

(A.)

## MINERAL RESOURCES OF TASMANIA.

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THE mining industry of the Colony is one of its most important sources of wealth at the present time—tin, gold, and other minerals constituting about one-third of the total value of its exports.\* When the silver-lead fields of the West Coast come into productive activity, as they shortly will, mineral produce will form a still larger and more important fraction of the whole. The following table, taken from the "Statistics of the Colony of Tasmania, 1889," page 347, shows the different kinds of minerals raised in commercially valuable quantities, and their relative importance:—

*General Return.*

MINES and Quarries for the Year 1879, and Years 1885-6-7-8-9.

	1879.	1885.	1886.	1887.	1888.	1889.
<b>GOLD.</b>						
Number of men employed .....	2060	868	837	824	893	1128
Quantity raised..... ounces	60,155	41,240	31,014	42,009	39,611	32,332
Value of Gold produced .....	230,895	155,309	117,250	158,533	147,154	119,702
<b>SILVER. (Argentiferous Lead.)</b>						
Number of Mines returning in-formation .....	...	...	...	...	...	11
Number of men employed .....	...	...	...	...	34	71
Quantity of ore raised .....	...	...	...	...	417	415
Value of products..... £	...	...	...	...	5838	7044
<b>COPPER.</b>						
Number of Mines returning in-formation .....	...	...	...	...	1	1
Number of men employed .....	...	...	...	...	8	6
Quantity of ore raised .....	...	...	...	...	100	50
Value of products..... £	...	...	...	...	...	300
<b>TIN.</b>						
Number of Mines returning in-formation .....	...	206	174	311	176	82
Number of men employed .....	...	1536	1499	2262	1912	2227
Quantity of ore raised .....	5790	5461	5728	5702	5245	5550
Value of products* .....	£ 347,400	289,433	355,136	399,140	356,630	321,900
<b>COAL.</b>						
Number of Mines returning in-formation .....	...	...	...	...	...	...
Number of men employed.....	...	49	127	85	104	134
Quantity of ore raised .....	9514	6654	10,391	27,663	41,577	40,390
Value of products† .....	£ 9514	6654	10,391	27,663	41,577	40,390
<b>STONE.</b>						
Number of Quarries returned ...	...	17	26	27	26	32
Number of men employed .....	...	184	132	144	96	128
Quantity of stone raised:—						
Bluestone .....	2800	...	...	...	...	2600
Limestone .....	1824	1830	3703	2443	1808	2028
Lime .....	12,900	3450	...	...	...	...
Lime .....	...	3000	...	...	...	...
Freestone, Flagstone, Building-stone .....	181,721	228,350	402,868	248,617	230,442	126,883
Rubble or Metal .....	3000	459,000	...	...	...	...
Rubble or Metal .....	...	...	726	...	...	12,469§
<b>VALUE OF PRODUCTS.</b>						
Bluestone..... £	...	...	...	...	...	13
Lime .....	...	2163	4593	2363	2150	2449
Building-stone .....	...	9437	8255	6314	3831	3189
Rubble or Metal .....	...	...	...	2280	2165	2520
Total Value of Output of Mines and Quarries .....	£ 587,809	462,906	495,625	596,293	559,375	497,426

\* General market value. † Local market value. § Dray loads.

\* "Statistics of the Colony of Tasmania, 1889," page 186.

From the above it will be seen that Tin is as yet by far the most important mineral product, Gold coming next in value, and then Coal. Up to the end of 1890 there has been no very large export of Silver-Lead Ore or of smelted Argentiferous Lead, but these will form an important factor in future returns.

Useful minerals are well distributed throughout the country, there being few large areas in it where none are found, the principal one being the great greenstone plateau in the centre of the island, which appears to be very barren of mineral wealth. Where the more valuable metallic ores do not occur there is usually coal, sandstone, limestone, or some other useful mineral to be had. The metallic ores, as might be expected, are found mostly in the regions where the crystalline, metamorphic, and oldest sedimentary rocks occur; hence in the North-Eastern District, from Port Sorell to Seymour, and on the West Coast. The later rocks of the coal measures contain such minerals as coal, fireclay, ironstone, sandstone, &c. They are most extensively developed in the Counties of Monmouth and Pembroke, though as yet the most important collieries are in the Mersey and Fingal districts.

