

27th YEAR

THE MINERAL INDUSTRY

1892-1918

VOLUMES I TO XXVII

Complete Sets of this work, uniformly bound, except Volumes I and VI, which are out of print, are available at the following prices:

	Per Copy
VOLUMES I TO XV	\$ 5.00
(Except Volumes I and VI)	
VOLUMES XVI TO XXVII.....	\$10.00

McGRAW-HILL BOOK COMPANY, INC.
239 WEST 39TH STREET, - - NEW YORK

THE MINERAL INDUSTRY

ITS

STATISTICS, TECHNOLOGY AND TRADE

DURING

1918

FOUNDED BY RICHARD P. ROTHWELL

EDITED BY

G. A. ROUSH, A.B., M.S.

ASSISTANT PROFESSOR, DEPARTMENT OF METALLURGY, LEHIGH UNIVERSITY; FORMERLY CAPTAIN, ORD. DEPT., U. S. A., AND CHIEF OF TESTS, METALLURGICAL BRANCH, INSPECTION DIVISION, ORDNANCE DEPT., U. S. A.; MEMBER OF THE AMERICAN INSTITUTE OF MINING ENGINEERS, THE AMERICAN ELECTROCHEMICAL SOCIETY AND THE AMERICAN CHEMICAL SOCIETY

ASSISTANT EDITOR

ALLISON BUTTS, A.B., B.S.

INSTRUCTOR, DEPARTMENT OF METALLURGY, LEHIGH UNIVERSITY; MEMBER OF THE AMERICAN INSTITUTE OF MINING ENGINEERS AND THE AMERICAN ELECTROCHEMICAL SOCIETY

VOLUME XXVII

SUPPLEMENTING VOLUMES I TO XXVI

McGRAW-HILL BOOK COMPANY, INC.
239 WEST 39TH STREET. NEW YORK

LONDON: HILL PUBLISHING CO., LTD.
6 & 8 BOUVERIE ST., E. C.

1919

AG
M665
1918

May 3, 1920

WILLIAM D. H. H. H. H. H.
GRADUATE SCHOOL OF
BUSINESS ADMINISTRATION

3800

COPYRIGHT, 1919, BY THE
MCGRAW-HILL BOOK COMPANY, INC.

THE MAPLE PRESS YORK PA

PRECIOUS STONES

BY GEORGE FREDERICK KUNZ

While diamonds are worth over four times as much today as they were 25 years ago, this is really quite in line with the general increase of wealth. From 1900 to 1917 the value of the crops produced in the United States increased 425 per cent. and that of the live-stock products 320 per cent., the increased value of both classes of products combined being 388 per cent. This, of course, embraces both an increase of quantity and an increase of price. Within a shorter period, from 1910 to 1918, the prices of the various edible products were increased as much as from 100 to 150 per cent. But the price of diamonds, as articles of luxury, depends primarily on the total augmentation of wealth, and in estimating this due attention must be paid to the increased amount and value of our mineral products.

The following figures calculated from the De Beers reports show that even the rough product at the mines has increased three times in value during the past 30 years, and the enhanced cost of marketing the material and of cutting it has been more than as much again:

VALUE OF DIAMONDS PER CARAT AT MINES

1889.....	\$4.80	1913.....	\$14.22
1895.....	6.20	1915.....	10.97
1900.....	8.25	1917.....	15.35
1905.....	11.19	1918.....	16.48
1910.....	9.96		

While the increase in value has not been regular, it has been essentially constant.†

The great increase in the sale of diamonds is due to the purchases of all classes, for never have the laboring classes had more money, especially in the case of shipyard workmen, among munition workers, in farming districts, at ports of embarkation and debarkation, and notably in the larger cities near which camps were located.

A matter of interest to buyers and sellers of precious stones and jewelry is the new tax laid in the United States on these objects on and after Apr. 1, 1919. The part of Section 905 of the Revenue Act referring to this reads as follows:

That on and after Apr. 1, 1919, there shall be levied, assessed, collected, and paid (in lieu of the tax imposed by sub-division (e) of Section

600 of the Revenue Act of 1917), upon all articles commonly and commercially known as jewelry, whether real or imitation; pearls, precious and semi-precious stones, and imitations thereof; articles made of, or ornamented, mounted or fitted with precious metals or imitations thereof or ivory (not including surgical instruments); watches, clocks, opera glasses, lorgnettes, marine glasses, field glasses, and binoculars; upon any of the above when sold by or for a dealer or his estate for consumption or use, a tax equivalent to 5 per centum of the price for which so sold. This, however, in finished articles is included in the selling price to the consumer. An accurate account of all such sales is kept by the seller.

UNITED STATES IMPORTS

As shown in the following tables, there was a marked falling off in the imports of diamonds and precious stones into the United States during 1918 as compared with those of the preceding year. However, this decline has been followed by an exceedingly rapid recovery in the early months of 1919, so that there is every indication that the imports for 1919 will exceed those of any previous year.

The recoil from the highwater mark that characterized the returns for 1917 was continued in those for 1918, where the full effects of the heavy war expenses and the greatly increased taxes necessitated thereby were realized in full measure. Yet even so the precious-stone imports were larger by \$4,500,000 in 1918 than they had been in 1914, the first year of the European war. Very notable in 1918 was the relative increase (although there was a slight actual decrease) in the imports of uncut as compared with cut diamonds, the uncut diamonds representing but 31 per cent. of the total imports in 1917, while they accounted for 52 per cent. of the 1918 imports. In actual figures the value of the cut diamonds of 1917 was \$5,324,988 more than that of the uncut, while in 1918 the conditions were almost exactly reversed, as uncut diamonds worth \$4,843,716 more than the cut stones were imported. The change in this aspect of the situation is even more striking if we compare 1918 with 1916, for while the value of the uncut diamonds imported in 1916 was \$11,264,704, those registered in 1918 were worth \$12,605,526; on the other hand instead of \$24,276,882 worth of *cut* diamonds as in 1916, there was only \$7,761,810 worth brought in during 1918. This serves to show that the diamond cutters in the United States are securing an even larger share of the diamond industry, and it remains to be seen what will be the effect of the revival of that industry in Belgium and the efforts to develop it in England. However, the exceptionally large diamond imports from March to July, 1919, show a return to the proportion of about 31 per cent. of uncut diamonds.

IMPORTS OF DIAMONDS AND OTHER PRECIOUS STONES INTO THE UNITED STATES,
1915-1918.

	1915.	1916.	1917.	1918.
Diamonds, gemmers' and engravers', unset and miners', free.....		\$840,735	\$1,098,102	\$718,397
Diamonds, uncut, dutiable.....	\$7,047,945	11,264,704	13,091,582	12,605,526
Diamonds, cut but not set, dutiable.....	13,140,548	24,276,882	18,416,570	7,761,810
Pearls and parts of, not strung or set, dutiable ..	4,309,837	11,972,018	4,898,406	722,981
Other precious stones and bort, dutiable.....	103,123	257,494	482,224	604,550
Other precious and semi-precious stones, cut, but not set, dutiable.....	1,021,221	2,143,543	1,752,384	968,094
Imitation precious stones, dutiable.....	898,656	834,704	1,167,399	890,642
	\$26,521,330	\$51,590,080	\$40,906,667	\$24,272,000

IMPORTS OF CUT DIAMONDS AND PEARLS ACCORDING TO THE SOURCE

	Diamonds, cut, but not set, dut.			Pearls, and parts of, not strung, nor set, dut.		
	1916.	1917.	1918.	1916.	1917.	1918.
Imported from:						
France.....	\$2,034,724	\$999,564	\$170,441	\$6,214,056	\$3,095,957	\$112,580
Netherlands.....	19,519,572	15,022,899	6,266,319			
United Kingdom.....	2,167,222	2,229,259	1,308,941	5,053,530	1,449,100	376,741
British India.....				594,519	300,463	150,097
Other Countries.....	555,364	164,848	16,109	109,913	52,886	83,563
Totals.....	\$24,276,882	\$18,416,570	\$7,761,810	\$11,972,018	\$4,898,406	\$722,981

In 1918 the notable falling off of the pearl imports is explained by the embargoes laid by Great Britain upon the export of precious stones and pearls from India and other British possessions. A chief reason for this was to prevent the loss of gold by Great Britain that would result from gold payments in Bombay and Calcutta by American dealers, as the precious metal would be drawn from the English reserves; this was more especially to be avoided as the gold exported to India is principally hoarded there, or used for ornamental purposes, and rarely finds its way back to the mother country.

