

THE MINERAL INDUSTRY

ITS

STATISTICS, TECHNOLOGY AND TRADE

DURING

1912

FOUNDED BY RICHARD P. ROTHWELL

EDITED BY

CHARLES OF

Mining Engineer

VOLUME XXI

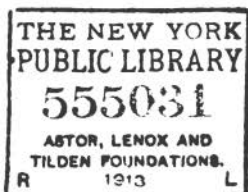
SUPPLEMENTING VOLUMES I TO XX

McGRAW-HILL BOOK COMPANY, Inc.

239 WEST 39TH STREET, NEW YORK

6 BOUVERIE STREET, LONDON, E. C.

1913



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PRECIOUS STONES

BY GEORGE F. KUNZ

During 1912 a rather remarkable condition existed in the precious stone market. Pearls continued to advance; diamonds advanced, and there was an unprecedented demand for sapphires. Emeralds were at their former price and rubies had become so rare that they were sought and appreciated, but the newer favorites were more in demand.

Quantities of diamonds weighing from $1/64$ to $1/300$ of a carat, the latter single-cut brilliants of many facets, were used to a large extent in successive or minute ribbon-work and in ways that diamonds have never been used before, the labor on the material representing frequently three-fourths or more of the cost of the stones themselves.

Sapphire has been unusually favored since January, 1912. These stones have materially advanced in price, and never have finer sapphires been sold than since this demand set in. Many of the stones are cut *en cabochon*, the finest in Cashmere and Burma. This special favor has increased the demand for Montana sapphires, which, although they usually run anywhere from a carat down to $1/16$ of a carat, rarely weighing as much as two carats, possess the property of retaining their color by artificial light. They have been unusually popular, being mounted in many ways that are at once attractive and often inexpensive. The Balkan War has suggested to Dame Fashion the demand for various colored stones. In a variety of colored combinations, the stones are being caliber-cut, that is, square and fitted into a setting without any intervening gold between them, and such combinations as tourmaline, red and green or blue sapphires, green tourmaline, yellow topaz, purple amethyst, and many other color combinations have been made up. These caliber-cut or mitred stones have also been cut in three-stone shapes to form circles, ellipsoids, and other quaint forms.

The precious stone cutters' art and that of the diamond cutters have never before been taxed to so great an extent as at present, nor has there ever been such a demand for the many forms of cutting. Many gems have been cut double-briolet, pear-shaped, and in other curious forms that take a pendant shape, and others have been cut with a grooved edge at the girdle along which the setting is slipped so as to be almost invisible. During the past year some remarkable pockets have been found contain-

ing red tourmaline (rubellite) on Pala Mountain, San Diego Co., California, as well as an enormous deposit of kunzite, the lilac spodumene at the same locality. Some of the crystals of rubellite weighed as much as 11 lb., and there were kunzites of from a few ounces to 4 lb. Occasionally the crystals had been shattered by blasting, but could be repaired for employment as cabinet specimens.

The finest of these have found their way, by gift, to the American Museum of Natural History, the Musée d'Histoire Naturelle, in Paris, and to the Holden Collection which was willed to Harvard University.¹ During the further development of the Humboldt County opal deposits there has been brought to light a great variety of replacement of prehistoric wood by opal of the greatest variety of colors, petroleum brown with a most intense and vivid flash of red, green and blue fire, and often with a faint purple reflection, and most magnificent and absolutely colorless pellucid opals, as well as those with magnificent colors in flame, red and green. These have been cut into beads. Some of the blacker material with the intense red, green and blue fire, resemble that from New South Wales. A new gem variety of golden beryl from German Southwest Africa is named heliodore.

The proposal to impose a duty of 20 per cent. on all cut stones imported into the United States has naturally met with strenuous opposition on the part of the gem-dealers. This opposition is dictated not only by business interests, but also by the great probability that under a duty of 20 per cent., instead of the former rate of 10 per cent., an immense amount of smuggling would be induced, thus placing reputable gem importers at a decided disadvantage.

A careful study of the figures for the imports of diamonds, precious stones and pearls into the United States for the period from 1867 to the present time shows that while the value of these imports has increased from decade to decade, this increase has not been constant and steady from year to year. The year 1879 marked the end of a period of general depression; with the year 1880 began an era of prosperity and of generally increasing values. 1893 was a high-water mark for the time being; the wave of prosperity had spent its force, and there ensued a rapid falling off in precious stone imports. In 1896 the tide turned again, and with the exception of the year 1900, when a presidential election exerted a disturbing influence, the increase was most remarkable. In 1907 came our recent financial panic and nothing can more strikingly illustrate the absolute dependence of the gem-market upon financial prosperity than the rapid decline of precious stone imports to \$31,866,599 in 1907 and

¹The collection of the late Albert F. Holden of Cleveland was the finest private collection of minerals in the United States, and was bequeathed to Harvard to be combined with existing collections.

to but \$13,700,404 in 1908. But the recuperative powers of our land are so astonishing that this period of depression has been immediately followed by 4 years in each of which the gem imports have run over \$42,000,000; the last 3 years are remarkable in the nearly identical figures, showing a steady demand.

IMPORTS OF PRECIOUS STONES.
Nine quinquennial periods, 1868-1912.

	Imports.	Annual Average.
1868-72.....	\$10,224,033	\$2,044,806
1873-77.....	13,836,574	2,767,314
1878-82.....	31,435,735	6,287,147
1883-87.....	42,400,515	8,480,103
1888-92.....	62,869,792	12,573,958
1893-97.....	35,094,294	7,018,859
1898-1902.....	88,501,998	17,700,399
1903-07.....	168,482,604	33,696,520
1908-12.....	184,202,674	36,840,534

Four decennial periods, 1873-1912.

	Imports.	Annual Average.
1873-82.....	\$45,272,309	\$4,527,230
1883-92.....	105,270,307	10,527,030
1893-1902.....	123,596,292	12,359,629
1903-12.....	352,685,278	35,268,278

IMPORTS OF PRECIOUS STONES FOR THE YEARS 1909, 1910, 1911, 1912.

	1909.	1910.	1911.	1912.
Diamonds, uncut, including miners', glaziers', and engravers', not set. Free.....	\$ 8,789,640	\$ 9,204,134	\$ 9,854,152	\$ 9,863,770
Diamonds, cut, but not set. Dut.....	27,369,405	25,672,639	25,705,663	22,876,042
Pearls and parts of, not strung or set. Dut.....	.....	464,712	1,387,689	5,139,406
Other precious stones, uncut. Free.....	440,638	222,513	109,241	115,812
Other precious and semi-precious stones, cut, but not set. Dut.....	6,970,864	6,751,832	4,519,263	3,342,219
Imitation precious stones. Dut.....	.....	.....	587,256	1,215,471
Total precious stones, etc.....	\$43,570,556	\$42,315,830	\$42,163,164	\$42,552,720

IMPORTS OF PRECIOUS STONES AND PEARLS INTO THE UNITED STATES
FROM 1867 TO 1908

Diamonds; glaziers', miners', and engravers', not set,.....	\$ 3,277,209
Diamond dust.....	6,787,740
Diamonds, rough or uncut.....	83,994,001
Diamonds, set.....	53,969
Diamonds, cut, but not set.....	152,784,223
Diamonds and other stones, not set.....	211,556,278
Pearls.....	20,120,798
Grand total, 1867 to 1912 inclusive.....	\$478,574,218
	\$649,176,488

In the first 9 months of the present fiscal year, which ends June 30, 1913, official figures show that precious stones worth \$35,000,000 were imported into the United States, while the totals for the same period in

each of the 2 preceding years were about \$30,000,000. The corresponding returns for 1900 were worth but \$11,000,000. This indicates the rapidly growing wealth of the nation, and also the increasing tendency to satisfy the merely aesthetic cravings of the purchaser. While it is true that in the case of precious stones the greater part of the immediate returns go abroad, this, in turn, augments the purchasing power of foreign lands and so in the endless chain of commercial distribution is to the advantage of all.

DIAMONDS

The unsettled political conditions in Europe due to the Balkan troubles did not stimulate the demand for diamonds. The strong demand for small diamonds has operated greatly to the advantage of mines such as the Premier and especially to that of the diamond mining enterprises in German Southwest Africa; in both fields an unusual proportion of the diamonds secured is quite small. Indeed, the diamond industry seems to be in a very favorable state both here and abroad.

The diamond interests of 1912-1913 have been influenced latterly by the threatened advance in the customs duties from 10 to 15, and even 20 per cent., with the result that many importers bought large quantities of diamonds, importing them so as to relieve themselves of a large part of the duty they might have to pay later on. This excess buying has strengthened the precious stone market abroad.

The exports of diamonds to the United States from the two ports of Amsterdam and Antwerp for the period 1905-1912 inclusive, compare as follows:

Year.	Amsterdam.	Antwerp.
1905.....	\$10,425,814	\$ 6,465,464
1906.....	12,435,181	6,448,894
1907.....	7,905,853	6,283,576
1908.....	4,571,804	4,408,366
1909.....	12,441,243	12,914,793
1910.....	10,655,753	10,857,038
1911.....	10,080,851	11,357,475
1912.....	10,645,280	10,903,894
	\$79,161,758	\$69,639,500

The cut diamonds amounted to \$10,009,324 in 1911 and \$9,665,027 in 1912; the rough diamonds \$1,348,151 in 1911 and \$1,238,867 in 1912.