#### *Tin.\**

Here, as elsewhere, Tin is intimately associated with granitic rock. Almost all the parts of the country where granite is found are more or less tin-bearing, the metal being found either in the rock itself or in alluvial deposits clearly derived from its disintegration. Outside of the granite country no tin ore of consequence is found, hence a glance at the geological map at the beginning of Chapter V. finds at the same time the granite and the tin-bearing country.

The principal workings are in the valleys of the Ringarooma and George's Rivers, at Mount Bischoff, and at Ben Lomond. Mount Heemskirk was for a time the scene of great activity in tin-mining, but has been practically abandoned for the present, the field not having come up to the somewhat extravagant expectations that were formed of it. A more extended list of the places where tin has been found is given in Chapter V. The deposits of cassiterite may be grouped in three classes—(1) *Lodes and Veins*, (2) *Impregnations*, and (3) *Alluvial Deposits*. There has hitherto been but little true lode-mining done, the lodes yet found having been as a rule small. The celebrated Mount Bischoff deposit, though often spoken of as a lode, is of a somewhat mixed character, combining features of all three of the above sorts of deposits. Much of the surface stuff is of distinctly an alluvial nature, containing waterworn stones of miscellaneous nature. The deeper workings of the Red Face have, however, revealed ore that has not been moved by water, and of the true lode character. The underground workings of the Mount Bischoff and Stanhope Companies have revealed true fissure veins carrying tinstone, and also dykes of quartz porphyry impregnated more or less with the ore. It is probable that the great surface deposit that has been worked so successfully by the Mount Bischoff Company is the result of the wearing down and concentration by atmospheric agencies of a large mass of rock which was at one time penetrated in every direction by large numbers of tin-bearing lodes, veins, and porphyry dykes. The tin ore, from its great weight and resistance to the chemical action of the atmosphere, has remained unchanged almost *in situ*, while much of the lighter and more decomposable rock in which it was enclosed has been disintegrated and washed away. There is thus a deposit of alluvial tin ore resting immediately upon the parent lodes. It is possible that the upper parts of these lodes were larger and richer than any yet found underground. The Red Face workings are in the top portion of what is probably a bulge in one of the lodes. The ore is here found in a matrix of brown oxide of iron, which is most likely

\* See also pp. 91-96, *ante*, for further particulars regarding this important mineral.—Ed.

the result of oxidation of a large mass of iron pyrites. The cause of the formation of deposits of tin ore at Mount Bischoff appears to have been an intrusion of eurite porphyry and topaz rock through the ancient sandstones and slates of which the main mass of the mountain is composed. As above mentioned, the porphyry itself frequently contains tin ore, and veins in it and in the adjacent slates are often richly charged. In the vicinity of some of the intrusions almost every joint in the country rock is coated with crystals of cassiterite.

Lodes have also been worked at Mount Heemskirk, the Blue Tier, and Ben Lomond. The Heemskirk lodes were not payable under the conditions of working at the time, but are likely yet to be worked. At the Blue Tier lodes have been mined upon by the Lottah, Full Moon, and Wellington Companies, but as yet without commercial success, the lodes being small, though often very rich. At Ben Lomond the Great Republic mine has been working a lode with considerable success, very rich ore being frequently obtained. A recent crushing of 34 tons is reported to have yielded  $2\frac{1}{2}$  tons of dressed tin ore, an excellent result.

Throughout the granite country rock of the Blue Tier, Mount Cameron, and other parts of the Ringarooma District, it is a common thing to find numerous small veins of quartz often carrying rich tin ore. These are not generally numerous enough to constitute a true "stockwork" and are not large or regular enough to be worth mining upon, but are sufficient to have supplied a very large quantity of alluvial tin ore in course of time as the country rock containing them has been worn away. The occurrence of these numerous veins renders it very probable that larger and perhaps payable lodes will yet be found.

A second class of tin ore deposits has been referred to above as "*Impregnations*." Dykes of quartz porphyry found traversing the granite rocks of the Mount Cameron and Blue Tier Districts have been found frequently to be richly impregnated with tin ore. Such dykes are well seen in the Anchor, Full Moon, Wellington, and M'Gough's properties at the Blue Tier. Efforts to work these dykes have not been altogether successful up to the present, owing in a great measure to inadequate and badly designed machinery, but sufficiently so to demonstrate that with extensive and cheaply working crushing and dressing-plant the mines would most likely be payable.

