

THE MINERAL INDUSTRY

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FOUNDED BY THE LATE
RICHARD P. ROTHWELL

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EDWARD K. JUDD

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GEMS AND PRECIOUS STONES.

AMBER.

The chief source of amber is along the Baltic coast of Germany, where the mines operated by the Government yield about 500 metric tons annually. Amber is also obtained from the bed of the sea by divers and by a steam dredging plant at Schwarzort. The amber is classed as osseous or bony amber; mottled osseous; oily or misty; and clear amber. The rare green and reddish-brown tints are believed to be due to some peculiar coloration of the original sap in the conifers from the resin of which amber is derived. The rare dark blue tint is thought to be caused by deposits of pyrite disseminated in minute cavities and cracks.

The raw amber for trade purposes is grouped under three heads, viz.: pieces suitable for the manufacture of pipes (*platten and fliesen*); those that can be used for beads and other ornaments, and those (*firnis*) which, from their small size, can be used only to make varnish. Within these chief groups there are about 150 trade subdivisions distinguished by color and size. The finest beads and ornaments are sold in England and Turkey, while there is a large market for amber in France and Russia, and in Roman Catholic and Mohammedan countries.

The famous Burmese amber diggings are situated in the Hukong valley, in the Nangotaimaw hills, near Lalung. The amber occurs in clays believed to be of Miocene age. The amber is fashioned into beads and other trinkets, chiefly in Mandalay. The amber of Burma differs both chemically and physically from all other known varieties. The Prussian amber contains from $2\frac{1}{2}$ to 6% of succinic acid, but the Burmese variety contains none; on dry distillation, formic acid and pyrogallol are obtained. Its ultimate chemical composition is as follows: Carbon, 80.05; hydrogen, 11.50; oxygen, 8.43; sulphur, 0.02%. Its specific gravity varies between 1.030 and 1.095. It is distinguished from many other amber-like resins by its superior hardness, greater toughness, and a peculiar fluorescence which it possesses. The Burmese amber-mining industry at present is in a depressed condition, owing to the competition of the cheap German amber.

An interesting occurrence of amber has been discovered in the Province of Santiago, Santo Domingo. The amber is disseminated through a friable, much broken sandstone and conglomerate containing large amounts of lignite. The amber is usually in ovate masses, from $\frac{1}{4}$ to 2 in. diameter, and is covered with a brown surface crust. It possesses somewhat of the

opalescent character of the Rumanian and Sicilian amber, and varies in color from yellow to a rich brown. The occurrence is, however, of doubtful economic importance.

DIAMONDS.

Production in all the South African diamond fields made rapid progress in 1904, the progression in monthly yield being extremely marked.

Orange River Colony.—The report of the De Beers Consolidated Mines, Ltd., of Kimberley, for the year ending June 30, 1904, states that its newest mine, the Dutoitspan, is undergoing active development. A recently erected dynamite factory has permitted economy in the obtaining of explosives, and a railroad is being constructed to bring coal from the coal mines at Vierfontein, in which the De Beers corporation owns a large share. The sale of diamonds recovered at the company's four mines—De Beers & Kimberley, Premier, Bultfontein and Dutoitspan—brought £4,918,568. Mining cost £987,335, and milling £599,466; the balance available for dividends, after allowing liberally for all fixed charges, was £2,066,197. The company's capital stock is £4,500,000, and its bonded liabilities £4,241,245.

The average yield and value per load (16 cubic feet) of the 'blue ground' and the stocks remaining unmilled at the close of the year were as follows:

DE BEERS CONSOLIDATED DIAMOND MINES.

| | Yield per Load. | Value | Value | Stocks on | |
|-----------------------------|-----------------|-------------|------------|-----------|--------|
| | Carats. | Per Carat. | Per Load. | Floors. | Loads. |
| De Beers and Kimberley..... | 0.54 | 48s. 11.8d. | 26s. 7.1d. | 2,212,490 | |
| Premier | 0.28 | 34s. 10.5d. | 9s. 10.6d. | 1,266,260 | |
| Bultfontein | 0.29 | 29s. 7.8d. | 8s. 6.5d. | 207,508 | |
| Dutoitspan | ... | | | 15,555 | |

Transvaal.—The output for the fiscal year ending June 30, 1904, was 497,917 carats, valued at £685,720. The progressive condition of the industry may be seen by the following statement of the output by months:

| 1903. | Carats. | 1904. | Carats. |
|-----------------|---------|----------------|---------|
| July | 16,670 | January | 24,516 |
| August | 16,751 | February | 43,579 |
| September | 20,332 | March | 51,907 |
| October | 28,805 | April | 77,737 |
| November | 29,701 | May | 78,735 |
| December | 30,120 | June | 68,976 |

The following limited liability companies contributed: Premier (Transvaal) Diamond Mining Co.; Shuller Diamond Mines; Kaalfontein Diamond Mines; Eastern Diamonds; Montrose Diamond Mining Co. Six other companies, engaged in washing diamonds from alluvial deposits, added something to the total. The Premier not only leads in point of output, but its progress is more marked than at the other mines.

