

29th YEAR

THE MINERAL INDUSTRY

1892-1920

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THE MINERAL INDUSTRY

ITS

STATISTICS, TECHNOLOGY AND TRADE

DURING

1920

FOUNDED BY RICHARD P. ROTHWELL

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VOLUME XXIX

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PRECIOUS STONES

BY GEORGE F. KUNZ

The mining and search for diamonds and other precious stones has been actively pursued for the greater part of the year 1920 the extraordinary demand for them offering much encouragement. In 1919 the imports of precious stones and pearls into the United States reached the unexampled total of \$105,273,543; in 1920 these heavy imports continued, the total for January-June being \$51,447,699, but in the latter half of the year a reaction set in, and during the period July-December the imports fell to \$24,307,892, against \$33,861,348 for these months in 1919. Still, this gives for the whole of 1920 \$75,775,591, a higher figure than for any other year except 1919. The steady and effective control exercised by the London Diamond Syndicate has sufficed to maintain prices.

The marked decrease in precious-stone imports for the year 1920 is best exhibited by the following table of the monthly imports of the year:

January	\$10,830,617	July	\$4,279,026
February	11,125,033	August	3,884,035
March	10,611,089	September	3,475,029
April	8,532,271	October	5,262,602
May	5,555,917	November	4,264,320
June	4,792,772	December	3,142,880
Total	\$51,447,699	Total	\$24,307,892

IMPORTS OF DIAMONDS AND OTHER PRECIOUS STONES INTO THE UNITED STATES

	1917.	1918.	1919.	1920.
Diamonds, glassiers' and engravers', unset and miners', free.....	\$1,098,102	\$718,397	\$984,381	\$1,527,753
Diamonds, uncut, dutiable.....	13,091,582	12,605,526	20,315,758	10,527,263
Diamonds, cut but not set, dutiable.....	18,416,570	7,761,810	64,232,947	45,444,999
Pearls and parts of, not strung or set, dutiable.....	4,898,406	722,981	11,541,000	7,377,772
Other precious stones and bort, dutiable.....	482,224	604,550	1,623,522	2,717,741
Other precious and semi-precious stones, cut, but not set, dutiable.....	1,752,384	968,094	5,006,032	5,081,639
Imitation precious stones, dutiable.....	1,167,399	890,642	1,679,903	2,228,225
	\$40,906,667	\$24,272,000	\$105,273,543	\$75,855,591

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.		
	1918.	1919.	1920.	1918.	1919.	1920.
Imported from:						
France.....	\$170,441	\$2,033,268	\$2,506,090	\$112,580	\$5,982,654	\$3,861,617
Netherlands.....	6,266,319	53,561,019	31,024,241			
United Kingdom.....	1,308,941	6,664,911	3,003,534	376,741	5,347,460	3,235,320
British India.....				150,097	81,003	79,452
Other countries.....	16,109	1,963,749	8,911,134	83,563	129,883	201,323
Totals.....	\$7,761,810	\$64,222,947	\$45,444,999	\$722,981	\$11,541,000	\$7,377,772

The large increase in the 1920 imports of cut diamonds from "other countries" over the figures for 1919 shows essentially the resurrection of the Antwerp market in the face of a heavy falling-off in the imports from Amsterdam. We have an increase in 1920 of nearly \$7,000,000 as compared with 1919 for "other countries" (including Belgium), as against a falling-off of \$22,500,000 for the Netherlands (Amsterdam).

From May 1, 1919 to April 30, 1920, the precious-stone imports reached the high-water mark of \$122,816,489, a figure that has never before been approached before or since. Itemized these importations would be as follows:

Diamonds, glassiers' and engravers', unset and miners'.....	\$1,178,512
Diamonds, uncut	18,479,571
Diamonds, cut, but not set.....	78,716,142
Pearls, and parts of, not strung or set.....	13,258,935
Other precious stones, uncut, and bort.....	3,469,461
Other precious and semiprecious stones, cut, but not set.....	5,868,187
Imitation precious stones.....	1,845,681
Total.....	\$122,816,489

On the whole it can be said to mark the climax of the greatest period in the precious-stone and jewelry industry which the United States has ever known, but toward the middle of the year, as has been noted, the tide began to turn. The unsuccessful jewelry strike, lasting from November, 1920, to March, 1921, involving the claim of the workers to an increase of remuneration to \$3 an hour, stipulating a 39-hr. week, coupled with a provision that one and a half times the ordinary pay was to be received for every extra hour's work, meant that jewels rather than jewelry were sold.

The great and widespread plentifulness of money enjoyed by the precious-stone industry had been largely due to war profits and bumper crops and phenomenal mine outputs of the West and the high prices realized because of the urgent European demand in the period immediately succeeding the war; to this was added the great production of copper, and of the oil of Oklahoma and Texas. Then the prices of these commodities began to fall as a result of the war reaction, and, moreover, the demand for engagement and wedding jewels which had been stimulated by the great army of soldiers and the enthusiasm incident to our victories, began to abate.

In the meanwhile the effects of undue speculation began to make themselves felt. Toward the climax of the rise, it frequently happened that a jeweler who had engaged and bought a quantity of rough or partly-cut diamonds was able to sell them to another jeweler at an advance of 10 or even 25 per cent. before they had been received, and in not a few cases the second purchaser was able to pass them on at an equal profit to a third aspirant, and the latter to still another eager buyer, so

that sometimes from two to six separate profits remained to be realized by the last purchaser. Naturally enough, when prices began to fall, the latter found himself in a very uncomfortable position, and occasionally suffered disastrous effects, although those who had avoided the danger of being swept along by this wave of excitement were safe enough. Still the check in distribution operated to halt the demand in the foreign centers, and although prices were maintained and the market was steadied by shutting down the South African mines to a great extent, the volume of imports fell off rapidly.

The semi-precious stone industry has somewhat changed with the great demand for Burmese jadeite, generally cut in China. Many California stones, such as rubellite, agate, etc., were also cut in China, and there have been great quantities of Madagascar gems. Beryls and tourmalines, rose-quartz and amazon stones have been cut in France and Germany, and also in Italy by German workers, who had migrated thither. To these should be added rock crystal and smoky quartz, the latter being often decolorized to citrine, the so-called "topaz" of the jewelers. There was also onyx, cut into many small forms, to be used as accessories in diamond jewelry, to be strung as rondelles or as beads, interspersed with beads of rock crystal and other semi-precious materials.

Germany.—The jewelry industry in Germany shows signs of a revival from the depression due to Germany's defeat in the World War. This is exemplified by recent reports from the great German jewelry center, Pforzheim in Baden. In spite of the cutting off during the war of direct foreign relations with their best customers, the jewelers of Pforzheim were able to preserve a part of their trade through neutral channels; after the conclusion of hostilities there sprang up a home demand for Pforzheim goods and also a good demand from foreign buyers. Since then, through the occasionally disturbed internal conditions, the industry has suffered some setbacks, and it has to contend with a very heavy export duty levied by the German Government, this amounting recently to about 1,000,000 marks a month, at least \$16,000 in terms of exchange, but really much more when computed according to the purchasing power of the mark in Germany. At present there are about 800 jewelry concerns in Pforzheim, the largest being the Kollmar & Jourdan Co., which employs about 2000 workers. The price movement toward the close of the war and after the conclusion of peace has been very extraordinary. By July, 1917, prices had risen 75 per cent. and by December of this year 125 per cent. Early in September, 1919, the added cost was 225 per cent. over pre-war figures, in early December, 1919, 500 per cent., and in February, 1920, the maximum increase of 800 per cent. was recorded. By May, 1920, the increase had fallen to 600 per cent.

and by August, 1920, to 450 per cent. Naturally this refers to prices in marks, and depended quite as much on the fluctuating value of the monetary unit as upon other economic considerations. On the whole, in spite of the many drawbacks which still exist and the strenuous efforts made to oust Pforzheim from the South American markets, of which this jewelry industry had strong control, the prospects for the future are pronounced to be far from unfavorable.¹

Later advices seem to show that the slow recovery of the Pforzheim industry still continues. In order to combat the tendency to an undue reduction of prices the manufacturers and traders have organized their 24 professional associations into a central syndicate, which keeps itself in close touch with the export offices. As to the present aspect of things, the *Frankfurter Zeitung* remarks:²

"The exports in Norway, Sweden, Italy, Austria and Holland are impeded by restrictive measures, the difference of exchange or other obstacles. The United States does not enter much into account . . . the Americans are endeavoring by all possible means to establish an industry among themselves capable of supplanting that of Pforzheim. The remainder of the markets of the world are either well supplied with goods, or have not, for want of money, any capacity for purchase. We cannot, therefore, rely too much on the States of Central and South America, which for more than half a century have been Pforzheim's best clients, but where the rapid decrease of productions of the soil and the fluctuations of exchange have disorganized business . . . If we are to believe letters from the Argentine, Brazil and Cuba, these three countries, loyal clients of German jewelry, will be the first to return to it."

The German writer finds that out of 200,000,000 marks' worth of jewelry sold annually in pre-war times from Pforzheim, 75 per cent. represented purchases made by foreigners. The main factors of the strength of the industry in its present difficulties are the capacity for assimilation and adaption on the part of the manufacturers, and the highly developed technique possessed by the 35,000 or 40,000 workers engaged in the industry.

