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NEW ZEALAND.

LONGWOOD AND MERIVALE GOLDFIELDS

(REPORT ON, BY PROFESSOR ULRICH).

Laid on the Table by the Hon. Mr. Larnach, with the Leave of the House.

Professor ULRICH to the Hon. the MINISTER of MINES, Wellington.

SIR,— University, Dunedin, 21st January, 1887.

In accordance with your request, I recently inspected the Longwood and Merivale Goldfields, and have the honour to report as follows:—

The Longwood Goldfield.

Under the guidance of Mr. C. Rilstone, an experienced miner engaged on the field, and in company with Mr. G. Robertson, the Chairman, and Mr. A. Cross, the Secretary of the Longwood Prospecting Association, and several citizens of Riverton, I examined, besides several abandoned workings, the two quartz reefs at present being worked in the Longwood, and named, after their respective owners, Port's Reef and Rilstone's Reef. The first inspected were:—

Douglas's Old Workings.—These are situated about three-quarters of a mile up the low rise westward of the Pourakino River, and consist of an adit, said to be 300ft. in length, and a bore-hole in front of the adit-mouth of unknown depth. Only a few feet of the adit were accessible for inspection, and in this distance it could be seen that the adit followed a vein of about 8in. in thickness of ferruginous quartzy-mullock, dipping at so flat an angle that it showed in both walls of the adit. According to Mr. Rilstone a sample of the vein-stone was sent to Ballarat, Victoria, for a trial-crushing, and produced at the rate of 17dwt. of gold per ton—a return which was either not considered good enough for further development of the mine, or, possibly, the want of capital for the supply of crushing-machinery led to the stoppage of the work. The bore-hole in front of the adit was evidently put down for the purpose of prospecting the ground for similar flat veins at a lower level, and, as far as known, it met with no success in this respect.

Port's Reef.—The discovery of this reef is due to Mr. Douglas, whose prospecting workings I described in the official report of my first inspection of the Longwood in May, 1878. The reef has been opened by two shafts and a small adit starting from an adjoining gully. The principal shaft is about 100ft. deep, and supplied with pumps, worked by a small water-wheel situated close by; the second—smaller—shaft, hardly 20ft. distant from the former in a northward direction, is about 37ft. in depth. Both were, unfortunately, inaccessible for inspection of the workings carried on from them, owing to the break of the axle of the water-wheel, in consequence of which accident, through the pumps coming to a standstill, the water had risen to the level of the before-mentioned adit, which communicates with the pump-shaft, and a few feet further on intersects the reef and follows it for some distance. This portion of the reef was therefore all I was able to examine, and, as the manager of the mine, Mr. Port, jun., was absent on a visit to Dunedin, and none of the workmen about, I should have had to remain unacquainted with certain important points regarding the behaviour of the reef and its prospects, disclosed in the inaccessible workings, had it not been for Mr. Rilstone, who, knowing the mine thoroughly, could supply me with this valuable information. As it shows in the adit, the reef is fairly well defined, but rather broken, the cracks being filled with ferruginous mullock. It is about 1ft. thick, and strikes nearly east and west, with an underlie to the south of 35° to 40°. The country-rock consists of brownish-yellow, decomposed hornblende greenstone (diorite), and is so soft and clayey as to be easily workable by the pick alone; and this property, as well as the colour, it has also in the other workings, though, as found in the deep shaft, its hardness gradually increases with the depth.