The report of the Premier (Transvaal) Diamond Mining Co., Ltd., of Johannesburg, for the second year of its existence, ending October 31, 1904, states that development is still maintained, and that, while no dividends have yet been distributed, all the equipment has been paid for out of earn-

ings, and that the balance of the year's profit is ample for, and will be directed toward, the completion of the elaborate system of operation now being instituted.

A washing plant, thoroughly equipped in every detail, is being erected, which will afford a total capacity of 20,000 loads per 24 hours. The plant is so situated as to provide ample room for the disposal of tailing, and to permit the use of steam shovels in the mine. This plan is expected to economize labor, and to minimize loss from theft. Additional area has been secured, and a system of water reservoirs will provide a copious supply of water. Railroad connection with the main line at Rayton Station is complete.

The most promising feature of the outlook is the large size and fine quality of the stones. A certain lot of stones, weighing 385 carats, when cut, yielded brilliants weighing 191 carats, and three other stones, weighing 689 carats, were valued at £14,066, or over £20 per carat. Loads, of 16 cu. ft. each, raised from the mine, numbered 1,289,234, at a cost of 2s. 7.6d. per load. They yielded 749,654 carats, or 0.80 carat per load. This yield was less than in the first year, owing to the inclusion of a thick overburden of lean material in the working face, but was superior to the record of the De Beers & Kimberley during the same period—0.54 carat.

Returns from sales of diamonds were £866,030, the net income from which was £667,738, making a balance of £770,601 in the two years.

At Christiana, in the Transvaal, diamonds are found in the bed of the Vaal river, and the alluvial diamond workings support a number of individuals, but the total yield is not large and has no immediate prospect of increasing. Reports of diamond discoveries in the northern parts of the Transvaal are frequent, but investigation never verifies them. The probability of the occurrence of a large diamond field in that part of the country, however, is considered rather good.

In the Orange River Colony, 127,771 carats of diamonds, valued at \$1,777,680, were obtained in 1903. The returns for 1904 are not available, but the production was very large. The value of the diamonds sold varied from \$7 to \$15 per carat, according to quality.

The export of diamonds from British Guiana in 1904 amounted to 11,046 carats, valued at \$85,947, which compares with 164,315 stones, weighing 10,742 carats, valued at \$103,123, in 1903—an increase of 304 carats in quantity, but a decrease of \$17,176 in value. The greatest activity prevails on the Mazaruni river. Prospecting on the Potaro river is attracting attention.

New diamond deposits, which promise to be profitable, are being developed in the Martapura district, in southern Borneo. The western fields continue to yield about 700 carats of diamonds annually.

Diamonds are found on the Diamantina, Bagagem, Matto Grosso, Goyaz and Grao Mogul fields in Brazil. The value of the precious stones (mostly

diamonds) exported in 1904 was \$316,798, as compared with \$545,033 in the previous year.

Diamonds weighing 14,296 carats, valued at \$55,776, were obtained from the New South Wales mines in 1904. This is an increase of 2,057 carats and \$7,838 in value over the production in 1903. Australian miners are able to obtain only \$6 per carat for their stones, for which reason only the richest mines can be worked profitably. Better prices would greatly stimulate production, as diamonds occur over a very large area in the State.

An interesting feature of the Australian industry in 1904 was the discovery of a diamond in the Inverell district, New South Wales, in a dolerite matrix. It was an irregularly shaped (twinned) white crystal of about one-third carat in weight. The dolerite differs altogether from the volcanic breccia in which the Kimberley, South Africa, diamonds are found, and, instead of a pipe, it occurs in the form of an intrusive dike. The formation is apparently extensive and is being developed.

EMERALDS.

The mines in the State of Boyaca, Colombia, between May 1, 1904, and January 31, 1905, produced 768,938 carats of emeralds; 10% was of first-class grade, the remainder of inferior grades. The mines were worked for centuries by Indians, then for 300 years by Spaniards, and more recently by lessees from the Colombian Government for short terms. Some of the emeralds found in narrow veins are of most beautiful green tints; others are of light green, white, yellow and red coloration. The emeralds are found in a formation lying from 100 to 200 ft. below the surface, and a great amount of barren material has to be removed to reach the gems. The mines are now being worked by an English company, and it is estimated that they yielded a net profit of \$700,000 last year.

