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(No. 79.)

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REPORT ON THE COUNTRY TRAVERSED BY THE ROUTE OF THE PROPOSED WARATAH-TO-ZEEHAN RAILWAY.

Geological Surveyor's Office, Launceston, 4th February, 1892.

SIR,

I HAVE the honor to report that, in pursuance of your instructions, I have visited the country traversed by the route of the proposed Waratah-to-Zeehan Railway, with the object of finding if it is likely to be mineral-bearing. In making this inspection, I have been very greatly assisted by the Great Northern Railway of Tasmania Company, who gave instructions to their survey parties to help me in every possible way, and provided horses and men when necessary. To Mr. John Provis, who accompanied me from Waratah to the Success Mine at North Dundas, and to Messrs. Anketell, Clarke, and Mitchell, of the Company's engineering staff, my best thanks are due for much assistance and very great courtesy. Without their help and guidance it would have been impossible for me to have seen more than a small part of the ground.

Two routes have been proposed for this railway, and partly surveyed. The first was that of the Government Survey of 1891, branching from the Emu Bay to Mount Bischoff Railway, about a mile from Waratah, and running across the Knole Plain and down the valley of the Coldstream and Huskisson Rivers, crossing the Pieman River just above its junction with the Huskisson, and then running southward through the Dundas and Zeehan Silver-Lead Fields to join the Zeehan-to-Strahan Railway. On this route very rugged country is traversed in portions of the Huskisson Valley, numerous deep gullies and high ridges having to be crossed. To find easier country a second route is now being surveyed. This leaves the Emu Bay and Mount Bischoff Railway about eight miles from Waratah near the crossing over the Hellyer River, and runs almost due south over open flat country for some 12 to 14 miles. Keeping on the watershed between the Huskisson and the Mackintosh Rivers, comparatively easy country for making a railway can be got down to the Pieman River, where this route joins the first one. The engineers have not yet, however, decided on the exact route to be followed along the watershed, surveys being now in progress to determine the best line. Having myself had some experience in railway surveying and construction, I may venture to express my opinion that a practicable route may be obtained without much difficulty. The dense bush which covers the ground is the great obstacle to the laying out of the line, entailing on the survey parties an immense amount of labour more than is required in open country.

On the present occasion, the time for my examination of the country being very limited, I devoted my attention to the portion lying between Waratah and the Pieman River, and did not visit the Dundas Silver-field further south than the Success and Owen Meredith Mines. On my former visit to this field, however, in October, 1890, enough of the country lying between the Pieman River and Mount Zeehan was seen to be sure that the whole zone traversed by this portion of the proposed railway is highly mineral-bearing. The development of the Dundas Field since then has been very great, and as far as the part of line from Zeehan to the Pieman River is concerned, there can be no doubt now as to the necessity for and success of a railway. The country north of the Pieman, on the other hand, has been as yet but very little prospected, and there is not the same assured support for a line. Until opened by the pack-track down the Huskisson Valley, and by Meredith's Cattle-track (now being marked through), it was almost inaccessible, and since the completion of these works a cessation of prospecting, owing to prevailing financial depression, has taken place, so that even at the present time very few prospectors have been at work. A fair amount of success has, however, been even now attained, several groups of sections having been taken up in the vicinity of discoveries of argentiferous galena and gossan, and it may fairly be expected that many more discoveries will yet be made.

The country traversed by both the trial railway lines for the first 14 miles from the Waratah Railway is of basaltic formation, forming a large plateau, to parts of which the names of Knole Plain, Netherby Plain, Racecourse Plain, and Hatfield Plain have been given. This basalt belongs to the series of Tertiary outflows which cover so much land in the northern districts of the Colony. It does not appear to be, as a general rule, a thick deposit, for wherever it is cut through by deep river gorges the older Palæozoic rocks are found beneath it. It is only in these gorges that any useful minerals may be expected to be discovered at first, though as time goes on it is quite probable that lines of lode, and possibly "deep leads," will be traced under the basalt. But as soon as the basaltic plateau is left the country passed over by both routes is of a highly promising nature, and will doubtless prove to be rich in minerals. From the southern side of the Netherby Plain to the Pieman River the Huskisson Valley Route passes over rocks so similar to those of the Zeehan and Dundas Silver-fields, and of the Whyte River and Heazlewood Districts, that there can be no doubt as to their all belonging to one formation. Very few fossils were noticed in the sandstones, but such as were obtained were all identical with forms common in the "fossil-cutting" on the Silver King Company's property at Mount Zeehan. The rocks observed were conglomerates, sandstones, slates, and limestones, together with serpentine rocks of intrusive character, quite indistinguishable from those met with on the now well-known silver fields of the Heazlewood and Zeehan. Sections of the strata are as yet unattainable, and the exact relationship of the different beds cannot be seen; but it is very noticeable that in going eastward from the Huskisson River over the watershed to the valley of the Mackintosh a similar succession of rocks to that met with in going eastward over the Dundas Range is encountered, crystalline schists, quartzites, and highly indurated coarse quartzite conglomerates being found in both cases as we go further inland. It may be years before the structure of the country is satisfactorily worked out, and any opinion now formed of it is necessarily of a tentative character; but I am inclined to believe that an axis of Archæan schists and quartzites runs northward from Mount Dundas in the direction of Mount Pearce, and that the Upper Silurian sandstones and slates of the silver-fields lie on the flanks of this. As to the position