According to Mr. Rilstone, the reef was intersected near the bottom of the small shaft, and followed by a drive to the west for about 10ft., where it gradually became thinner. By another drive to the east it has been opened for a length of 60ft., and in this its thickness gradually increases towards the end to good 2ft., and the quartz becomes more solid and richer in gold—in fact, the thickest part proved the richest. It was found, however, near the end of the drive that the reef quickly thinned out, and showed an unmistakable endlong dip in strike towards the east at an angle of about 40°, a feature which explains the absence of any outcrop in that direction. In the pump-

shaft the reef was sunk through at a depth of 50ft., and a cross-cut is being driven southward from the bottom (at 100ft.) for intersecting it at that depth. Another cross-cut was first put in to the north, and had progressed some distance when, by Mr. Rilstone's advice, it was stopped, as being in the wrong direction. About seven to eight tons of quartz have so far been obtained from the workings, and are stacked in a paddock close to the pump-shaft, and, in addition, about a ton was submitted some time ago to a trial-crushing at Kincaid and McQueen's machine in Dunedin, with the result of above 1oz. of gold; but this yield did not represent its whole gold-contents, as the sand saved on the blankets was left untreated. In some parts of the eastern drive from the small shaft rather rich stone is said to have been found, and proved to run underfoot. An assay made of one of the specimens by Professor Black produced at the rate of about 50oz. of gold to the ton. As is generally the case with reefs and leaders traversing greenstone, as, for instance, in Victoria and Queensland, the quartz is of highly crystalline character, showing not unfrequently druses of fine crystals, and presenting the appearance which, if occurring in reefs traversing slate rocks, would be called "hungry-looking." I found also, however, specimens in the paddock of dense bluish quartz, abundantly impregnated with pyrites. Judging from all the features so far disclosed, I think the working of this reef in a systematic and economic manner will well repay its owners, though towards this end it will soon be necessary to sink a new main shaft some distance towards the south-east from the present one, in order to open workings at a lower level. The visit of Mr. Port, jun., to Dunedin is, I understand, for the purpose of procuring a new axle for the water-wheel and making arrangements for the supply of a small crushing-machine.

Close to the western boundary of Port's claim, on the opposite rise of the small gully from which the adit starts, Mr. Taylor and party have in the line of strike of the reef sunk a shaft to a depth of about 30ft.; but, instead of striking the reef, they met below the surface-clay fine gravelly stuff, which has continued to the present depth of the shaft, and clearly indicates the existence of an older drift-channel—a discovery which may likely prove of great importance, for there is every reason to anticipate that any coarser drift resting on the bottom of the old channel will prove payably auriferous, if not rich. The further sinking of the shaft is therefore a highly advisable prospecting-work, even if there be much trouble in store in combating a probably strong influx of water. That the chance is also given of finding the continuation of Port's Reef in the bottom of the channel is evident. It must be remembered, however, that, on account of the rather flat southerly underlie of the reef, its line of strike will bend, or must be looked for, the further to the southward the deeper the gutter is proved to be. On the opposite rise of the latter it will turn again into its original course, as the ground in that direction is of about the same level as in Port's claim.

Rilstone's Reef.—This is situated about half a mile to the north-west of Port's, at the head of an alluvial gully in which, besides a considerable quantity of fine gold, a nugget of nearly 12oz. in weight is said to have been found some time ago. The reef is about 1ft. in thickness, and runs straight into the range at the head of the gully at a strike of N. 25° W., and with a nearly vertical dip. Both its walls, more especially the eastern one, are well defined, and it is altogether the best-defined and most permanent-looking reef I have as yet seen in the Longwood. It has been opened by a good-sized adit for a length of 270ft., making throughout this distance only a few small bends, remaining unimpaired in thickness and definition, and, as two rises—one of nearly 20ft. in height from the roof of the adit—have proved, extending most probably right up to the surface throughout. The quartz is of a similar crystalline character to that of Port's Reef, and shows occasional impregnations of copper-pyrites; but, unfortunately, only traces of gold—and these only in the pyrites-bearing parts—have as yet been found in it. Appreciable prospects of fine gold were, however, obtained by Mr. Rilstone from tin-dish trials of the casing and rubbly portions. Poor as these prospects on the whole for this fine reef appear, still Mr. Rilstone has legitimate hopes of finding them greatly to improve on further advance of the adit. These hopes are based upon the great probability that, on driving the adit about 90ft. further, he will strike the junction of his reef with two auriferous leaders which have been followed by adits starting within a short distance—about two chains—from the mouth of his own adit. These old adits, driven years ago, have now mostly fallen in; but Mr. Rilstone, with some danger, ascertained their directions, and from these, by drawing a plan, fixed the probable junction-point of the leaders they followed, as before stated. The adit furthest away from his own is reported to be 600ft. in length, extending beyond the line of strike of the so-called "Big Reef," which it was intended to intersect, and which will be noticed further on. The leader it originally followed proved to be auriferous, but not to such an extent as to invite further opening. Regarding the leader followed by the other shorter adit there is, however, the record that, at a distance of about 70ft. from the mouth, and within a length of 10ft., gold worth £170 was obtained in quartz-specimens and free particles washed from mullock. Thus, in view of the fact that reefs generally improve in gold-bearing quality at the points of junction with other auriferous reefs or leaders, Mr. Rilstone's enterprise is likely to be well rewarded—assuming, of course, that the leaders and his reef are of the same age and really unite. For, in case of their being of different age, the only probable event would be the faulting of the older by the younger.

