

## REPORT ON THE ZEEHAN-DUNDAS MINERAL FIELDS IN FEBRUARY, 1896.

*Mines Office, Launceston, 8th May, 1896.*

SIR,

I HAVE the honour to forward to you some observations on the progress of the Zeehan and Dundas fields, as noted during a short visit in February last. Owing to my illness during the greater part of March, and press of accumulated office work consequent on my absence, I regret to have been unable to send in a Report sooner.

Having described these fields pretty fully during 1895 and previously—(see "Report on the progress of the Mineral Fields in the neighbourhood of Zeehan," &c., dated 15th May, 1895, and former Reports therein mentioned)—it will only be necessary now to supplement the information previously given so as to bring it up to date. On this occasion I visited most of the mines actively at work in the vicinity of Zeehan, then went out to those near the Town of Dundas, and later on to the North-East Dundas and Mount Read Districts; but owing to illness I had then reluctantly to abandon my intention of visiting some new ground that has been taken up in the vicinity of Mount Tyndall and the head of the Henty River, and of going thence across country to Mount Lyell.

*Geological Notes.*—Since last Report a good deal of information has been gained as to some of the geological features of the district which is worth putting on record. The most important is that relating to the so-called "White Rock" of the Zeehan district, about the nature of which there has been a good deal of doubt. It occurs in the Western, Montana, Junction, Oonah, Silver Queen, Silver Queen Extended, Mount Zeehan (British), and elsewhere along a belt of country running north-westerly to north north-westerly across the field, conformably with the general strike of the associated Silurian strata. This belt has as yet proved the most productive portion of the district, and the galena in it is as a rule richer in silver than that from the parts where the white rock is not found, giving rise to an apparently well founded belief that this is the most favourable "country" for the existence of valuable lodes. In my last Report it was considered to be of rhyolitic nature, but had not been analysed or examined with the microscope. It has now been subjected to petrographical examination by Messrs. W. F. A. Thomae, late of Zeehan, and W. H. Twelvetrees, of Launceston, who have determined it to be a melaphyre. Mr. Thomae, in a paper on "The Zeehan and Dundas Silver Field, Tasmania," read before the Institute of Mining and Metallurgy, London, on 20th November, 1895, describes it as follows:—"This volcanic rock is a grey greenish, in some places dark green, hard rock, weathering to a soft red or yellow earth, amygdaloidal, the cavities being filled with delessite, siderite, calcite, and rarely with quartz. It gets very hard at a depth of a few hundred feet, where it is less decomposed. Here it apparently consists chiefly of altered plagioclase felspar and augite with its characteristic decomposition products, and both physical and chemical characteristics point to its being a melaphyre." Mr. Twelvetrees is describing the rock at some length in a paper to the Royal Society of Tasmania this year, and has been so good as to let me have his notes, from which the following abbreviated description has been prepared:—"Hard grey rock dotted with black spots from the size of a pin's head upwards, obtained from the Silver Queen mine: specific gravity, 2.80; microscope slides show glassy groundmass devitrified to some extent by globulites and felspar microliths; the felspar is labradorite, or closely akin thereto; the sections show numerous pores and cavities, often more or less filled with chloritic substance, probably delessite, sometimes with calcite, siderite, or more rarely, quartz; the rock is an originally vesicular basalt, much altered by decomposition and re-arrangement of its mineral constituents, and falls thus among the melaphyres."

In various parts of the field we find stratified beds of fragmentary volcanic material regularly interbedded with ordinary sedimentary material, a feature well seen in the southern tunnel on the Oonah lode, and these are without doubt the tuffs belonging to the lavas above described. It is clear that both lavas and tuffs were laid down during the period of deposition of the Silurian strata associated with them, and from the regularity of the bedding of some of the tuffs it is probable that the eruptions were submarine. The tuffaceous beds would probably be widespread over a large area in the neighbourhood of the points of eruption, while the lavas would be massed more or less closely round these. As beds of slate of considerable thickness are found separating the lava sheets, we must conclude that, as usual, the eruptions were intermittent and extended over considerable periods of time. These considerations will help to explain the distribution of the melaphyre lavas and tuffs.

in the district. The whole series has after deposition been subjected to very severe contortion, which has twisted the strata into very irregular folds. No doubt dykes of basalt or melaphyre must accompany the lava flows and tuffs, but few, if any, of these have been certainly recognized, and we may now regard it as pretty well established that the bulk of the Zeehan "White Country" consists of melaphyre lavas and tuffs intercalated conformably among the Silurian strata and belonging to the same period.

The extension of the Western Company's tramway to the northward has laid bare, in a cutting close to the Western Extended mine, a bed of mudstone full of rounded pebbles of sandstone, granite, and other older rocks of the district, lying unconformably on the Silurian strata. This is probably of Tertiary age and marine origin, but as yet no fossils have been found in it. Apparently there is only a small patch of this mudstone formation at this point, but it is liable to occur elsewhere in the district, and would have to be sunk through in searching for lodes. Like the high gravels on the track from Zeehan to the Pieman crossing at the junction of the Stanley River found a little further north, and those of the Eureka tin mine, North Dundas mine, and Eden railway ballast-pits, this deposit bears testimony to the fact that in comparatively late geological times the whole of the lower-lying parts of the Zeehan field were submerged below sea-level. It even seems probable that some of the existing topographical features are due to marine erosion, the flat valley in which the most of the town of Zeehan lies and the Argent flats evidently owing their shape to some other agency than the erosion of running streams. The valleys have wide flat bottoms, not filled with alluvial matter, but having the bed-rock planed down to a nearly level surface, and the enclosing hills rise very abruptly from them with steep slopes. The likelihood of the Silurian formation having suffered very little erosion since perhaps the middle of the Tertiary Period must be taken into account in any speculations as to possible chemical changes that may have taken place in the superficial portions of the lodes. It is believed by a good many persons, as a result of very general experience of this field, that the superficial portions of a great many lodes have been enriched by a chemical concentration in them of silver and lead, and the long period of time which the above considerations show to have been available for such chemical action to have gone on gives some support to their view.

Two other interesting instances of parts of the present land surface being nearly identical with very much older surfaces are seen on the top of Mount Reid. Near the South Mount Reid mine, and on the crown of the ridge almost opposite the Mount Reid workings, are seen two or three small patches of a soft conglomerate made up of coarse gravel and small boulders set in a mudstone matrix. I have not been able to find any organic remains which would show indisputably the age of these conglomerates, but from their position and composition they seem most likely to be portion of the Permo-Carboniferous beds seen further east on the Eldon Range and Mount Pelion. The formation has on Mount Reid been all swept away except these few remaining patches, but they are sufficient to show that the present surface of the top of Mount Reid is nearly the same as existed when the Permo-Carboniferous beds were laid down. The other instance above referred to occurs on the western spur of Mount Reid two or three miles to the north of the Mount Reid workings. Here yet another conglomerate, quite unlike the last, is found resting unconformably on the older schists. This is portion of the widespread formation of Upper Silurian or possibly Devonian age seen on some foothills of Mount Murchison to the eastward of Mount Reid, on the Pimple, on Mounts Pearse, Farrell, and Claude, and on Mounts Lyell and Owen. On North Mount Reid it has almost entirely been removed, but a few patches are left to show that the present surface must be very nearly the same as that upon which these ancient gravels were laid down. Of course enormous erosion has gone on in comparatively modern times in the valleys of the Ring River and other streams heading from Mount Reid, and it is not contended by any means that the shape of the existing surface of the old schists is anything like the same as that of the ancient one upon which the conglomerates were laid down, but it does seem probable that the portion of the old schists containing the deposits of sulphide ores now being mined has been for an enormous length of time comparatively near to the upper surface of the schist formation, and that though it may have been once and again buried deep under an accumulation of later strata, it has been more than once denuded of these, and brought within reach of the chemical action of the atmosphere and superficial waters. If these have any effect in forming or altering such deposits it would appear, therefore, that there has been ample time and opportunity for them to exercise their influence.

*Railways and Tramways.*—During last session of Parliament an Act was passed to enable the Van Diemen's Land Company to make a railway from Waratah to Zeehan, but as yet no active steps appear to have been taken to begin its construction. The making of a light railway from Zeehan to North East Dundas was also authorised as a Government work, and good progress has been made with this, construction following close on surveys. A few miles at the Zeehan end are said now to be finished, and before long the line will be very useful in taking out supplies and machinery and bringing back firewood and timber, even if very little ore is carried just at first till the more developed mines of the Upper Ring River Valley are reached. At the time of my visit it was proposed to have the terminus somewhere in the Ring River Valley at the foot of Mount Reid, where the ores from the Hercules and adjacent mines could be readily run down to it, but the survey was expected to be continued over the deep lead saddle towards the Rosebery district. Owing to the broken nature of the country the line is very full of curves and bends, but a



*Concentration Losses.*—In my last Report considerable attention was given to the losses of silver during concentration which occur in the dressing mills. I regret to say that in one matter there was a rather serious inaccuracy which has been pointed out to me by Mr. Luke Williams, formerly manager of the Grubb's mine. This was in some experiments attributed to Mr. Johnson, then assayer at Grubb's mine, but which were really designed and carried out by Mr. Williams. The results of the experiments quoted by me, and the description of the method of carrying them out, were given to me in conversation by Mr. Johnson without reference to his books, and the information turns out to be inaccurate. Mr. Williams has kindly supplied the exact figures, which are as follow:—

The experiments were conducted by putting a number of small pieces of ore of ascertained assay value into a small pocket of wire netting hung near the side of the jig some six inches above the sieve, where water passed in and out of the pocket at every stroke of the jig plunger, leaving them there for some time, and then assaying them. The loss shown is very much less than the figures quoted in my previous Report, though still very serious. The whole subject of the efficiency of the concentration treatment of the galena ores of the Zeehan district requires rigid investigation, to find out the exact causes of loss and the means of preventing it. An increased saving of even 5 per cent. of the silver passing through the mills would mean thousands of pounds annually added to the production of the district.

