THE MINERAL INDUSTRY OF TASMANIA.

THE present prosperity of Tasmania is to a large extent due to her Mineral Products; and the industry has received a great impetus during the present year, owing to the success attending the operations of the Mount Lyell Mining and Railway Company.

The annual value of the mineral output from 1891 to 1896 was as follows:—

1891.	1892.	1893.	1894.	1895.	1896.
£ 520,336	£ 518,390	£ 593,185	£ 698,704	£ 554,594	£ 705,586

The mean annual value for the six years being £598,466. For the first nine months of the present year the value of the metals and minerals exported exceeded £700,000; and it may be confidently expected that the total value of the mineral output for 1897 will be in excess of a million pounds, equal to nearly £6 per head of population, which, on September 30th, 1897, was estimated at 167,974.

The following Return compiled by the Government Statistician shows, as far as can be ascertained, the value of the minerals raised and exported to 31st December, 1896:—

	During the Year 1896.		To Date, 31 Dec. 1896.	
	Quantity.	Value.	Quantity.	Value.
		£		£
Gold raised..... ozs.	62,591	237,574	885,828	3,383,520
Silver exported—				
Ore..... tons	20,817	222,948	80,263	940,876
Bullion ..... "	—	—	1430	44,396
Copper Ore exported. "	84	1659	1053	168,126
Tin Ore and Metal " "	2703	159,038	78,510	6,387,554
Coal raised..... "	43,549	17,354	569,434	331,913
TOTAL.....	—	638,573	—	11,256,385

A glance at the above table shews that the value of the tin ore raised has been greater than that of all the other minerals put together,

and from 1875 to 1893 tin headed the list of mineral exports. In 1894, however, silver-lead ores took first place, with gold second on the list, and during the present year blister copper (containing gold and silver) has been the most valuable export.

GOLD.

Although payable gold was discovered in Tasmania in 1852, about the Nook, near Fingal, very little attention seems to have been paid to it for some years, and previous to 1871 the total recorded yield for the whole Colony was only 3999 ounces, valued at £13,806. "Gold has been found in Tasmania more or less in all the districts where the older Palæozoic formations occur, especially the Lower Silurian. The Beaconsfield, Lefroy, Mathinna, Mount Victoria, Mount Horror, and Gladstone Fields are all referred to the Lower Silurian system, and, in all probability, in the greater part of the West Coast gold-field the parent reefs, from which the alluvial has been derived, are also in rocks of this age; but the Queen River Field, and those at Middlesex and Bell Mount, seem rather to be of Upper Silurian formation. Much, however, has still to be learned as to the stratigraphical relations of the West Coast rocks. At the Lisle and Golconda Fields gold is found in veins in an intrusive granite, which has burst through the Lower Silurian series, and in certain parts of the West Coast range there is a little gold in tufaceous deposits of volcanic origin, but as a rule the igneous rocks have not yet proved favourable matrices of the precious metal in this Colony."*

Alluvial gold-mining has decreased very much in importance during the last few years, and the total recorded yield from alluvial for the quarter ended September 30, 1897, was only 591 ounces, or little more than 3 per cent. of the total production. It is, however, exceedingly difficult to obtain accurate returns of the alluvial gold won, the diggers being generally very reluctant to say how much they have obtained, and it is well known that a good deal of gold is taken by the diggers themselves to Melbourne or Sydney, and does not appear in the Tasmanian Returns.

It is satisfactory to note that in several cases cyanide or chlorination plants have been erected for treating the accumulated battery tailings, and the results are said to be good, but no direct returns are available.

The following table shows the relative importance of the various gold-fields for the quarter ending September 30, 1897 :—

* The Mineral Resources of Tasmania, by A. Montgomery M.A., late Government Geologist for Tasmania.

District.	Gold produced.				Per cent. to Total.
	Alluvial.	Quartz.	Cyanide and Chlorination.	Total.	
	ozs.	ozs.	ozs.	ozs.	
Beaconsfield	20	10,296	695	11,011	61·84
Mathinna	...	4718	...	4718	26·49
Lefroy	50	153	988	1191	6·69
Mt. Victoria and Warrentinna	80	365	...	445	2·50
Lisle	200	...	...	200	1·12
Golconda, Panama, Denison, West Coast, Middlesex, &c.	241	...	...	241	1·36
	591	15,532	1683	17,806	...
Per cent. to Total	3·32	87·23	9·45	...	100·0

The most important gold-field in the colony is Beaconsfield, which is situated on the west side of the River Tamar, about 26 miles north-west of Launceston. A good deal of alluvial gold was obtained in the early days of the field, and the presence of a deep-lead carrying good gold has been proved. The bottom of this lead is about 270 feet below sea level, and, although several attempts have been made to open it up, financial difficulties have prevented a proper trial being given to it.

The Tasmania Gold Mining and Quartz Crushing Company, Registered, was formed to work a reef discovered by Mr. William Dally in 1877, and since then has been a consistent producer of gold. Up to September 30, 1897, 341,150 tons of quartz had been crushed, yielding 411,946 ounces of gold, valued at £1,491,724, out of which £661,339 5*s*. has been paid in dividends.