The Big Reef.—This designation is applied to a reef of good 2ft. in thickness—the largest so far seen in the district—which has been exposed in the neighbourhood of Rilstone's Reef at the heads of several gullies, whilst working their auriferous alluvial drift. Its strike is N.W. and S.E., and its dip slightly N.E., or nearly vertical. The quartz has the same crystalline appearance as in the other reefs noticed, but there is so far no record of any gold having been seen in it. Judging from its situation and strike, Mr. Rilstone thinks that it ought to cross the line of strike of his own reef at a distance of about 190ft. ahead of the present face of his adit, and to this length he intends to drive the latter, in order to give the junction—or crossing-point, as the case may be—of the two reefs a good examination—*i.e.*, supposing the Big Reef to extend so far. That this extension exists is very doubtful, however—in fact, it is far more likely that the reef runs out in that direction, because the longest of the two old adits mentioned in connection with Rilstone's Reef failed in

finding it, though being driven far beyond its line of strike. Considering the great scarcity of reefs so well defined and strong as this one in the district, in connection with its position of crossing the heads of auriferous alluvial gullies, it well deserves, in my opinion, to be better prospected than it has been at the places where it is exposed.

Concluding Remarks.—In my first official report on the Longwood, I made special observations, based upon experience gained in Victoria, New South Wales, and Queensland, regarding the nature of the country-rock, the likelihood of its containing original auriferous deposits, such as true reefs, leaders, &c., and the probable prospects to be met with in depth. These observations I see, from my recent inspection, no reason to modify in any material respect, only I am now more strongly inclined to the belief that most of the drift-gold obtained in the district was derived from ferruginous quartzy mullock-leaders and pockets, and that such kinds of deposits exist in greater abundance than I before supposed, whilst genuine auriferous reefs are very rare. The difficulties connected with systematic prospecting for reefs, and a mode how to proceed, were also pointed out in my former report; but, as I was informed by Mr. Cross, the Longwood Prospecting Association intend to adopt instead the method of boring by means of the diamond-drill. This method is, in my opinion, quite unsuitable for the work in view, at least to a depth considerably exceeding 100ft., on account of the soft and clayey nature of the rock. In fact, I doubt whether throughout that depth the drill could be made to work at all, because of the strong wearing action on the walls of the bore of the water that requires to be forced down the boring-tube. Still, supposing even that it could be set to work, no cores would be obtained, to clearly show the nature, mode of deposition, &c., of the stuff bored through, though this supply of cores is one of the chief advantages of the drill in hard and solid rock, for which it is specially adapted. Although continuous washing of the discharged boring-mud would prevent the passing unnoticed of auriferous mullock-veins and pockets, still, their lay, exact thickness, &c., could not be ascertained. The Tiffin auger, or an auger of the kind at present employed by the Municipal Council of Invercargill for boring for water, would certainly prove a far more suitable and—in point of working expenses—considerably cheaper instrument than the diamond-drill for the work under notice. And it would also be the best instrument for prospecting an—in my opinion—important gold resource of the district, which I omitted to notice in my former report—namely, the auriferous drifts. All records regarding the Longwood alluvial workings are unanimous in that these workings have produced considerable quantities of gold, including nuggets of many ounces in weight: every gully and depression in the range that was tried and found to contain gravel beneath the surface-clay is said to have contributed its share of alluvial gold. Yet the flat ground at the foot of the range, and the main valleys intersecting the latter, into which all these worked auriferous gullies and depressions trend, have not as yet, as far as I could learn, received a single trial. The reasons to account for this neglect can only be want of enterprise, and anticipation of too great difficulties and expense in combating the water; for it is against all experience to suppose that in every instance the gold should have run out on touching deeper ground. I therefore strongly recommend the Prospecting Association to direct their first attention to this line of prospecting, as it holds out promise of better and quicker results than the boring for quartz reefs. In conclusion, I may remark that the construction, since my first inspection, of several lines of good tracks through the dense forest covering the field now greatly lightens the work of the prospector; but a serious want still remains to be supplied in a small public crushing-machine, for the testing of samples of stone near at hand, whereby the great trouble and expense connected with sending them to Dunedin or Melbourne would be saved; for it is, indeed, not at all improbable that promising discoveries of auriferous stone in the past and future have been, and will be neglected in dread of this expense and trouble.