*Zeehan-Montana mine.*—Two levels have been opened from the main shaft, at 112 feet and 192 feet, and at each of these a large amount of driving has been done. The lower level was full of water at the time of my visit, and could not be examined; it is said to have been hitherto very barren. At the upper level driving and stoping have been steadily carried on upon the four lodes in the vicinity of the shaft, and a long cross-cut has been run out westward to intersect what is known as No. 6 lode. A tunnel from surface has also been driven on this lode, which has been a very good one. At the 112 feet level it has been driven along both north and south, and, though not so good as in the tunnel, still promises fairly well. At the time of my visit there were seven parties of men at work stoping on five different lodes, four drives were being extended on lodes, and the main western cross-cut was being pushed forward. A peculiarity of this mine is that ground apparently barren where passed through in the levels has turned out payable in many instances when it has been stoped, the ore lying in small patches and bunches all through it. The policy of the mine has come to be to stop the lode even where little or no ore is showing, and in the main it has proved successful, the working having resulted very profitably. The output of ore since the present company took possession of the mine has been:—

The main shaft is only 120 feet from the eastern boundary of the property, and the lodes have an easterly underlay, besides which the effect of the slides met with in the mine is to heave them to the eastward. It has therefore become evident that there is not much use in sinking the present main shaft deeper, except for No. 3 lode, unless the company can acquire a portion of the adjoining Silver Queen section 1636M. It is now proposed to sink a new main shaft nearer the centre of the section to work No. 6 lode and another one seen on surface about 200 feet west of it, and to cross-cut from this east and west. The cross-cut from the 112 feet level is therefore being pushed on westward in order to cut any lodes that may be in that direction and to give information as to the best position for a new shaft. The property has been a good one so far, and there is little doubt that, if well developed as proposed, it will continue to give good profits in the future.

*Mount Zeehan (Tasmania) Silver-Lead Mines.*—The work done by this company during 1895 has been confined to what is known as No. 8 lode, on which workings are being carried on at the 60 ft. and 110 ft. levels. There is a large lode of pyrites to the east of the shaft, the outcrop of which is seen at surface, and with this appear to be associated two or more somewhat irregular veins of galena and blende. At the upper level the galena lode is to the west of the pyrites, but at the lower one it seems to have come in to the wall of the large lode, which here has ore on both sides of it. A great many smooth walls are encountered in the workings, which render the tracing out of the various branches of the veins very difficult and tedious, a lot of cross-cutting being still required to prove how many separate veins are here present and what are their relations to each other. Some good ore has been obtained from these workings, but on the whole they are rather poor. In a winze to the north of the shaft, at the bottom level, a nice vein of galena was seen going down, and this, I understand, has since improved.

A large number of tributors have been mining on this company's property, eight parties being at work at the time of my visit. Flaherty and party were getting out some very rich gossany ore and fair galena; Keddie and party had had a very profitable tribute, and at Bayley's tribute I saw some of the purest galena ever met with on the field, while other parties had worked with varying success. The plan of the sections in the manager's office shows some 24 or more apparently separate lodes which have now been worked, mostly by tributors, and it is evident that the argentiferous veins are very numerous. New ones are continually being found. The shallow workings made on the outcrops by tributors are useful in showing the strike and dip of the lodes, and so indicating the best position for shafts to be sunk to work them on a large scale, and it is now evident that three or more main shafts are required. The property is, in my estimation, a valuable one, but is too large to be done justice to by the present company, and would be best divided amongst several proprietaries, each with capital enough to sink a main shaft and make the necessary cross-cuts and other exploratory work.

*The New Mount Zeehan Mine.*—Preparation was here in progress for resumption of work, and it is to be hoped that the numerous lodes known to exist on the ground will now receive a fair trial.

*Oonah Mine.*—Steady and successful work has been carried on in this mine during the past year. The deepest level, No. 4, is 260 feet below the mouth of the shaft, or 205 feet below the adit. Two nice shoots of ore have been cut in it, one apparently the downward continuation of the ore worked above by the Junction Company on the boundary, the other being that seen in the winze from the level above. There seems a strong likelihood that another shoot will be struck on extending the drive still further south. In the stopes above this level some very fine ore was seen, massive galena of fibrous appearance, quite similar to the richest ore got near surface. As the lode here is a good depth below surface, and in hard solid country, this ore is not at all likely to be of secondary origin, and I look upon its occurrence as showing that the rich bunches of galena found near surface in so many of the Zeehan mines were also not of secondary origin, but were primary portions of the lodes, and, consequently, that other such bunches will be found to occur also in depth. The good galena in the bottom of the Oonah mine has often a somewhat banded structure, bands of fibrous and cubical galena alternating. The country is melaphyre lavas, often very scoriaceous, and tuffs.

In the adit level connection has now been made right through to surface on the south side of the hill. On this side the lode was found in doing some surface work, and was followed northwards, yielding excellent ore. When the tributors stopped driving the main No. 1 level (adit level) south they had lost the ore, but were within 20 feet of the bunch which has since been found.

The mine is now well opened up, and should put out a good deal of ore in 1896. Nos. 3 and 4 levels should be pushed on southwards, and either the present shaft sunk deeper or a new and more central one started: the developments shown by the south end of No. 4 level will probably decide which course would be the best. Some cross-cutting for other lodes parallel to the main one might also be done with advantage.

The concentration of the second-class ore from this mine has now become a matter of consequence, and at the time of my visit it had not been certainly decided what was to be done. The proposal which seemed to me the best was one to make a tramway round by the Junction mine to the Western mill, and have the concentration done there.

*Junction Mine.*—Work was confined to sinking the main shaft when I visited this mine, but a small shaft had also been lately sunk in the south of the section near the Oonah boundary, from which it was intended to crosscut for the Oonah lode. The main shaft was to be sunk to No. 4 level, 182 feet deep, the other levels being at 122, 92, and 50 feet. No stoping has been done south of the shaft over the 122 feet level. Some fair ground, showing really good ore in places, has been opened, and will probably yield a considerable quantity of ore when stoped. The lode has been all along rather poor, but is a promising one, and may come to the front as a producer any day. On surface a tramway is being made to take the second-class ore to the Western Mill for concentration.

*Western Mine.*—The main shaft is now down to No. 7 level, 430 feet, and a great deal of work has been done in extending the drives on the lodes. In the No. 6 and 7 levels the lodes



have been barren, but had not been driven along very far; better ground is expected to be met with in them both north and south. At No. 2 level the lode has been followed north into the recently bought section formerly held by the Silver Beauty Company, and in the end there was a little galena at the time of my visit. The lower levels throughout the mine do not look so well as the upper ones, the lodes being generally much poorer, but there is still a great deal of ground to be opened up, and better ore may make again at any time. Stoping is going on above Nos. 5, 4, and 3 levels, but between this last and No. 2 the greater part has now been taken out. Good ore was seen in many places in the stopes, but for some time past there has been more and more difficulty in getting first-class ore, and the grade of the stuff sent to the mill has fallen very low. The mine is, however, still more than paying its way, and there is every hope that the extensive exploration work that is being done will soon again develop richer ore bodies. The Western Company have lately bought the North-Western Mine also, and have decided to buy second-class ores from neighbouring mines for concentration at the mill, and everything possible is being done to make the best of the situation. In the south end of the mine it seems to me that it might be advantageous to cross-cut east to the lode known in the adjacent Junction Mine as No. 2, supposed to be the Oonah lode. Search should also be made for the Zeehan-Montana No. 6 lode, which may be connected with the ore found just inside the mouth of the Western No. 2 adit.

*Western Extended Mine.*—This is situated towards the N.E. angle of Section 1062-87M. A shaft has been sunk 90 feet, and levels opened from it at 27 feet and 86 feet, but as yet the workings are of small extent. At surface to the south of the shaft two small veins from 2 to 6 inches wide, containing pretty pure galena, have been cut by trenches, and a small tunnel has been run in to the southward on the course of one of these. Both run a little east of north. The vein in the tunnel was also seen in the 27-foot level. The main lode, however, is running north-westerly with rather a flat underlay to the north-east, and in the levels is seen to be a mass of clayey mullock and lodeslate intermixed with quartz and carbonate of iron, five to six feet in width, with smooth walls. The lode was valueless when I saw it, but may improve as it is followed. Some few tons of clean galena, mostly from the small vein in the 27 feet level, have been sold from the mine, but the value in silver was not very high. The sections belonging to the Western Extended Company lie in a good position with respect to the known lodes worked further south by the Western and other mines, and are worth prospecting in consequence. The country is mainly slate and sandstone, the ground lying to the north of the melaphyre belt. It is by no means unlikely that this may be found in depth, and if so the chances of getting payable ore in the lodes would be greatly increased. The machinery at present on the mine is quite inadequate for sinking the shaft deeper and opening out the lodes as extensively as is required.

*Tasmania Crown Mine.*—The adits from the east and west sides of the hill in Section 736-87M have been connected by a drive along the third lode met with in the former, and a little stoping has been done on this vein. A tribute party has also been at work on a lode near the N.W. angle of the same section, and has stoped it out pretty completely for a length of 130 feet down to the 100 feet level. The same vein is worked by the Western Company across the boundary from Simson's shaft. It seems probable that this lode is the same as that driven along between the two adits, but if so it must take a sudden bend or be heaved considerably by a fault. Seeing that there are several considerable heaves in the adjacent Zeehan-Montana mine due to faults, it seems most probable that there has been a dislocation.