The third class, or *Alluvial Deposits*, is the most important of all as regards production of tin. These deposits may be distinguished as of two groups, (a) *Tertiary*, and (b) *Recent*. The former form the so-called "Deep Leads" or "Deep Ground" and have been laid down by a system of watercourses different from that now prevailing, while the latter are evidently deposited by the now existing streams. The mines in the vicinity of Derby are good examples of the Tertiary Alluvials, the stanniferous "wash" occupying the bed of an ancient watercourse, which, subsequently to its filling with the gravel, has been covered by volcanic ashes and basalt flows, and entirely obliterated. The "lead" runs right across the present bed of the Ringarooma River, and under what are now hills 200 or 300 feet in height. In the same district the recent stanniferous deposits are exemplified by the gravels of the Cascade River. Under the basalts of Tertiary age in the vicinity of Mount Bischoff alluvial gravels have also been found, though not bearing tin to any payable extent so far as yet discovered. Deep leads also occur in the neighbourhood of George's Bay. All throughout the alluvial mines of the North-Eastern District there is abundant evidence that the tin ore has been deposited in the first instance not so much by the present streams as by older ones, and that these older deposits have been cut through in every direction by more modern watercourses, leading to a redistribution and

resorting of their contents. Many of them are thus somewhat curious mixtures of Recent and Tertiary deposits. This is well seen in the neighbourhood of Gladstone.

From the gravels, whether Tertiary or Recent, the tin ore is generally obtained directly by sluicing. In some cases, owing to the great depth of the overlying basaltic covering on the deep leads, the gravel has to be extracted by regular mining operations, the ground being systematically blocked out, and the richer wash hauled to the surface to be sluiced. Where enough water is readily available hydraulic sluicing is employed, but owing to difficulties in bringing in sufficiently large supplies for this purpose the method is not so extensively used as it might be, and ground-sluicing with small supplies of water under low pressure is most commonly adopted. Extension of the hydraulic system would enable a much larger quantity of gravel to be treated, and at much less cost. The great deposit worked by the Mount Bischoff Company is treated by a combination of sluicing and ore-dressing operations befitting its mixed alluvial and lode character. The tin-bearing material is quarried in large open faces, and the softer portion of it at once treated in box-sluices, while the harder material, containing stones of quartz porphyry and silicious limonite charged with tin ore is sent to a stamping battery. The stuff which has been treated in the box-sluices, after a partial concentration there, also goes to the battery. The crushed ore is treated in a system of classifiers, jiggers, buddles, and convex slime-tables, the whole forming one of the most complete tin-dressing establishments in the world.

The black tin, or dressed tin ore, from all parts of the colony is mostly all smelted in the works of the Mount Bischoff Company at Launceston, only a small proportion being exported for smelting elsewhere. The furnaces are reverberatory ones of the Cornish type. Newcastle (New South Wales) coal is used as fuel, and a little lime is required as a flux.

#### *Gold.\**

Tasmania is not a large producer of gold compared with the mainland of Australia, though possessing for her size a fair amount of auriferous wealth. It occurs, as in most places, both in reefs of quartz and in alluvial deposits. No very large quantities of auriferous gravel have been found, the alluvial gold being mostly got in shallow workings in the beds of existing streams, though, as in the case of tin ore, there is frequently evidence that these deposits result from the re-washing of older ones. On the West Coast, in the vicinity of the Pieman River, Long Plains, and Mount Lyell, there are considerable masses of gravel, probably of Tertiary age, containing a little gold, in which there is yet a probability of payable leads being found. At Beaconsfield an ancient Tertiary lead has been proved by several shafts and bore-holes, but has not as yet been worked with any success, though promising very fairly. Another effort to overcome the difficulties of its exploitation is now about to be made by the Ophir Gold Mining Company of Sydney.

Alluvial gold has been got in some quantity at Beaconsfield, Lefroy, Lisle, Fingal, and various places on the West Coast, as shown by the following table, reproduced from Chapter V., Official Record, 1890,† which also shows the localities where reef gold is obtained, and the relative amount of gold produced from each place and each source between 1866 and 1888.

\* See also pp. 97-113, *ante*, for a more extended account of this precious metal.

† See also p. 103, *ante*, showing results up to year 1889.—Ed.

