

MINING ECONOMICS

The position of mining in the economy of the State cannot be ascertained from a comparison of the statistics of production with those of other industries. Other considerations have to be taken into account such as its relation to metallurgical industries, the utilisation of electric power, its influence in the settlement of remote regions, the provision of essential metals and mineral products for use in the engineering trade, fuel for all purposes, and materials for construction works.

The chief mineral products are ores of copper, tin, zinc, lead and silver, and coal and limestone. Some others, such as iron ores and oil shale have not been produced on a commercial scale. Ores of copper, zinc, lead, silver, tin and iron are mined in the Western Division; tin in the Northeast; iron, coal, limestone, and oil shale in the North; and coal and limestone in the Eastern and Southern Divisions. The Midland and South-western Divisions are almost barren of commercial minerals and are very difficult of access.

The two factors of primary importance in connection with the development of the mineral industry are :-

1. Lines of transport, and
2. Cheap power.

In opening the country the State has spend over £6,000,000 on railways and over £7,000,000 on roads, yet the Western, South-western and Central divisions, comprising one third of the area of the Island, are not served by road ways of transport. As regards the central highlands and the inhospitable South-western country, road construction is not at present warranted; but the Western division, richest in minerals, is worthy of more favourable consideration. Owing to that lack no advance has been made in the Western division during the past twenty years, and it may be predicted that the rate of settlement there will be in direct proportion to progress in road construction.

Mining and metallurgical undertakings absorb 64 per cent. of the electric energy produced in Tasmania, yet it is a striking fact that the richest mineral belts are not well served and not one from the supplies of the Hydro-Electric Department. The chief reason for that has been the inability of mining companies to provide the necessary guarantees. However, the recent careful investigations performed by officers of the Hydro-Electric Department may lead to the transmission of electric power through the more important mineral areas. Such hydro-electric projects, it is thought, will lead to the beginnings of the transformation of Tasmanian economic life.

IRON ORES.

Tasmania possesses large deposits of iron ore of a varied nature in different parts of the Island. With the exceptions, however, of the chromiferous ores of Anderson's Creek, the brown hematites of Brandy Creek, and the high-grade hematites of the Penguin

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Creek Valley, no commercial use has so far been made of them. The ores from Anderson's Creek and Brandy Creek were smelted locally, but the increasing chromium content of the former interfered with its sales, while a fall in the market discouraged the owners of the latter enterprise. The Penguin ores were exported for flux, but more convenient sources on the Mainland, and other difficulties, caused the suspension of operations.

With regard to the other deposits, a small amount of development work has been performed in connection with some of them, but otherwise they have not been exploited. The chief factor which has operated in this direction has been the absence of transport facilities. Not only has this been a drawback in itself, but it has also affected the prospecting and opening up of the deposits and the introduction of capital. Other factors which have operated similarly, have been the unfavourable situation as regards fuel and power, and, in some cases, flux also.

The first step in the development of these deposits would be the thorough prospecting and opening up of them in order to determine their actual value (quantity, quality, etc). and nature. This has been advanced sufficiently in some cases to warrant further steps being taken.

All the known iron ore deposits of Tasmania were investigated by Messrs. W.H. Twelvetrees and A. McIntosh Reid in 1919, and the reports thereon are included in the Geological Survey Publication "The Iron Ore Deposits of Tasmania" (G.S. Mineral Resources No. 6), from which the following extracts are taken.

The following table gives a conservative estimate of the reserves existing in the different deposits at that date:

Blythe River	7,000,000 tons	
Dial Range and Penguin	700,000 "	
Long Plain (Rio Tinto)	20,000,000 "	
Zeehan District		
Tenth Legion	10,900,000 tons	
Reynolds & Davern	160,000 "	
Section 1812/M	800,000 "	
Davern's Prospect	850,000 "	13,710,000 tons
Beaconsfield & Anderson's Creek		1,300,000 "
Hampshire		(not estimated)
		<u>42,710,000</u>

In addition, deposits are known to occur at Nelson River in the north-west, Rocky River and Paradise in the Long Plain district, and at Hampshire, and while large reserves undoubtedly exist, they have not been sufficiently developed and investigated to enable the reserves to be expressed in figures.