DIAMONDS

How glaringly inexact were the statements in an article on diamond prices which has recently gone the rounds of our newspapers, is brought out convincingly by the statement therein contained that, while early in 1920 uncut diamonds were worth \$45 a carat, their price had gone down to \$28 a carat in December of that year, and had "slumped" to \$17 a carat by April, 1921. Now the actual figures, as given in the official treasury reports of imports, show that the average value of uncut diamonds for the entire year 1920 was \$86.12 and for the month of Decem-

¹ Thomas Reece, London, *The Manufacturing Jeweler*, 1920, p. 772.

² As cited in the *Watchmaker, Jeweler, Silversmith and Optician*, May, 1921, p. 985.

ber \$78.18. For the first three months of 1921, the average per carat was \$79.61. Although there was a decrease in March as compared with February, this evidently reflected a greater importation of small diamonds for the summer trade, for a similar change in average values is shown in 1920, and is apparent from the following figures for the two years:

	1920.	1921.
January.....	\$68.14	\$80.88
February.....	94.39	93.04
March.....	58.82	59.47

Thus it will be seen that the variations, though considerable, are not in the least indicative of any continuous movement in values, but only of temporary changes in the character of the parcels imported.

DIAMOND-CUTTING AND TRADE

France.—The French diamond-cutting industry of the region of Saint-Claude in the Jura Mountains appears to be in quite a flourishing condition at present. There are as many as 57 factories in operation there, giving work to some 1600 diamond-cutters. However, only three or four of these factories are large ones, many of the remainder being conducted by a single master workman with three or four assistants. Nevertheless, it is reported that the output of cut diamonds for the last six months of 1919 equaled 40,000 carats. Besides this old-established cutting industry at Saint-Claude, factories in Paris and in Nemours gave employment to 250 men, and there are small diamond-cutting works in a number of other French localities, such as Felletin, Lyons, Nice, Guimper, Bourg, Bellegarde, and in several places in the department of Haute-Savoie. Still there is a recognizable inferiority in much of the French work, due it is said to the imperfect instruction of apprentices. This want is about to be remedied by the founding of a diamond-cutting school at Saint-Claude.¹

The conditions of the gem-cutting industry in Paris are reported to be greatly in need of improvement, for although there are some quite well organized establishments, the smaller ones leave much to be desired. To remedy this an active movement has been initiated by the friends of this industry in Paris for the establishment of a factory equipped with about a hundred mills. By this means and by a more thorough organization of the training of apprentices, it is confidently believed that a great change for the better will soon be realized. In the meanwhile an appeal has been made to those who have stones to be cut, that they shall not too exclusively favor the cutters of the Jura region at the expense of the Paris workers.²

¹ *La Nature*, June 19, 1920.

² *Recueil Mensuel des Procès-Verbaux des Séances de la Chambre Syndicale des Négociants en Diamants, Perles, Pierres Précieuses, et des Lapidaires*, No. 48, Jan.-Feb., 1921, pp. 800-810.

Great Britain.—The experiment of Sir Bernard Oppenheimer in establishing a diamond-cutting factory to utilize the labor of disabled soldiers appears to have met with striking success. Beginning on a very small scale in July, 1917, it has now developed into the largest diamond-cutting factory in the world, and the great English seaside resort Brighton is destined to figure as a prominent center of the diamond industry, alongside of Antwerp and Amsterdam. At the end of 1920, as many as 700 hands were employed here, and provision has been made for increasing the number of workers to 2000. During the first six months of training the men receive an allowance from the Ministry of Labor, in lieu of their pension, no wages being paid to them by the firm, but free expert instruction being provided for them. At the expiration of the six months' training, the ex-soldier again receives his pension from the Ministry of Pensions, and is given a weekly wage of £2 by the firm. As he becomes more proficient, his remuneration is increased, and by the end of his first year an average cutter earns £3 a week; in the second year this average rises to over £5 a week. If expectations are fulfilled, the British Empire will soon be not only the chief producer of diamonds, but will also have a large share of the profits derived from cutting the stones mined in British dominions.¹

As an indication of this, it is stated that diamonds valued at £500,000 have not long since been shipped to Antwerp. In addition, orders from the East have reached a value of £300,000, and exports have been made to Paris and New York. A diamond weighing 600 carats, the largest received up to the middle of November, 1920, was cut into 40 stones of considerable size and a number of smaller ones. The industry does not depend solely upon South African diamonds, for rough diamonds to the value of £250,000 have been received from British Guiana and cut at Brighton. The machinery used is manufactured in Sussex County, and thus any needed part can be duplicated and replaced with very little delay. As has been stated, the work at Brighton is done exclusively by disabled soldiers of the World War, instructed in the diamond-cutters' art by expert Belgian workers who sought refuge in England during the German occupation of their native country.

Netherlands.—The diamond industry in the Netherlands has been taking active measures to resist the depression that set in after the middle of 1920. Encouraged by the resolute determination of the London Diamond Syndicate to maintain prices, a meeting of representatives of the diamond industry in Amsterdam was held in December, 1920, and passed the following resolutions:

¹ *So. Afr. Min. Eng. Jour.*, Dec. 18, 1920.

Whereas (1) there is no reason to reduce the price of a polished product, because the maintaining of prices by the English Rough Syndicate makes it impossible to replace the goods cheaper; (2) the production of diamonds is limited; and (3) there is great confidence all over the world in the value of diamonds, which cannot be considered merely articles of luxury, but have proved themselves to be solid investments; therefore, be it

Resolved (1) That, if necessary, we will assist financially the smaller concerns to prevent forced sales, and (2) that we will take most stringent action against any individual or firm, buyer or seller, making any attempt whatsoever to try to force prices down.

The details of these measures will be worked out carefully at the next meeting.

In July, 1920, it was reported that the Amsterdam diamond-cutting factories were seriously handicapped by the low exchange value of the Belgian franc, as this rendered it possible to have rough diamonds cut in Antwerp for less money than in Amsterdam. To offset the disadvantages for the Amsterdam cutters the employers have replaced the fixed surplus on cutters' wages by a sliding-scale, so that the surplus will move down as Belgian exchange drops. This measure, however, was not so successful as was expected, since the Antwerp employers reduced wages to counter-balance the reduction in Amsterdam. In the opinion of experts the crisis in Amsterdam last July was the most serious so far experienced, and the number of unemployed workers in the diamond industry had risen to 7100. The prohibition of diamond imports into France has been a depressing factor, especially as the American exports had also fallen off somewhat. The demand from Germany due to the sudden fall in value of the mark, which encouraged a feverish rush to buy diamonds and other valuable and portable objects lest the mark should lose all but a nominal value, was checked by a recovery in German exchange in the summer.¹ Late reports as to the unemployment of diamond workers in Amsterdam are very discouraging as it is said that on Apr. 1, 1921, 8328 of the 10,000 workmen engaged in the industry were out of employment, an increase of 350 over the report for June-Aug. 1, 1920.

In view of the immense number of diamonds that are cut and polished in Amsterdam, it is but natural that the systematic recovery of the diamond-dust is more highly developed there than in other places. The friction of the stone on the polishing disc, which is smeared with olive oil and diamond-dust, causes the formation of a muddy deposit composed of the oil and dust, and the exceedingly fine particles of the latter are successfully extracted from the "waste." The profits derived from this recovered diamond-dust have been donated to the Koperen Stelen Fund for the care of the tuberculosis patients among the diamond-

¹ *Holland's Import and Export Trader*, July 19, 1920, p. 356.

workers. In the first year of this donation as much as 100,000 florins (over \$40,000) was paid over to the Fund from this source, for as much as a half liter of waste is collected in the polishing rooms in a single day. This charitable organization has acquired 215 acres of ground in the pine woods at Hilversum, and a large Sanatorium is to be erected there affording accommodations for 150 adults and 50 children. To carry out this work 700,000 florins must be expended, so that any notable diminution of activity in the Amsterdam diamond industry will be attended with bad results for this benevolent enterprise.¹

DIAMOND MINING AND PRODUCTION

The different diamond fields of the world have produced in the whole course of their exploitation diamonds valued at about the following sums.

India.....	\$50,000,000
Brasil.....	150,000,000
German S. W. Africa.....	35,000,000
Borneo.....	1,000,000
South Africa.....	950,000,000
	<hr/>
	\$1,186,000,000

After adding the expense of cutting, the amount paid for duties and the cost of selling the cut stones, we may safely estimate that the eventual price paid for these diamonds has been close to \$3,000,000,000.

Borneo.—The prospect of an increased diamond production in the Dutch East Indian colony, Borneo, is discussed by Mr. H. J. van der Munnik, in *Commercial Holland* for August, 1920.² The question was drawn to the attention of the Dutch Government in 1917, in the First Chamber of the States General of the Netherlands, but very little has been heard of the matter since then, although some enthusiastic explorers have expressed the opinion that in the Matapoera fields of Borneo riches may be found rivaling those of Kimberley. Matapoera is only an hour's ride by motor car from Bandjermassin, and a diamond mine is already being operated there by a couple of hundred workers. There are also diamond-cutting works, where Borneo diamonds, and also some from Capetown, are cut and polished, and many of these are to be seen in the rich jewelery of East Indian potentates.