KUNZITE.

A pale pink and lilac-colored spodumene discovered in California has received the name of kunzite. It is found in a pegmatite dike on Pala mountain, San Diego county. Ordinarily the dike is a coarse muscovite granite containing black tourmaline. Lepidolite occasionally replaces the muscovite, and when it does, red, blue and green tourmaline take the place of the common black variety. The new variety of spodumene is associated with the gem tourmaline. Kunzite cuts and polishes well. It has been placed on the market for a little more than a year, and has gained popularity. It is valued at about \$5 per carat when nicely colored. Kunzite crystals have been found that have weighed from 7.7 to 31 oz., and varied in dimensions from 13 by 6 by 2.52 cm. to 23 by 4 by 2 cm. These are the largest and finest crystals of this mineral that have been obtained.

Spodumene is a silicate of alumina and lithia, rather complex in constitution and peculiarly liable to alteration. The common variety is found in small quantities in New England, South Dakota and California, in the United States; also in Peru and Brazil, in South America; in Sweden, Ireland, Scotland and the Tyrol, in Europe. The discovery of the transparent lilac spodumene in California adds a new and elegant stone of purely American production to those used in jewelry. It has also scientific interest from some remarkable properties which it possesses in connection with the action of the Roentgen rays, and those of radium and radio-active substances.

OPAL.

Australia continues to contribute the largest part of precious opal to the European market. The chief mining center is at White Cliffs, New South Wales. This field yielded \$268,800 worth of opal in 1904, as compared with \$480,000 in 1903. During the past year, important discoveries of opal of splendid quality were made at Wallangulla, 50 miles north of Walgett, New South Wales. Some of the gems obtained here sold for \$50 per ounce. The Queensland fields yielded opal valued at \$16,800 in 1904. This small output is attributed to a dull market and the exceptionally low prices offered.

RUBY.

Burma is still the chief source of the ruby. The principal mines are in the Mogok district, and are controlled by the Burma Ruby Mines Co. This company in 1889 was granted the right to mine the rubies and levy royalties from persons working in competition. The concession was renewed in 1896 for a period of 14 years, at a rent of \$102,060 per year, plus a share of the profits. The financial results, however, being unsatisfactory, the rent was reduced in 1898 to \$64,800, the interest of the Government in the company's profit being at the same time raised to 30%. Since then production has steadily increased, and the industry is now on a sound and profitable basis. Some of the rubies found in Burma are of exceptional size. One stone found in 1899 weighed 77 carats and was valued at \$130,000.

Rubies are the most valuable gem stones of Ceylon, a country which has enjoyed a reputation for the production of beautiful gems for many centuries. The Ceylon rubies never possess the splendid red of the Burma ruby, although they are frequently more brilliant than the Indian variety. A ruby of about 1 carat size, flawless, and of the best color, sells in Ceylon at from \$100 to \$266; as much as \$5,000 has been offered for a fine ruby weighing 4 carats. A few rubies have been found at different times in the gem-mining districts in the vicinity of Anakie, Queensland.

Artificial Rubies.—These have been made by Dr. A. Vermeuil, a German chemist, by melting a mixture of clay and oxide of chromium at an even temperature of several thousand degrees. The two substances are carefully

placed above each other in layers, so as to prevent cracking in the crystallized mass. He succeeded in producing an artificial ruby weighing 5 lb., which he valued at \$600. From this it may be judged that the quality of the product was not first class. In order to produce the exceedingly high temperature indispensable for success in the operation a blast of oxyhydrogen gas was employed to act directly on the top of the ingredients in the furnace. The hardness of the ruby was obtained by quick cooling through sudden interruption of the oxyhydrogen blast. The artificial ruby is said to be pure and brilliant, possessing all the physical properties of natural rubies. It can be cut, and takes a high polish.

SAPPHIRE.

The Anakie sapphire field, Queensland, produced 14,100 oz. of sapphires in 1904, valued at \$50,760. The industry gives employment to 200 miners. The Anakie deposits are the most extensive in the world; but the great obstacle to their development is the difficulty in disposing of the product at satisfactory prices. Attempts to establish selling depots in European and American cities have not proved successful, and producers are dependent upon the visits of foreign buyers.

A beautiful sapphire, 57 carats in weight, and valued at \$10,000, was recently found in the Ratnapura district in Ceylon.

TURQUOISE.

Turquoise of good quality is being successfully mined in several districts in California, New Mexico, and Nevada. The turquoise when pure and of good quality is cut into gems. The white and blue combination known as turquoise matrix is cut and polished as an ornamental stone. The pale varieties of turquoise are cut into beads. The demand for this gem is not now so keen as it has been within a few years.