 293, 611	\$4. 50	1938.....	1, 396, 247	\$4, 213, 412	\$3. 02
1936.....	1, 166, 094	4, 328, 603	3. 71	1939.....	3, 568, 730	9, 725, 683	2. 73
1937.....	1, 885, 970	6, 542, 365	3. 47				

The 1939 imports are somewhat misleading, as some shipments were sent here for safekeeping by the countries at war; in addition a number of dealers, forced to leave their homelands, brought with them their stocks of industrial diamonds.

EMERALD, RUBY, AND SAPPHIRE

The increased use of colored stones in jewelry during the past 4 years has caused concern over the source from which supplies are to be obtained in the future. With the State-owned Colombian emerald

mines closed, the Burma ruby mines worked only by the natives, and the production of world sapphire mines small, little new rough stone is coming on the market. The jewelers are using largely stones recovered from old jewelry, Spain having furnished many fine-colored stones in the past 2 years. Such a situation, however, cannot last, and eventually old mines must be reopened or new mines found.

The Muzo emerald mine in Colombia has been shut down several years, but the property of the Chivor Emerald Mines, Inc., has been operated under lease from September 15, 1937, to date by the Compañía de Esmeraldas de Colombia. From September 15, 1937, to September 1, 1939, 28,841.22 carats of emeralds of all grades and 73,633.4 carats of moralla were produced. About 100 miners were employed. Since September 1, 1939, the output has been unimportant. The property is to be sold to the leasing company on a royalty basis and a cash payment of \$10,000.

The emerald deposits of the Murchison Range, Transvaal (*see* bibliography, Kent, L. E., Emeralds, Murchison Range, Transvaal) were discovered in 1927; altogether there have been 15 producers, most of which are now moribund. Production to the end of 1937 was 664,612 carats, worth £84,294, or 2s. 6½d. per carat. Some of the stones are of fine color, but like most emeralds they usually are flawed (owing to movement after deposition) and often include biotite inclusions. Color zoning is common. Cobra Emeralds, Ltd., has been by far the largest producer. Emeralds occur as well-shaped crystals, distributed sporadically in shoots and pockets in biotite schist near pegmatitic intrusions. The pegmatite contains no emerald but does contain beryl. Near later basic intrusions the emerald has been "baked" to a brownish green. The emerald deposits resemble those of Egypt, the Urals, the Salzburg Alps, and North Carolina. The emeralds were deposited during the "hydrothermal phase" following the intrusion of the pegmatite.

Open-cut methods of mining are used, and the emeralds are separated largely by hand methods. The yearly emerald content has ranged from 2.75 to 3.16 carats per load (approximately a cubic yard). The product is sold directly to London gem buyers. In 1938-39 the Cobra Emerald Mines, Ltd., was shut down, owing partly to the depressed state of the precious-stone market and partly to decreased quality of the stones. N. M. Uspensky believes that although some of the emeralds at the Ural emerald mines near Sverdlovsk, crystallized at 500° C., most of them crystallized below 400° C. and some as low as 200° C.

In 1938 the Mogok or Katha workings, Burma, produced 202,483 carats of rubies, a 29-percent increase over 1937 (157,308 carats).

The subcommittee appointed by the Government of Ceylon to report on marketing and cutting gems in Ceylon, recommended (1) that a Government institute to instruct the natives in gem cutting be set up as part of the Department of Mineralogy, and (2) that a Government salesroom be attached thereto. The Singhalese cutter certainly has much to learn from an up-to-date gem cutter. The report of the committee is an interesting document, describing the three trades concerned (the miner, the cutter, and the dealer), the laws relating to gemming, mining methods, marketing, and other phases of the industry. It is understood that the recommendations of the committee will be acted on favorably.

The sapphire production of the Mogok ruby workings, Burma, has been as follows in the past 3 years: 1936, 172 carats; 1937, 4,392 carats; and 1938, 1,344 carats. Judging from the statistics of the Indian Government, the output of the Kashmir sapphire mines was probably less than 10,000 carats in 1938.

In 1938 gems valued at £2,166 were sold from the Anakie (Queensland) sapphire field (£1,410 in 1937). First blues comprised three-fourths of the sales; other sapphires (green and yellow) and zircons were not in demand. Production came from Rubyvale, Reid's Water Hole, and Mt. Laura. In 1939 a new field is said to have been discovered about 6 miles west of Rubyvale, central Queensland. A 412-carat emerald-green sapphire is reported among the finds. No gem sapphires were produced in New South Wales in 1938, but 132 ounces of industrial stones were produced at Sapphire.

At Mtito Andei, Kenya, patches of fine blue sapphire are found in crystalline corundum, encountered in working asbestos. Several small parcels of sapphires have been shipped.

LESSER GEMS

The Smithsonian Institution put on exhibition a huge topaz weighing 153 pounds, or about 350,000 carats, in 1939. It is pale blue, with a sherry-color interior. The Harvard University Mineralogical Museum also added to its collection a large white topaz weighing 225 pounds. Late in the year the American Museum of Natural History, New York, obtained an even larger topaz weighing 596 pounds. All three crystals came from Minas Geraes, Brazil.

In 1937 the output of aquamarine at Daso, Kashmir, was 6,260 carats (no output in 1935 and 1936).

The total value of the opal production of New South Wales to December 31, 1938, has been £1,627,021. The 1938 output was valued at £4,226 (1937, £3,357); Lightning Ridge produced stones valued at £4,132, Grawin £50, and White Cliff £44. No production was reported from Queensland in 1938.