Water has always been a great source of trouble and expense, and the main shaft is equipped with two 24-inch plungers worked by a powerful compound condensing engine, having cylinders of 45 inches and 72 inches diameter and 10 feet stroke. At each level floodgates are put in which are closed as soon as the reef is cut, and the water allowed to drain. The present pumps are barely able to cope with the water, and preparations are being made for extra pumping machinery. The deepest working level at present is 718 feet from the surface, the total depth of the shaft being 837 feet. At 818 feet a chamber has been cut, but it is intended to sink a further distance of 100 feet before cross-cutting for the reef. All the levels are lighted with electric light. The shaft, which at the top is 18 feet by 9 feet in the clear, has been enlarged to 21 feet 9 inches by 9 feet below the 718 feet level to accommodate the extra pit work. A new

main shaft is also being sunk, a contract having been let to sink 1156 feet within two years. Work was commenced in April last, and good progress has been made, the shaft being down 554 feet. Sinking has been temporarily suspended to put in pumps. This shaft is 17 feet 6 inches by 5 feet in theclear, timbered with 12 inch by 12 inch frame sets with 3 feet studdles.

The Company has two batteries—one of 40 heads, known as the Florence battery, at the mine, and the other of 60 heads, known as the Tasmania battery, close to the Tamar. In connection with the latter is a Lührig concentrating plant. The concentrated pyrites are treated by chlorination, but as there is at present only one small roasting furnace the concentrates are rapidly accumulating, and the estimated quantity on hand is 12,588 tons, of an average assay of 1 oz. 15 dwts. of gold per ton. The stone is brought from the mine to the battery by means of an electric motor. The accumulated concentrates and tailings from the Florence battery have been purchased by a syndicate, and are being treated by the Cyanide process. Zinc shavings are used to precipitate the gold, but no figures are available as to the cost of treatment and per-centage of extraction.

Active prospecting is being carried on at several of the adjacent mines, and gold has been lately struck in the Moonlight and Little Wonder mines.

The North Tasmania Mine has a small lode carrying auriferous copper pyrites and grey copper ore, and several tons of good ore have been raised in sinking the main shaft.

The Lefroy Field lies to the north-east of *Beaconsfield*, on the opposite side of the Tamar, and is connected by road with George Town (8 miles) and Launceston (27 miles). The field has had several periods of prosperity and depression, and a total of £281,875 has been paid in dividends. There are several distinct lines of reef, the Chums, Native Youth, Pinafore, and Volunteer lines, which are all approximately parallel to one another, running a little north of east, and south of west, have all had dividend-paying mines, but the payable stone has invariably cut out at a depth ranging from 300 to 450 feet. The question of deep sinking is one of vital importance for this field, and a strong effort is being made by the New Pinafore and the Volunteer companies to prove the reefs at a depth. At the New Pinafore mine a winze has been sunk 350 feet on the underlay of the reef from the 800 feet level, the bottom being 1086 feet vertically from the surface. At that depth a drive has been put in along one wall of the reef, and cross-cuts have proved the formation to be about 30 feet wide. Small patches of gold-bearing stone have been met with, and there is much reason to hope that payable stone will yet be found.

The mine is equipped with a battery, a small chlorinating plant, and a cyanide plant of a capacity of 200 tons per week. This is engaged in treating the accumulated heaps of battery tailings. For the half year ending August 31st, 1897, 2012 tons of tailings were treated

for a return of 362 oz. 13 dwts. 12 grs. gold, the cost of treatment being about 4/6 per ton. During the same period the chlorination works yielded 140 oz. 9 dwts. gold from 174 tons of mixed concentrates, slimes, and tailings, and 212 ozs. 14 dwts. were saved in the battery from 650 tons quartz crushed. This Company has paid £70,500 in dividends. At the Volunteer mine a winze is being sunk by means of an air-winch from the 600 feet level and is down 599 feet below that level, sinking still proceeding.

A small cyanide plant has lately been erected. The gold is precipitated with charcoal, and the percentage extracted is said to be highly satisfactory; 239 ozs. gold have been obtained to date. 10,486 tons of quartz have been crushed from this mine for 27,754 oz. 5 dwts. of gold, worth £109,092, out of which £60,625 has been paid in dividends.

A little gold is being obtained from the New Golden Point and Crown mine, and active prospecting is going on in various parts of the field with encouraging results. Prospecting is also going on at Golconda, Panama, and Denison, and at Lisle there are between 30 and 40 diggers at work. This field in the past has yielded a large amount of alluvial gold, and there is still a good deal of ground which would pay to work if a good supply of water could be obtained. At the Mount Victoria gold-field prospects have improved during the past quarter. 20 tons of quartz from the Ringarooma mine yielded 51 ozs. gold, and 73 tons from the Mercury mine yielded 76 ozs. At Warrentinna the Derby G. M. Co. have crushed 620 tons for 235 ozs.