of the coarse conglomerates (composed of well rounded pebbles of variously coloured quartzites), which form the top of Mount Owen, Mount Zeehan, parts of the ridge between the Huskisson and the Mackintosh, and Mount Pearse, I am in great doubt, but am disposed to believe that they are resting unconformably upon the Archæan and Silurian formations.

In the Heazlewood, Zeehan, and Dundas silver-fields large masses of serpentine rock of igneous origin have been found, which have very probably exercised a great influence on the formation of lodes in these districts. These are intrusive plutonic dykes and bosses, and vary a good deal in lithological character, from a serpentinous greenstone to pure serpentine and schiller-spar rock. In the Whyte River field and in the road-cuttings on the Magnet Range their intrusive character is plainly shown by the marked alteration of the slates in their vicinity, which are often baked and bricklike or converted into hornstone. Many of the soft clayey rocks at the Whyte River which have been taken to be decomposed diorite now appear to me to be nothing else than weathered masses of this same greenstone. Some of the richest ore in the district has been found in these. The fact that the serpentine rock occurs also at intervals throughout the Huskisson Valley increases the amount of similarity between this and the proved fields. It occurs near the head of the Que River, on the ridge between the Huskisson and the Mackintosh, about nine miles north of the crossing over the Pieman River, and again about three-quarters of a mile north of this crossing. Loose stones of it picked up in the Coldstream River show that it exists also up this stream. South-east from the Parson's Hood, on the Wilson River, another occurrence has been recorded.

We have therefore in the country lying between the basaltic plateau near Waratah and the Pieman River all the most likely conditions for the occurrence of minerals; namely—very ancient sedimentary rocks, much folded and contorted, broken through by plutonic intrusions, and exposed to view by the erosion of very numerous deep valleys. Further, these rocks, both sedimentary and plutonic, are identical with those in fields lying both to the north and to the south of them, which have proved highly fertile in minerals. As already remarked, but little prospecting has been done in this area, yet several discoveries have been made, which are an earnest of many more to come when the country is better opened up. A description of some of these finds will serve to show that the prospects of future mining here are very good.

*Just-in-time Claim.*—On the eastern side of the Huskisson, and close to the river, a discovery of galena has been made which goes by this name. It is about a mile south of the crossing of the Que River by the pack-track from Waratah to the Pieman River. Several sections have been taken up in this vicinity. The discovery is quite undeveloped at present, the lode not even having been cut through. The outcrop shows a mixture of quartz, baryte, galena, and a little calcite, and the lode is evidently a strong one, over two feet wide at the least, and probably quite five or six feet wide. Its course is not altogether clear, but appears to be nearly north and south. No first-class ore is yet exposed, though a good deal of the stuff would probably be worth concentrating. The country rock is limestone and sandstone. Working facilities are good, as it will be easy to drive on the course of the lode right into a considerable hill. This is a discovery of some importance, and is well worth following up to see if richer ore may be obtained.

*Lynch's Silver Falls.*—Another discovery of galena has been made some two or three miles from the last named, in a small tributary of the Huskisson, known as Ross Creek. A waterfall 110 feet in height occurs in this stream, and on breaking into the face of the rock it was found to be a lode. The face of the fall is, in fact, the exposed "hanging wall" of the lode. The country rock is a somewhat angular quartz conglomerate or grit. The lode is a wide one, not less than 30 feet through, and strikes, as far as at present ascertainable, N. 10° E., dipping to the westward. It is largely composed of quartz, and a good deal of altered country-rock, and contains much greenish serpentinous matter and some baryte and calcite. Towards the hanging wall there appears to be a good deal of lode-slate and some limestone. There appear to be a good many slickensides in the lode-stuff, and from these and its often brecciated appearance it is probable that a good deal of motion of the country has taken place while the lode was being formed. Galena is scattered through the mass of the lode everywhere, but not to my mind in payable proportion so far as yet exposed. No work of any consequence has yet been done to open up the discovery, however, and it is quite likely that mining operations will reveal good shoots of ore. It would be advisable to cross-cut the lode from the foot of the falls, and then drive along its course, making frequent cuts into it as work progresses. This mine is admirably situated for cheap working, being easily opened by adits into the hills on each side of the creek, and having excellent water-power. It certainly deserves to be tested further.