The Long Plain and Tenth Legion deposits contain the largest reserves, and are therefore to be regarded as the most important ones. Enormous reserves are also reported to occur at Hampshire, but this deposit has not been developed.

Blythe River Deposits - These deposits are situated on the Blythe River, which is a north-flowing stream entering the sea five miles east of the port of Burnie. The location of the deposits is between six and seven miles from the mouth of the river.

The deposit consists of one long main lode with several shorter parallel ones. The main lode is exposed along a length of 140 chains, but gaps occur in this

distance. The width varies from 30 feet to 150 feet. The estimate of 7,000,000 tons is based upon a horizontal, lode length of 90 chains and average widths and heights above river level for separate sections 70% being deducted for waste rock. The average width is slightly less than 50 feet, and the outcrop of the lode rises to 500 feet above river level, the reserves being calculated down to this level only.

The ore consists of hematite with a small amount of limonite but no magnetite. The quality varies considerably in different parts of the lode. The highest grade material has an iron content up to 69% and a silica content as low as 1.2%, but the average grade is, of course, lower in iron and higher in silica than these figures. The silica content is the only detrimental feature of the ore, and this occurs at portions of the lode only. Some of the siliceous ore assays as low as 44% iron and as high as 31% silica.

Thus, while high-grade iron ore undoubtedly occurs in large quantities, similar quantities of low-grade siliceous ore also exist. The deposits require thorough investigation to determine the grade of the ore throughout, and as to how far selection of the higher grade material could be effected without much extra expense.

Transport facilities would have to be provided to the deposits if they were being operated. A tram or railway of from 6 or 7 miles in length would require to be constructed to the mouth of the Blythe River to convey the ore to the Government North-West Coast Line, or to smelters if such are erected at that locality.

Long Plain, Rocky River and Paradise River - The fact that the Long Plain, Rocky River, and Paradise River iron-fields are comparatively difficult of access is the main reason why the deposits have not received more attention. As most of the large mines in Australia are far removed from the seaboard, and not more favourably situated, this disadvantage is more apparent than real. The natural outlet for the product of these mines is through Corinna a small settlement on the bank of the Pieman River. The Pieman at Corinna is a magnificent stream 450 feet wide and 40 feet deep, with a tidal rise of 5 feet. At this point the banks slope so steeply that vessels can be moored along side. A little higher upstream the river widens considerably, providing a splendid swinging basin for vessels of large size. The entrance, 11 miles from Corinna, is very broad, with a large accumulation of sand on the south side. This sandbar extends to three rocks which lie right in the fairway, half a mile beyond the entrance. It has been suggested that the removal of these rocks would create a strong scour on the bar, but it is doubtful whether any lasting benefit would result unless a break water were constructed on the south side. Small vessels have been safely navigated to this port for many years.

All the deposits named are now held under lease from the Crown, and as endeavour is being made to interest investors in the Rocky River and Paradise River bodies. Before the industry can be established the necessary improvements to the harbour must be made. The Paradise and Rocky River deposits are not far distant, and although the country is rough, six to eight miles of tramway only are necessary to connect with the navigable waters of the Pieman.

The Rio Tinto deposits occur on the valley sides of the Savage River, another tributary of the Pieman, about 20 miles away. They consist of a number of large disconnected lenticular bodies of magnetite with subordinate amounts of hematite. The lengths of the largest lens is 2000 feet, and the width over 100 feet. Others extend along the strike 1500 feet, over 400 feet along the dip, and are 40 to 60 feet wide. The estimate of 20,000,000 tons is calculated to a depth of 300 feet only, but the Savage River has exposed some of these lodes to a depth of 700 feet.

The ore contains up to 69% iron, but the average grade will not exceed 65%. The only impurities likely to prove detrimental are sulphides, restricted mainly to certain portions of the deposits, which however increase in proportion to the depth.