District.	Gold.			Per cent. to Total.
	Alluvial.	Quartz.	Total.	
	oz.	oz.	oz.	
Beaconsfield.....	33,136	265,371	298,507	55.91
Lefroy and Back Creek.....	9243	82,573	91,816	17.26
Lisle.....	71,660	...	71,660	13.51
Fingal and Mangana.....	9016	19,215	28,231	5.25
West Coast.....	23,907	745	24,652	4.69
Mount Victoria.....	...	9695	9695	1.88
Denison, Goleconda.....	260	2951	3211	0.56
Other places, including Gladstone, Hellyer, Minnow, Forth, and Cam Rivers, Branxholm, &c. ....	2824	2246	5070	0.94
	150,046	382,796	532,842	100.00
Per cent. to total .....	28.16	71.84	100.00	

The principal quartz mining districts at present are Beaconsfield, Lefroy, and Mathinna. Most of the reefs are found in slates, schists, and sandstones of Silurian or Archæan age. The Tasmania mine at Beaconsfield has been by far the largest producer of gold, having yielded, from 1877 to 1889, 278,661 ounces, of the value of £1,003,183, and paid in dividends £567,875. The reef has carried gold from the surface down to 450 feet, the deepest level yet worked, the metal occurring most plentifully in several rich shoots which dip easterly in accordance with the dip of the enclosing country sandstones. A diamond-drill bore-hole has cut the reef at a depth of 700 feet, the core showing gold freely, so that a continuance of rich ore in depth is confidently looked forward to.

#### Coal.\*

Though numerous discoveries of coal have been made at various places throughout the colony, only a few of the seams have yet been practically worked. The Coal Measures are extensively found in the north from the River Don to the Tamar in the County of Devon, and in the east in the Counties of Monmouth, Pembroke, Somerset, and Glamorgan. A considerable area up the Huon valley and along the shores of D'Entrecasteaux Channel is also occupied by them. In the County of Cornwall the extent of coal-bearing country is not large, but is of great importance, the large seams worked by the Cornwall and Mount Nicholas Companies being there situated. These two collieries raise more coal at present than all the rest of the colony.

The coal-bearing rocks belong to two distinct geological horizons, and are known as the Lower and Upper Coal Measures, the former being of Carboniferous age, and the latter referred to the Mesozoic Period. The Older Coal Measures are somewhat restricted in occurrence, being found only in the Mersey and Don Basins in the north, and at Adventure Bay in the south.† The Upper Coal Measures cover a much larger area, comprising extensive districts in the counties above named.

In the Mersey district (Lower Measures) it is doubtful whether there is

\* See also the account of Coal and Coal Seams, pp. 115-118, *ante*.

† The coal seam worked at Port Cygnet may also be referred to the Older Coal Measures of Tasmania.—ED.

more than one seam of coal of any importance yet found, though, being much broken by faults, it appears at varying elevations. It is usually from one to three feet in thickness, and supplies a very fair coal, non-caking, and containing a good deal of sulphur, but still of very useful quality. Several pits have been opened upon it from time to time, and an attempt is now being made to prove the strata more thoroughly and to open up the seams still further.

In the upper coal measures there are a large number of seams of coal, but as the strata are very much broken by faults it is not yet possible to establish a relation between the seams found even in closely adjoining districts, and no accurate estimate of the number of separate seams can therefore be made. The principal workings have been at Mount Nicholas, Longford, Sandfly, Jerusalem, York Plains, the Douglas River, and Port Arthur; but coal is known to exist at numerous other places, and, doubtless, will be worked as time goes on and facilities for getting the mineral to market increase. The coal is, generally, non-caking, and contains a large percentage of ash, but, though not of first-class quality, is very useful for steam purposes, and when burned on a grate properly adapted for such fuel it develops a very good heating effect. Most of the seams have as yet been worked only comparatively near the surface, and it is probable that when they are traced to greater depths and into undisturbed strata the quality will improve. A great deal has yet to be done to develop this important source of wealth.