The first governmental inquiry dates back to 1893 and resulted in a concession to certain French mining experts; this terminated in 1905. Renewed investigations, carried on by the explorer Captain Christoffel in 1911, procured him rights over a district of about 250,000 acres, principally of marshy ground. He endeavored to interest the Amsterdam jewel merchants in the project of founding a syndicate for the exploita-

¹ "The Dutch Diamond Industry," H. J. Van Der Munnik, *Commercial Holland*, August, 1920, pp. 28-31. Sent by Coldwell S. Johnston, Assistant Commercial Attaché, American Legation, The Hague, Netherlands.

² The number containing Mr. Van der Munnik's important article on the Dutch diamond industry has been kindly sent to us by Mr. Coldwell S. Johnston, Acting Commercial Attaché of the American Legation at The Hague, Netherlands.

tion of the diamonds, but his efforts were unsuccessful. When, however, during the World War, the danger became apparent that Amsterdam's supply of rough diamonds might be cut off, a group of persons subscribed a fund of 800,000 florins to finance investigation of the region by the mining engineer Loor, dry ground being chosen this time. The results, though essentially negative, were not altogether unfavorable. Later, explorations were undertaken, under Government auspices, by the mining engineer Kroll. His report only gives the opinion that in the long run something of value might be found, perhaps *coal*, if not diamonds. All this does not cast a very rosy light over the prospects of diamond mining on an extensive scale in Borneo, and the fact that since the war the normal sources of supply flow freely to Amsterdam as before, has acted as a check upon the development of Borneo's diamond fields. As we have already noted, a new danger has sprung up in the attempt to establish extensive diamond-cutting works in Great Britain, and also in South Africa, in the former land with the object of providing a suitable and profitable industry for soldiers who had lost their lower limbs. But, in spite of certain good results that have been obtained in this direction, it seems doubtful that a really dangerous competition for the trained army of Dutch diamond-cutters is to be feared from these enterprises.

Brazil.—The diamond prospects of Brazil have recently attracted the attention of representatives of financial houses in Europe, America and South Africa, with the result that several properties where the conditions for diamond mining seemed good have been acquired by them. Among these is an extensive tract of alluvial deposits along the Jequitinhonha River, and a company floated in London has installed machinery and has been testing the virgin gravels, which lie beneath a heavy overburden. Some diamonds of good quality have been found which, with the nuggets of gold found in association, have served to give a relatively high value per cubic yard to the material excavated. These encouraging results have favored registrations in London to secure additional capital so as to insure a scientific working of the deposits.

More important than these alluvials is the success that has been obtained by a methodical testing of the Boa Vista mine near Diamantina, State of Minas Geraes. This work has been done by a company formed in Rio de Janeiro, and a reliable authority has pronounced the results to be of a gratifying nature. This Boa Vista mine, in the Serra do Espinhaço, belongs to the class of "high level" occurrences, as it lies about 4000 ft. above sea-level. It has been given a good test under the direction of a well-known South African geologist, and is considered to be payable. It covers approximately an area equaling 15,000 of the South African claims, that is to say about 1,500,000 sq. yd. Situated as it is

upon an eminence, and enjoying an abundant supply of water, the hydraulicking method can be used for working it, and thus make it the most economically worked mine anywhere in the world. The quality of the diamonds is excellent, there being not more than 2 per cent. of inferior stones to the parcel. There are several other diamond mines in the Diamantina district, indeed one of these is reported to be even richer than the Boa Vista, though of much more modest dimensions.

However, it is stated that there are no indications of a true diamond "pipe" resembling those that have been found in South Africa.

British Guiana.—Here diamond mining has been prosecuted with considerable success in recent years. In addition to a renewed exploitation of the Cuyuni River around Dukwari, several small expeditions have operated on the Potaro River at points higher up the stream than those worked in former years. In this latter region the exploiters found stones of better size and shape than had before been extracted, the diamonds equaling those of the Mazaruni district. They came from a greater depth, and certain indications point to a permanence of good results that would attract capital to this region. A new area has also been located recently on the Mazaruni and its tributary the Puruni, and has been actively worked; a number of stones ranging in weight from 4 to $8\frac{1}{2}$ carats have been found. The output of British Guiana for the year ending June 30, 1920, is thus given:¹

District.	No. of Stones.	Weight in Carats.
Mazaruni.....	75,909	14,944-
Puruni.....	4,240	1,045 $\frac{1}{4}$
Cuyuni.....	15,702	1,920
Potaro.....	2,740	249 $\frac{3}{4}$
	<u>98,591</u>	<u>18,159$\frac{3}{4}$</u>

This gives an average weight of 0.184 carat, very nearly the same as that of the diamonds mined in the previous year, and much higher than the average of all those recovered from Apr. 1, 1900, to June 30, 1920, which was only 0.105 carat. The totals for this period of twenty years are as follows:

Number of diamonds, 1,747,618
Weight in carats, 183,630 $\frac{3}{4}$

There was an increased production of diamonds in British Guiana during the 10 months period, Jan. 1–Oct. 31, 1920, when there was exported 19,175 carats of diamonds, valued at \$805,593, an average of \$42 per carat, as against 12,115 carats, worth \$248,350, for the corresponding period of 1919, an average of only a trifle over \$20 per carat. Of these Guiana diamonds the greater part go to England, but few being sent to the United States. In view of the small average size of the stones the

¹ Thirteenth Annual Report of Institute of Mines and Forests, British Guiana, 1919–1920.

relatively high price for 1920 is noteworthy. It has been stated that a New York firm has opened an office in Georgetown for the purpose of buying diamonds and operating diamond-cutting works there.

In the last half of 1920, the diamond production must have increased very rapidly, as the Commissioner of Lands and Mines reports that during the entire year 234,456 stones were found, having an aggregate weight of 39,362½ carats. Uncorrected export figures for the last two years are as follows:

	Number of Carats.	Value.
1919.....	15,573	£ 83,650
1920.....	27,800	200,266

It is noted that, judging from these figures, there must have remained about 12,000 carats unexported. About two-thirds of the 1920 production came from the Mazaruni district, while from the more recently exploited Puruni district as many as 44,134 stones weighing 7,254½ carats were secured in the last quarter of 1920. In view of the fact that the mining operations in British Guiana are prosecuted in a thickly wooded tropical forest and by black prospectors, ignorant of geology and depending upon such knowledge as they can pick up from fellow-workers, the results may be regarded as quite satisfactory under present conditions. The following brief description is given of the modus operandi:

“The gravel or pay dirt’ is puddled and gradually forced through a series of iron screens, the holes in which begin with a half-inch in the first screen, and are gradually reduced to one-eighteenth of an inch in the last one. The fine gravel which has passed through this last screen is collected

PRODUCTION OF DIAMONDS IN BRITISH GUIANA

Year.	Number of Diamonds.	Weight in Carats.	Average Weight in Thousandths of a Carat.
1901-1902.....	91,206	8,227	90
1902-1903.....	163,680	10,447	64
1903-1904.....	164,315	10,742	65
1904-1905.....	175,400	10,619	60
1905-1906.....	65,752	4,097	62
1906-1907.....	65,903	4,661	71
1907-1908.....	29,007	2,122	73
1908-1909.....	63,161	5,618	88
1909-1910.....	85,537	7,181	84
1910-1911.....	26,467	3,035	115
1911-1912.....	78,683	7,648	97
1912-1913.....	62,624	6,099	97
1913-1914.....	93,752	11,110	119
1914-1915.....	100,522	13,716	136
Apr. to Dec., 1915.....	19,461	3,678	184
1916.....	93,782	16,409	175
1917.....	102,957	17,908	174
1918.....	77,819	14,196	183
1919.....	84,466	16,706	197
1920.....	234,456	39,362	168

and thrown on a large iron plate, on a table, and being spread out, it is then carefully searched through for the diamonds, which are easily recognizable by their brilliant lustre and shape."

After patiently accumulating their finds, the miners troop down to Georgetown in the course of the weeks preceding the Christmas holidays and realize upon their precious wares. For this reason the most favorable report of the Commission of Lands and Mines is that for the quarter in which are included these holiday transactions.¹

Congo.—While development work was pushed in 1920 in the Kasai diamond fields of the Belgian Congo, no attempt was made to increase the diamond output. The Forminière company produced about 215,000 carats of diamonds and also notably increased its stock of diamantiferous gravel. Another work that is being pushed by this company is the delimitation of the great tract of diamond-bearing land owned by it. Besides this, the company has directed the diamond exploitation work of five associated companies operating in the Belgian Congo. A production of approximately 100,000 carats of diamonds is reported from a sister company, known as "Diamang," which operates in Angola, Portuguese West Africa.²

DIAMOND OUTPUT OF THE BELGIAN CONGO

	Carats.		Carats.
1915.....	48,995	1918.....	164,420
1916.....	53,940	1919.....	275,000
1917.....	100,000		

The announcement has been made that the Société Forestière et Minière du Congo ("Forminière") has been granted the right to develop the diamond deposits stated to have been discovered in the region where the company has already secured a mining concession for gold, magnesite and hematite. The deposits are said to cover an area of 20,000 hectares (nearly 50,000 acres) in the vicinity of the Aruwimi, Tele and Dinda rivers.