According to the consular invoices the value of the diamonds sent from Antwerp to New York, given in quarterly periods, was as follows:

Cut Diamonds.	1911.	1912.
First quarter.....	\$3,331,201	\$ 2,230,324
Second quarter.....	2,701,961	2,433,942
Third quarter.....	2,491,503	2,589,355
Fourth quarter.....	1,484,659	2,411,406
	\$10,009,324	\$ 9,665,027
Rough Diamonds.		
First quarter.....	\$ 222,296	\$ 331,994
Second quarter.....	317,713	210,099
Third quarter.....	540,734	381,101
Fourth quarter.....	267,408	335,673
	\$ 1,348,151	\$ 1,238,867
Grand total.....	\$11,357,475	\$10,903,894

Diamond Cutting Industry.—Through the extensive use of the saw in cleaving diamonds, and also because of the competition of independent workers, the wages of the Dutch diamond cleavers have declined somewhat during 1912. Efforts are being made by the union to arrive at some understanding with the independent workers, so that a certain concert of action may be attained, tending to a stiffening of wages. There is said to be good prospect of success. The union's finances seem to be in good condition to judge from the fact that it has been decided to assign an allowance to all who have been out of work for 2 weeks, instead of for 6 weeks, as was formerly the rule.

The founding of diamond-cutting schools in Hanau and in Berlin has been announced for the near future by the German Colonial Secretary, Dr. Solf, in a communication to the Reichstag. In these proposed schools instruction is to be imparted in the Amsterdam system of diamond-cutting. While the task of transplanting in whole or part any well-established industry is a very difficult one, the supply of rough diamonds from Africa is large enough.

This will, if successful, make a marked difference in the industry in Antwerp, for of last year's German diamond production 94.55 per cent. went to Antwerp, but 4.79 per cent. being Germany's share, and it is believed that barely 3 per cent. was actually cut in Germany. One-third of the small amount of the diamond material brought to Germany was exported in a rough state.

An effort may be made to establish a diamond-cutting industry in South Africa, and to facilitate this the majority of a senatorial committee has recommended that an export tax of from 5 to 10 per cent. be levied on all rough diamonds taken out of South Africa. Skilled labor is to be introduced from abroad for the development of a school of cutting.

A conservative minority would place the duty at but 2 per cent., while still another minority report altogether opposes the proposition.

It is possible that the threat to start the diamond-cutting industry at the Cape may only be a ruse to effect a compromise on the general question of imposing an export duty on diamonds.

United States.—While but little development work was done in the Arkansas diamond field in 1912, there is reason to believe that the current year will show better results.¹ The Osark Company, the owner of some 5 or 6 acres of the first large pipe discovered, has already installed a steam washing, crushing and recovery plant, which can treat a hundred loads of ground daily. As this is the first application of practical methods to diamond mining in this region, the operation of this plant is expected to show more definitely than has heretofore been possible the character and quality of the diamond deposits. Another washing plant is in process of erection on Prairie Creek, on the neighboring tract leased from Mr. Mauny. The other interests in this field have not been so active. The largest owner, the Arkansas Diamond Co., did but little work; however, the small amount of washing performed always revealed the presence of diamonds in the ground. Many test pits were sunk during the year, and at one spot a diamond-drill hole was bored to a considerable depth to test the weathering quality of the peridotite. Little or no work was done either by the Kimberley Co. or by the American Diamond Mining Co. The ground to be mined by this latter company lies a few miles to the north of the large pipe.²

A small diamond crystal has been found in black sands from the Rock Flat Placer Mine, in township 19, range 2, east B. M., Idaho. These black sands appear to have their source in a dike of a blue basaltic clay, about 200 ft. wide, which seems to traverse at right angles the rock formation of a hard schistose granite, or gneiss, interspersed with quartzite dikes. On an average the blue clay carries gold to the value of \$2.87 per ton. The composition of the black sands, supposed to be derived from it, is as follows:

Magnetite.....	629.4 lb. per ton
Chromite.....	564.1 lb. per ton
Monasite.....	123.8 lb. per ton
Zircon.....	329.5 lb. per ton
Quartz.....	232.5 lb. per ton

A ton of black sands also carries about \$10 worth of gold and platinum. In this mining field have also been found some fine rubies and sapphires.³

¹ For full details of these diamond deposits see "Diamonds in Arkansas," by George F. Kuntz and Henry S. Washington, *Trans. A. I. M. E.*, (New York Meeting), pp. 187-194; John T. Fuller in *THE MINERAL INDUSTRY* for 1908, pp. 734-738; and also the writer's reports on precious stones in *THE MINERAL INDUSTRY* for 1910, pp. 578, 579, and for 1911, p. 634.

² John T. Fuller, "Diamond Mining in Arkansas," in *Eng. and Min. Journ.*, January 11, 1913.

³ Communication of Mr. Frank E. Johnesse, of Boise, Idaho.

Africa.—A recently reported estimate of the aggregate value of the mineral products of South Africa up to the present date gives the following stupendous figures for the gold and diamond production.¹

¹ Report of Minister of Finance of the Union of South Africa.		
Gold.....	£363,000,000	\$1,815,000,000
Diamonds.....	170,000,000	850,000,000
Coal.....	25,000,000	125,000,000
Copper.....	9,500,000	47,500,000
Tin.....	1,750,000	8,750,000
	<hr/>	<hr/>
	£569,250,000	\$2,846,250,000

At present the diamond interests in South Africa appear to be fairly well adjusted, so that, without any hard and fast agreement, those in control of the leading companies can avoid any risk of injurious competition. The German Diamond Regie, while acting independently, has established itself so firmly as regards the market for the smaller diamonds, that from this direction also no ill-considered or improvident management of the diamond situation need be apprehended. A close bond unites the interests of the De Beers and Premier companies through the large holdings of shares in both companies by Barnato Bros. It appears, however, as though the special relations of the Transvaal State with the Premier Co. would preclude any formal amalgamation of it with the De Beers Co.; indeed, this is quite unessential for the attainment of united action. The New Jagersfontein mine in the Orange Free State is practically part of the same complex of interests.

That the control of a smaller company by a larger one does not always help to raise the value of the smaller company's shares has been shown in the case of the Koffyfontein mines, the controlling interest in which has recently passed into the hands of the group controlling the De Beers Co., with the result that the price of the shares has fallen from \$15 to \$10. A like result is shown in the shares of the Voorspoed Company, which have gone down in selling value from \$12.50 to \$5 since the De Beers interests have acquired control. The reason for this is, of course, the risk that production may be diminished or checked in the small mine in case market conditions make this course seem advisable to those managing the larger concern.

The total production of diamonds in the Union of South Africa for the first 6 months of 1912 is officially reported to have been 2,392,255 carats, valued at the equivalent of \$22,100,970. This shows a decrease from the previous half year amounting to 651,192 carats. However, the value was only reduced \$30,940, owing to the advance in diamond prices.¹

¹ Consul Edwin N. Gunsaulus of Johannesburg, *Daily Consular and Trade Reports*, 26, 1912.

TOTAL PRODUCTION OF DIAMONDS IN UNION OF SOUTH AFRICA FOR 1911.¹

	Mines.		Alluvial.		Total.	
	Carats.	Value.	Carats.	Value.	Carats.	Value.
Pretoria (Premier)	1,802,093	£1,426,891	2,155	£1,909	1,804,248	£1,428,800
Pietersburg			951	3,474	951	3,474
Klerksdorp			38,142	196,607	38,142	196,602
Transvaal	1,802,093	£1,426,891	41,248	£201,985	1,843,341	£1,628,876
Kimberley (De Beers)	2,158,315	£4,967,360	8,629	£52,026	2,166,944	£5,019,386
Barkly West	296	1,076	78,365	465,094	78,661	466,170
Herbert			2,002	9,981	2,002	9,981
Kuruman			2,898	10,875	2,898	10,875
Cape	2,158,611	£4,968,436	91,894	537,976	2,250,505	£5,506,412
Boshof	90,902	£93,553	508	£2,674	91,410	£96,227
Fauresmith, N. Jagersfontein, Koffyfontein	462,367	1,302,418	3	4	462,370	1,302,422
Kronstad (Voorpoed)	242,112	210,541	33	61	242,145	210,602
Winburg	2,222	2,135			2,222	2,135
Other places			5	50	5	50
Orange Free State	797,603	£1,608,647	549	£2,789	798,152	£1,611,436
Union of South Africa	4,758,307	£8,003,974	133,691	£742,750	4,891,998	£8,746,724

De Beers.—The year ending June 30, 1912, was a prosperous one for the De Beers Co. The amount received from the sale of diamonds, after deducting decrease of stocks at production cost, was £5,630,968 8s. 3d. Taking from this £2,692,335 1s. 3d. for operating expenses and depreciation, £236,098 7s. 7d. for interest and sinking fund, and £358,155 8s. 7d. for taxes, there remained an available balance of £2,344,379 10s. 10d. as a result of the year's operations. From this were paid dividends of £800,000 on preference shares and £1,000,000 on deferred shares, as well as a bonus of £125,000 on the latter, leaving £419,379 10s. 10d., which added to the £623,019 15s. 11d. brought forward from 1911 made £1,042,399 6s. 9d. to be carried over to the current year. The net amount realized for diamonds sold was £692,882 in excess of that for the previous year.