The Merivale Goldfield.

I inspected this field, accompanied by Mr. A. Cross, under the guidance of Messrs. Probyn and Gillies, who were amongst the first engaged in its development.

The only description that can at present be given of this field is that it is an alluvial one, as no quartz-mining is being carried on, though certain prospects, to be noticed further on, promise an early change in this direction. The workings consist of sluicing-claims, comprising the bed and low terraces on either side of Buckton Creek and of a right-hand branch of it called Hay's Gully. They start from near the boundary of the Merivale Estate, and extend some three miles up the creek, where poorer returns, I was told, stopped their advance. At several places on the right-hand side of the creek, on gently-rising ground, several shafts have been sunk to a considerable depth through clay and drift, but are not bottomed on account of too much water, which cannot be drained off by adits from the creek, because of the rock-bottom of the latter not being low enough. This clearly proves that there exists at the respective places an older channel of the creek, which certainly is worthy of some enterprise towards being opened, for the probabilities are that it will be found richer in gold than the present one, judging from similar cases in other goldfields. The gold obtained by the sluicing-parties is not of so good a quality as that of the Longwood, being more largely alloyed with silver, which reduces its selling-price to only a few shillings above £3 per ounce. It is generally of medium-coarse character, and a mixture of water-worn with hackly and angular specks, to which occasionally quartz and iron-ore are found attached. The largest pieces as yet found did not come up to ½oz. in weight. In the heavy black sand—a mixture of magnetic and titaniferous iron—resulting with the gold from sluicing, grains of cinnabar have sometimes been observed by several of the sluicing-parties. A feature quickly noticed is the comparative scarcity of quartz in the drift throughout the extent of the workings up Buckton Creek. Only near the head of Hay's Gully this mineral becomes more abundant, and it is in this part of the field alone where quartz-boulders impregnated with gold have, as yet, been found. In these boulders, of which I saw one broken, there generally occur also large and small black patches of titaniferous iron—a circumstance that enables the miners easily to recognize them.