The Belgian Minister of Colonies has made arrangements with one of the diamond merchants of Antwerp to open an office in Antwerp for the sale of Congo diamonds. In this way the agents of the "Forminière" will be able to sell its diamonds directly to the Antwerp cutters. However, it is stated that some objection has been made by the "Union Diamantaire de Belgique" against the introduction of any more rough diamonds into the market so long as the present depression of the diamond industry continues.³

Southwest Africa.—It appears that under the five or six years of German control, the Southwest African diamond fields produced about

¹ Watchmaker, Jeweler, Silversmith and Optician, May, 1921.

² Sidney Ball, "Belgian Congo," *Eng. Min. Jour.*, Jan. 22, 1921.

³ Consul George S. Messersmith, Antwerp, *Comm. Rept.*, Feb. 17, 1921

5,400,000 carats of diamonds, having a value of nearly \$45,000,000. Of this the year 1913, the last of German exploitation, furnished 1,470,000 carats worth \$15,000,000, the maximum production. Of course the war put a stop to this industry for quite a time, but nevertheless after British occupation of the territory had been established, operations were resumed on a small scale, so that in 1918 there was an output of 372,139 carats valued at \$3,645,000. The recent amalgamation of the old companies of this region carried on under the initiation of the Anglo-American Corporation, Ltd., resulted in grouping the nine leading German diamond-mining companies into a new Consolidated Diamond Mines of Southwest Africa, Ltd., registered at Capetown. As a purchase consideration the German companies received £3,675,000, of which £1,900,000 was in cash and £1,775,000 in stock of the new company; they are also to have four of the nine directors on the board of the new organization.¹

The exceptionally high price of £8 4s. 4d. (something less than \$33 at present exchange) has been taken as the basic price of the 1920 output from the old German Southwest Africa. It now appears that this was based on parcels containing about 80 per cent. of Pomona goods, and the diamonds from the Pomona region average much higher in weight than those from other parts of these Southwest African diamond fields. Hence it is assumed that a truer average for the product would be £7 or £7 10s. (\$28 or \$30).² Indeed the price should probably be set even something lower than this, for the difference in favor of the Pomona diamonds is quite considerable.

The company formed in 1919 to dredge the sea-bottom between Possession Island and the shore of the Southwest African Protectorate realized at the outset an astonishingly high price for the shares, which were for a time quoted at a premium of about 800 per cent. However, the steam-dredge which was bought was destroyed by an accident, and no further attempt was made to carry on operations. In view of the fact that there was no sound reason for supposing that the submarine gravels contained diamonds in paying quantities, the fact that the needed capital could be raised for this undertaking is regarded as somewhat surprising. We cannot safely assume that the gravels of the sea-bottom are equally rich with the diamantiferous sands which have been worked on land, for admitting that the latter had originally lain under the sea before the uplift of the continent, their present state is due to long concentration by wind action, which has carried away billions of tons of sand, leaving the heavier diamonds and pebbles behind. Admitting this, the sands beneath the sea must be very much poorer in diamonds.³

¹ *Min. Jour.*, July 17, 1920.

² Communicated by P. A. Wagner in letter dated Pretoria, Aug. 1, 1920.

³ Communicated by Mr. A. S. Harger of South Africa.

Union of South Africa.—The estimated value of the diamonds produced in the Union of South Africa during 1920 constituted a record for the industry. The value of the mined, alluvial, and débris-washed diamonds totaled for the year the sum of £14,762,899. The bulk of this amount, or £12,289,602, came from the mines, £2,441,440 from alluvial mining, and £31,857 from débris washings. The previous record year was 1919, the output being valued at £11,734,495. Prior to 1918 the high mark was 1913, when diamonds were produced to the value of £11,389,807.

The past year's output aggregated 2,545,017.47 carats, of which 2,312,436.55 came from regular mines and 221,460.17 from alluvial mining; 11,120.75 carats were recovered from débris washings. It is to be noticed that production in the past six years has been practically constant, outside of 1915 which was an abnormal year; 1917 was the high mark in this period with 2,902,416.51 carats, and 1916 the lowest with 2,346,330.21. In the last three years production has fluctuated approximately by only 50,000 carats. The year 1910 is still the record by volume for the industry, 5,456,558 carats being taken from the earth in that year.¹

While production value constituted a record, the sales of diamonds fell below the total of 1919 by £3,411,257. This decrease is accounted for by the large drop in the volume of sales, which were only 1,765,993 carats as compared with 1919 sales of 2,648,931 carats. The sales total would have been even less in value except for the increase in the price realized, which was 117s. in 1920 against the 1919 figure of 101s. per carat. This high figure reflects the effect of abnormal conditions on prices, as the price realized per carat in 1917 was 51s. 1d. and in 1918 was 54s. 9d. That these high prices stimulated production is evident in that there were 19 mines producing in the Union in 1920, compared with 16 in 1918 and 11 in 1917.

The production within the Union is divided, in order of importance, among the Cape, the Transvaal, and the Orange Free State. The Cape contributed 1,364,706.25 carats, of which 1,258,129 were from the Kimberley mines. The Transvaal production was 905,297.05 carats, practically the whole of the 782,557.30 mine diamonds being the output of one mine. The share of the Orange Free State was 275,014.17, of which 269,178 carats were from the nine mines in that district.

The total diamond production of South Africa for the years 1913–1920 is given below.⁴ The variations in yield—in 1915 but very few diamonds were recovered—and those in price, are well worth attention:

¹ Trade Commissioner P. S. Stevenson, Johannesburg, *Comm. Rept.*, June 2, 1921.

² *So. Afr. Min. Eng. Jour.*, Mar. 15, 1921.

PRODUCTION OF DIAMONDS IN SOUTH AFRICA

Year.	Production from Mines.			Alluvial Diamonds.		
	Carats.	Estimated Value.	Value per Carat.	Carats.	Estimated Value.	Value per Carat.
1913.....	4,944,946	£10,254,203	41s. 6d.	206,049	£1,120,227	108s. 9d.
1914.....	2,653,089	4,906,242	37s. 0d.	143,924	576,729	80s. 2d.
1915.....	2,131	3,887	36s. 6d.	97,678	392,196	80s. 4d.
1916.....	3,170,348	4,769,479	43s. 11d.	167,620	948,571	113s. 2d.
1917.....	2,710,041	6,659,721	49s. 2d.	182,992	1,041,776	113s. 10d.
1918.....	2,385,361	6,137,283	51s. 5d.	143,438	964,574	134s. 6d.
1919.....	2,366,744	8,960,614	75s. 9d.	209,589	2,740,548	261s. 6d.
1920.....	2,312,436	12,289,602	106s. 3d.	221,460	2,441,440	220s. 6d.

The total sales for the above years are given as follows, a part of the diamonds sold having been mined in the previous year:

	Carats.	Value.	Value Per Carat.
1913.....	5,537,820	£12,088,963	43s. 8d.
1914.....	3,363,568	6,758,544	40s. 2d.
1915.....	551,951	1,459,597	52s. 11d.
1916.....	2,291,956	5,227,777	45s. 7d.
1917.....	2,416,209	6,170,906	51s. 1d.
1918.....	2,641,932	7,232,744	54s. 9d.
1919.....	2,648,931	13,379,662	101s. 0d.
1920.....	1,765,554	10,163,941	115s. 2d.

The production of alluvial diamonds in South Africa for 1920 is officially reported as follows:¹

Province and District.	Carats.	Value.	Value Per Carat.
Transvaal:			
Pretoria District.....	122,740	£1,209,442	197s. 1d.
Klerksdorp.....			
Cape:			
Kimberley.....	8,568	119,335	278s. 7d.
Barkly West.....	57,457	698,529	242s. 2d.
Taungs.....	18,926	232,773	246s. 0d.
Herbert.....	7,918	93,616	236s. 6d.
Hoy.....	$\frac{1}{4}$	2
Prieska.....	14	30
Vryburg.....	$\frac{3}{4}$	7
Orange Free State:			
Fauresmith.....	1	3
Boshop.....	926	12,863	277s. 11d.
Winburg.....	42	162
Rouxville.....	4,856	74,525	306s. 11d.
Vredesfort.....	8	137
Hoopstad.....	2	15
Ficksburg.....	2	1
Total.....	221,461	£2,441,440	220s. 6d.

The depression of the diamond trade caused, by the beginning of 1921, a cessation of mining operations in all the smaller South African mines, such as the Frank Smith, the Roberts Victor, the Eland, Blaauwbosch,

¹ *So. Afr. Min. Eng. Jour.*, Mar. 12, 1921.