At Mathinna the New Golden Gate mine still keeps up its reputation, and the stone shows no sign of decreasing in value with depth. This mine has the distinction of being the deepest in the colony, the main shaft being 1280 feet deep, and it is the intention of the Directors to sink to 1330 feet before opening out at 1300 feet. The company has been wonderfully fortunate in being able to reach this depth without pumping machinery. At present the mine is kept drained by baling for two or three shifts a week, the water in the meantime being dammed back in the north drive and east cross-cut at the 1100 feet level. At the 1000 feet level there is a splendid body of stone, and a winze is being sunk close to the shaft on what is known as the "new make" in payable stone. The output is about 400 tons of quartz per week, which is crushed in a well equipped 40-head battery, the pyrites being concentrated on Frue vanners. To treat the tailings a cyanide plant has lately been erected with a capacity of 400 tons a week. At present it is treating the large heap of accumulated tailings, but is so arranged as eventually to treat the tailings direct from the battery. Charcoal is used as a precipitant, but no figures are to hand as to the result of the first clean-up.

Up to September 30, 1897, 107,011 tons of quartz had been crushed from this mine for 97,962 ounces of retorted gold, which has realised £350,000, and of this £163,200 has been paid in dividends. The cost of mining and crushing, repairs and renewals to plant, and

all other expenses of working and management, amounts to £1 10*s.* 9*d.* per ton of quartz crushed, equivalent to 8 dwts. of gold.

Very little gold is being obtained in the district outside the parent mine. Some small parcels of stone have been crushed from the Twilight mine, and part of the mine is now let on tribute. At the Jubilee prospecting is going on at the 160 feet and 260 feet levels. At the Hatherton (late Chester and Murray's) the shaft is 350 feet deep, and a cross-cut is being driven to cut the Old Boys' main reef. Work has been suspended at the Golden Spur mine, immediately north of the New Golden Gate, but the results obtained from the latter mine should encourage the various companies to sink deeper.

North of Mathinna, in the neighbourhood of Dan's Rivulet, a good deal of prospecting is going on, and some rich stone has been obtained, but the reefs are, as a rule, very patchy.

At Mangana the New Sovereign Company has resumed work on the Old Union Reef, and the mine is being systematically opened up. Prospecting is also going on at the Golden Gully and on the old Fingal mine. Unfortunately for this district, a great deal of the most likely country is freehold and is, consequently, very little prospected.

In the West Coast District a little alluvial gold still continues to be obtained from the Queen River and Ring River fields, but the attention of prospectors is principally directed towards copper-bearing minerals. The gold contained in the blister copper shipped by the Mount Lyell Company is included under the head of copper.

To the north of the Pieman River there is a large extent of auriferous country, but prospecting is difficult, owing to the dense vegetation. The creeks in the neighbourhood of Long Plains have yielded a large amount of alluvial gold. The richest patches have been worked out, but a few diggers still make a living out of it. The largest nuggets yet found in the Colony were obtained in the Rocky River in 1883, one weighing 243 ounces and another 143 ounces.

PRODUCTION OF GOLD IN TASMANIA.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
* Previous to	Ounces.	£		Ounces.	£
1867.....	843	2708	1882.....	49,122	187,337
1867.....	1363	4382	1883.....	46,578	176,442
1868.....	692	2536	1884.....	42,340	160,404
1869.....	137	514	1885.....	41,241	155,309
1870.....	964	3666	1886.....	31,015	117,250
1871.....	6005	23,467	1887.....	42,609	158,533
1872.....	6969	27,314	1888.....	39,611	147,154
1873.....	4661	18,390	1889.....	32,333	119,703
1874.....	4651	18,491	1890.....	23,451	87,114
1875.....	3010	11,982	1891.....	39,203	149,816
1876.....	11,107	44,923	1892.....	45,110	174,070
1877.....	5777	23,289	1893.....	37,230	145,875
1878.....	25,249	100,000	1894.....	58,059	225,485
1879.....	60,155	230,895	1895.....	54,964	212,329
1880.....	52,595	201,297	1896.....	62,591	237,574
1881.....	56,693	216,901	1897†	59,407	222,775
		TOTAL		945,735	3,607,925

* Production previous to 1867 estimated.
† Production for last quarter of 1897 estimated.

TIN.

Tin ore was first discovered in Tasmania by the late Mr. James Smith at Mount Bischoff, in 1871, and the discovery infused fresh life into the mining industry of the Colony. Since that time tin has been discovered in alluvial deposits of Tertiary to Recent age, and also in lodes and stock-works in most of the Districts throughout the Island where granite occurs, but Mt. Bischoff has been, and still is, the largest producer.