DIAMONDS

TRADE CONDITIONS

The condition of the diamond market in Amsterdam during 1918 differed in certain respects from what it had been in the previous years. The difficulties of the export trade brought about a decrease in exports to the United States, but this was to some extent made good by increased sales to England, France and British India, as well as by an unusual demand from Sweden, Norway and Denmark, to say nothing of more active transactions at home in Holland. Toward the end of the year, the demand from the United States revived and went on increasing. Besides the countries already mentioned, Germany and Russia as well

became factors in the Amsterdam diamond market, and probably a good part of the diamonds sold in Sweden, Norway, and Denmark eventually found their way to Germany or Russia. The special demand in their case could not well be attributable to economic prosperity, although it must be borne in mind that whatever may have been the hardships endured by many Germans, others profited by the outlays for war materials; but the real cause is believed to be the dread of financial disaster, or in Russia, of wholesale confiscations, and thus easily portable precious stones, which could be carried away on the person, and would command a good price anywhere, had a marked advantage over securities which might become worthless, and over paper money which was rapidly depreciating in value. The able management of the diamond situation by those who control the African output and the marketing in London has thus given very excellent results, by inspiring general confidence in the stability of values in the diamond market.

Japan also is rapidly developing a demand for diamonds, which need not surprise us, since the wealth of that country has increased immensely as a result of the war, in view of the fact that her war expenses were mainly confined to the cost of the expedition against the Germans of the Shantung Peninsula, which did not last more than a few weeks. The demand for diamonds may be considered as a kind of barometer of wealth. Japan's diamond imports for 1918 were valued at \$1,059,500, while the worth of the 1917 imports was only \$550,000, or little more than half as much as in 1918, and this in spite of the imposition of a heavy import duty.

The removal of the prohibition on the export of unset diamonds from France has recently been decreed by the French Government. It is not, however, believed that a great quantity of French diamonds is available for export. Moreover, in the case of cut diamonds the fact that the older French cut produced stones either quite shallow or else very deep, of types not favored in the United States, would also serve as an impediment. That France should not be buying diamonds to any extent in the Amsterdam market is hardly surprising in view of the financial stringency in the land, and the consequent necessity for economy in the purchase of articles of luxury. The Chamber Syndicale of Paris in 1919 has made repeated efforts to secure a complete relaxation of the restriction in the trade in precious stones and pearls. The power to exercise a very wide discretion in this matter is accorded to the Minister of Commerce, but the unusually large imports for the last quarter of 1918 have made him hesitate to free this trade entirely. On the other hand the president of the Chamber Syndicale has emphasized the fact that France can only export the goods of this type which she imports, and that

although when stocks have fallen as low as at present, the home demand may absorb a good part of the imports, this will cease to be the case when the stocks have been replenished.

News came to Copenhagen on Apr. 1, 1919, of an order issued in Budapest by the new Hungarian Government, providing that jewels and precious stones the value of which exceeds 2000 crowns should be surrendered without payment to the Communist Government. Those who failed to conform to this order were threatened with the death penalty, a proceeding fully in accord with the Draconian legislation of the Hungarian friends of "liberty or death," a realization of the latter being more probable than that of the former.

USE OF DIAMONDS IN INDUSTRY

Industrial diamonds, for which the call was so imperative for war purposes, are now being utilized in a great variety of ways, in the making of great tanks and other large objects, and also for smaller products down to fuses. Thus the necessary abandonment of work for munitions and other war implements will probably be in considerable measure offset by the adaptation of many manufactories, forced into being under the stress of the war, as producers of material needed for the rapid expansion of the arts of peace.

The industrial use of diamonds is now so important that it is no cause for surprise to learn that they are utilized in a large factory in the construction of motors. Its particular application here is in regrinding the surfaces of crank shafts, cam shafts, pistons, etc. The diamond, which is set in a small socket at the end of a steel bar, is first covered with grease, and then pressed against the rapidly revolving emery wheel, so that the latter may be reground to a smoothness as nearly absolute as possible. As an indication of the number of diamonds required for this use, the motor factory to which we allude requires \$150,000 worth of industrial diamonds annually.

DIAMOND-CUTTING

Belgium.—As had been expected, the diamond-cutting industry is rapidly reviving in Antwerp, where it was too firmly rooted not to survive the storms of war. During the occupation of the city by the Germans, most of the cutters and polishers sought refuge in Holland or England, many of them establishing themselves in the Hatton Garden district in London. Now the greater part are eager to return. As is well known, many of them are Jews, and these were not disposed to respond to the tempting offers made by the managers of the Antwerp industry, until they should be assured that they would be recognized as of Jewish nation-

ality irrespective of the place of their birth. The authorities in Antwerp finally agreed to this. However, Jews of German birth are not as yet admitted, nor are Germans, of course. Everything is to be done to restore the houses of the repatriated to as good state as before the war, and the authorities are taking measures to supply the implements and furnishings the Germans may have carried off. It is expected that before long the regular tide of traffic in diamonds will be resumed, and thus the Saturday night boats from Harwich to Antwerp will soon bear the usual crowd of buyers, who will carry back with them to London, on Monday night, the goods they have bargained for in the interval.

Great Britain.—The newly established diamond-cutting industry in Birmingham, England, shows signs of healthy growth in spite of the not unnatural opposition of Amsterdam and Antwerp. As an answer to the reproach that Birmingham has taken an unfair advantage of the difficulties under which Antwerp has labored because of the German invasion, it should be borne in mind that the beginning of the Birmingham cutting industry dates back before the war. At its outbreak Messrs. Ginder & Ginder had already erected in Hockley Hill a factory especially designed for diamond-cutting, and placed it under the supervision of skilled foreign workers. The material used in its construction, ferroconcrete, was chosen so as to ensure a maximum of rigidity and thus avoid the vibration so greatly detrimental to the delicate operations of diamond-cutting. Boys from the local schools have here received instruction in the art, and those who have been in it for from seven to nine years are already able to take over the task of instructing new-comers. The boys are indentured for a seven-year period, but are paid from the outset whatever they may be able to earn. Some have proved so capable that before the close of their apprenticeship they have earned as much as £4 or £4 10s. a week (\$20 or more), while the wage for a fully experienced workman may be as high as £10 a week. As yet there is no idea of competing with the great European centers, but the demand for cut diamonds is so active that there is likely to be work enough for all.¹

Holland.—Reports from Amsterdam show that diamond-cutting is being actively carried on there, the material coming necessarily from the London market. The Indian demand for brilliants is reawakening, especially as local troubles in India are becoming quieted, and a noteworthy circumstance is that considerable shipments have been made to China, which land is probably destined to become a fair consumer in the future for this class of goods.