Theron, Postmas, Makgangene, and others, while at the Koffyfontein and the Jagersfontein mines work has ceased, and the Kimberley and De Beers mines remain closed down. At the other mines of the De Beers group (Wesselton, Bultfontein and Dutoitspan) and at the great Premier mine in the Transvaal, production has been curtailed. It is conjectured that even in case of a revival in the trade some of the smaller mines above noted may remain shut down, as they were barely profitable even with diamonds at their highest figure. In the case of some of the open mines, where the treacherous nature of their walls has made it necessary to resort to underground mining, in place of open-cut working, the increased cost of raising the material will render mining unprofitable. The alluvial diggers are in a much worse plight, as far too many were induced to come to the diggings on account of the extraordinary prices secured at the height of the diamond market. During 1919 it is said that 13,000 white men and 100,000 natives were engaged in this work, and most of them are now deprived of all means of livelihood, so that Government assistance on a very extensive scale must be initiated to save a good part of them from serious privation. Of the general situation Mr. A. S. Harger writes:

The débâcle in the diamond trade will doubtless cause a healthy revolution in the diamond industry by shaking out many of the "mushroom" concerns which have been riding on the backs of the great Diamond Syndicate, whose business initiative has steadied the diamond market for many years past. It will also probably crush the life out of the alluvial industry, for two important reasons: (1) The diggers' life is always an uncertainty, and it is only when diamonds are high in price that the majority earn a fair living. A crisis like the present one ruthlessly forces him to dispose of his equipment, if he can find a buyer, and seek pastures new. In the present case he will fail to find a buyer and will consequently (in the majority of cases) have to depart from his claim in a state of sad impecuniosity. He will probably be forced by ensuing circumstances to relinquish digging for good. (2) During the past 40 years the richer alluvials of the Vaal River have nearly all been worked out; and during the past 12 years many areas in southwestern Transvaal (which helped so much to swell the output of river stones) have been rapidly and completely exhausted. During the prosperous year 1919 it had already become a very difficult matter for the digger to find a claim which might be deemed "safe" to peg, as many learned to their cost. The whole countryside has for some years past been closely prospected by hundreds of diggers looking for new payable areas without success. In other words the limits of the diamantiferous gravels are pretty well known, and the payable patches awaiting exploitation are of very small extent. It is likewise highly improbable that new payable mines will be found for many years to come in South Africa, as prospecting far and wide has not indicated anything of promise. The recently discovered mines near Postmasberg, in Griqualand West, are small and poor, and therefore not to be feared as "producers." These factors, though disappointing to the individual prospector and company promoter, will have a gratifying bearing on the future of the diamond market, for the simple reason that they point to a much diminished output during the normal times which are bound to return with an improvement in world conditions.

The Thirty-second Annual Report of the De Beers Consolidated Mines, Ltd., for the year ending June 30, 1920, makes an exceedingly favorable showing. The Profit and Loss Account shows the immense sum of £6,761,840 credited to Diamond Account, as compared with £5,849,552 in the previous year. Interest, dividends, net revenue from rents, sundry receipts, transfer fees and profits realized on investments increased the income to £6,997,900. From this had to be deducted £1,991,258 for mining expenses, £442,305 for charges, £96,392 for interest on capital of leased companies, £69,917 for interest on debentures, £78,803 for sinking fund on debentures, £32,379 for expenditure consequent to the war, and £72,180 for sundry other small items. Thus there was left £4,264,666 to be transferred to Appropriation Account; of this account the income tax of South Africa absorbed £439,550, and the Reserve for Stabiliment of the Diamond Trade received £382,069. The preference dividends were 20s. per share, or £800,000, less dividend tax of £60,000, making £740,000, while the deferred shares received 60s. per share, or £3,000,000. Diamonds unsold at date are valued at £354,244, and there remains a balance of £237,830 16s. 11d. carried to the next balance sheet. The apparent discrepancy in the data as here given arises from the larger totals for previous balance and for unsold diamonds as compared with those for the current year. The dividends were equivalent to 40 per cent. on the preferred shares, and 120 per cent. on the deferred shares.

At the general meeting of the stockholders of the De Beers company, Dec. 10, 1920, the chairman announced the abandonment of the old flooring system in favor of the direct-treatment system. The reasons for this change are given by him as follows:

Hitherto in the treatment of our blue ground we have followed the old flooring system, under which the ground was deposited on cleaned spaces and left to weather for periods of from 9 to 18 months, at the end of which time it had pulverized and was ready for treatment at the washing machine. This system involved the carrying of enormous stocks of blue ground with, of course, the locking up of much capital.

These disadvantages do not occur in a direct-treatment system, and for some years its adoption has been under consideration, but for various reasons no decision was arrived at until July last. It was felt that a decision should not be delayed, seeing that with the increasing depths of the mines our blue ground was becoming harder and harder, and therefore required longer time to pulverize, which in turn meant the locking up of a much larger amount of capital. The flooring system entails the carrying of a stock of blue ground of about 10,000,000 loads, but with the direct-treatment system the reserve need not exceed 3,000,000 loads, which would be ample to meet our washing requirements during the longest time the mines could be closed down through any disaster.

In anticipation of direct treatment, and in view of the large stock of diamonds we hold, it was decided to reduce all operations by about 50 per cent. as from Sept. 1,

1920, and to deposit the output from the mines on dumps in readiness for direct treatment.

The cost of production per load of blue ground, the value per load, and the profit per load in the three mines of the De Beers group that were worked in 1918, 1919 and 1920 were as follows, according to data derived from the reports of the company.

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

1919.						
	Cost of Production per Load.		Value per Load.	Profit per Load.		
Wesselton.....	6s.	7.19d.	16s.	9.55d.	10s.	2.36d.
Bultfontein.....	5s.	6.39d.	19s.	8.03d.	14s.	1.64d.
Dutoitspan.....	4s.	9.39d.	23s.	9.22d.	18s.	11.83d.

1920.						
	Cost of Production per Load.		Value per Load.	Profit per Load.		
Wesselton.....	8s.	4.97d.	28s.	7.02d.	20s.	2.05d.
Bultfontein.....	7s.	3.99d.	29s.	9.94d.	22s.	5.95d.
Dutoitspan.....	6s.	8.48d.	35s.	4.70d.	28s.	8.22d.

In each case the greatly increased value of the diamond in 1920 far exceeds the trifling increase in cost of production.

The statistics of working and production in the De Beers group of mines for the years 1916 to 1920 are as follows:

DE BEERS AND KIMBERLEY MINES

	Loads of Blue Ground Hoisted.	Loads of Blue Ground Washed.	Carats of Diamonds Found.	Selling Value per Carat.
1915-1916	None	None	38½	Not Stated
1916-1917	None	None	41	Not Stated
1917-1918	None	None	315½	Not Stated
1918-1919	None	None	241½	Not Stated
1919-1920	None	None	242	Not Stated

WESSELTON MINE

	Loads of Blue Ground Hoisted.	Loads of Blue Ground Washed.	Carats of Diamonds Found.	Selling Value per Carat.
1915-1916	43,586	885,334	227,914¼	44s. 2.31d.
1916-1917	1,814,398	1,669,104	445,665¾	53s. 9.27d.
1917-1918	2,065,620	1,805,436	487,828¼	54s. 9.76d.
1918-1919	1,035,311	1,657,146	403,039¾	69s. 11.79d.
1919-1920	1,927,178	1,646,895	401,631¼	119s. 1.25d.

MINERAL INDUSTRY

BULTFONTEIN MINE

1915-1916	60,997	864,052	342,676½	39s. 11.00d.
1916-1917	2,092,267	1,761,756	675,401½	46s. 11.00d.
1917-1918	2,328,615	1,859,531	646,927½	49s. 9.62d.
1918-1919	1,262,942	1,629,198	507,858½	63s. 5.38d.
1919-1920	2,021,026	2,251,257	663,419½	102s. 10.29d.

DUTOITSPAN MINE

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	422,657½	108s. 6.22d.
1918-1919	1,389,883	1,066,465	180,983	139s. 9.77d.
1919-1920	1,796,573	1,892,558	305,587	221s. 2.36d.

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	1,857,988	591,369½	
1916-1917	4,042,810	5,358,195	1,498,079½	
1917-1918	6,595,078	5,843,099	1,557,729½	
1918-1919	3,688,136	4,352,809	1,092,123½	
1919-1920	5,744,777	5,790,710	1,370,780½	
1913-1920	28,080,185	30,338,016	8,202,439¼	

The number of loads of blue ground remaining on the floors of the De Beers mines at the close of the fiscal years, and the average number of carats found in the blue ground washed in the year 1919-1920, are thus given:

DE BEERS MINE

	Carats per 100 Loads.	Value per Load.	Loads of Blue Ground on the Floor at Close of Year.
1915-1916	48,396
1916-1917	48,396
1917-1918	48,396
1918-1919	48,396
1919-1920	48,396

WESSELTON MINE

1915-1916	26	11s. 5.8d.	2,607,097
1916-1917	27	14s. 6.22d.	2,752,356
1917-1918	27	14s. 9.59d.	3,012,870
1918-1919	24	16s. 9.55d.	2,390,735
1919-1920	24	28s. 7.02d.	2,671,018

BULTFONTEIN MINE

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
1918-1919	31	19s. 8.08d.	2,768,605
1919-1920	29	29s. 9.94d.	2,588,374

DUTOITSPAN MINE

1915-1916	19	17s. 3.48d.	4,233,303
1916-1917	19	20s. 3.94d.	2,411,618
1917-1918	19	20s. 9.22d.	2,434,229
1918-1919	17	23s. 9.22d.	2,757,747
1919-1920	16	35s. 4.70d.	2,661,762

BLUE GROUND IN SIGHT, VALUE IN POUNDS STERLING BASED ON LOAD-VALUE FOR

	1920	Number of Loads.	Value. ¹
De Beers, above 2040 ft.-level.....		2,750,000	£3,930,437
Kimberley, above 3250 ft.-level.....		2,000,000	2,858,500
Wesselton, above 980 ft.-level.....		8,500,000	12,148,625
Bultfontein, above 1000 ft.-level.....		5,000,000	7,448,750
Dutoitspan, above 750 ft.-level.....		10,500,000	18,680,625

Total..... 28,750,000 44,966,937

De Beers and Kimberley estimated at Wesselton average. With exchange at one dollar below par, this would be \$173,864,652.