The natural outlet for this deposit is through Corinna. This would entail the construction of a 25 mile railway along the east bank of the Savage River from the Rio Tinto Mines to Corinna.

Hampshire Deposits - The Hampshire deposits of magnetite ore which, it is reported, are only 8 miles from Hampshire railway station and 28 from the well-equipped seaport of Burnie, have not been examined by officers of the Department. It is reported that the deposit extends a distance of 70 chains and is from 3 to 7 chains in width. The favourable position in relation to lines of transport, and the high quality of the ore, are advantageous features of this deposit.

Zeehan Deposits - These deposits occur in a small area at the foot of Mt. Agnew to the west of Zeehan. They consist of a number of lenticular bodies of magnetite. Individual analyses show over 70% iron, but the average grade would be below this figure. The reserves are based on depths of 150 to 200 feet only. The largest lens has a length of 1400 feet and width of 50 feet.

This district is fairly well situated as regards transportation but additional facilities would be required. The Emu Bay railway passes through Zeehan, about 7 miles to the east of the deposits, and this communication could be made with the port of Strahan. The head of the Comstock tram from Zeehan is one mile from the deposits, and the extension to South Heemskirk passes a similar distance to the south. As Strahan would probably be used as the shipping centre, an alternative southerly route from the mines to the vicinity of Malanna might be worthy of investigation.

The deposits are leased at present by Hoskins Iron & Steel Coy. Ltd.

OIL-SHALES

Tasmanite has been found only in the northern portion of the Island. The known deposits are situated in two widely separated fields associated with cannel coals and kerosene shales. The more important is that extending from Latrobe to Quamby Bluff. Along this belt, 27 miles in length, tasmanite has been proved to extend 14 miles, and in the section intervening Quamby Bluff and Kimberley it probably occurs as well. Outliers of the main body occur at Beulah and Nook on the west side, and Paramatta on the east. Aside from the known deposits, it is considered likely that tasmanite will be found in the neighbouring areas. All these areas are well served by roads and railways which converge upon Devonport, the chief shipping centre of the North Coast districts.

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The facilities for the development of the oil-shale industry provided here are not present at the Oonah field, which is situated 26 miles from Wynyard, and accessible only by roads of very heavy grades.

A recent estimate of the oil-shale reserves of Tasmania is:-

	<u>TONS</u>
Latrobe-Railton-Kimberley area	30,000,000
Beulah area	3,000,000
Quamby Bluff area	3,000,000
Nook area	800,000
Oonah	<u>6,000,000</u>
	<u>42,800,000</u> tons

In addition there is a very large possible reserve in areas not yet investigated.

The Tasmanite shale is estimated to yield crude oil to the amount of 40 gallons per ton. The crude oil yields on refining the usual products such as benzine, kerosene, fuel oil, etc.

The shale seam ranges from three to seven feet in thickness.

Although much experimental work has been done in Tasmania by companies operating at Latrobe, it cannot be said that the problems connected with the distilling of the shale have been satisfactorily solved. The distillation of the shales should represent one of the most important industries of Tasmania and the solution of the problem is one of national importance.

In recent years several retorts have been used in attempts to work and treat the shale on a commercial scale. From 1924 to 1927, the Australian Shale Oil Corporation Ltd. carried on operations with the Bronder **retort**. At present this Company and the L. & N. Brown Coal Coy. have formed a new company (The L. & N. (Tasmania) Ltd.) and propose to use the retort of the L. & N. Brown Coal Coy. The New Southern Cross Motor Fuels Ltd. also operated with a Schultz retort for a number of years, but later developed the Long Retort, which is now being used by Tasmanite Shale Oil Coy. Ltd.

COAL.

The coal reserves of Tasmania as calculated by the Geological Survey on present economic conditions are 134,398,000 tons. The reserves, calculated on the basis of the scheme adopted by the International Geological Congress are:-

Actual	124,980,000 tons
Probable	123,013,000 "

The reserves in the fields at present being worked amount to probably no more than 70,000,000 tons. This leaves 64,000,000 tons in fields which could perhaps be developed, if assisted by the provisions of transport facilities. Of these fields, the most important are Fingal and Dalmayne. Fingal is well situated as regards transportation, and very little would be required in that respect. With Dalmayne, however, transport facilities are essential and the provision of these is being attempted by the East Coast Development Company who are constructing the East Coast Railway.