*Silver Queen Mine.*—Operations for the last year have been almost entirely confined to the vicinity of No. 4 main shaft, on the lode formerly worked on tribute by Messrs. Aird and Lamb. The company having bought out the tributors, have now entire control of the lode, and have worked it with splendid success, the Silver Queen mine having again become the largest producer of ore in the district. A tunnel has been put in from the flat ground round the main shaft following the lode southerly nearly to the boundary of the adjacent Silver Queen Extended section, and 44 feet below it is another level from the prospecting shaft known as Mace's, which also goes nearly to the boundary. The tributors' bottom level is a little lower, 60 feet from the top of their shaft, and a level has also been opened out from the main shaft at 110 feet. In the stopes over the 44 feet level at the time of my visit there was a splendid body of very pure ore, and a winze being sunk to connect with the bottom level showed this good galena continuing downwards. The bottom level had however been poor, but there was some doubt as to its being on the same lode as carries the ore, as the latter in the winze appears to be likely to lie to the eastward of the 110 feet level. The plans of the workings show in the north end a change in the strike of the lode from south-easterly to south-westerly, and it seems very probable that there are really two sets of lodes intersecting one another. A similar feature was seen in the upper levels of the Western mine, where it proved eventually that two lodes intersected one another in the form of an X. Cross-cutting on each side of the angle in the Silver Queen lode would therefore be advisable. At present the mine looks very like the Western in its earlier stages, and there is much reason to look for similar successful results. During the half-year ending 31st December, 1895, it yielded 1850 tons of first-class ore, which realised £20,991 when sold; the second-class ore has mostly been stacked for future treatment.

The concentrating plant belonging to this mine is being taken from its old site at No. 1 main shaft and re-erected near No. 4, and the mill is to be greatly improved by the addition of vanners

and other appliances to deal with the sands and slimes which cannot be treated by the jigs. In its new position the mill can easily be connected with Nos. 2, 3, and 4 main shafts, all of which are in its vicinity. The Zeehan tramway is being extended up to the new mill, which will be a great advantage.

*Silver Queen Extended Mine.*—This property has for two or three years past been chiefly worked on the tribute system, several parties having been employed on the numerous lodes and veins contained in it. It is regrettable that the owners cannot see their way to developing it more energetically. The Silver Queen lode worked from No. 4 shaft has been traced into the adjacent Section 187-87m, and a tunnel has been put in which cuts it on the boundary. The lode is here very small, and in two branches 12 to 18 feet apart. A winze has been sunk 30 feet, and the lode driven on about 30 feet each way, to N.E. and S.W., but as yet with very little success. The tunnel is extended eastward some 200 feet past the lode, keeping just inside the boundary of the section; near the end it cut through about 40 feet thickness of black clayey matter with a little gossan and quartz in it, which may be either a cross-course or a mullocky portion of a lode. A little driving might well be done on this to ascertain its nature.

The north portion of Section 187-87m has been divided into six roughly rectangular blocks of about 10 acres each, for the purpose of letting tributes, and these are numbered from 1 to 6 in succession from east to west. The tunnel just mentioned is in Tanner and party's tribute on block 1. On block 3 there is a shaft 30 feet deep, close to a small creek from which Messrs. Fahey and Hill took about 5 tons of galena. The lode is said to have shown about six inches of galena, but after following it some 25 feet to the N.E. the party had to abandon the work on account of inability to cope with the water. A cross-cut is proposed to be put in to this lode from the tunnel next to be described. This is on block 4 on Fahey's tribute, and has been driven southerly along a lode which was first found close to the creek. Here there was a little ore in it, but on trenching south along it the vein was found to consist of about 15 inches in thickness of gossan and carbonate of iron with but little galena, and valueless to tributors. The ground rising, the tunnel was then commenced and was put in 170 feet, the lode being iron oxide and blende, of small size, and valueless. Having got off the lode a cross-cut had to be made to the westward to pick it up again: it was then followed due south for 190 feet. The last 90 feet were in ore, from 6 inches to 15 inches wide, and in some stopes above the level I saw beautiful clean galena 12 to 15 inches wide. Some good gossan ore was also obtained. The country is melaphyre lavas and tuffs, much decomposed, but black slate comes in the end of the tunnel, without however cutting off the ore up to the time I saw it. The lode runs north and south and dips to the east. In this soft kindly country it would be advisable to cross-cut as often as possible in search of parallel veins of ore. This ore-body is not very large, but is promising, and a shaft should be sunk to work it below the tunnel level.

Near the centre of the north boundary of Section 188-87m a vein of galena 2 to 6 inches wide has been cut, and in another tribute block just north of this, in Section 187-87m, there is a 6-inch vein of very good ore. Both are in hard country and small, but may improve when followed. Near the centre of the eastern boundary of Section 188-87m two parallel lodes lying close together have been driven along for a distance of 200 feet by a tunnel. Near the mouth of this a shaft was sunk 35 feet in depth, but the lode, though strong, was poor, and work on it has been abandoned.

*Grubb's Mine.*—This is unfortunately now shut down, the company having got into financial difficulties. When it is re-opened it will be advisable to do a great deal more exploration work along the course of the lode than has hitherto been attempted; and there is much reason for believing that the mine will then again be successful. Its record of production is a fairly good one considering the amount of ground open.

*New Tasmania Mine.*—This also is shut down. After the company ceased working a party of tributors shifted the machinery from No. 1 to No. 2 shaft, and worked from the latter for some little time with considerable success, but eventually had to abandon the mine. Much, if not all, of the machinery has since been sold.

*Colonel North Mine.*—This property consists of two 80-acre sections, 1584-91m and 1585-91m, formerly held by the Queen and Balstrup Junction Company. There is a very large outcrop of good-looking gossan, (chiefly oxides of iron and manganese) near the centre of Section 1585, running north-westerly. A shaft has been sunk to a depth of 100 feet, when water was met with, and machinery had to be procured, which is now in course of erection. At surface the shaft is in the lode, but at 50 feet it passed into the country, showing that the lode has a northerly underlay. When this shaft has been sunk deeper, so as to be well below the oxidised portion of the lode, it will be possible to test the latter thoroughly. About three chains south of the shaft a tunnel has been driven 413 feet into the hill on which the gossan outcrops, on a course N. 40° E. The whole of the ground passed through in this is much weathered and stained with iron oxide, and it is evident that considerably greater depth must be attained in order to get below the zone of oxidation. Three large bodies of gossan were cut in the tunnel; one near the mouth, which is taken to be a lode, parallel to the main one and some 120 feet south of it, is a large likely-looking mass; the second or main lode is 55 feet wide; and the third, near the end of the tunnel, also seems a large body. There is much quartz in the face, and it is doubtful if the lode has been yet cut right



through. On the main lode a winze was sunk 60 feet, at which depth water was struck. The bottom of the winze is much on the same level as the bottom of the main shaft, and a drive about 150 feet long along the lode would connect them. This mine seems as likely as any to solve the problem of the behaviour of the big gossan lodes of the Zeehan and Dundas districts in depth. Neither in the Comet, Mount Dundas, Adelaide, nor Balstrup's lodes has the necessary depth yet been reached to get quite below the gossan, and in the case under notice it would therefore be advisable to sink right away to at least 300 feet before cross-cutting. The lodes are large and likely to be oxidised to some depth, and to avoid disappointment it would be best not to open out too soon. There is here a very good chance of success, and the venture is a highly commendable one.

*Section 2111-91M.*—This was formerly held by the Balstrup's Central Company, whose main shaft has been referred to in previous reports. Very little has been done on this section since the former owners held it, but from all appearances it should be worth energetic prospecting. In the S. E. angle of the section at the junction of a small creek running southerly with the Manganese Creek there is a very large outcrop of iron and manganese oxides, with a little carbonate of iron and galena. One piece of galena is stated to have assayed 60 per cent. lead and 40 ozs. silver per ton. The enclosing country is sandstone, and the south wall of the gossan mass, which is fairly distinct, runs about N.W. and S.E. The lode here seems to be quite two chains wide, but a good deal of work would be required to prove it properly, and as the ground is wet a good shaft and set of pumps are necessary.

*O'Rourke's Mine (Section 249-93M).*—This is close to the old South Balstrup's shaft, and affords an excellent illustration of the folly exhibited by several companies which a few years ago in a moment of scare abandoned operations after going to the expense of sinking shafts and putting machinery upon them without doing any exploration work. In this instance galena had actually been cut when orders came to cease working. O'Rourke's shaft and main workings are a little to the east of the South Balstrup shaft. A tunnel has been driven to cut a large lode running N. 35° to 45° W., the thickness of which has not been ascertained. Three parallel veins of ore have been worked in it down to a level 21 feet below the tunnel. An underlay shaft has been sunk on the footwall (sandstone) to a depth of 30 feet below the tunnel, and at the time of my visit preparations were being made to sink it deeper. When worked on a large scale it will be best to cross-cut to the lode from the South Balstrup's shaft. When I visited this mine some 200 tons of first class galena had been raised and had been sold for about £2000. When furnished with good machinery it should probably develop into a very fair mine.

*Section 260-93M.*—This lies to the S.E. of O'Rourke's, and on the line of his lode two small shafts have been sunk in wet ground, with the result of getting some galena and carbonate of iron. Nothing can be done, however, without machinery to master the water.

*Badenach's Mine (Section 288-93M).*—This also is on the line of O'Rourke's lode, and some ore has been taken out from a shallow tunnel and shaft. There appears to be a chute of ore here well worth going after. At present there is much difficulty with water, and steam machinery is required.

There is a wooden tramway from the South Balstrup shaft past the above workings (O'Rourke's, Dunnes, and Badenach's), which goes on past the old Austral and North Austral mines and connects with the Government wooden tramway. This has been very useful to the parties now working, and with a little repairing would continue to be so.

*Zeehan-Bell Mine (formerly Silver Bell).*—Very little work has been done here since last Report, the company having been in course of reconstruction. The tribute party who have the mine in their hands, in conjunction with the party on the neighbouring Silver King lease, have sunk a winze on the common boundary to a depth of 50 feet below the 115 feet level, and are preparing to open out from this. A new deeper level from the main shaft is urgently required, and also either a dressing mill or tramway connection with some neighbouring one. If the dressing ore known to exist in the mine were worked there would be a considerable addition to the output, but under present circumstances it does not pay the tributors to take it out.

*Silver King Mine.*—The work of the tribute party on the Zeehan-Bell boundary has for the last year been chiefly confined to making connection with the Bell workings, and sinking a winze on the boundary in conjunction with the Bell tribute party as above mentioned. A small pumping plant has been provided to unwater the workings below the Bell 115 feet level, but if they become at all extensive this plant will be insufficient. A lower level from the main Zeehan-Bell shaft would be the best solution of the difficulty.