*Carroll's Reward Application.*—About nine miles north of the Pieman River, on the track to Waratah, application has been made for a reward claim on a soft lode in serpentine country. A small hole has been sunk about seven feet, showing a wall of clayey decomposed serpentine, and about six to eight feet in width of lode-stuff composed of clay, oxide of iron, oxide of manganese, and quartz. The lode has not been cut through. It seems to run a little to the west of north, and a quantity of loose gossan in the vicinity probably belongs to it. I did not ascertain if any silver had been found in the lode-stuff, but from its close resemblance to the clayey and ferruginous outcrops of some of the Dundas lodes in similar serpentine I should judge it worth while to sink a little further on the lode to ascertain its value.

*Sale's Application.*—A section has been applied for on an outcrop of gossan in serpentine country about two miles north of the Pieman crossing. No work whatever has been done on this, and as it lies in a wet shallowish depression in the ground it is quite possible that it may prove to be nothing but a deposit of bog iron ore; still it is rather more probable that there is a lode in this vicinity, as the ironstone is found over a considerable distance.

Several sections have also been taken up on outcrops of gossan between the Huskisson and the Wilson Rivers, but I could not find time to visit these.

*Farrell's Discovery.*—An important discovery of galena is reported from the junction of the Fury and Brougham Rivers, which unfortunately I could not on this occasion spare time to visit, as it would have taken two more days. The specimens shown to me by the prospector were very pure galena. Mr. Farrell describes the country as limestone, and reports the existence of some large caves in it. This find is of consequence as showing that the silver-lead bearing country exists to the east of the railway route as well as westward from it.

*Silver Cliffs Mine, Waratah.*—This mine is also an evidence of the northerly extension of the argentiferous area. It is situated within two miles of the Town of Waratah, in one of the deep gullies lying north of Mount Bischoff. The country rocks are metamorphic sandstone or quartzite, sandstone, and slate. Two lodes have been discovered, and are being worked. The main one, from which the mine derives its name, was found cropping out in a high cliff, the face of which was covered with galena. Subsequent work has shown that the lode is a fault fissure traversing the strata obliquely, and that the hard quartzite which forms the cliff has resisted denudation, while the softer slates on the hanging-wall side of the lode have been removed. The face of the quartzite is very distinctly marked with strong horizontal striations, a very unusual feature, which shows that the displacement of the country along the fault fissure took place almost horizontally, instead of in a more or less vertical direction as is usual. The lode-stuff on the outcrop consists of quartz with galena, blende, and some pyrites, and is from two to four feet in thickness: slickensides are found through parts of it. Two adits have been driven to cut this lode, the lower one of which has not yet reached it. The upper one was continued some little distance through the lode without meeting with any further lode-stuff, and then a drive was put in from it along the course of the lode. This has so far proved very poor, but little galena being found. In the end of the drive at the time of my visit, however, a little more ore was coming in, and it is possible that the patch of ore met with on surface is just ahead. In this drive the footwall of the lode preserves the same hard, polished, and horizontally striated appearance which is seen in the wall laid bare on surface. Several small veins of galena have been found in another part of the face of the cliff, which seem to be running towards the lode, and are probably "feeders" to it. The results obtained so far underground have been very disappointing after the high expectations raised by the really good prospects on the surface, but it seems to me that there is no reason to despair yet of the future of the mine, and very probably as work proceeds further ore-bodies will be met with. There can be no doubt as to the permanence both in strike and dip of so well-marked a fissure. The second lode on this property runs almost at right angles to the strata and should cross the first-named—or more probably be faulted by it—on the hill behind the mining manager's house. A shaft had been sunk fifty feet on this, showing a lode up to two feet wide of galena, antimonial galena, Jamesonite (feather-ore), carbonate of iron, blende, and quartz. Some of the ore was very regularly banded. The lode has been traced some chains on surface, and appears to be a good and permanent one. Much of the ore from the shaft is of very good quality, and fit to be sent directly to the furnaces.