The number of loads below the levels above noted have been estimated as follows:

Wesselton, between 980-and 1150-ft. level.....	22,000,000
Bultfontein, between 1000-and 1600-ft. level.....	22,000,000
Dutoitspan, between 750-and 1300-ft. level.....	25,000,000
Total.....	69,000,000

The accumulated stock of blue ground on the floors of the mines and its value, computed according to the diamond-value per load in 1920, is as follows:

Mine.	Number of Loads.	Value.
Wesselton.....	2,671,018	£3,817,552
Bultfontein.....	2,538,374	3,765,773
Dutoitspan.....	2,661,762	4,610,210
Total.....	7,871,154	£12,213,535

Even counting the exchange value of the pound sterling as one dollar below par, this would mean \$47,223,633 as the value of the blue ground on hand June 30, 1920.

After remarking that of the De Beers mines, the Dutoitspan produces the greatest number of stones over 10 carats' weight, while the neighboring mine, Bultfontein, has the smallest number of large stones, Mr. J. R. Sutton pronounces to be erroneous the often cited opinion that the diamond yield diminishes with the increase of the depth, for he finds instead a slight increase since 1905. Nevertheless, the proportion of brown stones and of cleavage fragments increases. As to the latter, he favors the view that the breaking of the crystal has been due in many cases to the unequal thermal expansion of the diamond and of enclosed crystals, of zircon, garnet, ilmenite, etc.¹

The operation of the Premier mine during the year ending Oct. 31, 1920, resulted even more favorably than in the immediately preceding year, for the account showed a balance of £1,332,333, the Government share (60 per cent.) being £799,400, while £532,933 was left for the stockholders. This made it possible to declare two dividends, each of 6s. 3d. per share, on the preference shares, and two dividends, one of 15s. per share and the other of 12s. 6d. per share on the deferred shares.

¹ J. R. Sutton, "Kimberley Diamonds; Especially Cleavage Diamonds," *Trans. Roy. Soc. So. Afr.* 1918, Vol. 7, pp. 65-96.

The total number of loads washed was 4,660,498, from which were recovered 820,564 carats of diamonds, an average of 0.176 per load. Although this was the lowest average yield so far reported in the Premier, the decrease was in the first half-year, the last six months showing a slight increase in the average over the figures for the previous year. As to the working costs, there was an increase of about 3d. due to a 20-per cent. increase in wages to the European employees and a high wage paid to the native workers, besides the increased cost of mining supplies. The material was taken from above the 410-ft. level, where mining was carried on practically over the entire area. Above this level there still remain about 27,000,000 loads of blue ground. The 460-ft. level has been developed at the south end of the mines, where the total quantity of blue ground available is estimated at 41,000,000 loads. To facilitate future mining operations, a tunnel measuring 11 by 7 ft. has been run through a bar of floating reef, so as to furnish a haulage way between the 410-ft. level on the north side of the mine and the chief onsetting station. This will render it no longer necessary to preserve a large bench of diamantiferous ground on each level as a support for the auxiliary mechanical haulage in the northern division of the mine.¹

DIAMOND OUTPUT OF PREMIER MINE

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	939,365	749,653½	866,030	0.798	23	1.20	18	5.30	2	7.62	15	9.68
1905	1,388,071	845,852	994,687	0.609	23	6.29	14	3.98	3	3.44	11	0.85
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	8,058,844	2,078,825½	1,536,720	0.258	14	9.40	3	9.75	1	10.24	1	11.51
1909	7,517,793	1,872,186½	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	1,774,306	1,433,971	0.218	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	8.75
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		9.46
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	1,198,923	0.184	26	5.48	410	3.38	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
1919	4,529,261	814,577	1,961,259	0.180	48	1.84	8	7.92	2	10.68	5	9.24
1920	4,660,498	820,564	2,098,483	0.176	51	1.80	9	0.03	3	1.70	5	10.33

This gives the following totals for the 17 years:

Number of loads washed.....	93,487,679
Carats of diamonds found.....	21,686,461
Value of diamonds.....	£23,158,072

While, as we see, the returns for 1919-1920 were very satisfactory, the chairman, at the annual meeting, freely admitted that the stockholders could not look forward to as good results in the coming year, owing to the great falling off in the demand for diamonds. He then

¹ *So. Afr. Min. Eng. Jour.*, Feb. 12 and Mar. 5, 1920.

warned his hearers that the year 1920-1921 promised to be "a very lean one in profits," but he consoled them with the consideration that the diamond industry had often had such setbacks, and had always given proof of the possession of extraordinary recuperative power.

The Postmasburg diamond region, which has attracted so much attention of late, is approximately 40 miles from Griqua Town, and lies about 125 miles west of Kimberley. There is communication by a fairly good road to Kimberley, the nearest railroad station, and a motor makes bi-weekly trips between it and Postmasburg, passing through Griqua Town. The chief geological features of the field are a dolomitic limestone covering, basal beds of the Griqualand series, and doleritic dikes which traverse the limestone. A line of igneous intrusion seems to traverse the country for many miles from north to south. It is near this fracture line that the kimberlite occurrences are noted, and the Emerald Diamonds, Ltd., a company capitalized at £500,000, has secured options on over 40 farms along this line. This company is closely associated with the Victory Diamonds, Ltd., which holds very promising diamond fields in a large concession situated in the Gordania district, and also at Rietfontein in the Kuruman district, and at Paardeberg West, near Kimberley.¹

In the Postmasburg region several productive "pipes" have been discovered during the past 2 or 3 years. The earliest discovery was the Makganyene pipe, 45 miles north-northwest of Postmasburg. It has an area of 240 claims, but the yield is low, being only from $2\frac{3}{4}$ to 3 carats per 100 loads, and though the stones are of very fine quality, this yield is insufficient to make the mining very profitable. Somewhat better results were realized in the West End pipe, found in 1919, and having a yield of 5 carats to every 100 loads. Of two pipes located by the Postmasburg Diamond Prospect Ltd. near the West End pipe above mentioned, one has failed to produce results, while the other seems to be diamantiferous in a small degree.²

The company has erected a direct treatment plant with a capacity of 1000 loads per diem. It is located 1600 ft. east of the mine, and is equipped with crushers, rolls and jigs. The final eliminating jigs deliver to a tube mill which in turn delivers to self-greasing tables. For the present, the plan is only to treat 500 loads per shift.³

At the seventh general meeting of the South African Corporation in December, 1920, the chairman reported a profit for the year of £131,306, an increase of £86,934 over the profits reported in the previous year. These earnings were realized on a capital of £100,000 for the first six

¹ "The Postmasburg Diamond Field," *So. Afr. Min. Eng. Jour.*, Apr. 10, 1920.

² Communicated by P. A. Wagner, of Pretoria, in letter dated Aug. 28, 1920.

³ Letter of Dr. P. A. Wagner, Pretoria, Jan. 8, 1921.

months of the year, and £300,000 for the remaining six months. The chairman hoped that the Government would decide to repeal the excess profits duty, but owing to the uncertainty of this relief it had been determined to declare a dividend of only 25 per cent. per annum for the six months ending Dec. 31, 1920. He stated that, by the coming June, the former dividend of 50 per cent. per annum would be resumed.¹

The last statement of the New Jagersfontein Mining and Exploration Co., Ltd., shows that during the year 1919-1920 £1,257,678 was realized on diamonds, an increase of over £500,000 compared with 1918-1919. This made possible dividend payments of £531,350, while £100,000 was transferred to General Reserve Fund and £87,148 was carried forward as balance, after other expenses had been deducted. At the meeting of Aug. 24, 1920, in Kimberley, the deputy-chairman, Mr. F. Hirschhorn, declared that, at the conference of the four great diamond-producing companies, an agreement had been reached to control the quantity of diamonds put on the market, thus stabilizing prices.²

The yield of the Frank Smith diamond mine, where mining operations were resumed in December, 1920, after an interruption during the war, is said to be better than it was some years ago. The average weight of the diamond material in a hundred loads is reported to be 2.8 carats, and it has been computed that a yield of $2\frac{1}{4}$ carats covers cost of production. It is believed that even this small margin of profit will not prove unsatisfactory, in view of the large capacity of the plant and the moderate capitalization of the company.³ However, these favorable prognostics have not been fulfilled, owing to the decreased demand.