At the Silver King main shaft a good deal of work has been done, levels being open at 106 feet, 176 feet, and 246 feet; a considerable amount of stoping has been done over the two upper levels. Some very fair bodies of galena were visible in the workings at the time of my visit, and the lode is strong and well defined. The galena is rather poor in silver compared with the average of the Zeehan field, carrying only about 36 ounces to the ton. To make the best of the mine it should be opened up more extensively at several levels, and frequent cross-cutting in search of parallel ore-bodies should not be neglected.

The mill has lately done a good deal of work both for the mine and for the public, but could be greatly improved in several respects. The Silver King property has for some time past been entirely worked on the tribute system, but deserves more vigorous and systematic opening up than tributors are likely to be able or willing to give it.

*Section 345-93M.* (formerly known as the Talune southern block.)—Hearing that some work was being done on this lease I went out to it, but found no one on the ground. A prospecting shaft had lately been sunk near the creek, close to where a vein of coarse-grained cubical galena was found in 1890 (see my Report on the Progress of the Mount Zeehan and Mount Dundas Silver-Lead Fields of 25th November, 1890), but this was full of water, and nothing could be seen.

*Comet Mine* (including *Maestrie's Broken Hill Mine*, which has been taken on tribute by the Comet Company.)—Steady and profitable progress has been made in this mine since my last Report, and it is still looking well. A good deal of known ore-bearing ground yet remains to be stoped above the 260 feet level, and should be quite sufficient to keep the output up until the next level is ready. The shaft has been sunk another 75 feet, total depth 350 feet, and a cross-cut at 335 feet towards the lode is now being driven. As the galena is going strongly underfoot at the 260 feet level there should be a good block of ground above this lower one. The galena is not all in one vein, but in two or more parallel ones separated by bands of dolomite and gossan, and a good deal of cross-cutting is necessary in order to make sure of keeping all the veins in sight. The new bottom level, being only 75 feet below the present workings, will probably find still a great deal of gossan in the western part of the large lode, which has to be cut through before the galena veins are reached. No time should be lost in again sinking the main shaft as soon as the new level is in to the ore body and the work can proceed conveniently.

The dressing-mill is still a very crude one, but is expected soon to be improved, so as to be fit to dress properly the second-class ore, and the accumulated heaps of seconds which have been roughly treated by the existing plant. There is a good deal of second-class ore fit for dressing still in the stopes, which will be taken out when the mill is ready. There is also a lot of very good gossan ore carrying carbonate of lead, which will not concentrate well, but would be excellent fluxing material for smelting. The galena in this mine is rather below the average in silver, the selling value being from £5 to £6 a ton.

A long flume has been constructed to carry the creek well over the outcrop of the big lode, and thus keep its water as much as possible out of the mine. The water discharged from the pumps, however, runs north through the Comet adit to the mill, and as it runs over the upturned edges of the strata, and these are somewhat porous, it seems rather probable that a good deal gets back again into the ground in this portion of its course. To detect if this is so the stream should be gauged close to the shaft and also at the outlet of the tunnel, and if it should prove that there is appreciable loss it would be advisable to put in boxes to carry the water instead of letting it run over the bare rock.

*West Comet, (formerly Central Dundas) and Mount Dundas Mines.*—The West Comet Silver Mining Company, No Liability, now hold the ground formerly belonging to the Central Dundas Company, and have also taken the adjacent Mount Dundas Mine on tribute for five years. At the time of my visit preparations were being made to resume working from the Central Dundas main shaft, which is down 60 feet below the West Comet adit. For this purpose a 12-inch lift has been put in the shaft, and is proposed to be worked by flat rods through the adit from a water-wheel 20 feet in diameter, with 4 feet breast, driven from the Comet Creek. I am very doubtful as to whether this arrangement will answer, and would much prefer to see a good engine on the shaft so that the mine might be opened out in depth in a way to do justice to it. It is at present proposed to unwater the main shaft and connect the bottom level from it with Creer's shaft, which is to be deepened.

These two mines will always be best worked in conjunction, and it is a pity that the attempt to re-open them is not being made in a more efficient fashion, but the capital of the owners is not enough to do as much as could be desired. The lode has always given excellent promise of being payable if properly developed, and it is to be regretted that it has not been taken in hand by a strong company able to put suitable machinery upon it, and to open it at several levels from a deep main shaft.

*Section 2357-87M* (formerly Dundas Extended Company's.)—Not having previously seen this mine, I made a visit to it on this occasion, though no work has been done on it for some time. An adit has been driven some 200 feet or so to cut the lode, and a shaft has been sunk to a little below the adit level. The lode is a large mass of gossan containing a vein of chromate of lead, which probably corresponds to a vein of galena lower down. The strike of the chromate vein appears to be a little west of north, similarly to the galena veins in the Comet and West Dundas mines. There is a strong flow of water from the shaft, and to work the lode it is clear that fairly powerful pumping plant would have to be provided. The prospects are favourable, and the lode worthy of a good mining trial. The country seen in the adit is much weathered serpentine.

*Adelaide and Anderson's Mines.*—These have lately been worked in conjunction, the Adelaide Company having taken the Anderson's ground on tribute. Working has only lately been resumed,



the mines being shut down during 1894 and 1895. The machinery at the Adelaide main shaft not being able to raise the water satisfactorily from the bottom level, the lift has been hauled up to No. 2 level, and work has been going on at this. There are several veins of galena, mostly small, and in hard dolomite country. Some of them have very smooth regular walls, and seem likely to be permanent, but the hardness of the country is a great drawback. Work has also been proceeding in Anderson's section from a prospecting shaft to the east of the main one. Lately, however, the mines have again shut down owing to want of capital. A larger and better pumping outfit is much required so that the mines could be thoroughly opened to some depth, and a good deal of money must be laid out in driving and cross-cutting in order to open up stoping-ground. On surface the creek has been flumed for some distance to prevent the water getting down into the workings through the outcrops of the lodes, but the fluming ought to have been carried a little further down in order to get quite clear of them. There appears to be good inducement to give these mines a further trial, and much reason to think that energetic working will give profitable results.

*Sections 305-93M and 306-93M.*—These are held by the M'Kimmie Silver Mining Company, and lie in low wet ground in which prospecting is difficult on account of water. In Section 305-93M, near the centre of it, two lodes of galena have been cut in trenches. One of these runs N. 12° E., and has been trenched along the outcrop to a depth of about 6 feet and for a length of 126 feet, the cutting yielding 56 tons of ore, which sold for £10 15s. a ton. A main shaft has been started to work this lode, but cannot be gone on with until a pumping-engine has been procured. The second lode is visible three or four chains to the north of this in a long trench originally intended for drainage. In this it is seen to consist of carbonate of iron and galena, and seems to be running about N. 20° W., but is not bared enough to allow of the course being well seen. The galena was not found to be so rich in silver in this as in the first lode. The country is mostly slate. The two lodes being close together and apparently likely to intersect, could be worked from one main shaft. The prospects are good enough to warrant getting machinery and opening up the mine in a systematic way.

On Section 306-93M towards the N.E. corner a valuable discovery has been made of niccolite (arsenide of nickel), but unfortunately so little has been done to open it that we cannot know much about its size and general character. A little shaft has been sunk on it to a depth of 10 feet, but was full of water at the time I saw it, and the ore vein was invisible. The lode is said to be about 2 feet wide and to have about 10 inches of niccolite and a little galena. Strike about N. 40° E. Some beautiful pure ore was lying at surface, and it was intended to ship two tons of this to Europe to find out its value. Assays are said to have returned 37 to 45 per cent. of nickel, so the ore should be very valuable. I could not see what was the nature of the country enclosing the lode, but most probably it is slate; the serpentine however is seen close by to the eastward. The close connection of serpentine with nickel deposits was alluded to in my last Report, and the finding of this lode emphasises the advice then given to search for nickel along the contact of this rock with the stratified formation. Close to the little shaft there is a great deal of gossan running in a line towards the lodes on Section 305. The country is so low and wet that no sinking can be done without machinery. It would be advisable to try to drain the flat in the vicinity of the lodes by deep trenches which would carry off the surface water, and this work would also do some good prospecting. The new Zeehan-Mount Read tramway will pass quite close to this mine, so it will soon be an easy matter to get machinery out to it, and from the prospects afforded it is likely that it will contribute a considerable amount of ore for the tramway to carry to Zeehan.

*Nickel P.A., Section 1956-91M.*—No work has been done on this since my last Report, but at the time of this visit preparations were being made to open the mine again. The Zeehan to Mount Read tramway will afford very easy access to this promising property.

*Success and Owen Meredith Mine.*—The wooden tramway to this from the North Dundas road has been completed, and the mine working again during the past year. Unfortunately it shut down while I was at Zeehan, and I could not get out to see it before the water rose. Some very good ore was got, but it was found that the mine required to be opened at greater depth and furnished with more powerful pumping appliances, and the tribute party were unable to do so much dead-work, especially after their long and plucky struggle to make their tramway. Here, again, capital is required to put a very promising mine on a good working footing and give it a chance of being remunerative.

*North Dundas and Commonwealth Mines.*—These I did not visit, hearing that they were practically in the same condition as when last seen. They both are worth vigorous development.

*Gormanston Mine.*—This also was not visited, as no advance worth mentioning had been made during the year. Prospecting has been carried on from time to time and stones rich in tin have been picked up, but the parent lode has not yet been found. The bush is very dense and also green and hard to burn, so prospecting goes on very slowly. If a good fire could be got through it so as to clear the surface there would probably be little difficulty in discovering the lode, and, judging from the floating fragments of it, it should be a good one.

