

(No. 105.)



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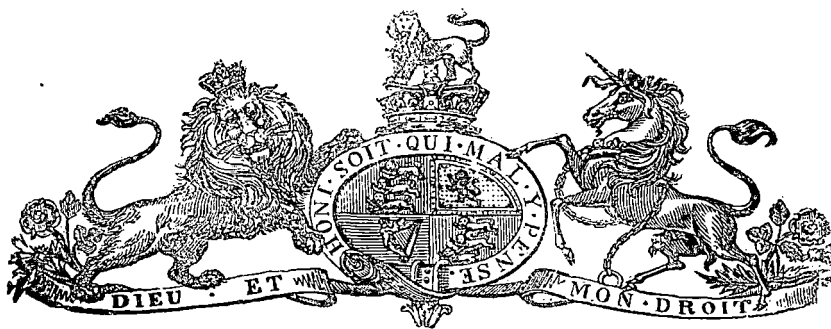
T A S M A N I A.

LEGISLATIVE COUNCIL.

M R. T H U R E A U :

REPORT ON GLADSTONE, MUSSEL ROE, AND WATERHOUSE.

Laid upon the Table by Mr. Moore, and ordered by the Council to be printed,
October 26, 1881.



Lands and Works Office, Hobart, 3rd September, 1881.

SIR,

I HAVE the honor to further instruct you to proceed, with as little delay as possible, to Mount Cameron, and to report on the Tin and Gold Mines in the vicinity of Gladstone. You will also be good enough to report upon the Mussel Roe Reefs, situate about 4 miles to the north of Gladstone.

Further instructions will be forwarded to Gladstone as to your future movements on the completion of your examination of the localities referred to above. In all probability you will next be called upon to visit Moorina and surrounding country.

I have, &c.

C. O'REILLY, *Minister of Lands and Works.*

G. THUREAU, *Esq., F.G.S., Alice Maud Terrace, Hobart.*

REPORT ON THE MINERAL DEPOSITS NEAR GLADSTONE (NORTH MOUNT CAMERON).

Boobyalla, 17th October, 1881.

THE metalliferous deposits in the vicinity of Gladstone comprise the following :—

I. Gold, in the quartzose matrices ; and gold in the alluvial gravels.

II. Tin ores, as impregnating primarily the mica trap-rocks, and casually the auriferous quartz lodes, as well as the metamorphic schists ; and in the form of stream tin in a variety of older and more recent gravels and washes.

Before recording the results of my careful examinations of this very interesting and valuable mining district, I would most respectfully submit that a concise description of the principal geological features would be materially aided by a geological sketch-map, delineating such features, besides placing shafts and workings on the various leaseholds, for the information of those interested ; and this map is now added to this report accordingly.

Mount Cameron proper consists of a chain of granitic mountains rising to 1730 ft. above sea level, and in appearance exhibits a general resemblance with Mount Heemskirk and the Meredith Ranges. Like all tin-bearing strata, varieties of granite constitute the principal component parts of the higher peaks and spurs. Lower down and around the southern and north-eastern base this granite is overlaid by metamorphic rocks or schists, which are lifted to high angles above the horizontal, of a well-defined character, comprising beds of sandstone predominating over bands of slates. Owing to the absence of petrifications of any kind in these schistose formations, due to the close vicinity of the eruptive granites, their proper geological period could not be ascertained with any degree of certainty, but a close resemblance exists with similar schists found elsewhere within the "contact margins" of granites ; especially so as "chiasolite" slates (Skiddaw) of a whitish to dark greenish-grey colour occur here in somewhat contorted bands, exhibiting dark columnar spots from a sixteenth to half an inch in length by a corresponding thickness, in which the needle-like crystals of this mineral have been discerned occasionally, and these crystals cross each other in all directions.

It is in these schists that the principal auriferous quartz lodes occur, as will be seen from the map ; at the same time these formations have been considerably disturbed and become contorted in consequence of dykes (protruding these schists) of mica trap-rock, composed principally of silvery mica, quartz, and impregnations of tin ore. Irregular veins of quartz traverse these dykes, besides enclosing large crystals of cassiterite from semi-transparent to black in colour.