Waratah, the township of Mt. Bischoff, lies at an elevation of 1950 feet above sea level (the top of the Mount being about 650 feet higher), and is connected by railway with the port of Emu Bay or Burnie, 48 miles distant. The Mt. Bischoff mine is worked as an open quarry, the three faces being known as the White or Porphyry Face, the Brown Face, and the Slaughter-yard Face respectively. Some portions are extremely rich in tin, and a reserve is always kept of the richest stone to mix with any poor stone that may be met with, and the average grade of the crushing dirt is thus kept at between 3 and 3½ per cent. of black tin. The ore is first broken by stone-crushers at the mine, and then taken by a locomotive to the dressing-sheds about a mile distant. A splendid site has been selected

for the dressing-sheds, which are so arranged as to ensure a minimum of handling; and for elevating the sands and slimes numerous small hydraulic elevators are used, with very satisfactory results. There are altogether 95 heads of stamps, and the tin-saving appliances, consisting of jigs, revolving tables, and buddles, are very complete. The motive-power is water, which works a series of water-wheels, the same water doing duty for several wheels arranged one below the other. Dams for conserving the water have been built with a total capacity of about 800,000,000 gallons, and, except in very dry summers, such as last year, there is an ample supply, the average annual rainfall being about 80 inches. For the half-year ending June 30th, 1897, 38,134 tons of stone were crushed, equal to $4\frac{1}{3}$ tons per stamp for every 24 hours actual working time. The yield of black tin was 1230 tons, equal to nearly $3\frac{1}{4}$ per cent. The total cost of mining, including development and progressive work, crushing and dressing, maintenance of plant, management and supervision, bagging, &c., amounted to $6/7\frac{11}{20}$ per ton, an increase of $7\frac{7}{10}d.$ per ton on the previous half-year's costs, due to a reduction of 8595 tons crushed, owing to scarcity of water.

During the quarter ending September 30th, 1897, 600 tons of tin ore were obtained, and £10,500 paid in dividends, bringing the total amount of ore obtained to that date up to 51,530 tons, and the total amount paid in dividends to £1,476,000.

The tin ore is shipped to Launceston, where it is smelted in reverberatory furnaces at the Company's works, together with most of the tin ore raised in other parts of the island. For the half-year ending June 30th, 1897, 1151 tons 4 cwt. 3 qrs. 7 lbs., yielding 785 tons 12 cwt. 2 qrs. 4 lbs. metallic tin, were smelted on account of the Mount Bischoff Company, and 572 tons 1 cwt. 1 qr. 20 lbs., yielding 400 tons 11 cwt. 3 qrs. 2 lbs. of tin, on public account. The only flux used is a little lime, slack coal being used as the reducing agent. The average assay of the refined tin was 99·86 per cent., and of the slag 5·3 per cent.

Very little work is being done outside the parent mine at Mount Bischoff, but a few tons of ore have been obtained during the past quarter by the Stanhope and Waratah Alluvial Companies. The principal alluvial workings are in the North-eastern and Eastern Districts, where several deep-leads, which are sometimes capped with basalt, have been worked. In the neighbourhood of Derby the present Ringarooma River has cut through the old bed of a former tributary of the original main stream, and on this are situated the Triangle and North Brothers' Home, Krushka's, New Brothers' Home, and Briseis mines, which are now all being worked by open cut. The drift has been covered by flows of basalt, and in some cases an enormous quantity of over-burden has to be removed. The New Brothers' Home mine was formerly worked by blocking out, but arrangements have now been made for bringing in a low-level tail-race through the Krushka's mine, and the company should soon be rewarded

for the large sums they have spent in dead-work during the last two years. The wash has been proved to extend over 70 feet below the present level of the Ringarooma River, but so far little attempt has been made to work the deeper gravels. On the old Branxholm Creek lead the Arba and Ormuz Companies have produced a good deal of tin. It is highly probable that the old Ringarooma main lead contains vast quantities of tin ore, but it has yet scarcely been touched, lying too deep to be easily worked. At the Pioneer, between Derby and Gladstone, a large excavation has been made by the Pioneer Company, the gravel being raised by a centrifugal pump worked by steam, but it is probable that hydraulic elevators, which have been so successful in California and New Zealand, will shortly be used.

In the neighbourhood of Mount Cameron are large deposits of more recent gravels, which give employment for a good many men. Water is very scarce, but the Government race supplies about 50 men, the water being sold under the royalty system on a sliding scale varying with the price of tin. The average price paid for the water is about 3*s.* 6*d.* per sluice-head, which is approximately equivalent to 150 gallons per minute for 48 hours.

In the Blue Tier District active preparations are being made for treating on an extensive scale the large bodies of low-grade tin-bearing rock which occur in several places. The tin ore occurs as an impregnation through dykes of quartz porphyry, which are intrusive through the main country granite. At the Anchor mine a very complete crushing-mill is being erected, containing 100 head of stamps with Challenge automatic ore-feeders, jigs, Frue vanners, and buddles, the motive power being derived from a number of Pelton wheels worked under a high pressure of water. A large area of tin-bearing rock has been exposed, which can be worked very cheaply as an open quarry, and, although the bulk of it is admittedly of low grade (under 1 °/₀ black tin), the treating of it on the large scale that will soon be possible should return a good profit.