*South Curtin and Davis Mine.*—(Section 293-93M).—Notwithstanding its name, this property is not due south of the Curtin-Davis lease, but south-west of the Curtin-Davis Extended one. On it is one of the numerous lodes which were discovered during the time when the Dundas Field was first taken up in mineral leases. This was then known as J. Fitzgerald's lode. Nothing, however, was done to it in the way of opening it up, and the ground was forfeited, and not taken up again until the discovery of the value of the Curtin-Davis lode again attracted attention to this part of the district. About the centre of the section a tunnel has been begun, going in on the course of the lode, which here runs N. 25° W. and dips to N. E. 82°. The tunnel was in only about 10 feet on the day I saw it, and the lode was about five feet thick, consisting of rather good-looking gossan, in some parts of which chloride of silver and native silver were freely visible. The country rock is coarse grit or conglomerate. The visible silver in the gossan speaks very well for the value of the lode in its unoxidised portions, and these should soon be reached by the tunnel. Probably the ore carried will be found to be fahlore similar to that in the Curtin-Davis mine. This, however, cannot well be the same lode as that in the Curtin-Davis, but is a parallel one lying very considerably to the westward of it. It is a very good prospect, and before long should be an ore-producer.

About 5 chains down the little creek which passes the tunnel mouth some work has been done on a vein of galena associated with blende and copper pyrites. The lode appears to be here very soft and mullocky, and the ore vein is not at all well defined. It is of very doubtful consequence, but may be worth prospecting when deeper tunnels are being driven on the main lode.

The ground falls rapidly towards the Ring River, and excellent facilities are afforded for tunnelling. In this part of the district the lodes do not appear to have been oxidised so deep as those near Dundas town, and shafts will not be required in most instances for a long time. Though at present difficult of access, the construction of the Zeehan-Mount Read tramway will make this property quite easy to reach, as it skirts along the slope of the hills quite a short distance down north from the workings.

*Section 307-93M.*—This is known as the *Curtin-Davis Consols* property. When I saw it work was only commencing, and not very much could be seen. There are two lode outcrops running about W.N.W., the northern one being a large quartzose mass with a good deal of pyrites. The other lode is smaller and contains more pyrites. Some of this is reported to have yielded at the rate of 40 ounces of silver to the ton when assayed. A tunnel is being put in to cut both these lodes. In cutting the approach for this a vein of very solid pyrites and blende was met with. The northern lode has been trenched on in two places close to the northern boundary, and also in the adjoining No. 1 Curtin & Davis block. In these trenches it is seen to be a strong lode containing much pyrites and gossan, the latter often carrying a good deal of arseniate of iron. The strike here is seen to be north-westerly. Though nothing of much value has been found on this section as yet, it appears well worth prospecting.

*No. 1 Curtin and Davis* (Section 317-93M).—This lease lies immediately south of the Curtin-Davis Extended block, on the south side of the Bellinger Hill. About seven chains south from the north boundary a big lode outcrop has been found, striking N.N.W. and dipping easterly. The lode matter contains a great deal of slate with pyrites blende and galena, and is enclosed between smooth slickensided walls. On the footwall there is a lot of solid pyrites, but the galena and blende seem to be in strings and small veins. A tunnel is being commenced to cut this lode, but will only strike it some 27 feet below the prospecting cutting on the outcrop. It will enable a shallow drive to be made for prospecting purposes along the lode, but will be of little use as a working adit. This discovery is said to be on about the line of the Curtin-Davis lode, but I am doubtful as to their being one and the same. The Curtin-Davis Consols lode has also, as above stated, been cut in this property near the south boundary.

*Sections 291-93M ("Orr's Section") and 343-93M* (belonging to the Central Curtin and Davis Mining Company, No Liability).—A lode has been found in these sections about six chains to the east of the N.W. angle of the Central C. & D. block, and has been traced northward from the boundary into Orr's section by a trench on the outcrop for a distance of about three chains, and to the southward in the Central block by cross trenches for about four chains. Its strike is N. 35° W. The lode is small but well defined, and shows some very good fahlore, with copper and iron pyrites. The veinstone is mostly siderite. In the Central section a tunnel could be driven along the course of the lode, but in Orr's block it does not appear to be an easy matter to get one in, as the outcrop is in low ground. The lode contains some good-looking ore, and is well worth testing.

*Curtin-Davis* (Section 242-93M) and *Curtin-Davis Extended* (Section 292-93M) *Mines.*—These are under one management and working on the same lode, so may conveniently be dealt with together. They have been vigorously developed, having had the good fortune to fall into the hands of owners able and willing to spend money freely upon them. A good pack-track has been made from the Government track at the Grey Ore Camp to the top of the Bellinger Hill, a lot of clearing has been done, good huts have been built, and the lode has been opened at different levels by a series of tunnels. The lode crops out on the steep north face of the Bellinger Hill, a bold bluff which is one of the most striking features in the topography of the district. The top of this hill is 1586 feet above the bridge across the Ring River at the Grey Ore Camp, or 2253 feet above



sea level. The horizontal distance between these points is about a mile, so that the average slope from top to bottom is about 1 in  $3\frac{1}{2}$ . Near the main Curtin-Davis workings it is actually 1 in 1 or  $45^\circ$  for a long distance, and in parts quite precipitous. The outcrop of the lode runs right up this steep face, thus affording most excellent facilities for testing and working it by adits driven along its course at different levels. Though generally spoken of as a new discovery, the lode has been worked on formerly by the Montezuma and John Godkin Companies, the latter very narrowly missing a good chute of ore found by the present owners. The strike of the lode averages about N.  $9^\circ$  W., and it underlays eastward. Between No. 4 tunnel and the summit of the hill, according to a fine plan of the property made by Mr. C. W. James, C.E., the average underlay of the lode would be about 1 in 2. Owing to the steepness of the slope, and the considerable underlay of the lode, the course of the outcrop on the face of the hill is N.  $13^\circ$  E., differing from the true strike by  $22^\circ$ .

On the top of the hill the lode has been traced by trenches southward in the Curtin-Davis Extended block to about 4 chains from the north boundary. It is seen as a fairly strong body of gossan, 2 to 4 feet wide, in this portion. The gossan can be easily followed down the steep rocky face to the highest of the tunnels, known as No. 1 of the Curtin-Davis Extended Mine, 105 feet below the summit. At the time of my visit only the approach to this had been cut, and the lode was still much changed to gossan, nevertheless 3 or 4 tons of oxidised ore had been considered worth saving and stacking for treatment. No. 2 Extended tunnel is 72 feet below No. 1, and was originally begun by the John Godkin Company. It is not on the lode the whole way, the first 93 feet being a cross-cut through country rock. Then a drive was made south on the lode, and before going far a fine chute of fahlore was found, forty feet in length, and reported to have been in one part as much as  $3\frac{1}{2}$  feet wide. The face of this drive was 74 feet in from the cross-cut at the time of my visit, and was then poor and slaty. Lower down the hill we find another tunnel driven by the John Godkin Company, in a distance of 81 feet, on a lode which appears to be parallel to the main one and lying to the east of it. This vein was oxidised all the way, but has not been followed further, as the tunnel is only 28 feet lower than the last one, and it is proposed to make this and the next lower one the working levels.

No. 1 Curtin-Davis tunnel is 242 feet below No. 2 C.D. Extended, and has been driven on the lode a distance of 104 feet. Ore was found all the way in for 55 feet, and was got also in the approach for about 30 feet. In the steep rocky cliff below the approach good gossan is also seen, so the chute is in all probability quite 100 feet long. In the face of the tunnel the lode was poor when I saw it.

Going down 137 feet more we come to No. 2 C.D. tunnel, which was in only 30 feet the day I visited it. The lode here is well defined but small, only 6 to 10 inches wide, and mostly gossan.

No. 3 C.D. tunnel, 121 feet below No. 2, is in 105 feet, and carried good ore nearly up to the face, where the lode became disordered and a great deal of pyrites came in, but fahlore again made its appearance the day I left the mine.

No. 4 tunnel is only a small one, 168 feet below No. 3, driven 19 feet, and the lode in it is very small and valueless. Above it there is a big mass of ironstained slaty matter, so it seems probable that here we have the lode channel filled with broken country. Cross-cutting would be advisable in this case if the lode does not improve as it is driven along, for the vein followed might not be the only one representing the lode, but merely one of a number of small branches.

No. 5 tunnel is 166 feet below No. 4, and is a short one, only 34 feet in length, and was the upper of two tunnels formerly put in by the Montezuma Company. In the mouth of it there is a gossan vein about 8 inches wide containing oxide of bismuth, and reported to assay very well for both silver and bismuth. When driven upon the vein thinned down quickly to a mere streak, but the walls remained distinctly visible, and probably if the drive were continued the lode would make bigger again. There are some surface cuttings just below the approach to this tunnel, and a vein about 10 inches thick of gossan carrying oxide of bismuth and arseniate of iron is visible. It is possible that the veins at this tunnel may not be the Curtin-Davis lode, and that this lies to one side of them, but from their position it is likely that they are all that it is represented by at this part.

The No. 6 tunnel, known as Brumby's, is a cross-cut 122½ feet long made by the Montezuma Company. It is 146 feet below No. 5, or 1157 feet below the outcrop on the top of the hill. The lode was not met with in it, though it is right across the course as shown by the workings higher up. The country is here rather a coarse conglomerate. According to Mr. James' map it would seem rather more probable that the lode lies altogether east of this tunnel than that it is still to the west of it.

The ore from all the tunnels which have yielded any has been very similar, consisting of fahlore with copper and iron pyrites, and sometimes a little stibnite in a veinstone of quartz, carbonate of iron, and lodeslate. The oxide of bismuth at the No. 5 tunnel doubtless indicates the presence in the unweathered lode-matter of native bismuth or its sulphide, and this may prove a valuable constituent.

Another lode, known as the Eastern lode, has been found about 500 feet east of No. 3 tunnel. A cutting has been made on it, which shows it to consist of 3 to 9 inches of gossan, copper pyrites, fahlore, and iron pyrites, with a good deal of quartz. Course about N.N.W. Though apparently of next to no consequence of itself on account of its small size, it is important as showing that parallel lodes to the main one are in existence, rendering cross-cutting from time to time very advisable. Indeed, it seems rather likely that the main lode itself is made up of a series of parallel

veins lying close to one another and often overlapping, rather than a continuous single vein. Frequent cross-cutting is all the more necessary if this view is correct.