*Mount Bischoff Silver-Lead Mines.*—The existence of argentiferous lead ores in the vicinity of Mount Bischoff has long been known, and a company was long ago formed to work one of the veins containing them, but without success. These earlier workings, however, taken in connection with the Silver Cliffs mine, show that such ores may be looked for in this formation.

*Timber.*—Both railway routes, after leaving the plateau, pass through forest country. Much of the timber is of small value, but there is also a fair proportion of "stringy-bark" and "celery-top pine" trees that would afford valuable timber for mining and building purposes, while the smaller trees, such as the "leather-wood," "tea-tree," sassafras, and "horizontal scrub" are good fuel either for engines or for household use.

*Transport from Mines to Railway.*—An important question for consideration in fixing the route of this railway is that of the possibility of bringing in feeders to it in the shape of tram-lines, roads, and aerial tramways. It is clear that the business done by the railway must depend greatly on the possibility of gaining access to it. Between the Pieman River and Zeehan I do not think that there is much to be feared on this score, the route following low-lying ground and being easily reached from most of the mines which lie near to it. In the choice of a route between the Pieman and Waratah it seems to me, however, that careful consideration of this question will be necessary, for parts of the country are so rough that it might often be necessary to make a very long detour in order to reach the railway. It has been pointed out that the Archæan schists and quartzites seem to lie in a line between Mount Dundas and Mount Pearse, and that the country most similar to that of the proved silver-fields lies to the westward of this line—that is, up the basin of the Huskisson. While it is extremely likely that the old schists will be fertile in minerals, gold being perhaps the most likely one to be found, yet the fact remains that such discoveries as have been made are in the Silurian formation and on the Huskisson basin. Farrell's discovery at the Fury and Brougham junction probably indicates, however, that the silver-bearing formation recurs on the eastern side of the axis of older rocks. The line of railway, if run from the Pieman Crossing up the valley of the Mackintosh and thence round the head waters of the Que River, would keep along the ridge of schists and quartzites; and should these unfortunately prove to be barren in minerals, this part of the line would have to be fed by tramways running over the ridge into the Huskisson valley or across the valley of the Mackintosh. Ore would then have uphill haulage to the railway in nearly every instance. If, therefore, a practicable line can be got down the Huskisson valley, it seems to me that it would be better policy to make it there than to sacrifice all considerations of feeding it to a perhaps lower prime cost of construction. Owing to the rugged nature of much of the ground there will necessarily be a good deal of difficulty in getting branch lines to mines at any distance whichever route is selected. As the country is explored, however, it is likely that many as yet unsuspected routes for tramways will be found, and it is quite possible that much of the anticipated difficulty will disappear. The luxuriant growth of tangled scrub and forest which now covers everything prevents good views of the country being obtained, and makes it perhaps seem more difficult to traverse than it really is.

*Older Discoveries of Minerals.*—In estimating the mineral-producing capabilities of this District it should not be forgotten that from time to time in years past the exploring parties who have penetrated it have reported the discovery of other minerals besides lead and silver. Gold has been found on the Wilson River, near the eastern base of the Parson's Hood; a very highly spoken-of discovery of bismuth has been long known to exist at Mount Ramsay; and tin ore has also been obtained. The last-named mineral has now been found in almost every place where granite occurs in the Colony, and as the country from Mount Livingstone to the Magnet Range is nearly all granite it is nearly certain that tin-fields will be opened up there. Particular attention should be given by prospectors to discovering further occurrences of the eurite and topaz-porphry dykes which have undoubtedly caused the immense deposits of tin ore at Mount Bischoff, as it is very probable that this was not the only outbreak of the sort.

*Prospects of the Railway.*—In conclusion, I have to say that in my opinion the prospects of success of this railway are very good. It passes through a very large portion of the Zeehan and Dundas Silver-field in close proximity to a number of mines which now are putting out ore of excellent quality, and to a great many promising prospects not yet developed; it taps the north-western slopes of Mount Read and Mount Murchison, which have lately been proved to be promising gold-fields; north of the Pieman it goes through a district as yet practically unproved, but still an evident extension of the Dundas Silver-field, and already affording undoubted evidences of carrying minerals; and at Waratah it connects with the road to the Whyte River and Heazlewood fields—a very important feeder. There can be little doubt that the whole of the country between Waratah and Zeehan is destined before long to carry a large population, whose requirements will ensure good business to this line.

I have, &c.

A. MONTGOMERY, M.A., *Geological Surveyor.*

*The Secretary of Mines, Hobart.*