South Africa.—The question as to the practicability and the advisability of establishing a diamond-cutting industry in South Africa was

¹W. T. Gracey, United States Consul at Birmingham, England, *Comm. Rept.*, July 17, 1919.

brought before the Industries Advisory Board of the Union of South Africa in August, 1918. After giving earnest attention to the various statements, reports and proposals that were made, the members of the Board were impressed with the difficulties of the project, and they were not entirely unanimous in thinking that the present time was particularly favorable for the introduction of the industry. It was believed by many that to promise success the enterprise would require a very large capital, and also the active support of the Government in the beginning in order to contend with the competition of the long-established centers of the diamond-cutting industry in Europe.

Several concrete propositions were made for the establishment of cutting works. One of the applicants asked the privilege of buying, at current market prices, 12,000 carats of diamonds during the first year, increasing this quantity in each succeeding year by 1000 carats a month, until the total annual purchases would be 120,000 carats. An alternative proposal was that the Government should supply the rough stones and take 60 per cent. of the returns on the sale of the cut material. The applicant stated that a master cutter was already in the Union, and he proposed to start his works with 40 Dutch and Belgian cleavers, cutters, and polishers, to be brought from Europe. It was estimated that they would turn out 364 carats of cut-stones weekly from 800 carats of the rough material. This output was believed to represent approximately the present South African demand. As the home or foreign demand increased, additional workers, up to 650, would be brought in, each one of whom was to undertake the training of a South African apprentice.

Two years ago another proposition was made by the proprietor of a small cutting factory in Johannesburg. He asked for a subsidy of £3000 a year for a term of years, and undertook to teach 10 young persons yearly in the various branches of the industry. This applicant suggested that a part of the proceeds of the export tax on diamonds could be properly used in this way for the founding of a home industry. Still another applicant has urged the Government to request the De Beers, New Jagersfontein, and Premier companies to make a definite statement as to their willingness to supply regularly to a bona fide cutting industry, in South Africa, all the rough diamonds it would need, at the same prices as those ruling in London.

The final conclusion of the deliberation was that the establishment of such an industry by Government aid or agency was far too complicated a matter to be decided just at this time.

United States.—The progress of diamond-cutting in the United States is shown by the fact that there are at the present time as many as 600 workers in this branch, for the greater part employed in the vicinity of

New York City. Their wages run from \$50 to \$75 a week. This has caused a very considerable increase in the quantity of rough diamonds brought in at the port of New York, as is exhibited in the figures for 1917, compared with 1916. This change became still more accentuated in 1918.

Employment of Crippled Soldiers.—Some further details are available regarding the successful employment of partially crippled soldiers as diamond cutters, which was treated of at some length in our last report.¹ Mr. B. Oppenheim, who has done so much to make the experiment a success, states that he proposed to the Ministry of Pensions that he would train up as many as 2000 disabled men, if the Ministry agreed to pay them for 6 months the training allowance of 27s. 6d. per week which was given to those learning other vocations. After the expiration of the 6 months, Mr. Oppenheim bound himself to pay the men a minimum of £2 a week and to guarantee continuous employment for a period of 3 years. This was not to imply any obligation on the part of the men to remain with him, but left them entirely free to go elsewhere if they considered this to be to their advantage. So many have already applied that the accommodations for training at Brighton will not suffice, and other centres of instruction are to be established at Cambridge, Wrexham, and Fort William. An interesting circumstance is that all the machinery used has been made by disabled men at the workshops connected with the enterprise. In a large number of cases the wages allotted to the trained men have already been increased so that some are able to earn £3 or £3 10s. per week, and it is believed that this will be increased before long to £5 a week, or even more than that.² A member of a leading firm of diamond cutters in Birmingham declares that with a little encouragement from the Diamond Syndicate it would be quite possible to have ten or twelve large cutting and polishing establishments in that city within a short time. If the industry were nationally developed in England, work could be provided in this way for 10,000 disabled men.

It is not only in England that energetic attempts are being made to establish diamond-cutting, either with Belgian workers or with maimed soldiers who are being given careful and special training in the art, but Scotland also is enlarging the field, for workshops are about to be erected on the grounds of the Highland Hotel at Fort William by the Ministry of Pensions, and it is expected that they will afford accommodations for some 200 disabled soldiers who are to be trained as diamond-cutters.³

It is questionable, however, as to whether men who are over 25 years

¹ MINERAL INDUSTRY, 26, 583, 584 (1917).

² So. Afr. Min. Jour., Dec. 7, 1918, p. 288.

³ Watchmaker, Jeweller, Silversmith and Optician, Jan., 1919, p. 69.

of age should attempt to learn so difficult a mechanical process, unless they have special qualifications for the work. Probably not more than 10 per cent. could ever become proficient, and the loss in imperfect stones from incompetent workmen would be very great.

DIAMOND MINING

Brazil.—There is promise of more active work in the Brazilian diamond fields, for quite recently a corporation has been organized in Rio de Janeiro under the title "Companhia Brasileira Diamantifera," for the development of diamond mines at Moribeca and Boa Vista, in the region of Diamantina, State of Minas Geraes. The capital of the new company is set at 3000 contos of réis, equivalent to about \$750,000, the number of shares being 150,000, each having a par value of 20,000 réis (the "conto" is 100,000 réis) or in the neighborhood of \$5 in United States money. It is said that almost the entire capital is represented by properties owned by the "Syndicato Diamantino."¹

Congo.—The war failed to check the steady growth of diamond production in the Belgian Congo. From the Kasai diamond field, owned and operated by the Société Internationale Forestière et Minière du Congo, there have been recovered up to the end of 1918 as many as 400,000 carats of diamonds. The growth of production in spite of the war is shown by these returns for the years 1915–1918.

DIAMOND OUTPUT OF THE BELGIAN CONGO

	Carats.		Carats.
1915.....	48,935	1917.....	100,000
1916.....	53,940	1918.....	164,420

These results were accomplished by the work of 30 white workers and about 3800 natives. Discoveries of new diamantiferous area are constantly made by the Kasai company, and to the northwest of these new workings others have been found by the Lower Congo-Katanga R. R. Co. On the other hand, the war entirely stopped work on the holdings of the Kundelungen Exploitation Co., on which are located many pipes of kimberlite slightly diamantiferous. Neither have any notable results been attained by the Simkat, although diamonds have been found in some of the pipes on these properties. The finding of scattered diamonds in the course of places sluicing is often reported from the northeastern part of the Belgian Congo.²

German Southwest Africa.—Following the policy of restriction so consistently carried on in the South African mines by the controlling

¹ Vice-consul Richard P. Momsen, *Comm. Rept.*, Jan. 23, 1919.

² "Mining in the Belgian Congo," Sidney H. Ball and Millard K. Shaler. *Eng. Min. Jour.*, Aug. 9, 1919, p. 216

interests, the output of the former German diamond fields in Southwest Africa, which toward the beginning of the war were producing 100,000 carats monthly, is now cut down to some 30,000 carats monthly. That those fields could have produced more than the largest quantity derived under German management is well known, since the Germans found it necessary to establish a maximum limit, but of course some uncertainty was felt as to the future, since the diamonds have only been found not far from the surface, whither they have been brought by alluvial processes in far distant times.

