

**OTHER COALFIELDS.**—Other mines in Otago having considerable outputs are the Waronui, Milton, and Taratu Coal Company, Lovell's Flat, each having private branch lines of railway from the collieries to the main line.

In Central Otago the chief mining centres are Alexandra, Clyde, Bannockburn, and Roxburgh.

#### SCHEELITE (Calcium Tungstate)

Scheelite has been mined in Otago for some years. It occurs in gold-bearing lodes, is concentrated during the process of gold extraction, and shipped to Europe, where the tungstic acid prepared from it is used in the manufacture of high-grade steel. Tungsten steel is mostly used for making high-speed, self-tempering engineers' tools, and for the inner tubes of big guns. The tungsten imparts to the steel increased hardness and toughness.

Tungstic acid is also made into some fine grades of paint, moreover, it is used by dyers as a mordant for hardening plaster of paris. Tungstate of soda is used in conjunction with starch for rendering light fabrics non-inflammable.

The main sources of supply of this mineral in New Zealand are Glenorchy (Lake Wakatipu) and Macraes, both in the Otago province.

**GLENORCHY.**—During the year the output from the Glenorchy Scheelite Syndicate's mine was 33 tons scheelite concentrate (72% WO<sub>3</sub>), valued approximately at £3,180. Six other parties are prospecting in the district, the ore produced being brought into Glenorchy for treatment. During the year the output from these scattered propositions amounted to 30 tons of 72 per cent. concentrate, valued at £2,900.

**MACRAES.**—During the year the Highlay Tungsten Mine, which was developed and successfully operated for many years by Messrs. Donaldson Bros. (the pioneers of the scheelite industry in the Dominion), was sold to a Christchurch syndicate, who have since carried out operations on a larger scale.

Professor D. B. Waters, A.O.S.M., supplies the following report of operations on this field:—

"Gold and scheelite-bearing reefs have been worked more or less continuously in this district for fully 20 years, but most of the work done has been on a small scale. The known reef-bearing area extends from Dunback to Hyde, a distance of 20 miles, but the width is probably not more than two miles. The field is accessible, no part being more than 16 miles from a railway station.

"The reefs are easily worked, and the ore is readily crushed; but so far the methods employed for saving scheelite have been crude. The whole system of treatment requires alteration. The mines can be very cheaply worked, but large areas require to be held for economical working. This field possesses considerable possibilities, and should prove a field of mining activity for many years to come.

"At present much prospecting is going on, there being ten companies at work; but only three of these have so far reached the producing stage."

Scheelite is sold on the tungstic acid basis, at prices which fluctuate between 24/- and 34/- per unit. The quantity of scheelite exported from New Zealand in 1911 amounted to 138 tons, valued at £11,853. The total output since 1899 has been 813 tons, valued at £66,918.

#### OTHER MINERALS OF ECONOMIC VALUE

**CINNABAR.**—Samples of this mineral are found in the alluvial claims in Nevis, Nokomai, Waipori, and Waitahuna. A sample from the Carrick Range contained as high as 82 per cent. of mercury, whilst samples from Waipori and Waitahuna contained from 70 to 75 per cent. of the metal. So far no payable lode of cinnabar has been found in Otago.

**ANTIMONY.**—According to Hutton and Ulrich's "Geology of Otago," samples sent from the Carrick Range yielded 50 to 54 per cent. of antimony, whilst a sample from Miller's Flat, Tuapeka, contained 58 per cent. of metallic antimony. An antimony lode exists on the west bank of the Molyneux River, Alexandra. In 1900 a few tons were sent to Melbourne for assay. Samples were also assayed at Otago and Thames Schools of Mines, and by the Government Analyst. The report from Otago School gave 65 per cent. metallic antimony, Thames 50 per cent.,

and the Government Analyst 52.8 per cent. It was found, however, that the cost of production and heavy freights in conveying the mineral to a seaport town absorbed the profits. The mine was kept unwatered until August, 1911, when pumping was discontinued.

**COPPER.**—Samples of copper ore, containing 13.5 per cent. of metallic copper, have been found on the Carrick Range; others containing 10 per cent. from the Arrowtown district. A sample discovered at Moke Creek, near Queenstown, contained 24 per cent. of metallic copper, the sample also containing gold. Copper has also been discovered at Ready Creek, Waipori, and a parcel of undressed ore sent to N.S.W. was reported to yield 11 per cent. copper. Machinery was erected, but the cost of drainage was heavy, and for various causes the work was discontinued.

In 1904 a quantity of ore was taken from the Wakatipu lode, and parcels were sent to Thames and Dunedin for valuation, but development was not continued.

A recent discovery of copper in the hills south of the Mataura River is attracting some attention amongst prospectors in North Southland. Samples have shown the presence of copper in varying amounts from 3 to 12 per cent.

**GRAPHITE.**—Graphite is found at Gibbston, Otago, where it is of fair average quality, and near Bannockburn in the schists.

**MICA.**—This mineral, which is so largely used in electrical machinery, occurs at a high altitude at the head of George Sound, Western Otago, in the gneissic schists. A company was formed to develop the deposit, but the prospects met were not very encouraging, and in a short time work was abandoned.

**ASBESTOS.**—A deposit of asbestos was discovered in the vicinity of Milford Sound in 1886, but its position was rather inaccessible for economic working. The mineral has also been found on Mount Cairnmuir and Mount Pisa, Central Otago, but not in profitable quantity.

**ROCK PHOSPHATE.**—In 1901, a deposit of rock phosphate was discovered at Clarendon. Since that date active development has proved the deposit to be a most valuable one. The rock is calcined on the ground adjacent to the workings, and afterwards forwarded to the chemical works for treatment and conversion into artificial manures. The Ewing Phosphate Company treated 10,000 tons of this mineral during 1911.

**BUILDING SAND.**—Fine quartzose sand occurs in large quantities on the Freeman's Colliery Company's property, Abbotsford.

**MARLS.**—These are abundant in the Lower Tertiary coal-measures at Burnside, Puketeraki, Waikouaiti, and Oamaru district. They are marine muds of uniform composition, and hence of great value in the manufacture of cement. During the year 1911 the quantity produced at Burnside was 6,600 tons.

#### FUTURE PROSPECTS

It would be a needless affectation to shut our eyes to the fact that the richest and most accessible of our alluvial gold has already been won. It is, however, quite certain that much gold still remains buried in the deep terrace gravels and lacustrine drifts of the Clutha Valley and Central Otago. The successful working of these deposits is a problem involving the expenditure of considerable capital. The development of these gold deposits is a matter that should be encouraged both by private and public enterprise, and while it would not be advisable for the Government to become owners of gold-mines, or even silent partners in such ventures, it is desirable that the preliminary work of prospecting should be subsidised on a liberal scale.

Systematic prospecting ought to be undertaken in the mountainous regions lying west of Lake Wakatipu and Lake Te Anau, and a careful search made for the rarer minerals, such as scheelite, monazite, and tin ore.

Owing to the activity now being displayed in the development of scheelite-producing mines, a considerable increase in the production of scheelite may be anticipated, unless the market price falls.

The amount of brown coal in Otago is estimated at 217,000,000 tons. The quantity available is sufficient to supply the domestic requirements for some 100 years or more; moreover, it is certain that in time to come much of the inferior coal will be used for the generation of electric energy at the mines for transmission to Dunedin and other industrial centres.