Thus there occur here the following metalliferous ores and other minerals; viz.—Auriferous quartz lodes—in which the gold is, however, sensibly alloyed with silver—also containing arsenical pyrites, copper pyrites (these containing an admixture of oxides of tin), traces of tellurium, rubies, calcites, smoked topazes (cairngorms), and rock crystals.

Then follow dykes of mica trap (impregnated with tin ores), diluvial stanniferous gravels (old leads or ancient river systems), more recent alluvial tin stream gravels, doubtless derived by the attrition and denudation of the former (diluvials) during the erosion of new watercourses and the contemporaneous formation of drainage areas. These secondary gravels denuded from the older are moderately auriferous, probably so after abrasion of the gold-bearing lodes; then succeed recent river gravels and sands, also stanniferous, in the present watershed of the Ringarooma River. It should be stated that these tin deposits in that river-bed are not only very extensive, but likewise of very considerable value in places, such deposits occurring in the banks and in the former watercourses of an ever changing river-bed.

Previously to my detailing the information I have collected in regard to these deposits generally, it should be stated that the granites are capped in places with a very thin stratum of schists, owing to the inconsiderable dip of the former beneath the latter,—in some localities at an angle of 30° only beneath the horizontal. (Diagram 1.) This fact will tend to considerably explain the peculiar appearance and mineralogical composition of the auriferous quartz at North Mount Cameron, so very different from other gold-bearing quartz. No doubt the almost immediate vicinity of the granites has caused this curious alteration, assimilating to the metamorphism of the schists in which these lodes occur. A fringe, so to speak, of this granite intervening between same and the schists, at the head of "Fly-by-Night" Creek, and also on the other side of the Ringarooma River, of a highly micaceous character, is strongly interspersed with rich tin ores, and some narrow quartz veins found in decomposed granite are likewise charged with that ore. These facts demonstrate a great metalliferous activity during the slow upheaval of the granite from below the sedimentary rocks now occurring as metamorphic rocks. Besides these alterations, the indications are to the effect of other changes taking place at the same period, involving a thorough change of level of the surface, a successive change in the water and drainage systems, one after another, down to the present time.

THE AURIFEROUS QUARTZ REEFS.

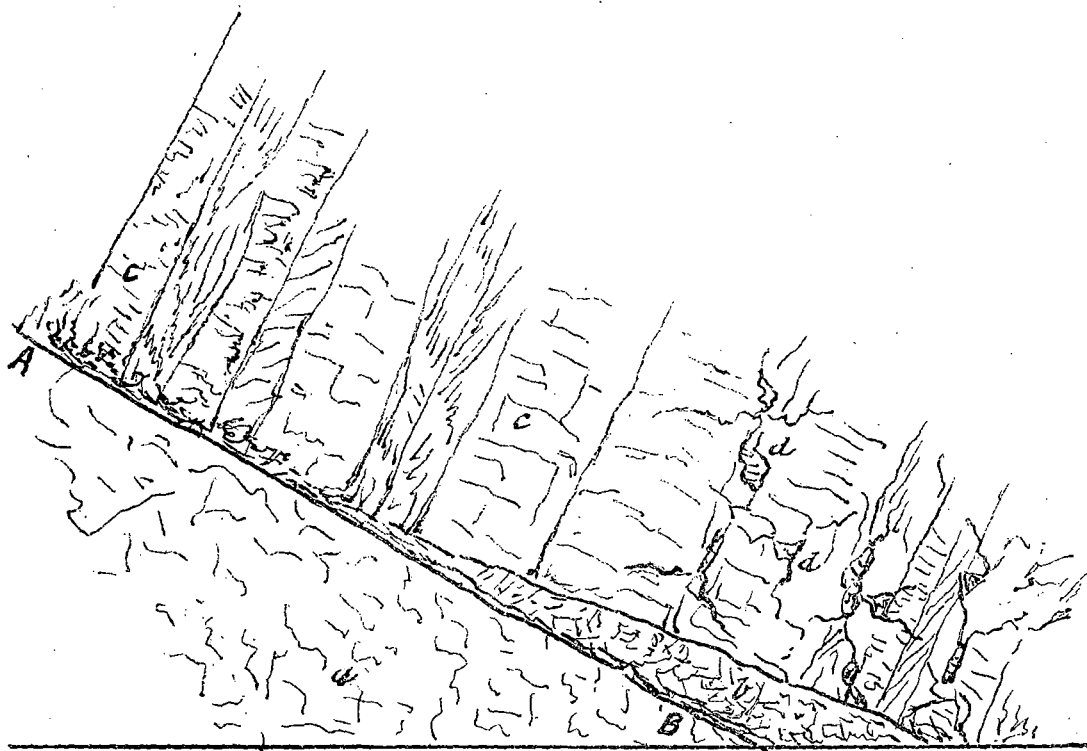
The extent of these, so far as they have fallen under my notice and observation, is yet limited; and, in reporting *in extenso* upon the same, I find it necessary to describe the appearance of that veinstone mined hereabouts. At the surface it resembles other quartz; and it is only on breaking that its decidedly dissimilar character is detected. As it may be useful to specially refer to this matter, inasmuch as similar quartz may occur elsewhere in Tasmania, which, owing to this peculiarity, may have been rejected by prospectors, the following description is given:—The freshly fractured Mount Cameron quartz-bearing gold has the general appearance of a fine granular sandstone, greyish to reddish in colour. Under the magnifying lens it is observed that, instead of the ordinary homogeneous crystalline composition of auriferous quartz elsewhere, this Gladstone variety consists instead of an aggregation of minute crystals of quartz, closely and almost mechanically impacted or kneaded together by means of a siliceous base, thus accounting for the friable character this quartz exhibits under the stamp-heads in the battery. With the exception of its sometimes containing rich tin ores, the sulphurets found in it are of the same description as occur in other quartz reefs. All the Gladstone quartz, when obtained at some distance beneath the surface, resembles semi-transparent marble, tinted light blue and red in places. It is hard to bore and to break underground.