At the Liberator mine a small mill similar to the Anchor plant is being erected, and at the Australian mine the mill is being reconstructed to treat what is known as the "Puzzle stockwork." All these plants should be ready to start by the end of the year, and if their operations are successful a great impetus will be given to the industry, as there are enormous masses of similar low grade rock in the district. At Weldborough and in the St. Helen's District between 70 and 80 men are working the alluvial, mostly under Miners' Rights, the output for the past quarter being 30 tons. Water has been very scarce all the year, and this, combined with the low price of tin, has caused a great falling off in the output from this district.

In the Ben Lomond District work has been resumed at the Rex Hill mine. The tin ore here occurs associated with arsenical, iron, and copper pyrites, blende, and galena, &c., and some of the stone is very rich, but the crushing-mill needs remodelling.

At Roy's Hill, in the St. Paul's District, a little ore is being obtained by tributors, who are crushing in a Mudie mill the stone formerly raised by the Company, but no attempt at systematic mining has been made.

At Belmont tin ore occurs in small lodes in Silurian sandstone, associated with wolfram and ores of bismuth, and a few tons of mixed concentrates have lately been sent away by the Shepherd & Murphy's Company, but the returns are not yet to hand.

On the West Coast, at Mount Heemskirk and North Dundas, Tin mining is at present practically dead, not being remunerative at the present price of tin.

The following Table shows the production of tin in Tasmania since it was first exported in 1873 :—

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Tons.	£		Tons.	£
1873	3	220	1887	3607	407,857
1874	100	7318	1888	3777	426,326
1875	366	31,325	1889	3674	344,941
1876	1453	99,605	1890	3214	296,761
1877	4760	296,941	1891	3293	293,170
1878	5369	316,311	1892	3203	290,794
1879	4563	303,206	1893	3266	266,156
1880	3954	341,733	1894	3053	202,454
1881	4124	375,775	1895	2740	167,754
1882	3670	361,046	1896	2703	159,038
1883	4122	376,446	1897*	2354	145,195
1884	3707	301,423			
1885	4242	357,587			
1886	3776	363,364	TOTAL	79,093	£6,532,746

* Last quarter of 1897 estimated.

SILVER.

True silver ores are of limited occurrence in Tasmania. At Mount Lyell a small vein carrying stromyerite (copper-silver sulphide), argentite (sulphide of silver), and rich arsenical fahl-ore was discovered, which yielded several hundred tons of ore, assaying over 1000 ozs. of silver per ton, and 20 to 25 per cent. copper. Chloride and sulphide of silver and native silver have also been found in small quantities in various localities—Zeehan, Dundas, Whyte River, Scamander, &c.—and rich argentiferous falh-ore is not uncommon, but by far the largest quantity of silver obtained is associated with lead. The principal ore is galena, or sulphide of lead, but the oxidised ores, carbonate, sulphate, chromate, and phosphate of lead, are frequently found in the upper portions of the lodes. The most important silver-fields at present are those of Zeehan and Dundas,

which produce approximately 20,000 tons of ore annually, of an average value of £10 to £11 per ton at the mine.

The Zeehan field was discovered in 1885, but it was soon found that very little depth could be attained without pumping machinery, and comparatively little progress was made until the beginning of 1892, when the completion of the Government railway to the port of Strahan (28½ miles) enabled machinery to be brought in and ore to be sent away. Two smelting-works were started in 1892, but the mines were not sufficiently developed to keep the furnaces going, and they only ran a short time. It is hoped, however, that another attempt at local smelting will shortly be made. One or two of the companies ship direct to England, but the majority of the mines dispose of their ore to local agents of Australian or German smelting-works, who pay a good price for ores rich in lead to mix with more siliceous ores. A good deal of the ore is rich enough to send away without concentration, being only roughly handpicked, but the bulk of it requires concentration to make a marketable product, and all the more important mines now have concentrating mills of various patterns—English, American, German, and Australian types being all represented. Very good work is done by some of these, but the silver loss is rather high, the proportion of silver to lead in the concentrated ore being invariably lower than in the handpicked ore. The lodes throughout the district are very numerous, and, doubtless, new ones will be discovered as the dense bush is gradually cleared. The upper levels have hitherto been the most productive, but the deepest shaft on the field (the Western) is only a little over 500 feet deep, and it is highly probable that further sinking will discover other productive zones.

At Zeehan the principal producers of ore at present are the Western, Montana, Silver Queen, Oonah, Smith's Section, Argent, Queen Extended, and Comstock. To these may be added the New Mount Zeehan, Empress (late Grubb's), Montagu No. 1, Silver King, and Tasmania Crown, which are all working and raising a little ore.

Besides being the deepest mine on the field, the Western has also been the largest producer of marketable ore. The main shaft is 515 feet deep, but hitherto comparatively little ore has been obtained below a depth of 300 feet; it is, however, satisfactory to note that the ratio of silver to lead is slightly higher in the ores from the lower levels.