The following figures show the analysis, evaporating power and calorific value of the average Tasmanian coal (Triassic Jura):-

Moisture	4.36	per cent
Volatile Hydro-Carbons	21.27	"
Fixed Carbon	51.84	"
Ash	22.64	"
Sulphur	0.60	"
Evaporating Power	10.49	"
Calorific Value	10.145	"
	B.T.U.	

The coal is high in ash and fixed carbon content and low in volatile hydro-carbons and sulphur. For a coal of this type, the calorific value is comparatively high. The properties of the coal, including the ignition point, and such that the coal should be quite suitable for use in the pulverised form with the resultant advantages thereof.

In all the important fields the seams outcrop at the surface and thus can be worked by adits or dip-adits with consequent low mining costs. (In the Mt. Nicholas field, the costs delivered on the railway appear to average 13/- per ton)

The total production to 1927 is 2,401,189 tons valued at \$1,878,873, that for 1927 being 112,056 tons valued at £99,802.

TIN ORES.

Total production (reported as both tin oxides and metallic tin at different periods):-

15,806 tons - Value £15,693,301

Production for 1927 (metallic tin):-

1,105 tons - Value £317,593

With the one important exception of Mt. Bischoff, practically all the tin ores have been produced from alluvial and detrital deposits. It is natural that these secondary deposits should be worked first, due to the ease of mining and the fact that the results are more likely to be commercially successful. Of the remaining secondary deposits, the greatest possibilities exist in the system of deep leads of the Ringarooma Valley.

Only the upper parts of the tributaries have been worked up till the present and the mining is proceeding down the leads in every case. In every case the tin content appears to be sufficient to warrant the continuation of mining.

With the exception of the Wyhifred lead, the remainder of the tributary leads and the Ringarooma lead are for the greater part covered by considerable thicknesses of Tertiary sediments and basalt. The thickness of the overlying rocks ranges from 100 feet of sediment to 350 feet of sediments (clays, sands and grits) and 200 feet of basalt. While of course, the tin ore is more concentrated in the lowest layers, it also extends upwards into the overlying sediments to a limited extent.

The overburden of basalt and sediments have of course tended to retard the working of these deposits. No attempts have been made to determine the contents excepting immediately ahead of the working mines. The deposits must contain enormous quantities of tin ore, but, of course, the actual value cannot be stated. As considerable lengths of the leads remain, there appears to be distinct possibilities of favourable development, but the greatest problem is that of economic working.

The principal lode tin fields of Tasmania are Mt. Bischoff Heemskirk, Blue Tier (including Branxholm and Weldborough areas) and Avoca.

In the Mt. Bischoff district there is the famous Mt. Bischoff Mine, which, up till the end of 1925, produced 78,234 tons of tin oxide valued at £5,462,748 from 4,728,086 tons of ore, and paid £2,539,500 in dividends.

The Blue Tier tinfield contains the greatest possibilities in the way of large low-grade deposits of various types. The southern part of this field in the vicinity of Lattah is now being investigated by the Blue Tier Committee of the Development and Migration Commission. A scheme of drilling operations has been finalised, the objective being to determine the presence of otherwise of a sufficient quantity of ore of suitable grade to warrant extensive mining operations.

The deposits in the other fields consist of smaller ones in the forms of lodes, greisen veins, etc. Very few of these are being worked or have been worked to any great extent in the past.

LIMESTONE.