#### *Silver and Lead.\**

An immense area of ground has within the last three or four years been taken up in mining leases in the neighbourhood of Mount Zeehan and Mount Dundas on the West Coast, and near the Heazlewood and Whyte Rivers. About 130 square miles of ground have been taken up in mineral leases or applied for in these fields. Argentiferous lead ore has long been known to exist in the neighbourhood of the Penguin Creek, and more recently in the vicinity of Mount Claude and at Mount Bischoff; but it is only lately that the discoveries have assumed their present great importance. The three principal silver-lead fields,—Mount Zeehan, Mount Dundas, and Heazlewood,—show considerable similarity in their geological structure, the country consisting of Silurian slates, sandstones, and limestones, penetrated more or less by eruptive rocks. Of these latter a serpentinous greenstone, ranging from pure green serpentine to diabase and gabbro in character, is the most largely developed, occupying large areas of ground at Mount Dundas and the Heazlewood, and bounding the Zeehan field on the western side. Besides this rock there are other rocks of volcanic origin appearing as tuffs and breccias interbedded with the slates and sandstones and as dykes penetrating them. These rocks are so entirely decomposed and altered by weathering agencies that their exact character cannot be certainly determined. The commonest sort of them is a granular-looking clay rock, much mottled and coloured by oxide of iron and speckled with whitish dots of kaolin, resulting from the alteration of felspar crystals. Through all these rocks, slates, sandstones, limestones, serpentines, and tuffs, true mineral lodes are found, containing argentiferous galena and carbonate of iron principally, also blende, iron pyrites, quartz, dolomite, and other minerals. The main lines of lead in all three fields appear to have a general course between N.W. and N.N.W., thus being roughly parallel to the axes of the West Coast and Meredith Ranges. In the Zeehan field, and at Mount Dundas to a less extent, another set of lodes, running in a north-

\* See also pp. 108-113, *ante*, for further information relating to Silver and Lead.—Ed.

easterly direction, and so crossing the first set, is also found. These lodes appear to be shorter and, on the whole, less strong than the north-westerly ones, but equally rich, or even richer, in mineral contents. It is not yet determined if these two sets of lodes are of contemporaneous origin, or which one is younger than the other if they are of different age of formation.

Where the lodes crop out in high ground they are almost always more or less thoroughly oxidised to gossans, consisting mainly of oxides of iron and manganese, and rarely carrying any payable quantity either of lead or silver. Occasionally, however, pyromorphite (phosphate of lead) and crocoisite (chromate of lead) are found in them, and sometimes chloride and other ores of silver. As a rule, however, the ferruginous outcrops are poor, the metallic contents having apparently been leached from them. In most cases work has not yet proceeded far enough to show if there is an enrichment of the lode beneath the oxidised capping; but the discovery of extremely good carbonate of lead, and of kaolin charged with carbonate of lead and silver ores, immediately above galena in the Silver Queen mine at Zeehan, and of rich carbonate of lead in the Maestri Broken Hill mine at Mount Dundas, seems to point to the inference that the lodes will be found to be so enriched beneath the gossans. In Balstrup's mine the gossan cut in an adit a considerable depth below the surface is markedly richer both in lead and silver than on the surface.

The preponderance of carbonate of iron over quartz in the gangue of the lodes, and the generally pure character of the galena, are very favourable for the easy smelting of these ores. In some of the mines, however, there are large quantities of zinc blende and pyrites, and the treatment of these ores will prove more difficult, dressing works being required to separate the various constituents. The galena is generally rich in silver, the mean of 71 assays, by Messrs. Ward & Provis, giving 63½ per cent. of lead and 65 ozs. of silver to the ton. Frequently it carries over 100 ozs. of silver per ton, and in the ore from a few of the mines a little gold has also been found. Sometimes the ore contains antimony, and this antimonial ore appears to be generally very rich, assays of as much as 1800 ozs. to the ton having been obtained from it. No smelting works have yet been erected on the fields, their state of development and the means of communication being not yet fit for their establishment and support. Owing to the wet and swampy nature of the ground, and to its being covered with dense forest, it is almost impossible to get any machinery on to it without enormous expense. Communication by means of roads, tramways, and railways is being established between the mineral fields and the main centres of population; but the work is necessarily slow, and till it is completed no great progress is possible. A railway is in course of construction from the port of Strahan, on Macquarie Harbour, to Mount Zeehan, and a tramway from Zeehan to Mount Dundas. When these are completed the fields should make rapid progress. The Heazlewood and Whyte River fields are in the same way not able to make much advancement, pending the completion of the road to Waratah or of a tramway projected by the Godkin Company. These factors have to be considered in explanation of the small export of ore from so large and promising a mineral district. At Mount Zeehan, and to some extent at Dundas and Heazlewood also, heavy drainage machinery will have to be erected before ore can be raised in quantity to support smelting works, and till good means of carrying such plant to the ground have been perfected work must almost be at a standstill. The natural difficulties in getting a mine into working order in these fields are very considerable, and time must be expended to overcome them. Less than two years, however, ought now to show a large production of lead and silver. It is not yet certain whether furnaces will be erected at Mount Zeehan or at

Strahan to smelt the ore from the Zeehan and Dundas mines. Practical considerations of cost of obtaining ore, fuel, and flux will decide their location.