The sum of £100,000 was added to the special reserve fund, making this £1,437,953. A special sinking fund has been created to provide for the payment of the 4 1/2 per cent. De Beers South African Exploration Debentures, due June 30, 1930, the year's contribution to this fund being £65,115. The Blue Ground Reserve valued at £2,268,266, of which £1,508,802 is on the floors, remains intact.

The sale of the Voorpoed Mine (Orange Free State) to the De Beers Company is believed to have been fully justified by the actual operating conditions there. During the past year £79,782 was realized by the sale of diamonds, but expenses so far exceeded this sum as to make a net loss

¹ From Mines Department Annual Report, Union of South Africa, for the calendar year ended December 31, 1911, Pretoria, 1912, Table 13.

of £41,278 on the operation. The progressive falling off in the average yield was continued, from 0.1612 carat per load in 1910 to 0.141 carat in 1911, and finally to 0.12897 carat in the first 7 months of 1912. As the diamonds sold at 19s. 11.35d. per carat, equal to 2s. 6.85d. per load at the last mentioned yield, while the cost of production was 3s. 2.2d. per load, increased production under the same conditions only added to the loss. The task of securing the large additional capital needed to enlarge and improve the plant to an extent that would promise better returns appeared to be a hopeless one, so that an acceptance of the cash offer of £253,571 made by the De Beers Company seemed to be the best, and indeed the only practical solution of the difficulty.

In addition to the nominal value of the shares amounting to £120,000 (\$600,000) the stock holders received 4 1/2 per cent. debentures to the amount of 12s. 6d. per share.

The death of Sir Julius Wernher on May 21, 1912, marked the passing away of the last of the little group of Life Governors of the De Beers Company, the others having been Barney Barnato, Cecil Rhodes and Alfred Beit. His judgment and experience enabled him to render valuable service in the conduct of the company's affairs up to the closing years of his life. Although these men no longer live, the eminently successful organization they called into being testifies to their remarkable foresight and to their thorough business methods. Sir Julius was born in Darmstadt, Germany, and was the son of General Wernher. He entered commercial life in London, emigrating to South Africa when the importance of the gold and diamond discoveries was just beginning to be understood. The noted firm of Wernher, Beit & Co. was founded in Kimberley, and in its activities the part actually assigned to Sir Julius was that of seller, his enterprising yet withal cautious management proving eminently successful. This trait of caution was perhaps somewhat unduly manifested in the arrangements made with the notorious diamond-faker, Lemoine, which are said to have entailed a loss of £64,000, yet had this man's claim been proven true—and there seemed to be good evidence in favor of this—the money would have been well expended. As it was, the De Beers shares rose 5s. when the fraud was finally exposed.

A comparison of the figures for July 1, 1911, and for June 30, 1912, would indicate a slight falling off in the number of white employees in the De Beers Mines, and a considerable decrease in the number of native laborers, although of course only average figures can be conclusive in this connection. Thus we have at the respective dates a decrease in white employees (men and lads) from 2786 to 2575 and in the number of native laborers from 17,654 to 14,712.

With the exception of No. 1 main rock shaft in the Dutoitspan Mine,

the depth of which was increased from 860 ft. to 1000 ft., the depths of the shafts remained as they were in 1911, being as follows:

De Beers, Main rock shaft.....	2466 ft.
No. 1 shaft.....	1670 ft.
Kimberley, Main rock shaft.....	3601 ft.
Atkins shaft.....	1009 ft.
Wesselton, No. 1 Main rock shaft.....	1119 ft.
No. 2 Main rock shaft.....	988 ft.
Bultfontein, No. 1 Main rock shaft.....	708 ft.
No. 2 Main rock shaft.....	1084 ft.
Dutoitspan, No. 1 Main rock shaft.....	1000 ft.
No. 2 Main rock shaft.....	768 ft.

THE OUTPUT OF THE DE BEERS CONSOLIDATED MINES, LTD.¹

Mine.	Loads Hauled.	Loads Washed.	Yield per Ld. Carat.	Value per Carat.	Value per Load.	Cost of Production.	Profit per Load.	Carats of Diamonds Found.
1912 De Beers Kimberley }	323,621	378,614	0.31	53s 11.47d	16s 8.716d	13s 6.78d	3s 1.936d	119,013
Wesselton	2,573,398	2,020,291	0.29	45s 3.12d	13s 1.504d	4s 7.576d	8s 5.928d	581,973½
Bultfontein	2,334,720	2,025,450	0.41	40s 8.242d	16s 8.179d	3s 11.357d	12s 8.822d	834,760½
Dutoitspan	2,718,703	1,845,796	0.23	83s 0.132d	19s 1.11d	3s 10.665d	15s 2.445d	428,213½
	7,950,442	6,270,151						
1911 De Beers Kimberley }	445,169	1,230,491	0.28	51s 6.29d	14s 5.12d	8s 7.67d	5s 9.35d	350,662½
Wesselton	2,422,487	1,423,117	0.27	37s 9.6d	10s 2.47d	4s 9.09d	5s 5.38d	390,192½
Bultfontein	2,457,412	1,866,212	0.38	35s 0.52d	13s 3.79d	3s 11.45d	9s 4.34d	700,398½
Dutoitspan	2,780,070	2,335,240	0.21	73s 6.5d	15s 5.325d	4s 7.09d	10s 10.235d	482,971½
	8,105,138	6,855,060						

It will be noted that (excepting De Beers and Kimberley where the production was comparatively small) there was a considerable increase of profit per load, greatest in the case of Dutoitspan as in the previous year. This was principally due to the increased value of diamonds, although in Wesselton the cost of production was slightly, and in Dutoitspan considerably, less than in 1911.

The increased cost of production in the Kimberley Mine was due to the fact that the bulk of the material, coming from below the 2520-ft. level, had to be double-handled until hoisting apparatus was installed to work from the 3520-ft. level, the necessary equipment for this service also entailing a temporary increase in the production cost.

The following estimate has been made of the amount of blue ground in sight in the various mines above certain given levels.

Mine.	Loads of Blue Ground.
De Beers, above 2040 ft. level.....	2,750,000
Kimberley, above 3520 ft. level.....	2,200,000
Wesselton, above 980 ft. level.....	20,500,000
Bultfontein, above 1000 ft. level.....	13,000,000
Dutoitspan, above 750 ft. level.....	16,000,000
	54,450,000

¹ From Twenty-fourth Annual Report of the De Beers Consolidated Mines, Ltd., for the year ending June 30, 1912.

On the basis of profits secured during the past year, and averaging the results from the different mines, this blue ground would realize eventual profits of about £30,000,000 for the shareholders of the De Beers Company.

A proof that the yield in diamonds of diamantiferous ground does not necessarily diminish with the increase of depth whence the ground is taken is clearly demonstrated by a careful test made in the Kimberley mine. This mine has been carried down deeper than any other in South Africa and yet 2375 loads of blue ground from the 3500-ft. level gave an average yield of 0.42 carat per load, or 42 carats per 100 loads. From a piece of "hard blue" taken at this great depth was extracted a single diamond of good quality, estimated to be worth about £100. The significance of these figures becomes apparent when we consider that since 1905 the average carat yield of all the material taken from various depths in this mine, most of it of course from very considerably lesser depths than the maximum one of 3500 feet, has ranged from 0.28 carat to 0.42 carat (this latter average in 1909 alone) per load.

A decision rendered by the English Privy Council gave judgment in favor of the De Beers Company in the action brought against the Rhodesian Chartered Company. As a result all diamonds discovered in Rhodesia can be claimed by the De Beers Company.¹

Premier.—The Premier mine continued to be the only important producer of diamonds in the Transvaal.² This company does not publish details of its production month by month, but the figures for 1912 have been estimated from the best information obtainable.

PREMIER (TRANSSVAAL) DIAMOND MINING CO. LTD.