The concentrating mill (Lührig system) is designed to treat 50 tons per shift of eight hours. During the half year ending 31st March, 1897, the mill treated 11,253 tons of second-class ore, producing 1134 tons of concentrates, containing 562 tons of lead and 101,943 ozs. silver. During the same period 737 tons of first-class ore and 5½ tons of gossan were raised, the average assay of 1875 tons shipped being nearly 51 per cent. lead and 98 ozs. silver per ton. The average nett value of the ore was £11 3*s.* 5*d.* per ton.

Up to 30th September, 1897, the company had sold and shipped 24,902 tons (nett dry weight), valued at £296,114, and paid £84,750

in dividends. An air compressor and rock-drilling plant has lately been added, and it is intended to sink the main shaft a further distance of 200 feet.

The Zeehan-Montana mine is a large producer of high-grade ore, and promises soon to take first place.

During the quarter ending 30th September, 1897, the output was 820 tons of hand-picked ore and concentrates, containing 74,151 ozs. silver and 543·29 tons of lead, valued at about £13 14*s.* per ton after deducting £5 2*s.* 6*d.* per ton to cover cost of freight, smelting, &c.

Hitherto the second-class ore has been concentrated at the Argent mill about a mile distant, but a concentrating plant is being erected at the mine, and will soon be completed. The mine has also been lately equipped with more powerful pumping and winding machinery (out of the proceeds of the ore sold), and it is intended to sink the shaft 1000 feet and test the lodes thoroughly at a depth. The result will be watched for with much interest, and if good ore is obtained at that depth the permanent prosperity of the field will be practically assured.

At the Oonah mine a Lührig concentrating mill is being erected, and is nearly ready. Pending its completion work has been restricted underground to avoid double handling of the second-class ore. This company has raised 6134 tons of ore, realising £78,587 nett, out of which four dividends of 3*d.* each, amounting in all to £5300, have been paid. The Junction mine has been acquired by the Oonah company and is at present let on tribute.

The Silver Queen P.A. has an extensive property, traversed by numerous lodes, some of which have yielded a great deal of high-grade ore, and regular monthly dividends were paid for some time. The concentrating plant by May Bros., of Gawler, S.A., which was originally erected at the No. 1 Mine, has been removed to what is known as the No. 4 Mine, and has been much improved by the addition of Frue vanners. It is lighted by electric light. The output from this mine has somewhat fallen off of late, but active development work is being carried on.

The Queen Extended Mine is worked by tributors, being divided into six blocks, and some very good ore is being won.

The British Zeehan (Argent) Mine is also principally worked on tribute, the second-class ore being concentrated at the company's mill, made by Green of Aberystwith, to which has been added a Bartsch revolving percussion table for slimes.

On Smith's Section some very high grade ore is being raised, and several tribute parties are doing well.

The New Mount Zeehan Company has a concentrating mill by May Bros., and the Silver King Company one by Parke and Lacy. The latter mine is let on tribute.

In the Comstock District several new finds of galena have lately been made.

At Dundas the Comet mine keeps up an output of from 200 to 250 tons of marketable ore per month, but it is of rather low grade, being worth only a little over £5 per ton at the mine. Water has been very troublesome at this mine, and the main shaft is provided with a powerful pumping plant. The concentrating mill, formerly at the New Tasmania mine, has been re-erected at the Comet with the addition of Bartsch Tables. From the West Comet several small parcels of very rich ore have lately been sent away. These are the only two mines at present raising ore in the Dundas District, but the M'Kimmie mine should soon be a producer.

In the Ringville District mines are being opened up in all directions, but, as the ores are mostly argentiferous copper ores, they will be mentioned under the head of copper.

The returns from the Zeehan and Dundas Fields show a slight falling off in quantity during the past quarter,—the total quantity shipped being 4655 tons against 5350 tons for the corresponding quarter of 1896; but the average value has been well maintained,—the fall in the price of silver being compensated by the rise in the price of lead.

Very little work is being done on the Whyte River and Heazlewood Fields, but a few tons of good ore have been lately sent away from the Confidence and Mount Stewart Mines.

At the Magnet Range, near Waratah, the Magnet mine promises to be a large producer of high-grade ore when properly opened up.

PRODUCTION OF SILVER-LEAD ORE IN TASMANIA.*

Year.	Quantity. Tons of 2240 lbs.	Value.
		£
1888	417	5838
1889	415	7044
1890	2053	26,487
1891	4810	52,284
1892	9326	45,502
1893	14,302	198,610
1894	21,064	293,043
1895	17,908	175,957
1896	26,106	285,106
1897 (last quarter estimated)	19,450	214,000
TOTAL	115,851	1,303,871

* Including some Silver-Lead bullion and argentiferous copper ore from Mount Lyell.

COPPER.

The successful inauguration of the Mount Lyell Mining and Railway Company's reduction works has introduced a new era of mining in Tasmania, and copper mining has become of more importance than any other branch of the industry. From first to last everything in connection with the Mount Lyell Mine has been carried out with the utmost energy, and nearly £400,000 was spent in construction and development works before any return was made to the shareholders. A railway 13 miles long has been constructed from Teepookana on the King River to the Reduction Works at Queenstown, through most difficult country; about 4½ miles of this distance has a gradient of 1 in 20, which is worked on the Abt system, with a rack-rail in the centre of the track. Teepookana is about 6 miles from the mouth of the King River, and, as only lighters and small steam launches are able to get across the bar, double handling of all goods is necessary, and it is probable that the line will eventually be continued to deep water on Macquarie Harbour.