In the diamond fields of the former German Southwest Africa, the depth of the diamond-bearing layer varies considerably. While commonly but from 4 to 6 in. in depth there are places between Luderitz Bay and Elizabeth Bay where it extends down from 25 to 30 ft. below the surface. The diamond content of gravel from the rich deposits of Idatal in the Pomona district has been as high, in some cases, as 200 carats per cu. meter ($1\frac{1}{3}$ cu. yd.) and the cost of production has been only 50 cts. per carat. Where, however, the diamonds are more thinly scattered over a wide surface, and the work has to be done in distant places, it has sometimes cost as much as \$8.50 per carat, a cost that would notably decrease the profit. Under the German régime about 500 whites and 5000 colored laborers were employed in work. The latter were Cape "boys" or Ovambos. As the Germans did not believe that the diamond fields would continue productive for more than 12 or 15 years longer, the production will not be large enough to seriously compete with the South African mines. That temporarily good results were attained in some quarters under the German management is shown by the fact that the Colonial Mining Co., Ltd., paid during the four years 1910-1913 dividends totaling 112 times the amount of its capital of \$24,450. The highest dividend was 3800 per cent. for 1912, and before any dividends could be declared the heavy taxes imposed by the Government had to be met.¹

The change in ownership of what was formerly German Southwest Africa bids fair to lead to the exploitation of a new source of diamonds. A British company, with liberal financial backing, is said to have been formed to carry on dredging operations on the ocean bed off the coast. It has been known for some time that the diamond deposits extend out beyond the coast line. All the probabilities favor the idea that these submarine deposits are of similar origin with the terrestrial ones in the province, being derived as the latter are from some unidentified source to the eastward, and hence the rumor of the existence of a true "diamond pipe" somewhere beneath the sea appears to lack any satisfactory basis in theory, although of course all theories are subject to the final arbitra-

¹ "Resources of German Southwest Africa," *Comm. Rept.*, June 5, 1919.

ment of facts. According to the *Board of Trade Journal* the Government is to take 40 per cent. of the proceeds of the work, and arrangements are said to be in a forward state for dredging within a short time. The enterprise is also supported by two well-known South African interests.

Rhodesia.—The official report of the diamond output of Rhodesia for the years 1913–1917 shows that the amount still continues to be small. The diamonds are almost exclusively from gem-bearing gravel of the Somabula Forest.¹

Year.	Weight in Carats.	Value in Pounds, Sterling.	Value in Dollars.	Value per Carat.
1913.....	706	3,645	\$17,739	\$25.13
1914.....	1,004	3,985	19,393	19.31
1915.....	272	1,016	4,944	18.18
1916.....	1,021	5,331	25,943	25.41
1917.....	619	2,991	14,556	23.51
Total.....	3,622	16,968	\$82,575	\$22.80

Union of South Africa.—There was a slight decrease in the diamond production of South Africa in 1918, as compared with 1917, when the reaction from the check given by the war was more decided. In 1918 the weight of the diamonds taken from the mines was 2,537,360 carats, having a value of \$35,574,335, while in 1917 the production was 2,902,416 carats worth \$38,569,050. This still shows an increase over 1916, the first year of the improved conditions, when 2,346,330 carats were taken out, valued at \$27,132,893. The value per carat rose progressively in these years, as follows: 1916, \$11.37; 1917, \$12.93; 1918, \$14.02. The higher prices secured thus served, in part, to offset the smaller output for 1918.

The renewed prosperity of the De Beers mines is shown to have maintained the high standard revealed in the report for the year ending June 30, 1917. In the Thirtieth Report, that for the year ending June 30, 1918, the value of the diamonds sold in the year, plus the increase of stocks at cost of production, is given as £4,327,648 (\$21,060,502 at normal exchange). This compares with £4,629,772 (\$22,523,837) for 1917, the apparent slight decrease being practically negligible. The undistributed balance on June 30, 1917, was £1,850,861, of which £715,579 represented unsold diamonds in stock at that date. From this total balance the sum of £1,135,277 was appropriated for the stabilization of the diamond trade, through investments in other diamond mining companies and in kindred interests. A further sum of £441,249 was set aside for this purpose from the balance of revenue for the year, making in all £1,576,531 (\$7,672,188 at normal exchange). Adding to the

¹ *Bull. Imperial Inst.*, p. 456.

resultant balance of £715,583, the revenue from diamonds sold, plus increased value of stocks, and an additional amount of £351,901 for interest and dividends on investments, etc., a total of £5,395,133 (\$26,248,815) was reached, from which was deducted £1,223,935 for productive mining expenditure, and £548,834 for maintenance of mines and floors temporarily shut down, expenditure on farms, charges, etc., interest in debentures and on capital of leased companies, and sinking fund toward repayment of debentures, and, finally, £135,266 for expenditures consequent to the war, such as salaries and wages of employees on active service, war bonus to all employees, donations of war funds, etc. This left a balance of £3,487,098 (\$16,969,963). This sum was distributed as follows: £267,517 as payment of income tax to the Union of South Africa; £441,249, as noted above, for the stabilization of the diamond trade; £740,000 for dividends on the preferred shares, after the deduction of the dividend tax; £1,250,000 for dividends and bonus on deferred (common) shares; the remaining £788,332 being carried as balance to the ensuing year. Of this amount £746,654 was entered on Suspense Profit Account, as representing value of diamonds unsold June 30, 1918, and £41,677 as unappropriated balance. It is interesting to note that the Suspense Account includes "Participation in South-west Africa Diamonds unrealized 30th June, 1917." This, of course, refers to diamonds extracted from the former German mining fields in Southwestern Africa.

The General Reserve Fund was reduced by £96,079 expended in increasing the stocks of blue ground, and now stands at £1,605,086 (\$7,814,071). On the other hand the Redemption Fund for the De Beers Four-and-a half Per Cents was increased £498,944. Both of these funds are invested in securities which are estimated at market prices of June 30, 1918. The special reserve fund for the stabiliment of the diamond trade is invested in the shares of other diamond-mining companies and related interests.

In the course of the year the company declared two dividends, each of 20 per cent., on the preferred shares, 40 per cent. in all. On the deferred (common) shares, two 20-per cent. dividends were also declared, as well as a bonus of 10 per cent. on each share, making a total distribution of 50 per cent. on this stock.

The stock of blue ground and lumps on the floors on June 30, 1918, is given as follows in the report.

	Loads.
De Beers.....	48,396
Wesselton mine.....	3,012,570
Bultfontein mine.....	3,220,808
Dutoitspan.....	2,795,493
Total.....	9,077,267

The value of this blue ground is set at £1,295,438 (\$6,304,149).

By the death on Sept. 1, 1918, of Mr. Francis Oats, for the past ten years Chairman of the De Beers Co., it has been deprived of the services of one who has devoted himself long and faithfully to it. His sterling judgment, based on protracted experience in the diamond field, made him an almost invaluable aid to the company, and his advice and counsel were always sought for when any momentous decision was to be made.