The lodes are of a good width on the average. Their extension in the direction of their strike has not in many cases been proved with any degree of certainty. This applies principally to the central or first discovered line of reef. At the same time, it is satisfactory to find that prospecting is carried on with a considerable amount of vigour and of skill.

By means of these gradually extending mining operations, the following distinct lines of reef have been opened during a very short period, comparatively speaking, starting from south west by north east in this District. It is found that they appear; viz.—

- (a.) The Royal Mint line of reef, having an average bearing of S. 42 E.
- (b.) The Royal Tasman No. 1, ditto S. 53 E.
- (c.) The Royal Tasman No. 2, ditto S. 33 E.
- (d.) The Royal Standard ditto, ditto, S. 56 E.

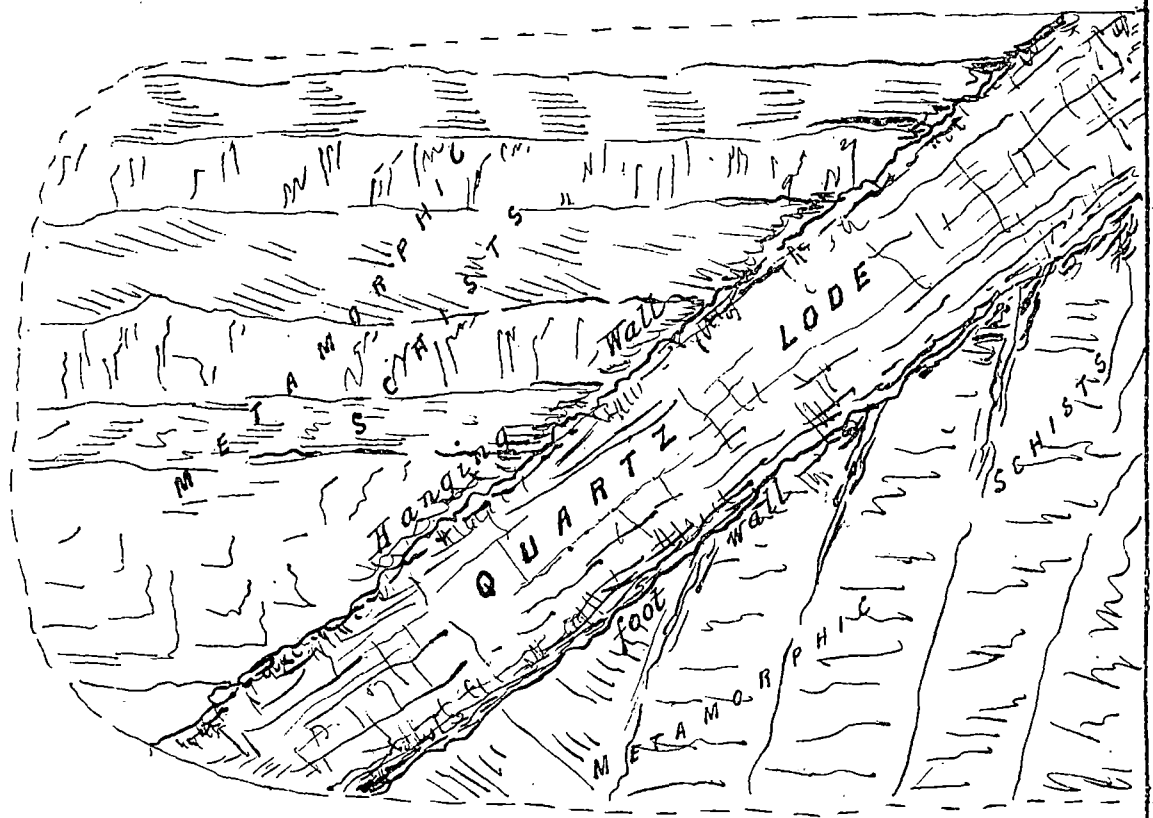
Besides these lodes, some of which are poor and others profitable to work, there occur some cross reefs, two of which, to all appearances, connect at least two of the lines at nearly right angles, viz., the Royal Mint and the Royal Tasman. Gold has also been found in quartz spurs and leaders in such localities as are delineated on the sketch map. In order to avoid anything like what may appear as undue preference, and as I cannot, on public grounds, refer specially to each lease or



CROSS SECTION AT A ON PLAN.

A to B. Dip of Granite beneath metamorphic Schists.

a. Granite. - b. Feldspathic Clay - c Metamorphic Schists. d. Quartz veins.



mine, I have deemed it necessary to number the various claims on the sketch map, without reference to their proper title, which I trust will avoid the difficulty mentioned.