In the Godkin mine at the Whyte River a large quantity of native silver has been found in galena. The country rock where this occurs is limestone: where the lode passes into sandstone it contains chloride of silver and but little lead ore. The owners are about to erect smelting works of their own, and to build a tramway to connect their mine with the Emu Bay and Mount Bischoff Company's Railway at Waratah.

From the richness of the lodes, their large number, and the great extent of country over which they are distributed, there is every reason to expect with confidence that the West Coast Silver-Lead Fields will be large and permanent sources of wealth to the Colony. The lodes are true fissure veins, and will doubtless extend to any depth to which they may be followed. From the character of the fields it may be predicted that, while individual mines will have frequent vicissitudes of fortune, the district as a whole will keep up a steady output of metal, the number of known veins being a sufficient guarantee that as one rich bunch of ore gives out, others will be found in previously poor lodes.

Indications of the probable extension of the present known silver fields are quite numerous, and there is reason to expect that a great part of the Silurian and Archæan formations on the West Coast will prove rich in argentiferous and other minerals. These formations appear to be highly metalliferous all throughout the Colony.

#### *Copper.*

Native copper has been found in considerable quantities in the Mount Lyell District, and small quantities of copper ores are found with the silver-lead minerals in parts of the West Coast fields; but, with the exception of the deposits of copper pyrites at Saxon's Creek, in the West Tamar District, no discoveries of this metal have yet been made of sufficient importance to be worked. Very good chalcoppyrite has, however, been got at Saxon's Creek, and a company has recently been formed to work the mines.

#### *Bismuth.*

This metal has been found in large quantity in hornblende rock at Mount Ramsay, the deposit being described some years ago by Professor Ulrich as "a discovery representing to my knowledge one of, if not the most important and richest made of this rare metal in recent times." No mining work of any extent has yet been done, though efforts are now being made to have the deposit regularly opened up.

#### *Zinc.*

Blende occurs frequently in some quantity in parts of the West Coast silver-lead fields, and as it is often argentiferous it will no doubt be worked for silver. Should it be found in sufficient quantity to support special works for its reduction it will be of value for its zinc as well. Present appearances favour the belief that when ore-dressing is thoroughly established at Zeehan, and the Heazlewood and the mines are in full working order, there will be enough blende separated from the galena ores to render its special treatment necessary, and a small production of metallic zinc may therefore be anticipated.

#### *Iron.\**

The Colony has rich stores of the ores of iron, but commercial conditions do not yet allow of their being profitably worked. Near Beaconsfield there

\* See also pp. 89-90, 457, for further information relating to Iron.—Ed.

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are extensive deposits of red and brown hematite and magnetite, the latter containing a little chromium. Brown hematite of good quality is found also on the east side of the Penguin Creek, and red hematite at Marsden's Hill. Brown hematite and magnetite occur on the west side of the Mount Zeehan silver field; and throughout all the West Coast silver fields the immense out-crops of manganiferous brown hematite would be of value as iron ores under favourable market conditions. Doubtless many other deposits of iron ore than are now known exist throughout the Colony, but owing to their being at present of no market value there has been no inducement to look for them. In course of time the extensive and rich stock of iron ore in this country will be sure to be of great value, and will be the basis of large industries.

Nickel.

The hydrous carbonate of nickel (*zaratite*), and silicate of nickel, have been found in the serpentine rocks of the Heazlewood District, but it is very doubtful if there is enough ore to pay for working.

Rarer Minerals.