Beds of limestone occur in strata of the Lower Palaeozoic, Permo-Carboniferous, and Tertiary systems. The Lower Palaeozoic limestone is of exceptionally good quality, and is used for a variety of purposes. At Ida Bay, South-Eastern Tasmania it is quarried for use in the manufacture of calcium carbide, at Electrona, and for use by the Electrolytic Zinc Company in its metallurgical process. At Railton, North Western Tasmania, it is burnt for the production of quicklime, and is also to be used in the manufacture of cement in the immediate future. At Melrose, also in the North-West, it is quarried and exported to Newcastle, New South Wales, by the Broken Hill Proprietary Company for use as a flux in its iron works.

Silurian limestone occurs in the Western districts, but its sole use so far has been for fluxing purposes at Mount Lyell and Zeehan. Permo-Carboniferous limestone occurs in the North-east, East, and South-eastern districts. At Maria Island the National Portland Cement Company has erected a cement plant, and is using the limestone of this age occurring there. At Bridgewater it is burnt for quicklime.

Tertiary limestone occurs at Table Cape in the North-west, and at Geilston Bay in the South-east.

Partial statistics from 1900 to 1923 show a production of 885,043 tons, with a value of £193,716, and 63,469 tons of quicklime, with a value of £87,617. During the past five years the Broken Hill Proprietary Company has quarried 694,152 tons for use as a flux in its iron smelting plant in New South Wales.

There are numerous areas occupied by the high grade Lower Palaeozoic limestones on which no work is being performed. Many of these are situated conveniently to means of transport and offer ready facilities for mining. Deposits of suitable clay materials are generally in close proximity and so the conditions are extremely favourable for the large scale production of cement.

BUILDING & ORNAMENTAL STONES GRINDSTONES, ETC.

Enormous quantities of sandstones suitable for building and other purposes occur in Tasmania. These sandstones belong to the Hoss series of the Trias-Jura system, and are largely developed in the eastern, midland, and south-eastern portions of Tasmania.

Brindstones - These sandstones are specially adapted for the manufacture of grindstones. Ross is the centre of this industry and large numbers of grindstones up to 6 feet in diameter are exported to the mainland.

Ornamental and Monumental - These sandstones are largely used throughout Tasmania for the manufacture of head-stones, sidestones, etc., and for erecting in cemeteries.

Building stones - In former times enormous quantities of the sandstones were used in the construction of buildings bridges, etc. The number of houses and other buildings in Hobart and Launceston and right throughout the Midlands and south-eastern portion of Tasmania illustrate the popularity of the stones for this purpose. The fine bridges at Ross, Richmond, Pontville, etc. are good examples of the use of the stone for constructional purposes.

These stones are thus greatly favoured for many purposes. The Ross stones form one of the best grindstone materials in the world. For building and decorative purposes all colours, including white, grey, yellow, brown, pink, and variegated, can be obtained, and the ease with which it can be worked makes it very useful for ornamental purposes. In all the quarries operated up to the present, only hand methods of mining and dressing are employed. With the introduction of modern methods of mining or quarrying and the installation of dressing and cutting machinery, a great advance should be made in the utilisation of these stones. An export trade is already established with grindstones and this could be increased and probably export trade established for the stones for building and ornamental purposes.

HYDRO-ELECTRIC POWER

Tasmania possesses numerous possible schemes for the generation of hydro-electric power and the total horsepower which could be generated is extraordinarily large.

Electric power is used to a considerable extent in mining and metallurgical operations and so the State offers great advantages to those desiring to commence such operations. In addition it possesses other advantages such as raw materials of many kinds, plentiful water supplies, good ports, &c.

Of the power already developed within the State, a considerable proportion is utilised in mining and metallurgical operations. The Electrolytic Zinc Company at Risdon use over 30,000 H.P. in connection with the production of zinc. The Mt. Lyell Company at Queestown have their own plant and use the electric power for all mining and metallurgical operations and have lately erected a plant for the production of electrolytic copper. This company also supplies the Electrolytic Zinc Company at Zeehan and Rosebery.

Other mines using hydro electric power are Mt. Bischoff, Magnet, and Pioneer. A considerable amount of power is also used at the Carbide Works, Electrona.

There is thus everything favourable to the introduction of mining, metallurgical and chemical industries, such as those of iron, zinc, copper, aluminium, carbide, in Tasmania.

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