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THE COPPER RESOURCES OF TASMANIA

(1) Geology of Tasmania

The oldest rocks are the schists and quartzites of the Proterozoic era. The Lower Palaeozoic sedimentary rocks include the dark slates and quartzites of the Cambrian or Cambro-Ordovician system; the purple slates and breccias of the Dundas series (probably Ordovician system), and the conglomerates, sandstones, slates and limestones of the Silurian system. Devonian sedimentary rocks are absent but conglomerates, sandstones, shales limestone &c. were formed during the Permo-Carboniferous period. Between the close of the Silurian and the commencement of the Permo-Carboniferous sedimentation, intrusions of granite, syenite, porphyries, dolerite, gabbros and ultrabasic types occurred. Mineralisation accompanied this intrusion and represents the major metallogenetic epoch of Tasmania.

Conglomerates, sandstones, mudstones, felspathic sandstones and coal seams were formed during the Triassic period. The State was a land surface during the Jurassic period unless some of the rocks assigned to the Triassic were deposited during the Jurassic period. Cretaceous sediments are unknown. During the late Triassic or Jurassic period, intrusions of dolerite (diabase) occurred on a large scale.

The Tertiary sedimentary rocks include marine sandstone and limestones of Miocene age and sands of Upper Pliocene age; and fresh water sands, clays, gravels &c. of mid-Tertiary age. Basalt flows occurred during the Oligocene and Pliocene, while alkali porphyries were intruded at Cygnet.

Glacial and fluvioglacial rocks were formed during the Pleistocene. Marine and freshwater sediments were probably also laid down in estuaries around the coast.

The major metallogenetic provinces are:

(a) West and North-West Coast. This province is characterised by the presence of Devonian (?) granite and porphyries intrusive into Lower Palaeozoic sedimentary rocks. The Mineral deposits include those of tin, silver-lead, zinc-lead-silver and copper, the principal mining fields being Mt. Lyell, Zeehan, Heemskirk, Read-Rosebery, Tullah, Waratah, Manget, Balfour and Moina. The tin deposits are associated with the granite or acid intrusive dykes. The copper and zinc-lead-silver deposits are associated with the acid to intermediate porphyries in the main portion of the province.

(b) North-east Coast. This province is characterised by Devonian (?) granite intrusive into Cambro-Ordovician sedimentary rocks. The principal mineral deposits are those of tin and gold and to a less extent, tungsten. The tin deposits are restricted almost entirely to the granite and the gold to quartz reefs in the sedimentary rocks.

Mt. Lyell.

The Mt. Lyell district is occupied by Silurian Sedimentary rocks intruded by Devonian (?) porphyries in the form of a long dyke of irregular form and with a considerable range in width. The eastern portion of the dyke has been rendered schistose due to shearing. The western boundary of the dyke exhibits intrusive contacts with the Silurian sandstones, but it is possible that extensive faulting has occurred along the eastern margin which is in contact with conglomerates. The main fault, if present has a general N-S direction, while numerous tranverse faults have also been reported to occur. Several small dykes penetrate the Silurian rocks to the west of the main one.

The ore-bodies are restricted to the sheared zone on the eastern side of the dyke. They are of two main types:

(a) Lenticular bodies of pyrite.

(b) Mineralised bands of schists &c.

The pyritic bodies include the Mount Lyell and South Lyell deposits. The Mt. Lyell body was elliptical being 800 feet long and 200 feet wide at the outcrop, and tapered gradually downward to a rounded base, the probable depth being 730 feet. The South Lyell body probably represents the faulted extension of the Mt. Lyell body. The pyritic bodies are very pure, consisting essentially of pyrite with some galena and less sphalerite, while the gangue (chiefly quartz and barite) is present in only small amounts. At first ore containing 2.35% copper was mined, but the grade decreased and the average content became 0.5% copper, with 1.5 ozs. silver and 0.04 ozs. of gold per ton.

The outcrop of the Mt. Lyell body was represented by hematite, rich in gold and the mine was originally operated as a gold mine until the hematite was depleted.

The mineralised bands of schist &c. include the ore-bodies of the North Lyell (and adjacent Crown Lyell, Lyell Blocks, Royal Tharsis) mine and the Lyell Comstock mine. They form large ore-bodies of considerable length and vertical extent but irregular in shape and with a considerable range in width. The North Lyell body has been mined to a depth of 1,300 feet from the surface while the Tharsis has been proved to a depth of 1,100 feet. The ore consists of schists, or quartzite &c. with bornite, chalcopyrite, pyrite &c.