The quick rebound of production in the De Beers mines succeeding to the rapid decline in the first years of the war is brought out very distinctly in the figures for the years from 1913 to 1918, the successive years ending June 30:

DE BEERS AND KIMBERLY MINES				
	Loads of Blue Ground Hoisted.	Loads of Blue Ground Washed.	Carats of Diamonds Found.	Selling Value per Carat.
1913-1914	None	75,815	27,346½	80s. 10. 21d.
1914-1915	None	None	83	None
1915-1916	None	None	38½	None
1916-1917	None	None	41	None
1917-1918	None	None	315¾	None
WESSELTON MINE				
1913-1914	2,373,522	2,083,352	593,305	45s. 7. 62d.
1914-1915	217,483	219,276	56,359¼	37s. 7. 13d.
1915-1916	43,586	885,334	227,914¼	44s. 2. 31d.
1916-1917	1,814,393	1,669,104	445,865¾	53s. 9. 27d.
1917-1918	2,065,620	1,805,436	487,828¾	54s. 9. 76d.
BULTFONTEIN MINE				
1913-1914	2,279,838	2,069,552	785,510¾	40s. 10. 47d.
1914-1915	256,950	214,522	76,084	33s. 6. 86d.
1915-1916	60,997	864,052	342,676½	44s. 11. 09d.
1916-1917	2,082,267	1,761,756	675,401¾	46s. 11d.
1917-1918	2,328,615	1,859,531	646,927¾	49s. 9. 62d.
DUTOITSPAN MINE				
1913-1914	2,513,469	2,412,679	497,459	84s. 0. 9d.
1914-1915	264,039	260,024	55,609¾	68s. 6. 25d.
1915-1916	None	108,597	20,740¼	91s. 0. 26d.
1916-1917	135,650	1,927,335	377,571½	106s. 11. 93d.
1917-1918	2,200,000	2,178,132	422,657¾	108s. 6. 22d.
GRAND TOTALS FOR ALL MINES				
1913-1914	7,166,829	6,641,398	1,903,621¼	
1914-1915	738,472	693,822	188,136	
1915-1916	104,583	1,857,983	591,369¾	
1916-1917	4,042,310	5,358,195	1,498,679¾	
1917-1918	6,595,078	5,843,099	1,557,729¾	
1913-1918	18,647,272	20,394,497	5,739,535¾	

Considerable development work was done in the Wesselton mine during the year. The Main Rock Tunnel on the 1600-ft. level was

completed. The total length from No. 2 Main Rock Shaft to No. 7 Rock Prospect Shaft is 1420 ft. No. 7 Rock Prospect Shaft, from the 980-ft. level to the 1600-ft. level was holed in December, 1917; its total depth is 628 ft. A water shaft from the surface to the water tunnels was also completed, this having a depth of 130 ft.

The following table gives the number of carats per 100 loads, the value per load and the number of loads of blue ground on the floors of the De Beers mines at the close of the fiscal years 1913-1918, each year ending June 30:

DE BEERS MINE				
	Carats per 100 Loads.	Value per Load.		Loads of Blue Ground on the Floor at Close of Year.
1913-1914	36	29s.	1.28d.	48,396
1914-1915	.....	.....	.....	48,396
1915-1916	.....	.....	.....	48,396
1916-1917	.....	.....	.....	48,396
1917-1918	.....	.....	.....	48,396
WESSELTON MINE				
1913-1914	28	12s.	9.33d.	3,450,638
1914-1915	26	9s.	9.29d.	3,448,845
1915-1916	26	11s.	5.8d.	2,607,097
1916-1917	27	14s.	6.22d.	2,752,386
1917-1918	27	14s.	9.59d.	3,012,570
BULTFONTEIN MINE				
1913-1914	38	15s.	6.38d.	3,095,893
1914-1915	35	11s.	9d.	3,138,321
1915-1916	40	15s.	11.6d.	2,335,266
1916-1917	38	17s.	9.94d.	2,665,777
1917-1918	35	17s.	5.16d.	3,134,861
DUTOITSPAN MINE				
1913-1914	21	17s.	7.87d.	4,358,185
1914-1915	20	13s.	8.45d.	4,341,900
1915-1916	19	17s.	3.48d.	4,233,303
1916-1917	19	20s.	3.94d.	2,411,618
1917-1918	19	20s.	7.42d.	2,434,329

Thus the quantity of the blue ground on the floors of these mines, June 30, 1918, amounted to 8,630,156 loads, against 7,878,177 loads in June 30, 1917, an increase of 751,979 loads during the year, and showing an excess of loads hoisted over loads washed.

The blue ground in sight in these mines on June 30, 1918, is thus reported:

Mine.	Number of Loads.
De Beers, above 2040-ft. level.....	2,750,000
Kimberley, above 3520-ft. level.....	2,000,000
Wesselton, above 980-ft. level.....	11,000,000
Bultfontein, above 1000-ft. level.....	7,000,000
Dutoitspan, above 750-ft. level.....	12,000,000
	<u>34,750,000</u>

This is a decrease of 4,100,000 loads from the corresponding figures of the previous year.

Following are the estimated quantities at lower levels:

Mine.	Number of Loads.
Wesselton, between 880-ft. and 1500-ft. levels.....	22,000,000
Bultfontein, between 1000-ft. and 1600-ft. levels.....	22,000,000
Dutoitspan between 750-ft. and 1300-ft. levels.....	25,000,000
	<u>69,000,000</u>

These estimates are unchanged from last year.

The values per 100 loads of blue ground show a slight decrease for Bultfontein. On the other hand the average selling price per carat is higher for all three of these mines, that for Dutoitspan (108s. 6.22d., equal to \$26.08 at normal exchange) being the highest average ever recorded in the De Beers mines.

These figures give the cost of production per load of blue ground, the value per load, and the profit per load in the three De Beers Mines worked in 1917 and 1918.

1917.			
	Cost of Production per Load.	Value per Load.	Profit per Load.
Wesselton.....	4s. 9.959d.	14s. 6.22d.	9s. 8.261d.
Bultfontein.....	3s. 9.851d.	17s. 9.94d.	14s. 0.084d.
Dutoitspan.....	6s. 1.366d.	20s. 3.94d.	14s. 2.574d.

1918.			
	Cost of Production per Load.	Value per Load.	Profit per Load.
Wesselton.....	4s. 10.94d.	14s. 9.59d.	9s. 10.65d.
Bultfontein.....	3s. 11.61d.	17s. 5.16d.	13s. 5.55d.
Dutoitspan.....	3s. 8.8d.	20s. 7.42d.	16s. 10.62d.

Here the only notable change is the great reduction in cost of production for Dutoitspan, entailing a corresponding increase in profit per load.

During the 10-year period from June 30, 1908, to June 30, 1918, the following quantities of blue ground were hoisted and washed from the De Beers mines, yielding the number of carats mentioned; the annual average is also given:

	1908-1918.	Annual Average.
Loads of blue ground hoisted.....	50,744,568	5,074,457
Loads of blue ground washed.....	52,018,061	5,201,806
Carats of diamonds produced.....	15,807,856½	1,580,786
Value of product in dollars.....	\$198,472,897	\$19,847,290

The value of the 1918 product in dollars at normal exchange would be \$25,192,281, or more than \$5,000,000 over the 10-year average. As the carat product of the year was a little below the average (1,557,729¼ as compared with an average 1,580,786) this gives an excellent indication of the notable rise in diamond values at the present time.

At the 30th annual meeting of the shareholders of the De Beers

Consolidated Mines, Ltd., held on Dec. 13, 1918, the chairman, Colonel Sir David Harris, thus summed up the results achieved in the main properties controlled by the company, and the general condition of the markets:

"During the year under review the diamond market was firm, and prices have advanced. The total number of carats produced by the three largest concerns—De Beers, Premier and Jagersfontein companies—did not total in the aggregate the average annual quantity put on the market by these companies during the three years preceding the war, for the reason that the world was not prepared to purchase the quantity exported in former times. I may say, it is a source of great satisfaction, if not surprise, that the market absorbed the large amount it did, considering the devastation of Belgium and Northern France, the condition of Russia and other States, and the demoralization of the cutting and polishing industry in Antwerp, which was the seat of an enormous diamond trade, and which center will, I feel confident, in the near future resume its great industrial activities. America, as usual, has been our best customer, and we are not only grateful to this great Republic for putting the finishing touches to the ghastly war, but for her continued large purchases of gems, the production of which provides employment for many thousands of human beings, and gives an impetus to an industry of great importance to the Union of South Africa. The stability of the diamond market is attributable to one circumstance, and to one circumstance only, the policy of regulating rates to the demand, and to this fact we owe the present gratifying condition and position of the industry and the confidence established throughout the whole trade."