Year Ended Oct. 31.	No. of Loads Washed.	Number 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	99,208	137,435	1.29	27 : 8.5	35 : 6.7	4 : 7.2	.....
1904	939,265	749,653	866,030	0.798	23 : 1.2	18 : 5.3	2 : 7.62	.....
1905	1,388,071	845,652	994,687	0.609	23 : 6.3	14 : 4.0	3 : 3.4	.....
1906	2,988,471	899,746	1,277,739	0.301	28 : 4.8	8 : 6.6	3 : 5.7	.....
1907	6,538,669	1,889,986	1,702,631	0.290	18 : 0	5 : 2.5	2 : 4.0	.....
1908	8,058,844	2,078,825	1,536,720	0.258	14 : 9.4	3 : 9.75	1 : 10.2	.....
1909	7,517,793	1,872,136	1,172,378	0.249	12 : 6.3	3 : 1.4	1 : 11.4	1 : 2.0
1910	9,331,882	1,245,832	1,496,641	0.230	13 : 11.4	3 : 2.5	2 : 0.5	1 : 1.9
1911	8,325,272	1,774,206	1,433,970	0.213	16 : 2	3 : 5.3	2 : 2.60	1 : 3.3
1912 ¹	.....	2,006,000	1,810,000	0.205	18 : 0	4 : 1.6	2 : 4.8	1 : 8.8

¹ Estimated and partly for fiscal year.

The report of the Premier Mine for the year ending October 31, 1912, registers a banner year in the number of loads of blue ground hauled and washed, the total being 9,437,673 loads, besides 269,425 loads of tailings,

¹ *Eng. and Min. Journ.*, Feb. 17, 1912.

² H. F. Marriott, *Eng. and Min. Journ.*, Jan. 11, 1913.

making in all 9,707,098 loads. On a single day, September 23, 1912, 46,780 loads were taken out of the mine; and in each of the three months, July, August and September, 1912, the total exceeded 1,000,000 loads. This immense output considerably exceeded that of the De Beers group of mines, but the total number of carats of diamonds produced (1,992,474 carats as against 1,963,960 carats) was about the same, owing to the progressive falling off in the carat-average per load. Nevertheless the average value per carat has risen so steadily during the past few years that the profit per load, in spite of an upward trend in the cost of production, has also increased.

The diamond account for the year is credited with £2,004,943 3s. 5d. and net profits of £749,196 19s. 3d. were carried over to the Expenditure and Revenue Account. After deducting £76,612 for general equipment and 60 per cent. (£403,550) from the remainder as the share belonging to the Union of South Africa, the sum of £269,033 represented the realized profits for the year to be credited to the shareholders' account. Sundry revenue (£83,612) and the previous balance (£87,471) increased this to £440,118, enabling the company to declare two dividends of £50,000 on the preferred shares, and two dividends of £120,000 on the deferred shares, in all £340,000, and carry over a balance of £100,118 to the next year.

During 1912 difficulty was experienced in securing an adequate number of native workers in the diamond mines. It was found that the effort to supply workers from the Province of Cape Colony was not destined to be successful, as these natives were quite unsuitable. However, actual recruiting in other parts of the country, coupled with the inducement provided by the increased wage, supplied the deficiency that for a time existed in the labor market. Of the total number of natives admitted to the compound of the Premier Mine, 5359 came voluntarily, 18,255 being forwarded by agents, making in all 23,614. The daily average employed was 13,363, and the daily average wage 2s. 11.29d. There were 803 white employees.

This company inaugurated on November 1, 1912, a Pension Fund for its employees, four-fifths of the amount of the pension to be contributed by the company and one-fifth by the employees themselves. On this account the company made last year an initial appropriation of £85,000, the equivalent of the company's contribution to the fund had it existed from the date on which each employee entered its service. Should there be no change in the number of employees, the regular annual appropriation for this purpose will be about £10,000.

Another record find is reported from the Premier Mine, which can now place to its credit the two largest diamond crystals ever discovered.

The new diamond was uncovered by a blast near the bottom of the mine. The crystal is of a truncated egg-shape and weighs 1649 carats. Although it is stated to show a few black streaks, these are believed to be only superficial. The Cullinan crystal, also from the Premier, weighed 3025 3/4 carats, nearly twice as much, but the new diamond far exceeds in weight its nearest rival, the Excelsior, of 969 1/2 carats, from the Jagersfontein Mine.

The withdrawal of Mr. A. Wagner from the directorate of the Premier Company marks an epoch in its history, the removal of an influence that has contributed most potently to making this mine a great success. In his address at the last meeting, in yielding to the inevitable and recognizing the rights acquired by Barnato Bros. in the management of the company, he felt justified in using the following words: "I have the satisfaction to know that I have converted the strongest opponent the company ever had into the largest shareholder of to-day, which proves to me that he endorses our policy."

Vaal River.—The New Vaal River Diamond and Exploration Company of Barkly West, although its output for the year only totals 16,660 carats, realized for the diamonds the sum of £124,770, showing the unusually high average of £7 10s per carat. This is said to be due to the working of some exceptionally rich areas at Droogveld.

The Vaal River alluvial diggings in the neighborhood of Boshoff continue to prove more or less profitable to the many diggers at work there, according to their greater or lesser degree of luck in finding good-sized stones. The recent finding of a diamond crystal weighing 30 carats and worth £800 is reported from this field.¹

The opening up of a deposit of true kimberlite, containing diamonds, ilmenite and garnets, is reported at Droogspruit, near Machavie, in the Potchefstroom district, where several shafts have been sunk to a depth of 70 ft.²

German Southwest Africa.—The diamantiferous region, title to which was acquired by the German merchant Lüderitz from the native chiefs, became, in 1885, the property of the Deutsche Kolonialgesellschaft für Südwestafrika. In 1908, when the first diamonds were found here, the greater part of the land owned by this company was legally open to all. To keep down the number of small proprietors whose mining methods were unlikely to result in the fullest, best, and most profitable working of the diamond deposits, the German Secretary of State for the Colonies decreed that the tract bounded on the north by 26° S. Lat., on the south by the Orange River, on the west by the ocean and on the east by a line

¹ *Eng. and Min. Journ.*, Dec., 1912.

² *South African Min. Journ.*, Oct. 26, 1912.

100 km. inland running parallel with the ocean, be reserved by the company for its own exclusive use; a considerable tract within this zone was assumed by the Government under previous agreements. However, a large number of claims had already been allowed, and the territory north of 26° was still left open, and it is stated that as many as four thousand small claims have been allowed.¹

The output of diamonds in German Southwest Africa is increasing.² The supply from this source is now over 100,000 carats per month. This is in spite of conditions such as a scarcity of labor and a rather oppressive customs system; proposed changes in the levying of duties will probably tend to still further stimulate production. The newly organized Pomona Diamond Company, established as the result of an agreement entered into March 13, 1912, between Daniel de Pass & Co., of London, and the Pomona Mining Company, Ltd., of Berlin, will also prove an important factor in augmenting the German output, and the opinion has been expressed that before long 150,000 carats of diamonds per month may be provided from the German fields.³ Present conditions are shown by the report of 19 shipments of diamonds from Lüderitzbucht and Swakopmund in the year 1911-1912, having a value of \$4,960,000. The stones were as usual, small, averaging 6.52 to a carat, equivalent to an average weight of about 5/32 of a carat (0.16 of a new metric carat) for each stone.

The largely increased production of the German African diamond fields is shown by the fact that during the third quarter of 1912 the diamond production was 241,507 carats, and during the last quarter 370,258 carats, in all, 611,765 carats for the six months; in the last six months of 1911 the production was 372,775 carats, only about 2500 carats more than in the last *three* months of 1912.⁴

The production of the principal diamond mining companies in German Southwest Africa for 1910 and 1911 was as follows:⁵

	1910, Carats.	1911, Carats.
Colonial Mining Co.	312,684	377,246
German Diamond Co., Ltd.	135,038	150,391
Diamond Lease Co.	144,494	.....
Kolmanskop Co.	146,653	147,333
United States Mines of Lüderitzbucht.	57,331	54,976

These five companies are estimated to produce about 95 per cent. of all the diamonds from this field. The only notably successful one is the

¹ Jean Demuth, "Der Diamantenmarkt," Karlsruhe i.B., 1913, pp. 61-71.

² For details as to this field see the writer's articles on Precious Stones in the MINERAL INDUSTRY for 1908, pp. 732-734, and for 1911, pp. 629-631.

³ See Report of Consul General Diederich of Antwerp to the Department of Commerce and Labor

⁴ Deutsches Kolonialblatt for April 15, 1913.

⁵ Jean Demuth, "Der Diamantenmarkt," Karlsruhe i.B., 1913, pp. 97, 98.

Colonial Mining Company, which was able to declare in 1910 a dividend of 2500 per cent. on its capital shares amounting to 100,000 marks; in 1911 the dividend was 2400 per cent. The Kolmanskop Company, with a low rate of operating expenses, distributed 55 per cent. in dividends in 1909, 45 per cent. in 1910 and 22 1/2 per cent. in 1911. On the other hand, the United Diamond Mines of Lüderitzbucht did not realize in 1910 profits warranting the declaration of any dividend.¹ Two companies suspended operations in 1911, Weiss, de Meillon & Co. in September of that year and the Swakopmund Diamond Co. in November.