The following figures for the reserves were supplied by the General Manager (Mr. H.M. Murray) :

	Tons	Copper Content
North Mt. Lyell Mine.	700,000	4.75%
Lyell Comstock Mine	700,000	3.00%
Crown Lyell Mine	500,000	2.00%
Royal Tharsis Mine	2,500,000	2.25%
Prince Lyell Mine	5,000,000	1.00%

Jukes-Darwin Field

This field is situated to the south of the

Mt. Lyell field and possesses the same geological features. The ore-bodies are similar and occur under similar geological conditions and structural relations. The field has not been exploited owing to transport difficulties and absence of high grade deposits.

Mt. Balfour.

This field is occupied by Cambro-Ordovician sedimentary rocks intruded by Devonian (?) granite and amphibolites. The copper lodes are enclosed in the sedimentary rocks and the amphibolites. The metallic minerals are chalcopyrite and pyrite in a gangue of quartz, chlorite, sericite and dolomite.

Very little production has taken place.

Heazlewood

This district is occupied by intermediate basic and ultrabasic igneous rocks intruded in Cambro-Ordovician and Silurian sedimentary rocks. The copper deposits consist of bornite and chalcopyrite in the ultrabasic rocks probably as segregations. The deposits are small and the production has been very limited.

Exploration, Mining and Technology

The Mt. Lyell ore-body was worked by open cut to a depth of several hundred feet and then underground methods were employed. The North Lyell and adjacent bodies were worked from vertical shafts, but in 1928 a long adit (6952) and 9' x 9' in section was driven to connect with the 1100 foot level and now serves for transport of the ore from the North Lyell and Royal Tharsis mines. The Lyell Comstock mine has been opened up by adits.

At each level certain drives and crosscuts are driven and this is followed by diamond drilling to outline the ore-body at that level.

The reduction works are at Queenstown and have a capacity of 1000 tons per day, all ore being trammed to them. The bulk of the ore is subjected to wet concentration (flotation), the concentrates being sinered and smelted in blast furnaces. The matte is treated in converters and the blister copper is refined electrolytically for production of high grade cathode copper.

Historical

The history of copper mining began with the discovery in 1883 of the hematite overlying the Mt. Lyell ore-body. After being worked as a gold mine, the underlying pyrite was revealed. Following reports by experts, it was decided to work the deposit for copper and pyritic smelting was decided upon. Smelting began in 1896 and has been carried out continuously to the present day.

A boom followed the discovery of the Mt. Lyell ore body and the whole of the district was pegged and numerous companies formed. The North Mt. Lyell was the most successful and was first worked in 1895, but the rich deposits were not found till 1897. This company carried out mining and smelting but in 1903 it was amalgamated with the Mt. Lyell Mining and Railway Co. Later the latter company became possessed by purchase &c. of all the deposits in the district.

As the Mt. Lyell pyrite decreased in copper content, it became used as a flux only, but its use has now been discontinued. The ore is now obtained from the North Lyell (including Royal Tharsis and Crown Lyell) and the Comstock mines. The pyritic smelting was eventually abandoned and concentration of the ores began.

The blister copper was forwarded to Port Kembla until 1928, when the company installed itsown refining plant.

The production is illustrated by the figures for 1932, during which year 380,800 tons were mined. Of this 13,622 tons of North Lyell ore were sent direct to the smelter, and the remainder was concentrated to yield 45,535 tons of contentrates. Including a small amount of purchased ore, 59,168 tons of copper-bearing material were smelted for a production of 11,101 tons of blister copper containing 10,995 tons of copper, 161,633 ozs. of silver and 4,865 ozs. of gold with an approximate value of £441,222.

Statistics

The total amount of ore treated by the Mt. Lyell Company up till the end of 1932 was 9,493,399 tons. This yielded 260,867 tons of blister copper containing 258,079 tons of pure copper, 14,470,902 ozs. of silver, and 406,545 ozs. of gold. The total dividends paid amount to £5,251,569.

The statistics of the Mines Department show the total production from Tasmania as follows (up till December, 1931):-

Copper & silver in blister copper to 1918	£13,778,527
Copper ore to 1918	577,873
Copper matte	133,736
Copper (from 1919)	6,257,872
	£20,748,008

Bibliography

Mt. Lyell.

A reference to publications on Mt. Lyell was contained in the Fourteenth Geological Congress Vol. 11,p.p. 630 and 631 in the article on the The Mount Lyell Pyritic Ore by Prof. J.W. Gregory. The most important publication since then is :

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