No. 1. This proprietary is engaged in driving a tunnel in the northern bank of the Fly-by-Night Creek, for the purpose of connecting same with a shaft sunk on the top of the hill, which would give them 84 feet of backs on any reef they may yet discover. A body of stone was discovered underlaying south, and charged with sulphurets. The bearings of this tunnel are due north.

No. 2. Have sunk two shafts. Of these the present main shaft has reached water at 71 feet. A cross-cut has been driven 60 feet to the W.S.W., in which a gold-bearing leader was found to underlay towards a decomposed formation of quartz underlaying southerly. At the surface gold-bearing quartz has been met with.

No. 3. The main shaft has been sunk to a depth of 100 feet through metamorphic schists, dipping south. Lately, a leader 4 inches thick has been cut, which underlays west, and which carries fine gold with sulphurets. As soon as the shaft and plat are secured properly, cross-cuts will be commenced for the line of reef traversing this ground.

No. 4. This proprietary have inaugurated an extensive scheme of mining and other necessary works on the lodes and veins they have discovered, immediately after the first gold-bearing reef had been found on this goldfield. Extensive prospecting works having proved the existence of a very promising lode, a main tunnel was driven for a total length of 220 feet, where the first underlay shaft or winze (sunk on the lode) was broken into,—the quartz averaging in the 64 feet of backs 4 feet in width. Another winze, 300 feet south east of the former, exhibits an average width of stone of 2 feet; and a main level is now being driven from the first winze to the second on the course of the lode, which here averages from 8 inches to 16 inches in width. About 10 feet east of the first winze a cross vein 18 inches thick, almost vertical, has been proved auriferous. Another cross vein, 90 feet still farther east, has been discovered, containing payable gold for a considerable distance along the surface.