A new South African company is the Victory Diamonds, Ltd., with a capital of £60,000. This company has secured the farm Mahura Mathla, on the Kaap Plateau, where some fine alluvial diamonds were found a few years since. Another acquisition of this company is the Paardeberg West mine in the Kimberley district. This mine was worked in 1905 and 1906 and it is now proposed to reopen it soon. The resumption of activity here and in other old workings is a result of the high prices obtainable for diamonds recently. Another old mine at which working has been resumed is one of those of the Montrose company, the pipe situated near Rayton, east of Pretoria.⁴ Of course the resumption of work, or the continuance of work, in all these mines depends upon future developments in the diamond market.

The 7000 enthusiastic diamond diggers who, in March, 1920, rushed to the Thlaping farm in the Hart's River valley, which forms part of the Taung's Reserve, were not overwell rewarded for their expedition. It

¹ *So. Afr. Min. Eng. Jour.*, Dec. 11, 1920.

² *Manufacturing Jeweler*, Sept. 23, 1920.

³ *So. Afr. Min. Eng. Jour.*, Jan. 22, 1921.

⁴ Communicated by P. A. Wagner, of Pretoria, in letter dated Aug. 28, 1920

has been already noted in the previous report that the proclamation of this district was opposed by the native chief, but his opposition was overruled. From Mar. 25 to the end of June, 1920, the production was 7207 carats, valued at £113,590, equivalent to nearly \$445,000 counting the pound sterling at \$3.90. This gives an approximate value per carat of more than \$55, indicating that a good number of large stones were found, although the returns to most of the diggers were small. The gravels in which the diamonds occurred were shallow and patchy, so that before long they were practically exhausted by the great concourse of diggers. Later on, the adjoining farm, Doyle's Prospect, was proclaimed, and it is stated that fairly good results have been secured there.¹

The alluvial diamond deposits of Rouxville, near the Orange River, in the Aliwal North district, have been successfully exploited by a company, a proof that, under certain conditions, better results can be secured by a company than by individual diggers. There appears to be good reason to believe that on the lower reaches of the Orange River, which here traverses a wild and mountainous region, valuable diamond deposits may be found. At this point, where this river constitutes the boundary between Little Namaqualand, Cape Province and the former German Southwest African Protectorate, there are on its banks immense terraces of gravels, closely resembling those of the diggings, but evidently much more highly concentrated. About 50 miles from its mouth, where the river passes out from a series of narrow cañons, within which it has been enclosed for a long distance, the terraces have developed into hills 200 or 300 ft. high, consisting of a succession of layers of gravel. In the lower strata, the gravel is bound together by lime so as to form a kind of conglomerate, and closely resembles the appearance of the very rich deposit recently found at Rouxville almost 800 miles distant. Occasional diamonds have been found here by the natives, but owing to the inaccessibility of the region no serious attempts have been made to exploit this very promising region.²

In view of the so often observed association of gold and diamonds, it is interesting to learn that in 1920 there were recovered from the Witwatersrand gold mines, notably the Modder B. and Van Ryn Deep, 61 carats of diamonds worth £293.³

Venezuela.—The finding of diamonds in Venezuela has been reported by Prof. Louis Duparc of the University of Geneva. Not long since he carried out a prospecting journey through the auriferous deposits of Callao. In the course of this trip he was able to determine that the

¹ Communicated by P. A. Wagner of Pretoria in letter dated Aug. 28, 1920.

² Fred E. Cornell, "The Alluvial Diamondiferous Deposits of South and South-West Africa," *Chem. News*, Mar. 4, 1921.

³ *So. Afr. Min. Eng. Jour.*, Mar. 12, 1921.

alluvials of the Caroni River, markedly auriferous in certain places, contained almost everywhere very pretty diamonds. As a rule they were quite small, weighing less than a carat each, but occasionally some were met with having a weight of as much as two or more carats. Ordinarily they are of octahedral form, and quite strongly rolled; they are generally of fine water and of unusually white hue.¹ One might conjecture, under these circumstances, that Venezuela could become a rival of the not far distant British Guiana as a diamond producer.

OTHER PRECIOUS STONES

Connecticut.—A certain quantity of gem material was found in Connecticut during 1920, mostly at Strickland's Quarry, from which about \$250 worth of gems was sold during the year. The material included some fine crystals of purple apatite of gem quality, considerable gem citrine quartz and smoky quartz, a blue-green tourmaline weighing 131 carats, and some beautiful beryls.²

Madagascar.—The most valuable of the precious stones exported from Madagascar recently have been the pink beryls (morganite), of which some exceptionally fine specimens of a salmon-rose hue have been furnished by a new vein discovered in the region of Anjanabonona. Locally these beryls sell for from 35 to 40 francs per carat, while the tourmalines from the same region bring only from 3 to 5 francs a gram (equal to 5 carats). Other semi-precious stones, such as the garnets of Fianarantsoa, Bektroks and Fort Dauphin, are disposed of at prices ranging from 100 to 500 francs the kilogram (equal to 5000 carats). Beautiful crystals of transparent orthoclase are reported from the neighborhood of Isohy. In all, semi-precious stones weighing 424 kilograms were exported from this island in 1919.³

JADE

It is reported that but little fine cut jade was imported to China from Burma during 1919, and for this reason there was a considerable advance in prices. For the year the sales amounted to about \$800,000. Disturbed local conditions in Canton caused a decrease in the number of cutters of jade-stones employed there to about 5000, this being only half the number usually at work in this industry. For this reason the supply of cut stones was so much restricted that but few were exported.⁴

¹ Communicated by Prof. Duparc in letter dated Geneva, May 8, 1921.

² Communicated by Mr. Harold T. Stearns, Dec. 7, 1920.

³ *Le Moniteur de la Bijouterie.*

⁴ Walter A. Adams, Vice-Consul in Canton, China, *Comm. Rept.*, 1921.

MOSS AGATE

The tree agates of Montana are found in a very narrow strip of territory running along the Yellowstone River for about 100 miles, from Billings to Glendive. Here may be picked up agates of many shades of color, from dark-red to a very light-red, often blended with brown or black. The so-called moss agate is also met with, the dark blotches seeming to fan out at the edges as would a piece of moss. Besides these there are the "fern agates," or "tree agates," perfectly transparent, and whereon are markings which seem to figure perfect little scenes, such as groves of trees, with occasionally a little strip of yellow at their bases, figuring a pool of water. Sometimes the fern-like markings appear in two colors, as, for example, when the base of the fern is black, while the upper part shades into a beautiful brown, the delicate top leaves being as perfectly formed as in the natural plant. It is stated that fine examples of such agates are becoming very rare.

OPALS

The discovery of opals in Australia has greatly reduced the price of this beautiful gem. In fact, the production of Australian opals in great quantities of magnificent specimens has resulted in the practical closing down of the famous opal mines in Hungary, whence for more than two centuries most of the fine opals had been derived.

Of the Australian discoveries, the earliest dates from about 1880, when the wonderful examples of the so-called "blues" and "greens" were discovered in Queensland. Here they permeated an ironstone formation in minute veins up to an inch in width. Then came the finding of great quantities of the white varieties of precious opal in 1883, in New South Wales, at White Cliffs, where the gem was extracted from a cretaceous sandstone, sometimes named the "Desert Sandstone" in Australia. This formation contains fossil reptilian bones; mollusca (shells); belemnites (cuttlefish), and a mineral resembling galyussite. This was followed by the surprising and unique occurrence, also in New South Wales, of the famous Lightning Ridge deposits, where the magnificent specimens of black or gray opals were mined, the tones emitting the most vivid flashes of red, green, yellow and purple, rendering them unique in splendor.

Not long since, in 1915, these earlier discoveries have been supplemented by the finding of opals in the desert region of South Australia—the white sandstone region—similar to the White Cliffs of New South Wales—at a point 1000 miles distant from the nearest of the

other localities, in an exceedingly arid district, barren of trees, grass and water, so that all provisions, as well as water, for man and beast must be transported thither on camel-back. Still more recently an entirely new field of white opals has been located at Tintenbar, about 50 miles south of Sydney, in New South Wales, where the gems occur in a basaltic rock, and are of the fire-opal type, resembling a number of our Nevada opals, and unfortunately sharing with them the tendency to develop cracks and fissures due to rather rapid dehydration.

Of the prevailing rock formation, L. Keith Ward, Government Geologist, writes as follows:¹

This upper Cretaceous formation, which is usually known by the name of Desert Sandstone, extends far beyond the limits of the country hitherto proved to be opal-bearing. The Geological map of Australia shows its extent through Queensland, New South Wales and South Australia.

The opal at Stuart's Range occurs for the most part in irregular veins and patches, which are enclosed in the sandstone and claystone. . . . The veins or seams are inclined at all angles, and in more than one instance a vein vertically disposed when first located has been found to gradually assume a horizontal position as it is followed downwards. The thickness of the opal seams ranges from as much as 2 in. down to an almost imperceptible streak.

The same writer reports that the maximum length of this new opal field, measured from the northwest to the southeast is about 10 miles, the maximum width nearly 2 miles, but he believes that when a water supply has been assured, further prospecting will extend the boundaries of this field. The fact that the Australian opals are found in an exceedingly dry region suggests to Mr. Ward the theory that their development is a special phase of the silicification of the upper portion of the Desert Sandstone.