On account of a regular increase in the size of the diamonds found as the search proceeds from north to south the proximate source of the diamonds is thought to be in the southern part of the field. In the northern part, at Spencer Bay, 0.1 carat is the usual size of the diamonds found, at Lüderitz Bay to the southward, 0.2 carat stones are plentiful, while in the Pomana district, still further south, 6 and 7 carat stones have been found and at Arch-rock, south of this again, a 17.5 carat diamond, the largest uncovered in this region, has been met with. This has led to the theory that these diamonds may have been washed down from original deposits in the interior of South Africa along the course of the Orange River, and then cast up on the coast by ocean currents, the prevailing southerly winds carrying the diamantiferous gravel toward the north, whereby the lightest diamonds were naturally borne farther away. An expected confirmation of this view by the finding of good-sized diamonds quite close to the Orange River has not, however, been realized.²

The proportion of diamond material in the gravels of the German Southwest African diamond field is greater than that of the South African mines, as regards the blue ground in which the diamonds are found there. In the richest of the Kimberley mines the ratio is 1:3,000,000, while 1:9,000,000 is considered good and even a proportion 1:36,000,000 admits of profitable working. In the German field, on the other hand, the proportion varies from 1:2,000,000 to 1:6,000,000; at the same time the expense of recovery is notably less, amounting on an average, to but one-quarter of that necessary in the South African mines. Apart from the difficulty experienced in securing proper native labor, the chief trouble with which the Germans have had to contend here has been the lack of water for mining operations, as well as for the use of the laborers.³

¹ Jean Demuth, "Der Diamantenmarkt," Karlsruhe i.B., 1913, p. 98.

² "Die südafrikanischen Diamant-Vorkommen," by Prof. Dr. Keiser, Bericht der Oberhessischen Gesellschaft für Natur und Heilkunde zu Giessen, *Naturwissenschaftliche Abteilung*, Vol. IV (1910-1911), p. 134.

³ "Die südafrikanischen Diamant-Vorkommen," by Prof. Dr. Keiser; Bericht der Oberhessischen Gesellschaft für Natur und Heilkunde zu Giessen, *Naturwissenschaftliche Abteilung*, Vol. IV (1910-11), p. 35.

The following figures give the imports of diamonds to Berlin from the German African Protectorate, since the arrival of the first shipment on April 10, 1909. It will be noted that while there was a rapid increase in the number of carats, the average value per carat decreased because of smaller average size of the diamonds, owing principally to the substitution of machinery for hand work.¹

	Carats.	Value in Marks.	Value per Carat in Marks.
1909-10.....	590,977	16,733,257	29.83
1910-11.....	798,865	21,389,465	26.775
1911-12.....	816,296	20,898,600	25.602

The progressive decrease in average size is stated to be: first year 13/64 carat; second year 11/64; third year 10/64 approximately, the number of stones to a carat being respectively 5, 5 3/4, and 6 1/2 in the several years.

The revenue secured by the German Government from the 33 1/3 per cent. export tax on diamonds from South west Africa in the three fiscal years (ending Feb. 29) 1910, 1911, and 1912 is given as follows:²

	Marks.	In Dollars.
1910.....	5,298,863	\$1,261,129
1911.....	6,773,328	1,612,052
1912.....	6,617,890	1,575,058
	18,690,081	\$4,448,239

The heavy export duty has operated to discourage mining in all but the richer and larger tracts. While it has been perhaps correctly urged that a check upon overproduction is not undesirable, the exclusive exploitation of the richer deposits tends to create large areas of comparatively unproductive gravels, and in order to render it profitable to mine these an eventual reduction of the duty will be imperative; probably the substitution of a tax on net revenue of 50 per cent., or even of 60 per cent., will prove to be the best solution of the problem.³

The rigid control exercised by the German Government has resulted in considerable revenue, but has not operated to improve the position of the shares. For example, the German Colonial Company's shares which were quoted at 190 in May, 1908, and had risen to 1850 by July, 1909, stood, after some fluctuations at 1815 in May, 1910; but from this date they fell steadily, their price being but 575 in August, 1912.⁴

¹ Dr. Kreuskam, "Diamantenmonopol," *Die Umschau*, No. 34, August 17, 1912.

² Jean Demuth, "Der Diamantenmarkt," Karlsruhe i.B., 1913, p. 90.

³ Jean Demuth, "Der Diamantenmarkt," Karlsruhe i.B., 1913, pp. 90-92.

⁴ Jean Demuth, "Der Diamantenmarkt," Karlsruhe i.B., 1913, p. 75.

The German Diamond Regie renewed in 1912 its contract with the Antwerp syndicate that has for some time had a practical monopoly of the product of the German diamond fields. This action was the subject of considerable opposition in Germany, public opinion favoring the selection of some German syndicate instead, especially that organized in Hanau. The matter was discussed before the Budget Commission of the Reichstag, and it was shown that the price per carat in the new contract had been advanced by 3 or 4 marks. There was a disposition to recognize the risks of experimenting in so important a matter as the sale of a million carats of diamonds annually, it not only being essential that the purchasing syndicate should be thoroughly responsible financially, but also that it should have the established trade connections insuring an eventual and profitable distribution of the diamonds it had acquired. Without an assurance of this there would be a danger of disturbing values, and little prospect that the arrangement with the new syndicate would be of a permanent character.

The approaching termination of the agreement now existing between the German Imperial Council Board and the Antwerp syndicate for the sale of diamonds from German Southwest Africa, is expected to bring out lively competition on the part of a number of groups eager to secure a new contract. That entered into with the Antwerp syndicate on March 30, 1912, was for 1,000,000 carats of diamonds, and official notice of its termination can only be given after 700,000 carats' weight have been furnished to this syndicate. The impression prevails that the Germans would favor a syndicate undertaking to open their sales bureau in Germany. However this innovation, a radical departure as to locality may not be found practicable. So far, the trade in uncut diamonds in Germany is very small.

As a preventive measure to forestall any possible attempt on the part of those connected with the De Beers Company, to gain control of the German Colonial Company by buying up its shares in the open market, Secretary Dernburg caused this company to issue additional capital stock to the amount of 2,000,000 marks, and to trustee these new shares in the hands of German holders.¹

Brazil.—If the diamond mines of Brazil are no longer so productive as in the past, the memory of their former glories still casts a powerful spell over the minds of certain investors, if we can trust the reports in the press regarding the success—to the original projectors—of the many mining schemes that have been launched during the past few years. Indeed, it has been stated that from \$6,000,000 to \$8,000,000 has been lost in this way by the unwary. On the other hand, a holding company entitled

¹ Jean Demuth, "Der Diamantenmarkt," Karlsruhe i.B., 1913, p. 73.

"The Brazilian Companies," capitalized at \$250,000, seems to have been managed in an entirely legitimate way. It is stated to own, directly or indirectly, an immense tract of mineral-bearing lands in Brazil, the control of this property having been acquired many years ago by Jay Gould during the reign of Dom Pedro. Gould is said to have contemplated the organization of a company to exploit these holdings, supposed to be rich, not only in diamonds, but also in gold and semiprecious stones. In one respect the managers of the "Brazilian Companies" show an altogether commendable prudence, as they do not undertake to mine the concessions on their own account, but simply lease out the rights to certain specified tracts for a royalty on the produce of the mines to be opened up.

There was a decrease of 75 per cent. in the exports of "carbonado" from Bahia, Brazil to the United States between the years 1910 and 1911. In the former year 1,108 carats of this material was exported with a value of \$46,413, but in 1911 the exports fell away to 251 carats valued at \$11,725.¹

*British Guiana.*²—The diamond yield was notably greater in the year ending June 30, 1912, than in the previous year, and slightly exceeded that for the year 1909–10.³

	Stones.	Carats.
Year ending June 30, 1910.....	77,695	6,319
Year ending June 30, 1911.....	36,450	4,683
Year ending June 30, 1912.....	81,034	6,977
Year ending June 30, 1913.....	26,259	2,257

As in the first of these 3 years, the larger yield is represented by stones of smaller average size than in 1910–11. The source of these diamonds is given as follows for 1911–12.

	Stones.	Carats.
Masaruni.....	68,785	5,682
Cuyuni.....	12,230	1,290
Wenamun.....	19	5
	81,034	6,977

The total diamond production of British Guiana from April 1, 1900, to June 30, 1912, is stated to be 1,006,557 stones, weighing in all 74,203 carats. The average weight for 1912 is thus very low, less than 3/32 carat

¹ Consul S. P. Warner and Vice Consul O. E. Mueller in *Daily Consular and Trade Rep.*, December 18, 1912.

² See the writer's report on precious stones in *MINERAL INDUSTRY* for 1910, p. 574, and for 1911 p. 633.

³ Gold, Diamond and Forest Industries of British Guiana, 1911–12.

(more exactly, .088 metric carat); in 1911 it was somewhat higher, 1/8 carat (0.128 metric carat).