The mine is situated at Gormanston, which is about four miles by road from Queenstown, but only about a mile and a half in a straight line. It is worked in benches as an open quarry, but exploration work is also carried on by means of tunnels, winzes, &c. Rock-drills worked by compressed air are used, and the charges are fired by electricity. The ore as it is broken is taken over the haulage line to the reduction works by means of a stationary engine at the highest point of the track. It is treated by what is known as the Pyritic Smelting Process, being smelted without previous roasting in large water-jacket furnaces with the addition of quartz and limestone as fluxes, and a very small percentage of coke. A hot blast is used, and the heat generated by the oxidation of the sulphur present in excess of what is required to form a matte helps to keep up the temperature in the furnace. The products are matte, containing most of the copper, gold, and silver of the original ore, and slag, which falls into water and is carried away in a granulated form. The first matte is resmelted in another somewhat smaller furnace, and the resulting matte, known as converter matte, containing from 50 to 55 per cent. of copper, is melted in a special furnace, and run into one of the Bessemer Converters, where, under the influence of a light blast, it is converted at one operation into blister copper, containing between 98 and 99 per cent. metallic copper, the oxidation of the sulphur, iron, and other impurities affording sufficient heat to keep the copper in a molten state. Although smelting operations were started about the middle of 1896 with one furnace, it was not until the completion of the Converter Plant in January of this year that a marketable product in the shape of blister copper was produced. The second furnace was blown in on October 6th, 1896, and for the half year ending 31st March, 1897, 34,069 tons of ore were smelted, producing 2657 tons converter matte, containing, according to assays, 1463 tons of copper, 90,332 ounces

of silver, and 6528 ounces gold, valued at £108,506. During the same period, 1177 tons of converter matte were treated, yielding 553 tons blister copper, assaying 98·74% copper, 64·86 ozs. silver, and 4·29 ozs. gold per ton. The costs per ton of ore treated were as follows :—

	£	s.	d.	
Mining operations	0	1	8·27	per ton.
Removal of overburden	0	2	0	„
Smelting operations.....	0	18	1·64	„
Converter operations	0	3	10·39	„
TOTAL	£1	5	8·3	

which will probably be reduced as the plant is extended. Up to date, 31st March, 1897, a total of 42,297 tons of ordinary run of ore had been smelted, producing 3535 tons of converter matte, the average extraction per ton of ore as mined (wet weight) being 4·6% copper, 3 ozs. silver, and 0·192 ozs. gold.

These figures agree very closely with those of Dr. Peters, Jun., the eminent American specialist in copper smelting, who estimated that there were at the time of his visit 4½ million tons of ore in sight, of an average value of 4·5% copper, 3 ozs. silver, and 0·125 ozs. gold per ton.

During the last half-year three additional furnaces have been completed,—two of the same size as the first two, and the third rather shorter, for matte concentration. The capacity of the plant is now 500 tons per day, and it is one of the most complete and modern plants in existence. It is proposed gradually to extend the plant to a capacity of 1000 tons per day. Detailed figures are not yet to hand as to the result of the last half-year's operations ; but, up to September 29, 1897, 3265 tons of blister copper had been shipped,—being 2790 tons for the half-year.

The North Mount Lyell, South Mount Lyell, West Mount Lyell, Lyell Tharsis, and others, have started to work in a practical manner, and have good prospects.

The belt of copper-bearing country has been traced from Mount Lyell past Mount Tyndall, Mount Read, Mount Murchison, and, north of the Pieman, extends through to the Rocky River and Savage River.

At Mount Read (the Hercules Group) active work is going on, and large bodies of ore are exposed. The ores of this field are very refractory, consisting of complex sulphides of zinc, lead, copper, and iron, but are generally rich in silver and gold. The best method of treatment has not yet been decided upon. The Hercules Company are preparing to construct a tram-line to connect with the North-east Dundas Government Line. In the neighbourhood of Ringville several mines are opening up well, including the Curtin-Davis Group, Fahl Ore, Rich, and Ring Prospecting Associations ; and 50 tons of ore

have been sent away from the South-west Curtin-Davis, valued at £13 per ton. At the Colebrook a very large body of low-grade ore has been opened up, which, from its composition, should be easy of treatment. At Mount Black the Tasmania Copper Company are opening up large bodies of ore; and several other properties in the District have good prospects, but little can be done until railway communication is established. A very extensive belt of copper-bearing country has been traced from Mount Black to the Pieman River, and thousands of acres have been applied for between the Murchison and Mackintosh Rivers. Some of these Sections have good prospects; and the Waratah-Zeehan Railway, which is now in course of construction, will open up a large field. It must be remembered, however, that the ore bodies are nearly all of low grade, and can only be profitably treated by working on a large scale, requiring a very large preliminary outlay. In many cases the mere presence of traces of copper has been sufficient to warrant the flotation of Companies; and much harm will be done to the industry by the foisting of so many "wild cats" on the public.