Taking the work described above it will be seen that valuable ore has been found at No. 5, No. 3, and No. 1 Curtin-Davis tunnels, and at Nos. 2 and 1 of the Curtin-Davis Extended, the lode being proved ore-bearing for a length of 1300 feet and vertical depth of 1000 feet. The ore seems to be in chutes. Some very high assay returns have been obtained from small parcels of the ore which have been tried, but up to the time of my visit there had been no bulk sampling of the heaps of ore that had been raised. A sampling of the largest heap, at No. 1 C.D. tunnel, was then proposed to be made before long. Until bulk samples have been assayed there is no certainty as to the average value of the ore, but, judging from its appearance, it should give very good returns. The treatment of the second class ore from which the richer stuff has been picked out will demand serious consideration, as wet concentration in the ordinary way is almost certain to be attended with very serious loss through sliming of the friable fahlore. The extraction possible by concentration should be the subject of very careful experiments before a dressing-mill is erected.

A very fine waterfall, known as the Montezuma Fall, is seen in the eastern part of section 242-93M of the Curtin-Davis holding. Its height is said to be between 470 and 500 feet, the top portion being a clear leap of 200 feet. In wet weather a large stream passes over the fall, which is then a magnificent spectacle, and even in dry weather there is a considerable flow. Higher up the creek there are said to be several smaller falls. In all probability it will be possible to make dams for conservation of water at various points along the course of the stream, so as to ensure a steady supply all the year round, and if so a magnificent water-power will be available at small expense for generation of electricity, compression of air for rock-drills, and driving dressing machinery, furnace-blowers, &c. There are said to be two other considerable waterfalls in the district on other creeks further westward, and with attention to conservation of the winter's abundance, so as to have a supply during the short dry season, there should be very little difficulty in getting all the water-power required for the purposes of the mines, and the works for the treatment of their produce.

The Zeehan-Mount Read tramway has been surveyed so as to pass only a very short distance below the Montezuma Falls, and the ore from the Curtin-Davis mines will very easily be sent down to it. The prospects of success seem therefore in the main very favourable, the lode promising well for a good yield of ore, and everything being most advantageous for dealing with the minerals after they are extracted.

*Fahl Ore Mine, Section 3212-87M.*—This has been shut down for some time, but will probably be re-opened before long. The lode belongs to the same series of fahlore-bearing veins as those above described of the Curtin-Davis and Central Curtin and Davis Companies, there being apparently a group of such in this part of the Dundas district. No doubt as time goes on numerous others will be found as well as those now known.

*North Colebrook, Section 236-93M.*—Only a little prospecting has yet been done on this, but it has revealed that there are two large bodies of lode material in it similar to that in the adjacent Colebrook holding. On the supposed line of the Colebrook main lode a trench has cut a mass of rather good-looking gossan, and a short distance further north-east a little work has been done on a large outcrop of axinite containing copper pyrites, pyrrhotite, arsenopyrite, and a little chrysotile disseminated through it. The enclosing country rock is not here visible, and there is nothing to show the course of the lode, if lode it is. The material here is very poor in copper, and as yet does not appear to be of any value. The other lode is near the western boundary of the section, and is a similar large mass of gossan and axinite with the above sulphides in small quantities. It had been barely stripped when I saw it, but was evidently a very large outcrop.

*West Colebrook, Section 239-93M.*—The workings on this lease are also as yet confined to surface cuttings, and are on the western slope of the Colebrook hill. Veins of axinite with copper pyrites, pyrrhotite, and arsenopyrite have been laid bare, and close to surface native copper and sulphide, red oxide, and carbonates of copper have been found in small quantities, no doubt resulting from superficial chemical action upon the copper pyrites. In places the vein matter appears to replace the country rock metasomatically, and the whole occurrence is rather that of a sort of stock-work than of a true lode.

*Colebrook, Section 216-93M.*—On this a tunnel has been driven a distance of 110 feet, the last 83 feet being through an almost solid mass of sulphides, chiefly arsenopyrite and pyrrhotite, with a little copper pyrites. The sulphide body has not been cut through, the face of the drive still being solid pyritic matter. There is a good deal of axinite with the sulphides, also some chrysotile and chlorite. Unfortunately, though there is such a huge mass of mineral matter, it is all but valueless, the small quantities of copper, silver, gold, nickel, and cobalt which have been found in it being insufficient to allow of profitable extraction.

Down the steep slope below the mouth of the tunnel there is quite a cliff of axinite and sulphides, but this is separated as far as can be seen on the surface from the body seen in the tunnel by a mass of country rock. On top of the ridge again, near the West Colebrook boundary there is yet another large outcrop, and the ground between this and the tunnel appears to be more or less all seamed with veins of the same minerals as above mentioned. Going south along the ridge there



is yet another large outcrop. All these occurrences, both on this section and on the North and West Colebrooks, seem very irregular, the bodies of sulphides and axinite apparently neither being of definite shape nor running in regular lines; they rather seem to be huge bunches and ramifying veins. The country in which they occur is a black fine-grained rock, weathering whitish externally, easily fusible, with white streak and splintery fracture, which I take to be of igneous origin. It is now shortly to be examined microscopically, when its proper appellation will be determined. Throughout this rock spots and little veins of pyrrhotite are often plentifully scattered, and also veins of chrysotile, besides larger veins of axinite and sulphides. The occurrence of axinite in the huge masses in which we find it here is quite unusual. A good deal of copper is sometimes seen in the sulphide masses, especially near surface where chemical concentration has gone on, and some of the richer bunches of black copper sulphide are said to have given good assays for silver. The large masses of sulphides are very alluring to the miner, and probably sooner or later portions of them will be found rich enough for metallurgical treatment. A deep tunnel into the hill from below the cliff under the Colebrook tunnel would probably give valuable information as to these deposits, and prove if they contain useful metals in workable quantity.

*South Rosebery.*—Very little has been done on this lease since my last visit. The shaft has been sunk about 34 feet and a start made to drive west, but it was found that the sulphide body had been passed through and the drive was apparently going into the footwall, which proved to be schist with layers of pyrites and baryte: the dip here is  $55^{\circ}$  to the eastward. The sulphide body is a large solid one, but hardly so big as would be expected from the adjacent trench on surface. The whole of it seems to carry a large percentage of zinc. It is possible that the schist met with in the bottom of the shaft is not the true footwall, but only a layer of rock lying between the hanging-wall portion of the lode and another on the footwall still to be cut: it is a pity the cross-cut from the bottom of the shaft was not carried further.

Some three chains to the S.E. of the shaft down a small gully a tunnel has been begun some 45 feet below the mouth of the shaft, and has been driven about 70 feet to S.  $70^{\circ}$  W. The country passed through is whitish argillitic schist (pyrophyllite schist), containing much pyrites, and dips to the eastward. In the end the schist has become more than ever impregnated with pyrites, copper pyrites, and blende, at times being very heavily charged with sulphides, but I hardly think it is far enough in yet to cut the mass seen in the shaft. A deep tunnel from the other side of the hill would, however, be of much more real service in developing the mine than any extension of a shallow one like this.

This is a valuable property, though of small acreage (ten acres), and deserves to be vigorously opened out. The gold-bearing vein at the west end of the surface trench should have especial attention paid to it.

*Rosebery.*—A certain amount of work has been done on this extensive property during the past year, but not nearly the progress has been made that might fairly have been expected in the time, and there is but little to add to my last year's Report.

A number of shafts have been sunk along the line of the lode, but all were full of water and could not be examined. The furthest south of these is situated between the South Rosebery workings and the big trench described in my last Report, and is said to be 25 feet deep, and to have bottomed on a solid sulphide body. A good deal of very solid sulphide ore, principally blende and pyrites, with but little copper or lead, was seen lying about the surface. Going north the next shaft is that formerly described beside the big trench, in the hanging-wall of the sulphide lode. This shaft is said to be 53 feet deep. According to the stuff thrown out it has gone through a large body of very solid dense blende and pyrites, the ore being very similar to that found as boulders in the big face of the alluvial workings. Fifty-six (56) feet W.S.W. from this shaft another has been sunk about 15 feet in the footwall portion of the lode, and the stuff from it is mostly schist very heavily impregnated with granular iron pyrites and some copper pyrites and blende. Between these shafts must be almost all lode-matter, more or less metalliferous. About 10 chains further north two shafts have been sunk 27 feet and 20 feet respectively, and very solid heavy lumps of mixed pyrites, blende, and galena have been obtained. There seems to be more lead ore at this point than heretofore, also more barite. The surface material passed through here consisted of heavy alluvial drift containing large heavy boulders, and as the shafts were full of water I was not able to satisfy myself as to whether the ore at surface was from the true bedrock, or from large boulders such as were got pretty plentifully in the alluvial workings. Still following the line of the lode, which has been taken as N.  $30^{\circ}$  W. for another 10 chains or so northerly, we find three shallow pits sunk close together on clayey gossan which may be portion of the lode. They will have to be sunk deeper to get through the gossan and prove what lies underneath. Some 4 chains further north a tunnel has been driven across the layers of schist country (here striking N.  $20^{\circ}$  W. dipping N.N.E.  $65^{\circ}$ ), a distance, when I saw it, of about 90 feet—course N.  $55^{\circ}$  E. A small vein of quartz with crystalline stibnite was cut in this tunnel, and is said to have given a good assay for silver. On surface above the tunnel a trench shows schist highly charged with pyrites, but further to the north-east deep alluvial matter comes in and surface prospecting becomes difficult. The tunnel is intended to go under the alluvial gravel and prove this part of the ground. It is very shallow, however, and to my mind was not worth putting in, as the labour could have been much more profitably employed in making a deep tunnel at a much lower level, which would be

available for working the lode. I understand that lately a deep tunnel has been begun, but it ought to have been taken in hand long ago.

The year's work on this mine appears thus to have consisted of sinking some 8 shallow windlass shafts a total distance of about 160 feet, and driving through soft country about 100 feet, besides building a few huts and cutting a trifling matter of tracks. This is the sort of development that sickens investors by its slowness, and ruins many a good property. The Rosebery Company have a very promising mine, but so far there is little or nothing payable in it in quantity worth working, and to make anything of it energetic and intelligent management and systematic work are required.