With regard to prospecting for quartz reefs, very little has up to the present been done on this field. Reports of the discovery of auriferous reefs in various parts of the district are current; but the discoverers keep the precise localities mostly secret, and I only saw two discoveries in this line on which some prospecting-work has been done. One of these, due to Mr. McGregor, who, I was told, is also the discoverer of the field, is situated in Hay's Gully, and consists of a nearly horizontal vein of ferruginous, quartzy mullock, traversing highly feldspathic, granite-like greenstone. It is about 1ft. in thickness, and has been followed by an adit of about 60ft. in length. That gold has been found in it is known, but in what quantity I could not ascertain, as the owner of the claim was absent at the time of my visit. Considering the small size of the vein and the increasing hardness of the rock at the end of the adit, the vein-stuff would certainly have to be very rich in order to pay for working. But this is very probably not the case, as the adit seemed to be neglected. The second discovery I inspected is situated on top of a high hill near Hay's Gully, and is called, after its discoverer, "Garvie's Reef." It is a fairly-well-defined mullocky quartz-vein, traversing decomposed greenstone at a strike of E. 25° N., and dipping N. 25° W., at an angle of about 40°. Its outcrop on the surface is very thin—barely 3in. to 4in.; but it increases in thickness to nearly 2ft. at a depth of about 18ft. on the underlie, as seen at the bottom of a small vertical shaft 11ft. deep, which represents so far the only work done at the place. According to Mr. Garvie, the auriferous character of the stone has been proved by assay, and fair prospects of fine gold are obtainable from the soft, mullocky stuff by washing in the tin-dish. These favourable prospects, in connection with its indicated widening in depth, render this vein, in my opinion, well worth being further opened both in strike and dip, more especially as this can easily be done by adits from the slopes of the hill.

The Merivale Goldfield is covered throughout with dense forest, the same as the Longwood; in fact, the forest extends from one to the other, the distance between, in a straight line, being perhaps not more than ten to twelve miles. Both fields belong to the same system of mountains, and geologically resemble each other in the important point that the country-rock is the same in both —namely, "hornblende greenstone." There is this difference only: that the rock of the Merivale field is in places much more feldspathic than that of the Longwood, assuming, as seen in Hay's Gully and noticed in connection with McGregor's mullock-vein, quite a granite-like appearance, and disintegrating to sandy detritus. Wherever rock is visible in other parts of the field it is, like that in the Longwood, strongly decomposed, and undistinguishable from it both in softness and colour, though whether the decomposition extends so far in depth as there, has not as yet been ascertained. That the greenstone does extend right through between the two fields, as might be supposed, is rather doubtful, however, from the fact that in the drift of Buckton Creek there occur abundant pebbles and boulders composed of hornblende schist, hornblende gneiss, and hornblende porphyrite, which clearly indicate that these kinds of rock occur within the drainage-area of the creek and thus probably break the connection.

Having herewith noticed the main features of the Merivale Goldfield, it remains to make some reference to its future prospects. In this respect its resemblance to the Longwood is very suggestive of the existence of similar conditions both as regards original auriferous deposits and drifts. Touching the former it is next to certain, from the scarcity of quartz and the angular or little water-worn character of the gold found in Buckton Creek, that mullock-veins and pockets are there the original gold-bearers, and should be looked for in the bed-rock of the creek and bounding rises; whilst, on the other hand, the abundance of quartz and occurrence of auriferous specimens in Hay's Gully distinctly indicate that one or perhaps more auriferous-quartz reefs exist and wait discovery in the ranges on either side, or more probably at the head of that gully. And where, on opening alluvial drifts in other parts of the district, similar occurrences regarding gold and quartz are observed, similar conditions for original deposits as those just stated will obtain. A district very promising, in my opinion, for good reefs is that from which the various rock-boulders (hornblende schist, &c.) are derived, of which mention was made in another place: the boundaries, more especially, between these rocks and the greenstone deserve examination. With regard to drifts, it is not at all improbable that, wherever any gravel is found within the area occupied by greenstone, it will be found more or less auriferous; and it is therefore possible that the field will ultimately stretch right to the Longwood, enclosing even the steep gullies falling from the bounding ranges into the Waiau River. The flat open ground at the outlets of the creeks and gullies in the Merivale Estate is also well worth proper prospecting. About facilities required for, and mode and manner of, prospecting, all I stated in my former and the present report on the Longwood will hold good for this field also.

I have, &c.,

GEORGE H. F. ULRICH.

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