An exceptionally fine, blue-white diamond, weighing $388\frac{1}{4}$ carats was found in January, 1919, at the Jagersfontein mine, Orange River Colony. Jagersfontein is already credited with the great Excelsior diamond of 995.21 metric carats ($969\frac{1}{2}$ of the older carats). The "Jubilee" diamond found in South Africa in 1895 was also considerably larger, weighing in the rough 650.81 metric carats. After having been cut as a brilliant, the weight was reduced to 245.19 metric carats (239 of the older carats). It has been recently reported that this diamond was sold to a Paris house for the sum of £45,000, or about \$220,000 at normal exchange.

The finding of an amber-colored diamond in the Dutoitspan mine of the De Beers Co. was reported in October, 1917. It had the unusual weight of $442\frac{1}{4}$ carats, and was stated to have been the finest and most valuable diamond ever found in the region of Griqualand West. While not approaching in weight that of the Cullinan or the Excelsior diamonds, the find is well worthy of being permanently registered.

The Premier Mine directors have continued the policy so successfully pursued in the past, and the results as chronicled in the last report, that for the year ended Oct. 31, 1918, testify to the excellence of their management. The diamonds sold yielded £1,203,904, and the diamond stock was reduced in value to £5362. After deducting £505,379 for mine expenses, £14,240 for directors' and auditors' fees, and £19,012 for administrative expenses, the sum of £670,264 was credited to Expenditure and Revenue Account No. 2. This amount, less £3190 for general equipment, gave £667,074 as the balance of realized profits, of which the 60-per cent. share due the Union Government amounted to £400,244, the remaining 40 per cent., or £266,830, being transferred to Stockholders' Appropriation Account. Out of this were declared two preference dividends of 6s. 3d. per share, each amounting, less Union dividend tax of 7½ per cent., to £46,250, and two deferred dividends of £80,000 each, or 5s. per share. The South African Income Tax was £12,191 and the 7½-per cent. Dividend Tax £21,377.

At the annual meeting held Feb. 28, 1919, the chairman, Sir M. Cullman, made an earnest protest against the imposition of an export tax upon the rough stones. He called attention to the fact that the Government already absorbs 60 per cent. of any increase in value of the Premier diamonds, and thinks it to be not a little hard that a part of the 40-per cent. share of the increase which the company now has should be made the subject of an additional impost.

The Premier Co. gave in its 16th Annual Report the following details of the operations in the mine from the outset to Oct. 31, 1918, to which have been added here the profit per load:

Year Ended Oct. 31.	No. of Loads Washed.	No. of Carats Found.	Value of Diamonds.	Yield Per Load in Carats.	Value Per Carat.		Value Per Load.		Cost of Production Per Load.		Profit Per Load.	
					s.	d.	s.	d.	s.	d.	s.	d.
1903	76,931	99,208½	£ 137,435	1.290	27	8.50	35	6.70	4	7.20	30	11.50
1904	939,265	749,653½	866,030	0.798	23	1.20	18	5.30	2	7.62	15	9.68
1905	1,388,071	845,652	994,687	0.609	23	6.29	14	3.98	3	3.44	11	0.55
1906	2,988,471	899,746	1,277,740	0.301	28	4.82	8	6.61	3	5.71	5	0.90
1907	6,538,669	1,889,986¾	1,702,631	0.290	18	0.20	5	2.49	2	4.14	2	10.35
1908	8,068,844	2,078,825¼	1,536,720	0.258	14	9.40	3	9.75	1	10.24	1	11.51
1909	7,517,793	1,872,136½	1,172,379	0.249	12	6.29	3	1.43	1	11.42	1	2.01
1910	9,331,882	2,145,832¾	1,496,641	0.230	13	11.39	3	2.49	2	0.56	1	1.93
1911	8,325,272	1,774,206	1,433,971	0.213	16	1.97	3	5.34	2	2.02	1	3.32
1912	9,707,098	1,992,474	2,004,942	0.205	20	1.50	4	1.57	2	4.79	1	8.78
1913	10,434,680	2,107,983	2,336,828	0.202	22	2.05	4	5.74	2	6.67	1	11.07
1914	7,683,943	1,417,755	1,259,643	0.185	17	9.23	3	3.34	2	5.89		9.45
1915	Mining operations suspended.											
1916	1,572,521	419,947	475,856	0.267	22	7.95	6	0.63	2	7.62	3	5.01
1917	4,928,629	906,341	1,198,023	0.184	26	5.48	410	38	2	2.68	2	7.60
1918	4,805,851	851,573	1,203,904	0.177	28	3.29	5	0.12	2	2.89	2	9.73

This gives the following totals for the 16 years:

Number of loads washed.....	84,297,920
Carats of diamonds found.....	20,061,320
Value of diamonds.....	£19,098,330

The development of the 410-ft. level has been completed, and the blue ground available above that point has been determined to be 37,000,000 loads. Improvements in the prosecution of development work rendered it possible to accomplish this task with less expenditure of labor than would heretofore have been the case.

The blue ground washed during the year came from the following levels:

	Loads.
260-ft. level.....	526,898
310-ft. level.....	948,663
380-ft. level.....	2,745,682
410-ft. level.....	584,608
Total.....	4,805,568

While the number of carats of diamonds produced during the year was 54,768 less than in the previous one, and the cost of production per load was a trifle higher, the higher diamond prices more than offset this. A larger output would have been realized had it not been for exceptionally heavy rains in the earlier half of the year and the prevalence of Spanish influenza among the laborers in the later months. Perhaps more important is the falling off in yield per load to 0.177 carats, the lowest point yet reached, although the increased value of diamonds has so far made good for this progressive decrease also.

The Crown Diamond Mining Company of the Orange Free State proposes to double its present capital stock of £125,000; of the additional £125,000, the sum of £20,000 is to be allocated to reserve, and the remaining shares sold at par. This will supply funds for more extensive working, for which there is good promise, as shafts sunk to a depth of 300 ft. from the 140-ft. level reveal additional blue ground.¹

The following recently formed South African diamond company may be added to the list given in Volume 23:²

The Koodoo Mining Syndicate, Ltd., capital £4500; property rights over 2500 morgen (5275 acres) of the farm Uitkyk, Cape Province; working has already begun.

From the Monteleo Diamonds, Ltd., of South Africa, we have the report that owing to the installation of a new crusher plant, as many as 180 loads of ground can be treated in a day's work. The blue ground now exposed promises well, and a shaft is being sunk to the 200-ft. level, at which point the walls of the mine are to be definitely determined. From April to June, 1918, some 40,000 loads of reef were hauled.³

United States (Arkansas).—It is anticipated that the United States may become a factor in the diamond output, as the Arkansas Diamond Co. is about to be operated on a somewhat extensive scale.

¹ *So. Afr. Min. Eng. Jour.*, Apr. 5, 1919.
² *MINERAL INDUSTRY*, 22, 627-643 (1914).
³ *So. Afr. Min. Jour.*, June 8, 1918.