Opal mining is especially suited for individual miners, as but little capital is needed. Indeed, it has been found that operations on a comparatively large scale are not remunerative, and that the best results are attained when the individual prospector owns and works his own ground.

In spite of a splendid season and an excellent market, opal mining in the far west of Queensland was as dull in 1920 as in the preceding year, when drought conditions prevailed. The only district where anything at all was done in opal mining, as far as is reported, was at Sheep Station Creek. A few specimens were obtained, some in country previously untried, but, on the whole, the result of the year's work was insignificant.²

PEARLS

Pearl-fishing in the Concho River in Texas was actively revived in the latter part of 1920, and it is reported that some very fine pearls have been

¹ Reports forming addenda to the Records of Mines, pp. 36-44.

² *Queens. Govt. Min. Jour.*, Apr. 13, 1921.

found and that the yield has been quite considerable for many years past; the chief profit, however, has been from the sale of the pearl shells, which have been collected and shipped to the button manufacturers.

It is reported that the United States Bureau of Fisheries has pointed out the need for faster propagation and the prevention of unnecessary destruction of the fresh-water mussel whose shell is used by the pearl-button industry. An active campaign is said to be planned in all the large cities of the Mississippi Valley. At the same time no charge has been made that wilful destruction of the mussels has taken place. The industry is a most important one, as the annual value of the buttons and by-products reaches \$5,000,000 and 8000 persons find employment in the work; the capital invested is over \$3,000,000. The mussel fishing to secure supplies is prosecuted in at least 20 states in the Mississippi River basin, and the annual value of the shells amounts to \$800,000, while \$400,000 is realized from the pearls obtained.

A report comes by way of Paris that an unusual number of pearls, some of extraordinary size, have recently been found in pearl-oysters at certain points of the Mediterranean. In view of the theory that pearl formation is generally, or at least frequently, caused by a trematode parasite which enters the shell of the mollusk and causes an enveloping secretion of nacreous substance, the conjecture has been advanced that these Mediterranean pearls are due to an influx of such parasites through the Suez Canal from the Indian Ocean. The colors of the pearls range from light blue to pink, and they are said to be most plentiful in the waters about Tripoli, although they are also to be met with at points along the coasts of the French possessions in North Africa.

At the meeting in Paris, January 19, 1921, the Committee of the *Chambre Syndicale des Négociants en Diamants, Perles, Pierres Précieuses, et des Lapidaires*, warned the members against the deceptive designation given by some dealers to the Japanese pearl in calling it "Perle Fine Japonaise," for these pearls are not genuine, and those dealers who offer them for sale as such lay themselves open to prosecution under the law for the suppression of frauds. For this reason, the Committee decided to put the public on its guard in this matter by publication.¹

RUBY, SAPPHIRE, SPINEL

Burma.—The Burma Ruby Mines, Ltd., according to its report for the year ending Feb. 28, 1920, showed an increasing prosperity compared with the immediately preceding year. The sales of rubies amounted to £91,601, an increase of £40,759 over 1918–1919, when the sales were only

¹ *Recueil Mensuel des Procès-Verbaux des Séances de la Chambre Syndicale des Négociants en Diamants, Perles, Pierres Précieuses, et des Lapidaires, Paris, No. 47, Jan., 1921*

£50,842. The number of loads of ruby earth washed was 754,324, against 903,760 loads in the previous year, but the value of the ruby material was £76,153 compared with £44,168 in 1918-1919. While the cost per load rose from 10.4d. to 1s. 2.2d. the higher value of the ruby gave a profit of 10.03d. per load, against only 1.33d. per load in 1918-1919. It is stated that a good part of this satisfactory result is due to the finding of the great "Peace Ruby," in July, 1919, for the last six months of the year exhibited a considerable falling-off in returns.

In 1920 about 800,000 loads were washed, and rubies valued at £43,000 were produced.¹ This shows a falling-off in yield as compared with 1919. It is stated that on an average a "pin's head" size of ruby is found in a truck-load of earth. However, from time to time large gems appear, notable among which was the so-called "Peace Ruby" found in the Saroktan mine in 1919, and which weighed 42 carats; it was of perfect color, with the crystal faces well developed. A valuation of 300,000 rupees, or £20,000, was put upon it, and it was sold in the rough.

Queensland.—The prosperity which had marked the closing months of 1919 on the Anakie Sapphire Field was continued in the early part of last year. Competition between the various buyers seemed to have the effect of forcing up prices, which, compared with any previous period in the field's history, reached a phenomenally high point. The effect of the high prices was, through the over-booming of the field, to attract thither a far larger population than the industry could support, and then the inevitable reaction set in. It has been the experience on the field for the past 20 years that a period of inflated prosperity is always followed by a term of depression. Doubtless, the great amount of stone that was produced between October, 1919, and April of last year was more than the available markets could absorb, while at the same time this over-supply was augmented by large quantities of cut stone which had been held in Germany being also offered for sale early in 1920. International exchange, also, adversely affected the market for Queensland gems. A feature of the year's mining work on the field was that, with a greatly increased total output, most of the operations were confined to the vicinity of the old workings at Retreat and Policeman Creeks. Towards the end of the period, however, a few miners migrated to Tomahawk Creek, and seemed satisfied with the results obtained, notwithstanding that repeated trials extending over many years have not led to any permanent settlement in this locality. Some fresh ground has also been opened between the New Rush workings, 4 miles from Sapphire, and those at The Scrub, and on this ground a few claims have proved payable.²

¹ Communicated by Mr. Montagu Ballye, May 6, 1921.

² *Queens. Govt. Min. Jour.*, Apr. 15, 1921.

The following is an estimate, carefully made from all available sources, of the output of the field for the past year, as supplied by Mr. J. Stewart Nisbet, secretary of the Sapphire Progress Association:

Gemstones	£55,050
Mechanical stones—machine and corundum	7,000
Stones cut during the year	1,000
	<hr/>
	£63,050
Approximate value of stones sold privately	400
Approximate value of stones held over, unsold	600
	<hr/>
	£64,050

Sapphires of a novel type have been found on the Excelsior Claim, $3\frac{1}{2}$ miles south of Ruby Vale, near Placeman's Creek, in Central Queensland, Australia, near the Central Queensland Railroad. They are of blue color, not transparent, but show a well-defined (not movable) star cross, due to crystallization. They occur in alluvial soil, in a second layer of an old river channel. The discovery dates from October, 1920. There is also reported, from some 25 miles above this region, the occurrence of a green, rolled, corundum crystal weighing over 2 oz.; this also is not transparent.

To facilitate the marketing of Queensland sapphires, the Government has entered into an agreement with a firm of gem dealers having offices in Bombay, Paris and London. By the terms of this agreement, the firm is appointed sole agent for the sale of all sapphires which are the property of the Government, for a term of three years, the privilege of terminating the contract at three months' notice being reserved by both parties. The Government is to take all reasonable steps to acquire the entire production of sapphires in Queensland, except of the so-called "fancy stones," defined as orange, golden-yellows, parti-colored, and green. The firm is to appoint a grader, who shall examine, grade and classify the sapphires received from the miners on the field, and shall then consign them to the contracting firm in Paris or elsewhere. The Queensland Secretary for Mines is to receive from the firm monthly advices of the highest ruling price for each kind of sapphire, and also the firm's estimate of the probable price two months later, and the Government will make advances to the miners not exceeding 75 per cent. of the value of the gems as deduced from these advices, the balance, less charges, to be paid to them when the gems have been sold. The money for such advances is to be deposited to the credit of the Government by the gem dealers. Except by consent of the Queensland Government the firm is not to retain possession of the sapphires for more than five months. It is provided that the cost of operating this plan is to constitute a charge against the returns for the stones, and this expense is not to exceed $7\frac{1}{2}$ per cent. on the turnover, when this is not more than £30,000 in a year.

This charge is to be reduced $\frac{1}{2}$ per cent. for every additional £10,000, but is never to be less than 5 per cent. During the first week of this agreement about £4,500 was paid to the miners in the Anakie fields for their sapphires, the gems purchased including about 226 oz. of first-grade blue sapphires, for which £1700 was paid. For 480 oz. of small first-grade blues the miners received £1,980, and £450 was given on second-grade and machine or industrial stones. All these sums represent 75 per cent. of the value of the stones acquired.¹

United States.—The New Mine Sapphire Syndicate of Utica, Fergus Co., Montana, reports an output for 1920 of 309,195 carats of sapphires, valued at \$200,325. Owing to shortage of labor, mining operations were considerably restricted, more especially during the harvest season, and the fact that the electric separator got out of order rendered it necessary to ship the smaller-sized stones to London in the gravel for the first sorting.²

TURQUOISE

A report comes from Argentina that a British mineral prospector, Mr. Robert Davidson, has discovered in the Cordilleras, near a mine in the province of San Juan, a rich vein of turquoise. Samples of the precious materials that have been sent to Buenos Aires were pronounced by an expert to be fine turquoise, and worth about 7 pesos per gram. The vein from which the fragments were taken traverses a basaltic formation, and this is declared to be the first time that turquoise has been found in Argentina.³

¹ *Queens. Govt. Min. Jour.*, Feb. 15, 1921.

² Communicated by C. T. Gadodem, Jan. 14, 1921.

³ *South American*, New York, December, 1920.