None of these are yet exported, though several occur in sufficient quantities to be of some commercial value. *Wolfram* has been found with tin ore at Ben Lomond, the Blue Tier, and other places, occasionally in considerable masses worth saving as a by-product while mining for the more valuable tin ore. *Molybdenite* occurs in much the same way, and, like wolfram, has a small commercial value. *Chromite* or *chromic iron ore* has been found in small quantities in the serpentine rocks of the Heazlewood district, and might perhaps be found in larger masses if looked for. Good parcels of this ore are readily saleable. In the Ben Lomond district *arsenolite*, or natural white arsenic, has been found in unusually large and solid masses, no doubt derived from the oxidation of arsenical pyrites. If found in any quantity this could very easily be refined to white arsenic for export. *Alumogen*, or sulphate of alumina, occurs in the neighbourhood of Chudleigh, along with sulphates of magnesia, iron, and other bases. The quantity easily available is reported to be very large; if so, it would probably be worth refining to a marketable product.

Precious Stones.

One small *diamond* is said to have been found in the Arthur River district. *Sapphires*, some of good size and quality, are frequently found in the tin drifts of the Weldborough and other north-eastern districts, along with *garnets*, *spinnels*, *zircon*s, *topazes*, and occasionally *beryls* and *chrysoberyls*. The *topazes* of Flinders' Island are very large and fine, and are often cut and sold as "Flinders' Island diamonds." Most of the varieties of quartz, *rock crystal*, *chalcedony*, *agate*, *cornelian*, *onyx*, *jasper*, &c., are found in the Colony. Such as have a good colour have always a market value when cut and polished. In the tin-drifts at Gladstone large crystals of *smoky quartz* are very common. They are gathered by the Chinese, and exported by them for the manufacture of dark spectacles.

Ornamental Stones.

Very pretty green *serpentine* of various shades is found near Beaconsfield, Mount Dundas, and the Heazlewood. It takes a good polish, and might be used for a variety of indoor ornamental work. The fine crystalline dark blue limestone of Silurian or pre-Silurian age found at Beaconsfield, in

the Mersey Basin, on the Gordon River, and elsewhere, takes a very fine polish, works well, and yields an excellent dark or *black marble*, occasionally very prettily variegated with white calcite veins. Should a place be found where this stone could be got in large strong blocks close to a shipping-place, marble quarries would probably give good profits. A very handsome *shell marble* occurs at Maria Island, and could be readily put upon the market. Many of the varieties of *granite* found in Tasmania are very well fitted for ornamental and monumental purposes, and will doubtless be much used when facilities exist for getting the stone cheaply to the ports.

#### *Building Stones.*

Quarries were at one time opened for *slate* in the Tamar District, but have been abandoned. Some fair slate was obtained, but the bulk of the product was not of good quality. Perhaps, as the material has been shown to exist in the country, future operations will result in finding a really good article. The *greenstone* (diabase) so common in many places, is much used for road metal, manufacture of concrete, foundations for buildings, paving, and rough building. *Sandstones* belonging to the Upper Coal Measure series are very largely used for building purposes, dressing easily, and lasting well. Many of the best buildings in Hobart and other towns are built of this sort of stone. It is usually of a yellowish or brownish tint, but is occasionally almost pure white. Quarries of this white sandstone have been worked at Okehampton and Prosser's Bay, the stone being exported to Melbourne. Owing to the great expense of getting it to market the quarries have been practically abandoned. Good grindstones are cut still at Prosser's Bay. *Fireclay* of good quality is found with many of our coal seams, but is not yet made much use of, while *brick clay* of various qualities is common almost everywhere, and is much used locally. *Lime* and *hydraulic lime* are easily obtained from the limestones common in the Silurian and Coal Measure formations. The dark crystalline Silurian limestones generally afford a purer lime than the shell limestones of the Coal Measures, which are more hydraulic when burned. Very good *Portland cement* has been made from some of the hydraulic limestones of Maria Island, and its manufacture promises to be an important industry.

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A review of the Mineral Resources of Tasmania shows that she is bountifully endowed with great variety and abundance of mineral wealth. Her future prosperity depends more on the development of her stores of coal and metals than on the agricultural, pastoral, and timber industries. While these are not thought lightly of, it is remembered that in them our Colony has no especial advantages over her rivals, and in many respects is at a disadvantage, hence it is not to them that she will owe future eminence. Her great wealth of minerals and natural advantages as a manufacturing centre will, however, necessarily make her take a leading part not only as a producer of raw materials, but also as a maker of finished products. With large coal supplies, an excellent temperate climate, plentiful water, and large stores of tin, gold, iron, silver, and lead, her manufacturing future is assured.

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