The mining here is not systematically prosecuted; whether possible results would warrant the establishment of adequate machinery is uncertain, more especially in view of the difficulties of transportation to the out-of-the-way region where the diamonds are found. In 1910-11 diamonds to the value of \$29,574 were exported (\$300 worth to the United States); in the year 1911-12 the value of diamonds exported rose to \$56,505, of which \$1586 represents the value of those sent to the United States.¹

Dutch Guiana.—A few diamonds are reported to have been found at intervals in Dutch Guiana, the most noteworthy of these finds occurring about 15 or 20 years ago at a mining concession on the Surinam River. It is stated by Mr. David E. Headley of Albina, Dutch Guiana, that 5 years ago, as manager of the Compagnie Française du Maroni, of St. Jean, he examined some conglomerates on the Maroni River which presented indications of being diamantiferous, and found one small octahedral diamond. Not long since a beautiful diamond was discovered in tailing piles at the scene of the recent cinnabar discovery on the Maroni River.²

Canada.—Some expeditions have been prospecting for diamonds recently in northern Quebec, especially in the blue clays and sand gravels along the banks of Matagami Lake. However, the expectation that they might harbor diamonds has proved fallacious, as might have been foreseen, for they are really blue clays and not decomposed peridotite as were the overlying diamond deposits of Kimberley. The clays of northern Quebec are alluvial deposits.

RUBY AND SAPPHIRE

Burma.—Ruby mining in Burma is continued on about the same scale as in previous years. However, the report of the Burma Ruby Mines, Ltd., for February 29, 1912, states that, as a result of a satisfactory agreement made by the company with the Government in regard to the payment of indebtedness for unpaid taxes, the field of operations is to be enlarged at an eventual expense of about £20,000. This new mining ground is located in Kathé, a valley some 6 miles from Mogok. Here the existence of a considerable area of ruby-bearing ground has been determined, and fine sapphires have already been found, but the necessary opening out and draining of the valley and the installation of machinery

¹ Consul Hanna of Georgetown, in *Daily Consular and Trade Rep.*, Nov. 8, 1912.

² David E. Headley, "Diamonds in Dutch Guiana," in the *Eng. and Min. Journ.*, May 3, 1913.

will delay active operations for some time yet, although the work is well under progress.

In spite of continued depression in the London ruby market, the report of the Burma Company shows that during the year ending February 29, 1912, the sales of rubies amounted to £58,787 7s. 2d., as against £51,189 0s. 6d. in the previous year, an increase of £7598 6s. 8d. At the same time the value of the stock of rubies on hand increased from £56,809 to £62374. The profits for the year are figured at £7635 16s. 4d. of which the Government of India receives £2378 18s. 2d., leaving a net profit of £5256 18s. 2d., and making the total balance £22,021 9s. 10d. In view of these favorable results, the directors recommended the payment of a dividend of 6d. per share (4 1/6 per cent.) on the ordinary shares of the company, which would amount to £7475. The agreement with the Government to which we have alluded provides that the company shall not be required to make any payment on the amount due (£19,589) until its annual profits, after deducting the Government's share, shall exceed £18,000, equivalent to 10 per cent. on the paid-up capital. In such case, half of the excess must be paid to the Government until the indebtedness be liquidated. During the year 1,479,845 trucks of ruby earth were washed at a cost of 7.5d. per load (222,968 carats of rubies being secured) as against 1,466,136 loads at the same rate in the preceding year. The profit per load appears to have been equivalent to about 6.4 cents.¹

It is gratifying to note that the operations of the Burma Ruby Mines for the year ending February 28, 1913, show essentially a continuance of the conditions noted above. The sales of rubies amounted to £65,647, 13s, 7d, an increase of £6,860, 6s, 5d over the previous year; the net profits were £5,340, 17s, 6d. This, added to a balance of £14,546, 9s, 10d, (after payment of last dividend), makes £19,887, 7s, 4d, from which it is proposed to pay another annual dividend of 6d per share, slightly reducing the balance as compared with that of the preceding year. The amount of ruby earth washed was 1,383,146 trucks, 96,699 trucks less than in 1911-1912; the average expense of washing increased .27d, amounting to 7.77d per truck.

The tract in the district of Mogok, Upper Burma, where ruby-mining is carried on, covers an area of some 45 square miles, but Mr. W. S. Lockhart, for many years the resident engineer of the Burma Ruby Mining Company, believes that the ruby-bearing region is much greater in extent, his estimate being about 400 square miles. There are three classes of mines. First, the pit or Twin-lone, which concerns the valley deposits, the bed of "byon," as the ruby-bearing soil is called by the

¹ *Daily Cons. and Tr. Rep.* November 19, 1912.

natives, appearing at a depth of from 15 to 20 ft.; here pits, or where the soil is a little stiffer, shafts are sunk and the "byon" extracted, after which it is washed in a series of troughs. The second classification bears the name "Hmyau-Dwin," or hillside mining, and is resorted to when the wet season interrupts operations in the valley bottoms, cuttings being made in the hillsides at such points as are thought to give promise of an underlying bed of "byon," which is here of a yellowish color and quite stiff, so that tunnels may be opened up through it; this hillside "byon" sometimes contains sapphires and tourmalines as well as rubies. To the third class is given the name "Loo-Dwin," or cave mines. Here the mining is done in widely ramified caves, whose entrance is clearly marked by outcrops of the limestone base of the mountains. The miner has to incur considerable risk in traversing the subterranean passages, but enjoys a corresponding reward in finding larger and finer rubies in the sandy "byon" of the caverns than are met with in other deposits. The chief improvements upon the old methods that have been introduced by the English company have been the use of power pumps to free the pits from water, and the treatment of the "byon" by rotating pans and a pulsator.

Ceylon.—A duty which is practically prohibitive has been imposed by the Ceylon Legislative Council upon all imitation and artificial precious stones, excepting imitation pearls and imitations in glass, by a resolution of September 9, 1912. This duty, which is a specific one, amounts to 100 rupees (\$33) *per carat*, and is evidently designed to operate as an effectual bar to the importation of "reconstituted" or "synthetic" sapphires or rubies into this island. Heretofore the duty was only 5 1/2 per cent. *ad valorem*. Perhaps a danger of reexportation as genuine product of the Ceylon mines may be assumed as the guiding thought in this recent bit of legislation.

United States.—Sapphire has been greatly in demand during the past year, indeed, there has been a steady demand for it for some years. The sapphire working, in the Judith basin, Fergus Co., Montana, operated by the New Mine Sapphire Syndicate, furnished in 1912 about 90,000 carats of gem sapphire, the greater part of the output (478,405 3/4 carats) being only available for watch jewellery. The gem material ranged from 1/32 of a carat to three of four carats, no large pieces coming to light during the year.¹

EMERALD

In the Turner mines near Shelby, North Carolina, have been found a number of emeralds during the past year,² none of fine color or of any

¹ See for further particulars of this mining field writer's report for 1911, *MINERAL INDUSTRY*, XX, p. 641.

² For the geological conditions see the writer's report in *MINERAL INDUSTRY*, for 1911, p. 638.

great value. On this property, which is now owned and operated by Lovat Fraser and E. P. Earle, emerald material to the weight of 2700 carats had been found up to the middle of the year; out of this about 200 carats' weight of cut gems have already been made, and the balance of the material is expected to furnish gems weighing some 700 carats more. As is always the case with this precious stone, there is a very wide range in prices, depending upon the relative perfection of the gem, a fairly perfect emerald being always quite rare. Here the average value per carat has been approximately \$15.

The name heliodor ("gift of the sun," from the Greek *Helios* and *dōron*) was bestowed on the stone by Prof. Lucas von Granach, a descendant of the famous sixteenth-century German artist of that name (1472-1553). A most graceful and patriotic gift recently made to the Empress by the German Emperor is a cruciform ornament composed of heliodors and brilliants in a platinum setting. This act of the Kaiser will be sure to make the new stone a favorite in Germany, whence the fashion will extend to other lands.

That German Southwest Africa hides other treasures of precious stones besides diamonds, is shown by the discovery of some fine beryls near the station of Rössing on the railway from Swakopmond to Windhuk.¹ They occur in pegmatite veins closely connected with parallel veins of rose-quartz and common quartz. The pegmatite veins are irregularly developed and often of small extent. The principal one is about 18 meters wide, the gem beryls only appearing in some 6 meters of this width at least as far as the vein has been examined, to a depth of somewhat over a meter; the other part offers nothing but common beryl. Most of the crystals are light green, the typical light aquamarine shade; some, however, are of a darker green and others again are bluish-green or yellowish-green. Recently a number of fine crystals of a light yellow hue have been found here, offering excellent gem material. Some of these have already come to Idar, where they have been cut and polished and have been placed on the market.²

While recognizing that there is no necessary connection between the coloration of the Madagascar beryls and their specific gravity, since the coloring pigment represents an almost imponderable quantity, M. A. Lacroix nevertheless remarks that the bluish and greenish shades are predominant among the beryls of lower specific gravity, and the pink shades among those of greater density.³

¹ Erich Kaiser, "Ein neues Beryll (Aquamarin)—Vorkommen in Deutsch-Sudwestafrika," *Centbl. für Min.*, etc., 1912, No 13, pp. 385-390.

² Gürich in *Neues Jahrb. für Min.*, etc., 1890, Vol. I, p. 114, and H. Thiene, "Ueber Apatit und Beryll von Tonkerhock," *Centbl. für Min.*, etc., 1909, pp. 97-101.