At the Rocky River and Savage River work is steadily going on, but no fresh developments have been lately reported.

Copper pyrites occur in limited quantities in most of the silver-lead lodes throughout the Island: at Badger Head, Saxon's Creek near Frankford, Mount Maurice, Beaconsfield, and many other localities, and some of them are again receiving attention.

At the Scamander River some very good oxidised copper ores (argentiferous) have been raised from the Eastern Proprietary Mine, and at the North Scamander Mine a strong lode is being prospected, carrying copper pyrites containing a little gold and silver, with galena blende, magnetic pyrites, &c.

COAL.

Coal is found in Tasmania in rocks of two distinct geological ages, the Lower Measures belonging to the Permo-Carboniferous system of the Palæozoic division, and the Upper Measures to the later Mesozoic rocks (Triassic or Jurassic). The beds of both ages are much faulted and broken through by intrusive masses of diabase greenstone. The Lower Measures are of limited extent, being found principally in the basins of the Mersey and Don in the North, and at Adventure Bay and Port Cygnet in the South. The coal is of a good quality, but the seams are few and comparatively thin. The principal collieries are the Russell and Dulverton collieries, near Latrobe, but the output was only 825 tons for the quarter ending September 30, 1897.

The Upper Measures are extensively developed in the eastern and south-eastern parts of the Island, and pits have been opened at different times in numerous localities.

The most productive coal-field is that of the Mount Nicholas Range, where there are several seams of workable thickness. The

two principal mines are the Mount Nicholas and Cornwall,—the former worked on the Long-wall system, and the latter with Pillar and Board. During the past quarter 7091 tons of coal were raised from the Mount Nicholas Mine, and 4713 tons from the Cornwall Mine.

The coal is non-caking, of good quality, but has a large percentage of ash—85%. The Mount Nicholas Railway Station is 78 miles from Launceston, and 141 miles from Hobart, and the consequent heavy freights preclude any export trade; but these collieries will be able to supply all local requirements for many years to come.

A third mine, known as the Jubilee, has lately been started but has only sent away 100 tons.

A little coal is also raised at Jerusalem and York Plains. Cannel coal of excellent quality has been found at Barn Bluff; and a discovery of what is said to be a good coking-coal has lately been reported from Mount Pelion.

The following table shows approximately the production of coal in Tasmania,—accurate figures not being available previous to 1880:—

Year.	Quantity.	Value at market.	Year.	Quantity.	Value at market.
Previous to 1880.....	Tons. 145,114	£ 115,000	1889.....	Tons. 36,700	£ 33,030
1880.....	12,219	10,998	1890.....	50,519	45,467
1881.....	11,163	10,047	1891.....	43,256	38,930
1882.....	8803	7923	1892.....	36,008	32,407
1883.....	8872	7985	1893.....	34,693	27,754
1884.....	7194	6475	1894.....	30,499	24,399
1885.....	6654	5989	1895.....	32,698	26,159
1886.....	10,391	9352	1896.....	41,904	33,523
1887.....	27,633	24,870	1897*	44,572	35,657
1888.....	41,577	37,420			
			TOTAL	630,469	533,385

* Last quarter of 1897 estimated.

IRON.

Iron mining has not as yet assumed much importance in Tasmania, though large deposits of very pure red and brown hematite are known to exist in various localities. Lately, a few hundred tons of iron ore have been shipped from the Penguin District, and it is hoped that it may lead to a large export trade.

BISMUTH.

Bismuth is found in small lodes on the Shepherd and Murphy's Mine, Belmont, associated with tin-ore and wolfram. Several small

parcels of hand-picked bismuth ore containing carbonate and sulphide of bismuth have been sent to England, the bismuth contents realising 3*s.* 11*d.* per lb. Bismuth is also found in lodes at Mt. Ramsay and at Mt. Murchison. Some years ago a large lump of native bismuth, weighing 55 lbs., was found in the tin drift at Weldborough.

NICKEL.

Nickel ores occur in Serpentine at Dundas and at Heazlewood, and some rich ore has been raised, but not in any quantity.

Other mineral products are freestone, from the coal measures, much used for building, especially in the south; limestone, which is quarried near New Norfolk, Beaconsfield, and Latrobe; basalt and greenstone, used for foundations, road-making, &c.

In comparison with her area, it must be admitted that the mineral resources of Tasmania are very great, and doubtless fresh mining fields will be opened up as railways are gradually extended and permit of ready access to parts as yet but little explored. For the last few months there has been a regular "boom," especially in West Coast mines, and it cannot be denied that advantage has been taken of this to float companies for purely speculative purposes, which all true friends of the mining industry must deplore.

Much of the general information contained in the foregoing pages is taken from the Mineral Resources of Tasmania, by Mr. A. Montgomerie, M.A., late Geological Surveyor for Tasmania.

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