In 1930 a deposit of lapis lazuli was discovered by G. L. Judin at Ovalle, Pamir Mountains, Badakhshan. Like similar occurrences, it is a contact-metamorphic deposit in marble.

The Katanga copper deposits are the most important present-day producers of malachite. The material is used in cheap jewelry and objets d'art. Recent sales are as follows: 1937, 3½ tons; 1938, 2½ tons; and 1939, 1½ tons.

A little turquoise is produced in northern Baja California, Mexico, not far from Ensenada.

The amber mines at Palmnicken, Samland, Prussia, produced 400 metric tons of amber in 1938 (1937, 328 metric tons). Amber is used as an ornament, and considerable amber oil and amber acid are distilled, as they are employed in the German dye and varnish industries. In 1938 Germany exported 16,400 kilos of amber valued at 229,000 reichsmarks. Most of the amber goes to Danzig for processing and reexport, the major trade being with the Balkan States and the Orient. In Germany the use of amber "German gold" has been increased by nationalistic propaganda and the difficulty of buying other types of jewelry. Laws forbid the sale of imitation amber and synthetic resins resembling it in Germany.

Some gem prospecting is being done in the Grenville limestone near Laurel, Quebec. Clear pale-lilac diopside and honey-yellow vesuvianite occurrences may have some gem value. Previously minute blue sapphires were found at Kilmar. As Frank D. Adams has pointed out, the geology of the Laurentian rocks is similar to that of the gem-bearing rocks of Ceylon, but owing to recent glaciations there is no concentration of the gems in stream gravels.

The mining and cutting of jet at Whitby, England, was an important industry 75 years ago. Today, only a few score of people are engaged in it. The present war may revive the trade.

In 1938 Brazil exported 746,872 kilos of rock crystal, 2½ times the average for the preceding 14 years (*see* bibliography, Winslow, Rollin R., Quartz Crystal (Brazil)). Japan in particular, Great Britain, Germany, and to a smaller extent the United States are the principal purchasers. The best-quality crystals are sent to the United States for use in scientific instruments. Bahia is the principal producer, followed by Minas Geraes and Goyaz. The crystal occurs in pegmatite dikes or in detrital or placer deposits derived from them. Mining methods are primitive and usually are carried on by "garimpuros," locally called "crystalleiros"; the open pits are rarely more than 5 meters deep. Most of the exporting firms have their own buyers in Brazil. Rough crystal is worth \$0.15 to \$18.50 per kilo, according to quality. Reserves of crystal are reported to be large. Optical quartz has been discovered recently in the Mtito Andei district, Kenya.

No other gem except the diamond has a wider variety of industrial uses than rock crystal. It is employed for oscillators in radio transmitters; for quartz-plate resonators at cable and long-distance telephone terminals; and for quartz plates in sound-detecting and sound-locating devices of various sorts and in detonator measurers. Quartz is also the basis of fused quartz employed as tubes, flasks, and fibers for precision instruments. It is used widely in the optical trade, in moderate-priced jewelry and objets d'art, in quartz lamps, and as an abrasive. A glass developed in 1939 by the Corning Glass Works may decrease the use of fused quartz. In December the United States Treasury Department bought 14,800 pounds of Brazilian crystals under its strategic-materials buying program. The price was \$98,875, or \$6.68 per pound.

San Luis and Mendoza Provinces, Argentina, produced, respectively, 325 and 270 metric tons of greenish yellow translucent marble ("onyx") suitable for decorative purposes in 1937. The United States is the principal purchaser; the rough material is worth \$140 to \$230 per ton. To obviate flaws, the blocks are cut by hand with chisels, no percussion drills or powder being used. The "onyx" deposits at El Marmol, Baja California, Mexico, produce from 3,000 to 25,000 cubic feet a year. The product is trucked to Santa Catarina, whence it is shipped to the United States.

In 1938 Madagascar exported 453,638.037 kilos of gems and industrial stones. Beryl, tourmaline, colored topaz, opal, sapphire, ruby, garnet, and spodumene totaled 6.81 kilos; feldspar, scapolite, amethyst, and other lesser gems, 263.544 kilos; opaque beryl and garnet, 328,979.208 kilos; rock crystal, 4,693.625 kilos; rose quartz, amazonstone, etc., 6,249 kilos; and industrial rock crystal, 111.763 kilos. France was the principal purchaser, although Germany purchased the

finer rock crystal and Switzerland and England certain grades of stones.

There were four producers of precious stones in South-West Africa in 1938. The following table gives productions and exports for 1937, 1938, and the first quarter of 1939.

Production and exports of precious stones in South-West Africa, 1937-38 and first quarter of 1939

	Production			Exports		
	1937	1938	1939 (first quarter)	1937	1938	1939 (first quarter)
Semiprecious stones:						
Aquamarine.....grams	4, 970	270	2, 000	4, 350	200	
Chalcedony.....do				119, 000	70, 000	
Rose quartz.....do			6, 720	54, 786	9, 720	
Topaz.....do	4, 000	500		3, 000	1, 000	70
Tourmaline.....do	37, 795	26, 248	4, 300	507, 851	59, 508	10, 666
Iceland spar.....pounds	873	3, 630	250	309	24	

Germany buys virtually the entire output of aquamarine.

With the possible exception of Ceylon, Brazil is the most important producer of the lesser gems, but figures on its 1939 production are not at hand.

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