³ A. Lacroix, "Sur la continuité de la variation des propriétés physiques des beryls de Madagascar," *Bull. de la Soc. Franc. de Min.*, Vol. XXXV, June, 1912, pp. 200-208.

TOPAZ AND TOURMALINE

An important deposit of gem topaz exists in Mason Co., Texas near the settlement of Streeter which is about 8 miles due west of the town of Mason, the county seat. The discovery here was made accidentally in 1904 by R. L. Parker of Streeter, who picked up one day in the bed of a stream what he at first supposed to be a quartz crystal. Its unusual weight, however, induced him to submit it for determination to a mineralogist, who pronounced it to be a crystal of topaz. A careful search at last revealed the source whence this specimen had been washed down, a pegmatite dike traversing a stratum of coarse red granite. Here the crystals appeared in cavities, associated with large crystals of flesh-colored microcline feldspar, biotite, small needles of black tourmaline, smoky quartz and albite (cleavelandite). Many of the topaz crystals are colorless, but some are blue and a few have the beautiful sky-blue shade of those from the Adunchilon Mountains, Siberia. The largest of these blue crystals measures nearly 3 in. in diameter and is of faint greenish blue. The fact that topaz is but little in demand for gem purposes has caused this deposit to be practically neglected for the past two years.¹

The classification of tourmalines according to the presence or absence of magnesium oxide in their composition shows that those lacking magnesium are found principally in granitic pegmatites, with quartz, albite, orthoclase, microcline, muscovite, garnet, as well as often with lepidolite, beryl and spodumene. In hue these tourmalines are bluish black, blue, green, red or colorless, including the blue indicolite and the so-called lithium tourmalines. Those in which magnesium is present, on the other hand, are but rarely found in pegmatite veins, but occur commonly in metamorphosed rocks such as schists, metamorphosed limestones, etc., with quartz, biotite, phlogopite, augite, plagioclase, tremolite, etc., as accompanying minerals. They are of a black or brown color, rarely of lighter shade.²

OTHER MINERALS

The jadeite of Burma finds a ready market in China, whither nearly the entire output is sent. While this imported jade is chiefly handled in Canton, where the shops of the jade merchants occupy an entire street, the bulk of it reaches China by way of Hongkong whence it is brought to Canton. The material comes in large, vari-colored pieces, which are later divided into smaller pieces of uniform color. The value of the

¹ H. Conrad Meyer, "Topaz and Stream Tin in Mason County, Tex.; in the *Eng. and Min. Journ.*, Vol. XCV, No. 10, March 8, 1913, pp. 511, 512.

² Waldemar T. Schaller, "Beitrag zur Kenntnis der TurmalinGruppe," Inaugural Dissertation, Leipzig, 1912.

jade imports, almost exclusively from Burma, has fallen off considerably since 1907, when it amounted to \$348,987 in gold, as is shown by the following figures giving the value in gold of jade imports in recent years:

1909.....	\$131,433
1910.....	186,266
1911.....	106,511

The belief is expressed, however, that a considerable quantity of Burmese jadeite is brought into China by passengers and not entered for duty; indeed, it has been claimed that the total value of the jade which comes into China, regularly and irregularly, may be as much as \$500,000, this estimate receiving a certain degree of confirmation from the fact that the value of the Burmese output, practically absorbed by China, has been estimated at a like figure. Little or none of this jade is re-exported from China.

Chinese jewellers are said to apprehend that the modification of the old ceremonial dress due to the radical changes initiated by the new régime will exert a depressing influence on the Chinese jade market. The Burmese jadeite is still secured by means of the old, traditional methods which have so long prevailed, and it is thought that a change to modern methods might not result favorably, as a largely increased output would only serve to lower prices.¹

Beads of chrysoprase strung for a necklace have been found on a mummy unearthed near Nasca, Peru. They are of a pale, greenish hue and are of especial interest as being, to the writer's knowledge, the first objects of chrysoprase ever found in a South American district. A string of over fifty beads was seen by Prof. Hiram A. Bingham, of Yale University, who submitted several to the writer for identification. They were believed to be emeralds.

The wood-opals from northwestern Nevada come from a part of Virgin Valley about 20 miles south of the Oregon boundary, and 40 miles east of the California State line. They occur in a stratum of dry clay having a thickness varying from a few inches to several feet. These opals are metamorphosed from trunks and branches of the Mountain Mahogany, the time of their formation being assigned to the Miocene period. The deposits, which are at an elevation of 5500 ft. were first discovered in 1909 by Mr. George Mathewson, and they have been more or less actively exploited since October, 1911, when Mr. M. Ivan Dow acquired an interest in them. Over \$20,000 worth of opal material is said to have been extracted.²

The supply of opals, from the State of Queretaro, Mexico has been

¹ Consul General George E. Anderson of Hongkong, in *Daily Consular and Trade Rep.*, Sept. 23, 1912.

² For a full description of these opal deposits and of others in Idaho, Nevada and Washington, see the writer's report on precious stones in *MINERAL INDUSTRY*, for 1911, pp. 639-641.

somewhat irregular, owing to the mining operations, which have varied according to the demand for opals. The mines are owned by local syndicates and the stones are cut and polished in the towns of Queretaro and San Juan del Rio.

While Mexico City secures the finer grade of opals, a large quantity of the poorer material is exported to Germany. A disadvantage of many Queretaro opals is their great transparency as compared with those from either Australia or Hungary, so that in order to bring out their fire, which is in nowise lacking, resort is often had to artificial backing such as black velvet; sometimes, indeed, the natural backing of the matrix is preserved. Such stones, often rather irregular in shape, are called "matrix-opals." The Mexican opals are credited with greater durability than those from Australia, being less liable to injury from the slight, unavoidable accidents that sometimes happen in setting or wearing the gems; but it is asserted that they do not retain their brilliancy so well.

The opals are found near the top of a range of hills in a reddish-gray spherulitic rhyolite, forming the matrix. They were first noted, casually, about eight years ago, some exposed specimens showing their fire as the sunlight fell upon them. The presence, on the surface, of a white silicious sinter in cavities of the rhyolite, has been found to be an excellent indication of the existence of opal material; these appearances go by the local name of "pintas." How deep down the opaliferous rock extends has not yet been determined, but in some of the older mines opals have been met with at a depth of over one hundred feet. A few opals of rather poor quality have occasionally been found in Tlaxiaco, in Oaxaca, where the surface conditions seem to be quite similar to those obtaining in Queretaro.¹

The sources of supply in New South Wales of the much-fancied Australian black opal appear to be exhausted, at least temporarily. Most of the miners have drifted away, and the chances of discovering new deposits are correspondingly lessened. It is reported in 1912 that the quantity of opal material of every kind from the Australian fields is 75 per cent. lower than at any time within the past twenty years. During 1911 opals to the value of about \$300,000 were secured, \$106,000 worth from the White Cliff district, the Wallangulla field in the Walgett division furnishing the remainder. The total value of the opals secured in Australia from 1890 to 1911 is estimated to be \$6,529,377.²

A large mass of black opal from the Australian deposits is owned by a gem-dealer in Sydney, New South Wales. It weighs 4100 carats, or

¹ T. M. M. MacFarlane, "A Mexican Opal Mine," *Informes y Memorias del Instituto Mexicano de Minas y Metalurgia*, pp. 127-132; read at the Session of Aug. 7, 1911.

² "Opal Production in Australia." Report of G. H. Prosser, Consular Agent at Adelaide; *Daily Cos. and Tr. Rep.*, Aug. 21, 1912.

about 2 lb. 3 oz. troy, and was found in 1912 in the Queensland mines by two exceptionally lucky miners and is valued at £10,000, or \$50,000. It is confidently asserted to be the largest piece of black opal ever discovered.

Some pretty opals, semitransparent specimens, are found in the Hôko-tô group, Formosa, associated with chalcedony. They are sometimes blue as at Shôchikaku and Hattaku-tô, and sometimes gray as at Tsûryô, where resinous opal also has been observed.¹

A valuable deposit of amethyst, the specimens extracted being of unusually fine quality, has been discovered in the Russian Transcaspian territories, 8 miles from Kereposti-Kushka.²

In 1906 a large deposit of moonstones of unusually fine quality and size, transparent and generally white, sometimes with a beautiful blue sheen if cut in the proper direction, was found in Ceylon at the village called Weragoda in the low-lying lands belonging to the Crown. The region is a mile and a half due east of the seacoast and fifty miles distant from the capital city, Colombo. The discovery of a new and rich deposit of this beautiful gem stone in Ceylon was more especially fortunate as the older deposits of Kandy and Wagawella had been nearly exhausted. Some of these are cut in Idar and Oberstein, in Oldenberg, Germany, but most of them are native cut with the quaint irregularity that has much charm. The great quantity of the material found here has led to a great revival and demand of this beautiful and inexpensive gem stone.