The results that have so far been secured in the preparatory working of the deposits are as follows:

Number of Stones.	Weight in Carats.	Average Weight.
2052	793.47	0.387 or $\frac{3}{8}$ ¹
110	42.57	(Not weighed, but estimated at about the average.)
<u>2162</u>	<u>836.04</u>	<u>0.387 or $\frac{3}{8}$₄</u>

Recently a remarkably fine, yellow octahedron, weighing 17.85 carats, has been found, as well as two brown stones of 11.21 and 2.77 carats, respectively, weighing together 13.98 carats, and also six white stones, weighing respectively 6.83, 4.40, 3.38, 2.50 and 1.42 carats, totaling 20.62 carats. These are absolutely perfect and are equal to the finest stones found at the Jagersfontein Mine, or that were ever found in India. The special demand has caused interest in the Arkansas diamond mines and a strong syndicate will finance them for the present.

OTHER PRECIOUS STONES

Australia.—The production in 1918 of sapphires and of corundums used for industrial purposes in Queensland, representing in the main the output of the rich Anakie deposits, is given as follows:¹

Sapphires.	Value in Pounds, Sterling.	Value in Dollars at Normal Exchange.
Gemstones, blue and fancy stones.....	11,619	\$56,544
Mechanical, corundum and machine stones.....	2,613	12,230
Estimate of stones sold privately.....	40	194
	<u>14,172</u>	<u>\$68,968</u>

The returns from the Anakie gem-fields show an improvement on last year, although the prices for gem material have ruled a trifle lower. The general tone is good and better prices are expected.

Burma.—The output of gem material in the Rangoon district of Burma for the year 1917 was of much higher value than that of 1916, although the quantity produced was slightly less. This proves that notably higher prices were realized, as appears in the following table, giving quantities and values for the three years 1915, 1916 and 1917, all "war years."

Precious Stone.	No. of Carats.			Value in Dollars.		
	1915.	1916.	1917.	1915.	1916.	1917.
Rubies.....	167,904	136,785	132,409	\$169,748	\$174,454	\$212,057
Sapphires.....	39,718	34,100	32,369	6,211	7,018	39,015
Spinel.....	43,827	38,841	33,422	687	1,085	1,164
	<u>251,449</u>	<u>209,726</u>	<u>198,200</u>	<u>176,646</u>	<u>182,557</u>	<u>252,236</u>

¹ *Queens. Govt. Min. Jour.*, May 15, 1919, p. 112.

The jade production, which comes from the Myitkyina district in the extreme North of Burma, goes to China, and naturally enough the mining and marketing are in the hands of Chinese. While the quantitative increase in 1917 was not great, the qualitative increase was remarkable, much more of the finest material being produced. A little amber is also found by Chinese near this jade region. The total product of jade of all qualities mined in the 3 years 1915, 1916, and 1917 was 1,303,818 lb.; of amber 8624 lb. was obtained.¹

The export value of the jade mined in 1917 was £67,502 (about \$328,500 at normal exchange) against but £48,926 (about \$238,100) in 1916, an increase of \$18,576, or over \$90,000. The other large contribution of India to the precious-stone market, ruby, sapphire, and the spinels, showed a difference of nearly \$70,000 in favor of 1917 over 1916. As a general rule rubies commanded unchanged prices in the London market, although Mogok rubies of superior quality were sold at very high rates. The Indian returns for all classes of stones increased about \$160,000 in 1917 over the previous year, and the yield for the year 1918 was double that for 1917, due to the greater demand creating more active search, and the much higher price for which the material sold. This was mainly owing to the unusual demand for the rich-hued jade. The total value of the Burmese jadeite worked into ornaments by the Chinese, when exported from China, totaled over \$2,000,000 in the five-year period 1914-18 inclusive.

The rich emerald-green jade, feitsin (jewel jade), imperial jade and jadeite of all shades of green has been in the greatest favor, either in the form of plain beads, or else intricately carved into Chinese forms, generally as pendants, and often with a loose ring of jade cut out of a single piece. These are frequently attached to cords of a green or of some other hue, with a setting of seed-pearls, and strung with beads of jade, or with gold beads. Often there is a simple setting of diamonds encased in platinum. Jade ornaments are highly appreciated all over the world at present, fine necklaces of dark green jewel-jade beads 20 to 40 in. long bringing as much as from \$7500 up to \$20,000, while for jade pendants the sum is often from \$300 to \$1500 each.

The Burma Ruby Mines, Ltd., made a good showing in the report for the year ending Feb. 28, 1918, the income and Expenditure Account having at the close a surplus for the 12 months of £3600 16s. 8d. Of this the share of the Government of India was £1080 5s., being 30 per cent. of the whole. Although the number of truck loads of ruby earth washed decreased to 969,919 from 1,181,023 in the previous year, and the cost per load increased to 8.9d. from 6.68 in 1917, there was still a good margin

¹ U. S. Consul Lawrence P. Briggs, Rangoon, Burma, *Comm. Rept.*

of profit, as the rubies recovered were worth £50,123 12s. as against £40,842 the year before. Of these, the new mines at Kathe must be credited with stones to the value of £23,991, against the £21,860 worth produced in 1917. The total figures show that in spite of the increase of 2.22d. in cost of working, there was an increase of 1.88d. in the excess of value per load over the cost.

In the course of the year the sum of 214,140 rupees was collected from the native miners as royalties, compared with 126,066 rupees in the preceding year. The entire amount was turned over to the Government under the temporary arrangement by the terms of which, in lieu of fixed payment for rent, the Government has been receiving during recent years the actual royalties collected less 10 per cent. The Secretary of State of India has lately agreed to extend this arrangement for another period of 7 years, up to Feb. 28, 1925. On the other hand, the royalties retained by the company in 1914, amounting to £8799 12s., have been handed over to the Government.

The company reports sales of rubies for the year ending Feb. 28, 1919, to the value of £54,598 6s. 8d., as compared with £49,724 14s. 7d. the year before. The native market both in Burma and India was good during the entire year; in London the stock of stones was reduced from £20,405 to £13,115.

Mexico.—Mining for opals in the Queretaro district of Mexico is carried on still in about the same irregular way as it has been already for more than half a century. The opals are for the most part cut out and polished in Queretaro and San Juan del Rio, the establishments for the performance of the work being owned and managed by the local syndicates owning the mines. The stones are found, irregularly distributed, in a reddish-gray spherulitic rhyolite, and the open-quarry working is practised. When the stones have been cut, the less excellent ones are sold to tourists, while the better ones find their way to dealers in Mexico City who dispose of them in foreign markets. Owing to their comparative transparency, Mexican opals often show to the best advantage when given a backing of some dark fabric; for this reason they are sometimes left in the natural matrix, these being known in the trade as "matrix opals."

Persia.—Disturbed conditions in Persia during the war produced a cessation of gem-mining there, so that the supply of turquoise and of lapis lazuli from this source practically ceased. In addition, the interruption of commerce has made it impossible even to bring out any of the stock already on hand. All this conspired to cause a great scarcity of turquoise, as well as of lapis lazuli.

United States.—The Precious Stones Reports of the United States Geological Survey were instituted by George F. Kunz in 1882. The

totals for the years 1880, 1881 and 1882 were estimated by him, and the figures given for 1882-1905 inclusive are his. From 1906 to 1914, inclusive, the figures are those of Douglas B. Sterrett, and from 1915 to 1918, inclusive, those of Dr. Waldemar T. Schaller.