*Sheppard's Section, 504-93M.*—In the bed of the Koonya River, a short distance above the bridge on the pack-track, a small lode about two feet wide is visible running N. 55° W. No work has been done to open this, and where seen it is of no value, consisting of quartzose lode slate and carbonate of iron with a little pyrites. On the S.E. side of the river the ground rises, and some prospecting might easily be done on the course of the lode. Lower down the river, close to the crossing of the old track, a little vein  $\frac{1}{4}$  inch thick of galena was pointed out to me in a small creek, but there does not appear to be any regular lode just here. The vicinity would, however, be worth prospecting.

*Allom and Morley's Sections, 409-93M and 410-93M.*—These are close to the Deep Lead saddle, on some spurs forming foothills of Mount Read. On one of the sections some prospecting cuts have been made into a steep spur of argillitic schist rock, exactly similar to that found enclosing the Mount Read and Mount Black sulphide bodies. In these cuts the schist is seen to contain a great deal of iron and copper pyrites, and as the trenches got deeper a great improvement was noticed in the mineral contents, bunches and strings of pretty pure copper pyrites making their appearance. It seems likely that a body of ore is not far distant. The shape of the ground allows it to be easily prospected by tunnels, and there is much reason to think that a little diligent work will soon result in finding bodies of ore. The strata here run about N. 30° W. and dip 70° to the N.N.E. The line of the Zeehan-Mount Read tramway if continued to the Mount Black district must pass very near these sections.

*Ring River P.A. (Sections 252-93M and 253-93M.)*—A good deal of prospecting has been done on this property, and some very promising veins have been found. The country is the same pyrophyllite schist as in the last case, with a good deal of pyrites and other sulphides disseminated through it. In one trench I noticed a band about 3 feet in width very heavily impregnated with iron and copper pyrites and some blende, which would be worth sinking upon. Further west from this another trench has cut about two feet in thickness of solid pyrites, apparently highly cupriferous, and about one foot of heavily mineralised schist, the lode being capped on surface with gossan. Work had been begun to cut this with a tunnel at a lower level. This property seems a very likely one, and certainly is worth vigorous prospecting.

*Barlen's Section, 30-92G.*—This has attracted a great deal of attention of late on account of a vein of good ore having been found in a prospecting drive from a shaft near the south boundary. It also deserves notice on account of the plucky way it has been opened up by a small party of men working for themselves, who have made a very much better show of development than many of the neighbouring companies. The rich lode struck in the Hercules mine being not far from the south boundary of Barlen's section, a shaft 26 feet deep was sunk on the latter on the supposed line of it, and a drive from the bottom of this has been put in to the eastward a distance of 150 feet, where it cut a lode of pyrites and mixed sulphides, the latter from 6 inches to 2 feet in thickness, and assaying well for silver. The ore did not rise any distance above the drive, but seems to be making strongly underfoot. A good deal of flinty lodeslate is associated with the sulphides. At the time of my visit it was intended to cut a chamber and sink on the ore vein, but for permanent work a tunnel will be required. The shaft is about 4 chains from the west boundary, and the surface slopes steeply westward. An adit from the west boundary would cut the lode at a much lower level than the existing workings, and would prospect a lot of ground as well, probably cutting the big lode of the Hercules. For prospecting purposes it would be well to carry the tunnel right across the section to its eastern boundary. No ore has yet been sold from this mine, but it was reported to me that a bulk assay of the stuff raised had been made and had given a highly payable result. It does not seem at all certain that Barlen's lode is the same as the rich vein of the Hercules, but no surveys appear to have been made to exactly determine their relative positions. The big lode of the Hercules has not yet been found in Barlen's section, though according to its strike it should go into this. The property is a valuable one, and well worth the outlay of capital for thorough development.

*Hercules.*—The progress made on this holding during the past year has been in one way rather disappointing, not nearly the amount of development work having been done that might reasonably have been expected in the time. The large ore body mentioned in my last Report has been proved to be 45 feet in width and underlays to the eastward. On the hanging-wall side there is a good deal of fairly pure blende, copper pyrites, and galena, in veins pretty distinct from each other and



associated with some quartz. Close to the trench across this big lode a short distance to the south-east a shaft has been sunk some 20 feet on the underlay of a gossan vein striking N. 35° W., from which fair prospects of gold may be washed. The rich vein mentioned in my last Report widened out rapidly when sunk upon, and has been of great service to the company. It has been worked from a shallow adit for a length of 47 feet. Below the adit a winze has been sunk on the underlay 20 feet, the ore body here being four feet wide of sulphides of iron, copper, lead, and zinc, carrying gold and silver. Near surface the sulphides were oxidised, and the resulting gossan was very rich in gold. The following figures show the quantity and value of the ore raised from this vein from 29th May, 1895, to 14th April, 1896, according to a return kindly furnished to me by Mr. E. Gaunt, manager of the company:—

	tons.	cwts.	qrs.	lbs.		ozs.	dwt.	grs.		ozs.	dwt.	grs.
Gossan.....	9	13	1	13	containing Gold	102	18	22	and Silver	2051	10	0
Sulphides...	62	1	2	27	„ „	142	19	0	„	4227	17	19
	71	15	0	12		245	17	22		6279	7	19

The weights of ore and figures of gold and silver values are those upon which sales were made in the Zeehan ore market after making the usual deductions and allowances; the actual values would be somewhat greater. The great cost of packing out the ore has persuaded the company not to send away any more at present, but to wait for the completion of the Zeehan-Mount Read tramway. The high value in gold and silver of the sulphide ore is very encouraging, as there seems no reason why it should not be maintained in depth, or why similarly rich veins should not be discovered.

To cut the big lode and the rich vein at some depth a tunnel has been driven S. 75° E. a distance of 192 feet, but at the time of my visit it had not yet reached the lodes. Lately it has been reported in the newspapers that ore has been cut. The tunnel is over 100 feet below the outcrops, and the lodes are underlaying eastward, so a considerable distance has to be driven to cut them. It would be well to carry the tunnel on through the known lodes and as far as possible into the hill, so as to intersect any parallel ore bodies, which are very likely to occur in such a formation as this.

To the south from the main workings a small tunnel has been made from the side of the pack-track through a body of gossan 22 feet wide containing fair prospects of gold, and a little further south along the track I was shown a new find that had lately been made, viz., a vein about 18 inches wide of sulphide ore (containing much blende), said to assay at the rate of 19 dwts. of gold and 85 oz. of silver to the ton.

There is every reason to believe that the country here is full of veins of sulphides, all more or less auriferous and argentiferous, and much trenching and tunnelling across the strike of the schist country requires to be done in order to discover these and prepare them for working.

*South Hercules (Sections 15-95 and 23-95).—*Prospecting on this property had practically only begun at the time of my visit, and there was not much to be seen. About two chains from the northern and four chains from the eastern boundary of Section 15-95 a vein six inches thick of sulphide ore (intimately mixed pyrites, copper pyrites, blende, and galena) had been cut in a lode of broken schist and quartz veins four feet wide. The ore was reported to be of low value, carrying only 3 dwt. 22 grs. of gold and 8 ounces of silver per ton. The vein runs N. 20° W., and seems to be getting a little bigger as it is followed downwards. Near this place in another cutting veins of copper pyrites were noticed in the schist country, here running N. 30° W. Doubtless, numerous sulphide veins will be found by continuance of prospecting, and some of them may well turn out to be of workable size and value.

On the south boundary of the holding a shaft has been sunk right at the south-east corner of Section 15-95 (or S.W. angle of 23-95) on a dense lode of solid sulphide ore. The shaft is down 16½ feet, and the lode is 6½ feet wide. The walls are well defined, and strike N. 17° W., dipping easterly 60° to 70°. The ore is mostly pyrites and blende with a little copper pyrites and galena, and is said to assay much the same as the average sulphide ore from the Hercules' big lode and the Mount Reid Company's lodes, as quoted in last year's Report. The lode appears to be portion of the same one as is worked by the Mount Reid Company.

*Mount Reid Mine, Section 3302-87M.—*The progress on this mine during the past year has not been very great, only a few men having been employed, pending negotiations for the sale of the property in London. The work done has been directed to proving the lode as thoroughly as possible. Seven shafts have been sunk at intervals along it, and the material brought out has been daily assayed. The main prospecting shaft is down a depth of 50 feet, and the lode has been proved by cross-cuts to be 25 feet thick, and has been driven on south a distance of 40 feet. No. 1 shaft south is 12 feet deep, and crosscuts from it have proved the lode-matter to be 40 feet wide. No. 2 shaft south is 14 feet deep, but the lode has not been cut across. No. 3 and 4 shafts south are each 20 feet deep, and cross-cutting was beginning at the time of my visit. In No. 4 the hanging-wall was cut 6 feet east of the shaft. The lode-matter comprised a great deal of solid sulphide ore with thin layers of schist through it at times, and on the west side of the shaft was really a schist

very heavily charged with pyrites rather than ordinary lodestuff. The strike here was noted as N. 70° W., dip eastward, 60°. In No. 3 shaft there was much quartzite, which is also seen plentifully about the surface in the vicinity of both the southern shafts, but also some solid sulphide ore, and a vein of fairly good galena. North of the main shaft there are two shafts in gossan; "No. 1 north," 12 feet deep, got sulphide ore in the bottom; and "No. 2 north" cut the footwall at 4 feet, and sulphides at the bottom, 13 feet. This last shaft is about 4 chains from the north boundary of the section, where, as above stated, the South Hercules Company have again cut the lode. From the main shaft to the No. 4 south is a distance of about 8 chains.

Mr. G. P. Sinclair, the Manager of the mine, was good enough at my request to furnish a synopsis of the assay results obtained during the progress of the above workings, which I now give in his own words:—"The following are the average results of assays made from the different prospecting shafts sunk by me on the above property. The assays from main prospecting shaft are from 24 feet deep to 50 feet, and about 60 feet of drives. There are 261 different samples:—

No. of Shaft.	Gold.			Silver.			Lead.	Copper.	Zinc.
	oz.	dwt.	grs.	oz.	dwt.	grs.	per cent.	per cent.	per cent.
Main prospecting shaft .....	0	3	9	6	6	22	9.0	0.7	30
No. 1 South " " .....	0	5	15	28	7	22	12.7	2.35	20
No. 2 " " " " .....	0	9	9	25	19	8	6.6	traces	15
No. 3 " " " " .....	0	11	22	13	5	13	5.7	$\frac{1}{2}$	10
No. 4 " " " " .....	0	9	4	6	18	21	3.7	$\frac{1}{2}$	10

The two shafts north in gossan bulked 18 dwts. gold and 20 oz. silver per ton each."