The mineral kornerupine was discovered in a gem form in Madagascar deposits in the southern part, about 20 miles from Itrongahy in the direction of Betroka, and was described by Prof. A. Lacroix, of the Musée d'Histoire Naturelle, Paris. This mineral, with a hardness of 6.5, a specific gravity of 3.27, was formerly known from Fiskernas, Greenland, where it was associated with green amphibole, sapphirin, and with brown magnesian mica and gedrite, and iolite. It was named in honor of the Danish geologist, Kornerup. It was not in gem form in this locality, but in Madagascar it is transparent, and is wonderfully dichroic, with a green hue parallel to the vertical and a reddish brown perpendicular to this. It is here of a sea-green color, and has cut into beautiful gems weighing over two carats each. Kornerupine is a silicate of magnesia, alumina, and monoxide or sesquioxide of iron. One of the many interesting things is that it is responsive to radium β and glows with a golden yellow, due evidently to the coloring matter described by I. Lorensen.³

Specimens of thulite, of a rich rose-pink hue, resembling that of the

¹ T. Wada, "Beiträge zur Mineralogie von Japan," No. 4, Tokyo, June, 1912, p. 167.

² *Eng. and Min. Journ.*, Jan. 25, 1913.

³ *Medd Cröna*, July 19, 1884.

best rhodonite, have been reported as occurring in Okawagan Co., Washington State, at a point three-quarters of a mile distant from the line of the Great Northern Railroad. Here the material appears in large masses, in veins of from 2 to 5 inches in thickness. The mineral takes a fine polish.

Amber.—Nearly all the larger pieces of raw amber, mined or recovered by The Royal Amber Works near Königsberg in Prussia, are retained in Germany, but very few being disposed of to foreign importers. The so-called "amberoid," however, produced by the amalgamation of small fragments of raw amber under strong pressure after subjection to a temperature of 150° C., is exported in large quantities to the United States, especially forms in the shape of cigar-holders, mouthpieces for pipes, etc. As this material is really amber, though not in its natural state, we need not be surprised that only a trained eye can discriminate between amber and "amberoid." Several firms in the United States have special contracts with the Royal Amber Works, giving them the exclusive right to deal in its products. Pressed amber of this type is quoted at \$26 per kilogram, or a little less than \$12 per pound.¹

PEARLS

Pearl fishing has not been carried on in Ceylon since 1907. The records of these fisheries go back as far as 306 B.C., at which date the Rajavali chronicle makes mention of them. A temporary exhaustion of the supply of pearl-oysters, followed by a renewal of favorable conditions, has not been of rare occurrence in the course of centuries. Indeed, the best returns have been recorded in the years succeeding such a period of unproductivity and this may perhaps again be the case.

The aid of science appears to have been rather ineffectual in stimulating, enlarging or directing exploitation, notably the use of the radiograph to determine which of the bivalves removed from the banks contained embryo pearls, the mussels being then returned to the water. All the mussels so treated died after being replaced in the water. Prof. Herdman discovered, in 1908, a large number of oysters, estimated to number over four millions, on the bank known as the Kondatchi Paar, which had been given up as exhausted. After only 650,000 oysters had been taken out by dredges and by native divers, the remainder were lost, or at least were not recoverable either in 1908 or in the succeeding year.

The control and management of these fisheries are now, since the passing away of the Ceylon Co. of Pearl Fishers, in the hands of the Govern-

¹ Consul General A. M. Thacar of Berlin, in *Daily Consular and Trade Rep.*; for further details see the present writer's articles on Precious Stones in *The Mining Industry* for 1910, p. 588 and for 1911, p. 643.

ment, the master attendant of the port of Colombo acting as inspector of the pearl-banks, and the Government agent of the Northern Province as superintendent.¹

A careful inspection of the rocky areas north of Colombo has been recommended by Capt. Kerkham, formerly superintendent of the Ceylon Company of Pearl Fishers, as he inclines to the belief that miniature oysters are often swept off the banks by the strong currents and carried to these rocky areas where they develop and then die of old age without their existence having been suspected by the pearl fishers.

The "paars" (oyster-beds or banks) suited for the development of the pearl-oyster are constituted by a coarse granite sand amalgamated with old oyster-shells by a cement of coral lime. This bottom insures a certain immobility to the coating of sand resting on it, while away from the "paars" the sand is heaved up and down so that any oysters resting on its surface are soon covered up and disappear.

Until about six years ago a pearl syndicate of rich Arabian and Hindu merchants in Bombay kept large stocks of pearls on hand and exercised a certain control over the world's pearl-market. This syndicate also acquired most of the output from the Persian Gulf fisheries. Formerly the contracts for purchases from these fisheries provided for payment of the principal only at the expiration of two or even three years, a large yearly interest payment being made, sometimes as much as 20 per cent. annually, a rate not relatively as high as it may seem to us, for 12 per cent. per annum is quite common in India. The object of this delay in payment was to give time for the pearls to dry out thoroughly, as when first taken from the mussel they often have a slightly greenish hue unfitting them for immediate use as ornaments. Recently, however, a Hindu chemist has improved and adapted the European methods of cleaning pearls so that now the same good results are obtained in a fortnight as were heretofore only possible in two or three years' time.²

Pearl farms are being developed in Lower California and more recently in Japan. Since the notable falling off in the supply of pearls from the Indian pearl-fisheries during the past few years the experiment of artificial pearl-culture has been worked out on a large scale in Japan, where the company known as the Mitsui Bussan Kaisha owns culture-pearl beds at Omura, on Omura Bay, containing, it is claimed, 200,000,000 pearl-oysters, 10 per cent. of which are expected to develop pearls of commercial value. The method of impregnation that has been elaborated by Dr. Nishikawa, of the Tokio Imperial University, has been employed

¹ "The Pearl Fisheries of Ceylon," by Consul Charles K. Moser, of Colombo, in *Daily Consular and Trade Rep.*, May 18, 1913.

² Léonard Rosenthal, "Le Diamant."

to a considerable extent in these Omura Bay beds. At least seven years' time, after impregnation of the pearl-oyster, is considered requisite for the growth of pearls.¹ In contradistinction the so-called culture pearls are not true pearls; they are merely hemispherical pellets of mother-of-pearl that were inserted in the pearl-oyster. And when they are coated with a thin layer of nearby nacre they are cut out and cannot be used in necklaces, because the sides show and they are only half-spheres. The Mexican pearl farm was much injured by a storm in 1912.² All pearl beds are subject to many dangers, as well as beds of edible oysters that are so firmly attached to heavy objects. Specially planted Japanese pearl beds and Cingalese beds of a similar nature have been so often subjected to such dangers that they have been known to pass out of sight in a night, having been swept away in great storms, or covered by great layers of sand. One cannot count with certainty on the safety of even the beds of edible oysters that are so firmly attached to heavy objects, as before mentioned.

The Mexican Government is reported to have cancelled the British "Mangara" concession; this opens up a field for independent fisheries on the coast of Lower California.

The Caddo Lake pearl fishery in Texas has lately been the object of some attention on the part of state legislators, with a view to secure the enactment of a law containing provisions for the control of this fishery and for the imposition of a state tax on the shells. The belief is expressed that a substantial revenue would result from the operation of such a law.

The abalone blister pearls produced by artificial means form a class by themselves, the method followed in stimulating their growth having been suggested by one of the chief causes of pearly excrescences on the inner surface of the abalone shell. It frequently happens that the shell of this mussel is invaded by a boring mollusk *Pholadidea parva*, which works its way into the abalone shell by cutting with the serrated edges of its own shell, this mechanical means being perhaps supplemented by the decomposing action of a secretion of sulphuric acid. When the *Pholadidea* has penetrated the shell until the pearly layer has been reached, the abalone seeks to arrest its further progress by secreting an unusual quantity of nacreous matter at this point, producing as the intruder forces its way in, a mound-like excrescence of pearly substance attached to the shell—the so-called blister-pearl. This occurs principally in the red abalones. This natural causation of blister-pearls suggested their artificial production by boring a hole in the shell and inserting in this a

¹ Vice-Consul Harold C. Huggins, of Nagasaki, in *Daily Consular and Trade Rep.*, July 5, 1913, p. 88.

² See "The Book of the Pearl," by George F. Kuns and Charles H. Stevenson, New York, 1907, pp. 41-72; 148; 288-293. Pearl Farm, Espiritu Santo, Mexico, p. 219, *loc. cit.*

form shaped like a long-shanked collar-button, the expanded bar being brought into contact with the mantle of the mollusk, while the shank projecting out of the orifice is made fast to the shell and tagged with a serial number or the date, so that when the mussel is taken out of the water again the exact length of time elapsed since this treatment may be immediately known.

Pearl-fishing near the port of Manta, Ecuador, is at present profitably carried on, pearls to the value of about \$20,000 having been recently shipped thence to Europe. The Ecuadorian Government has bestowed upon one of its citizens, Senor Marco Aurelio Calderon, the exclusive right to pearl-fishing along the coast of Ecuador. From Peru also there seems good prospect of receiving pearls, as the latest reports state that some have been received near the port of Payta in that country.¹

¹ Report of Vice-Consul Charles F. Baker, of Guayaquil, Ecuador.