VALUE OF THE PRODUCTION OF PRECIOUS STONES IN THE UNITED STATES					
1880.....	\$100,000	1893.....	\$264,041	1906.....	\$208,000
1881.....	110,000	1894.....	108,850	1907.....	471,300
1882.....	150,000	1895.....	113,621	1908.....	415,063
1883.....	188,750	1896.....	97,850	1909.....	534,280
1884.....	222,975	1897.....	130,675	1910.....	295,797
1885.....	209,900	1898.....	160,920	1911.....	343,682
1886.....	118,750	1899.....	186,220	1912.....	319,722
1887.....	163,900	1900.....	231,170	1913.....	319,454
1888.....	139,850	1901.....	289,050	1914.....	124,651
1889.....	188,807	1902.....	328,450	1915.....	170,431
1890.....	118,833	1903.....	307,900	1916.....	217,793
1891.....	235,300	1904.....	324,300	1917.....	131,012
1892.....	312,050	1905.....	326,350	1918.....	106,523
Total.....					\$8,785,730

This output includes sapphires worth \$1,260,663 and rubies valued at \$21,170 for 1882-1914, to which is to be added \$241,598 for 1915-1917, when both are entered as corundum, making a total for both classes of \$1,523,431 for the 37-year period 1882-1918. Diamonds to the value of \$29,076 were recovered in this period, most of them since 1906 from the Arkansas field. Of kunzite or hiddenite (variety of spodumene) the value secured was \$134,045, while tourmalines furnished \$610,795 of the total and turquoises \$2,021,702, this being the highest figure credited to any precious stone in the United States, which shared with Persia in the production of this beautiful and favorite gem. The sapphire figures, as estimated, are exceedingly low, as these stones were cut abroad and then returned to this country. They should be increased, probably by 50 per cent.

The following values of precious stones were produced in the United States in 1918: corundum, \$42,414; quartz, \$15,211; tourmaline, \$6206; turquoise, \$20,667.

Less precious stones were found in 1918 than in former years. Owing to war conditions, the high cost of labor and the absence of many small producers, less mining was done than ever. The principal discoveries according to districts were as follows:

Oregon.—Quantities of beautiful agates were found in the vicinity of Medford, many of them exceptionally fine moss agates. Then there were also the small, beautiful pebbles found at Tuscarora Beach, Calif., which are extensively purchased by the tourists who visit these regions.

Montana.—Sapphire mining was carried on for the blue stones at Yogo Gulch, Fergus County. The output was still further hampered, owing to war conditions and to the lack of lapidary facilities in France, England and Germany, where many were formerly cut. A great quan-

tity of the stones from Philipsburg, Granite County, and from the Missouri River district were mined for their industrial qualities—for watch jewels, the bearings of scientific instruments, etc. The value of Montana precious stones, most of which was sapphire, was \$47,753, of which about \$30,000 represented blue stones for gem purposes.

Nevada.—Large masses of opal, more than \$5000 in value, were found in the northern part of Humboldt County. These, in many instances, were an alteration or replacement of wood by opal, the color being dark, almost a petroleum color. They are wonderfully lustrous, but owing to the large water contents frequently crack; nevertheless they are admirable mineral specimens.

Arizona.—From Arizona only a limited amount of garnets, rich ruby-red pyropes, were gathered; all were found on the wind-blown sandy surface.

For optical purposes in connection with the War Department there was a demand for quantities of rock crystals. Unfortunately, very little of value was obtained in the United States, the demand being supplied from Brazil and, to a slight extent, from Madagascar.

California.—A limited amount of kunzite was found in the Pala district, and some crystals of rubellite weighing from 3 to 8 lb. each.

The following figures as to the total gem production in California annually for the period 1900–1917 are presented in "California Mineral Production for 1917," by Walter W. Bradley, Mining Statistician, Sacramento, 1918, p. 93.

Year.	Value.	Year.	Value.	Year.	Value.
1900.....	\$20,500	1906.....	\$497,090	1912.....	\$23,050
1901.....	40,000	1907.....	232,642	1913.....	13,740
1902.....	162,100	1908.....	208,950	1914.....	3,970
1903.....	110,500	1909.....	193,700	1915.....	3,565
1904.....	136,000	1910.....	237,475	1916.....	4,752
1905.....	148,500	1911.....	51,824	1917.....	3,049
				Total.....	\$2,091,407

Maine.—Some very fine rich tourmalines, wonderfully brilliant pale green in color, were found in the Auburn district.

As to the product of gem mining in Maine, \$7132 worth of cut gems from this source is reported for 1918. This includes tourmalines, colorless, pink, green and blue-green; beryl, colorless, green, bluish yellow, and very rarely pink (caesium beryl); topaz; quartz, amethystine, colorless, rose and smoky; and a small amount of amazonite. There were also a few garnets and one gem was cut from a fine purple specimen of apatite from Auburn. Almost all of the material was derived from Oxford, Andros-

coggin and Sagadahoc counties, and it was obtained by a mere scratching of the surface, being only incidentally revealed in mining for feldspar.¹

Uruguay.—Prior to the great war a considerable supply of amethysts was derived from Uruguay, the departments of Tacuarombo, Artigas, Salto and Paysandú furnishing the greater part. They generally occur as crystals on the inside of geodes, the latter having usually the appearance of common stones more or less rounded in shape. In a bulletin of the Uruguayan Geological Bureau it is stated that the exports of amethyst for 1909 were between 13,000 and 15,000 lb., and this was an average year. A large agate supply was also taken from the above-named region. In value the amethyst product varied greatly, ranging usually from about 10 cts. a kilo to something over \$12 for this quantity, while for exceptionally fine material as much as over \$40 a kilo was realized. The German cutting works at Idar and Oberstein absorbed practically the entire supply of amethyst and agate.

In recent years, the output of amethyst and other precious stones from Uruguay has been both small and irregular. Various causes have been assigned for this. That the disturbance of commercial intercourse due to the war has been one of these causes must be admitted, but, from information secured by the American consul at Montevideo, the director of the Uruguay Geological Bureau has been told that the deposits have been to a considerable extent exhausted as far as the best material goes, so that what remains are the stones of the second grade or even lower. How far this represents the actual situation must be the subject of further investigation. As to agate and amethyst, an expert residing at Montevideo states that the finest come from Artigas, near the Brazilian frontier. They are shipped in barrels to Salto, and then transferred to river-boats which bear them to Montevideo. The Uruguayan agates are superior in quality to those found in Europe.

The amethysts of Uruguay are generally larger, and are of a deep violet hue, rivaling those from Auvergne in France, but not as rich and wonderfully brilliant as the Russian amethysts from the Ural region, or those of Ceylon. And yet many are sold as "Siberian" amethysts. It is believed that this beautiful and refined gem will be greatly in demand for mourning wear, in view of the fearful loss of life entailed by the world war. This is said to have been the case after the Franco-Prussian War of 1870-1871.

Venezuela.—The pearl fisheries about Margarita Island, off the coast of Venezuela, South America, were visited in February, 1918, by a most unfavorable phenomenon, locally called "el turbio." This is a contamination of the waters, from some unknown cause, that makes the oysters

¹ *Eng. Min. Jour.*, May 24, 1919.

sicken and die, thus producing a depopulation of the beds. In order to allow the mollusks time for recuperation so that the beds may be restored to their former state, fishing has been prohibited in the infected district. The economic loss in the year's fisheries was quite considerable, amounting to from 3,000,000 to 4,000,000 bolivars, or from \$570,000 to \$772,000 of U. S. money.¹

¹ Homer Brett, U. S. Consul at La Guaira, Venezuela. *Comm. Rept.*, May 29, 1918.