The above figures being averages of daily assays may be fairly considered representative of the bulk of the ore in the mine. The quantity of such ore in sight is very large, and the mining costs should be very low, inasmuch as for a long time the stuff could be raised by an open cut along the outcrop of the lode, a method of working which would probably result also in the finding of numerous veins of ore which would escape notice in ordinary mining. The average value, however, is so low that it is at once seen that the general run of the ore will not pay for export, but will have to be treated on the spot.

*Evenden Mine, Section 299-93M.*—About two chains from the eastern and 8 chains from the northern boundary of this section a tunnel has been begun on a course of S. 35° W. to cut a lode seen higher up the slope of the steep hillside on which the lease is situated. At the time of my visit the tunnel was in a distance of 42 feet, but had not reached the lode. This is seen, however, some 60 feet higher up the hill, where it has been cut into and followed by a drive to the southward for a distance of about 50 feet. The lode here was much oxidised and rather small, but a little galena and pyromorphite were obtained, and some native silver. In the end of the drive a mass of carbonate of iron and pyrites appears to be associated with the lode. A winze has been sunk 10 feet where the vein was first cut, and in this the lode-matter was three feet wide between the walls. Course of lode N. 15° W., underlay to westward. 25 feet above these workings the outcrop of the lode is seen in another little cutting, consisting of about 5 feet in width of gossan, quartz, and carbonate of iron, with pyrites and a little galena, the latter being said to assay close on 100 ounces silver to the ton. A great deal of a green serpentinous mineral is here associated with the lode. The course of the latter was here noted as N. 12° W.

Near the centre of the same section a large outcrop of gossan, 82 feet wide in one place, has been exposed by trenches, and traced for a distance of 10 or 12 chains to the north and 5 or 6 to the south. Course N. 10° W., underlay not yet known. The ground is very steep, and it is proposed to test this lode by a tunnel which, according to the mining manager, Mr. Evenden, in 195 feet of driving would come in 250 feet vertically below the outcrop. This lode seems well worth testing, though so far as I could learn nothing of any value has yet been found in it. Another small gossan lode associated with some jaspery quartz is seen in a trench down the hill below the main one some little distance.

On the road from Dundas to Mount Read, which passes through this property, a mass of dense quartz impregnated with a good deal of iron and copper pyrites is seen at the junction of the slate country with the conglomerates which form the Pimple Peak. The latter seem undoubtedly to lie unconformably upon the schist and slate country seen in the Evenden workings, and it seems possible that this quartz mass is a lode formed in a fault which has thrown down the conglomerate against the slate country seen to the westward.

*Treatment of the Mount Read and Mount Black Sulphide Ores.*—As very great interest is now being taken in the Mount Read district, numerous new companies being floated to work mines along the sulphide belt, it is timely to give some consideration to the question of what is to be done with the ore when it is raised in order to give profits to investors. So far as work has gone the ore obtained may be divided into the following three classes:—

(1.) *Gossan Ore.*—Found as yet principally in the Hercules and Mount Reid mines. Some of this has been very rich in gold and silver, and would pay handsomely if sold in Zeehan to the ore-



buyers. The great bulk of it, however, would leave little if any profit to the mine-owner if it had to be exported for treatment. Under present circumstances it would probably be best treated by pan-amalgamation; but if local smelting works became available, it would be most desirable fluxing ore. It is not proved yet that it exists in quantity sufficient to keep a pan-plant of economical size running for a reasonable length of time.

(2.) *Rich Sulphide Ore.*—The rich vein in the Hercules, and a little of the best ore in the Mount Reid, Barlen's, and Rosebery mines are valuable enough to pay export charges. The quantity of this class of ore yet known to exist is, however, very limited.

(3.) *Ordinary Sulphide Ore.*—The great bulk of the deposits in question yields a mixture of pyrites and blende, with more or less galena and copper pyrites, carrying a little gold and silver. In some cases the galena and copper pyrites may be to a small extent separated mechanically from the other minerals, and a merchantable product thus procured, but the great bulk of the stuff has the minerals too intimately mixed together to allow of mechanical separation. This principal bulk of the ore of the district is too poor to be profitably exported, and will require local treatment. To get at some idea of the general value of this ore we may collect the following figures from last Report and the Mount Reid results given above:—

			Gold per ton.			Silver per ton.			Lead.	Copper.	Zinc.
			ozs.	dwts.	grs.	ozs.	dwts.	grs.	per cent.	per cent.	per cent.
From 1895 Report.	South Rosebery .....		0	4	21	22	4	6	12·5	0·64	28·0
	Mount Reid .....		0	4	21	17	14	10	12·8	0·72	26·4
	Hercules .....		0	4	21	5	1	16	13·5	0·90	28·8
See above	Mount Reid, main shaft		0	3	9	6	6	22	9·0	0·7	30·0
	Mount Reid, No. 1, 2, 3, 4 shafts .....		0	9	0	18	12	22	7·2	0·84	13·8
Average .....			0	5	10	14	0	0	11·0	0·76	25·4

The value of such a mixture may be taken as, at the most, £3 per ton unless the zinc is utilised. In ordinary smelting it is not only lost altogether, but is besides an intolerable nuisance; indeed, with such a percentage of zinc as shown smelting would be impracticable. Numerous processes have been devised for the treatment of ores carrying a large percentage of zinc, and it is claimed that some of these are a commercial success, though I do not know of any instance where one has proved to be so on a working scale under Colonial conditions. The Smelting Company of Australia, Limited, are now putting up works for the purpose of dealing with such zinciferous ores at Illawarra, in New South Wales. They propose to roast the ore to a condition in which the zinc contents can be leached out by water and dilute sulphuric acid, the residue being then smelted in the ordinary way. The zinc is to be recovered from the solution either in the metallic state by the electrolytic process of Messrs. Siemens Bros. & Co., Limited, or as oxide by the Marsh and Storer process. The principle of the latter is precipitation of zinc by magnesium oxide, an operation which creates a demand for the mineral magnesite. It will shortly be seen if this Company is successful in treating the sulphide ores of Broken Hill; if so the same process would do for the Mount Read ores, and works would probably have to be erected in the Ring River Valley. For roasting purposes wood is an excellent fuel, and is plentiful and cheaply obtainable there, while water-power for the generation of electricity for the electrolytic process is available within reasonable distance. The Hercules Company have, I understand, secured the water-rights from a small lake on the north-west side of Mount Read, and should the water power available from this and the various branches of the Ring River be insufficient it seems quite possible to bring in electrical power from stations near Lakes Westwood, Selina, and Julia, from the head of the Henty river, or from the Pieman River. Coke for smelting the roasted ore after extraction of the zinc would of course have to be brought from Strahan by rail and tram. Should the methods of using pyrites as fuel in smelting operations, which nowadays appear to promise great success, become thoroughly practicable, the huge masses of pyrrhotite and arsenopyrite in the Colebrook mines might be made available, as well as the less zinciferous portions of the sulphide ore from the Mount Read mines.

The future of these mines depends on the successful treatment of their large deposits of comparatively low-grade ore, and this treatment must be a local one. The establishment of metallurgical works at the foot of Mount Read or near the Pieman River seems to be a necessity for their successful working. Such works would also treat the ore from the Curtin-Davis group of mines, and would be of great benefit to the whole Dundas district. If the development of the district has to depend only on the rich ore that can be profitably exported, it does not seem likely that there will be any rapid progress, and the mining will be on a small scale. No doubt the rich veins already found are not the only ones in the district, and more like them will be discovered; nevertheless, the greatest value lies in the large low-grade bodies, and the sooner the metallurgical treatment of these is successfully taken in hand, the more quickly will the field pass from the stage of small and intermittent production to that of a permanent mining centre.

Though the above-quoted average value of the Mount Read and Mount Black sulphides is nearly the same as that of the average Broken Hill ore proposed to be treated at Illawarra, I am by no means sanguine that ore of such grade can be profitably handled locally for some time to come, and it would probably be necessary to select the stuff so as to send to the furnaces only the best portions. Assays show that the ore varies greatly in value, and I do not think that there would be much difficulty in getting large supplies of material considerably richer than the quoted bulk average. The Mount Reid Company, for example, could supply from their southern shafts ore carrying over £4 a ton in precious metals. Unfortunately data for calculating what is possible to be done are not yet available, none of the mines except the Mount Reid having yet undertaken systematic assaying of the ore-bodies. A few desultory assays are made from time to time, usually of picked specimens, but no attempt has in most instances been made to ascertain definitely and exactly the values of different portions of the ore bodies and the quantities of each grade available. It is now imperatively necessary that the mines shall prove that they can furnish a constant and regular output of ore of value to pay for metallurgical treatment, for until this is done it would be absurd to erect reduction works. There is every reason to believe that the mines will be able to supply ore of the requisite quality, but accurate figures of quantity and value are required in place of vague opinions of this sort. Systematic laying open of the ore-deposits and daily assaying of the sulphides are the only method by which the necessary knowledge can be gained.

*Concluding Remarks.*—The Zeehan-Dundas field has on the whole made very satisfactory progress during the past year. The output of ore is fairly constant, and shows no likelihood of falling off, but may rather be expected to increase. Capital is finding its way back to these fields as they prove their permanency, and better development may be looked for in consequence. The opening of the N.E. Dundas district by the light railway is a great step in advance, and promises to make a large increase almost at once in the output of minerals. It should be made at once to a spot where it can be reached by tramways from the Mount Read mines, and extended as soon as possible to the Mount Black district.

I have the honour to be,  
Sir,

Your obedient Servant,

A. MONTGOMERY, M.A.,

Geological Surveyor.

The Secretary for Mines, Hobart.

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