This Company has likewise provided, besides an iron tramway over half a mile in length, a very substantial plant of crushing machinery, which is supplied with water by means of a race one and a half miles in length, and a reservoir near the works. The engine cylinder is 18 inches in diameter, with a stroke of piston of 42 inches. This drives 15 heads of stamps (revolving) of 750 lbs. each. Outside the boxes there are five copper plates in each set of three, measuring 5 feet long by 2 feet wide. Four blanket strakes are constructed for each of the three boxes, for a length of 23 feet. The quartz is proposed to be crushed through gratings having 200 holes to the square inch; and the boiler measures 24 feet in length by 6 feet 6 inches in diameter.

No. 5. A very straight main tunnel has been driven under the northern range of the Fly-by-Night Creek, for a length of 462 feet, where a vein of quartz was intersected, 5 feet thick, underlaying west, which gives fine gold in the casings after crushing and washing. The ochreous water exuding from this vein indicates the presence of pyrites, which should be prospected. 300 feet from the mouth of the tunnel a narrow leader was discovered, almost vertical in position. This has a promising appearance,—being laminated and heavily charged with sulphurets of copper and of arsenic. Besides these, oxides of tin occur in this vein. An air shaft has been sunk to a depth of 110 feet from beneath the summit of the range, or about 64 feet west of the quartz referred to as 5 feet wide in the tunnel. Another shaft was sunk, on the top of the same hill, to a depth of 40 feet; and, by driving 14 feet to the west (Diagram 2), the No. 2 Royal Tasman lode was intersected with an encouraging prospect of gold in the stone.

No. 6. The discovery of the lode in this company's ground established this region as a goldfield, and other discoveries of auriferous quartz rapidly followed in due course. This first lode crops out at the surface on the precipitous sideling of the range, at a height of about 115 feet above the creek bottom; the outcrop is very massive, and the quartz exhibits the fine gold and pyrites so characteristic a feature of Gladstone. The mine has been judiciously laid out for supplying the crushing machinery with ample quantities of stone, and two tunnels have been driven under the hill in question. Of these tunnels the upper one intersected the lode at a distance of 80 feet from its entrance; at the end a connection has been made with a winze sunk from the surface on the course of the lode; the lower tunnel has also been driven to a length of 140 feet without as yet intersecting the continuation of this quartz at an additional depth of 42 feet below the upper tunnel, which would make a total height of backs of 82 feet available for stoping. Certain features have been developed in this mine which deserve general attention; the quartz averages at and above the upper tunnel level 7 feet and 6 inches in width near the flat sheet or turn table; that in the east end, 60 feet from the same place, or about the centre of the tunnel proper, the quartz is 3 feet wide in the top, and 2 feet 6 inches in width at the bottom of that level. On the opposite side of the tunnel, at a distance of 42 feet, the lode is 7 feet 6 inches in width, thus indicating a dip of the whole formation in its strike to the south-west, a point of considerable importance to adjoining proprietaries. Owing to the metamorphic schists having been

much disordered with the lodes they enclose, one portion of this lode itself has been thrown for a distance of 12 feet farther into the hill than the remaining portion, which two separate blocks previously formed one continuous body of quartz.

The "slide" or "fautler" runs nearly parallel with the course of the upper tunnel at N. 64 degrees E., and measures from 4 feet to 6 feet in width; it is composed of angular fragments of quartz, metamorphic schists, and some felspar embedded in brown to blackish clay, thus forming a "friction breccia" as the result of the forcible movement of one stupendous mass of rock upon another remaining quiescent, to the already mentioned distance of 12ft.

This break or slide of the reef underlays from west to east, and frequently contains greasy, shaly, carbonaceous clay; some stone east of this break has been crushed from the surface, but the rest is not yet taken in hand for stoping.

Now that the stone has been found profitable to work—the yield from over 300 tons being amongst the highest per ton in Tasmania, and the size being also satisfactory—future developments can be expected to be of a favourable nature. On the same lease, about 220 feet in a northerly direction, a second and almost parallel lode has been discovered north west of No. 1 reef. The peculiar behaviour of this stone for the limited distance it has been exploited from beneath the surface confirms the assumption of a very great geological activity prevailing in this region since the deposition or formation of these lodes. The No. 2 lode crops to the surface for a length exceeding two chains, and it is from 4 feet to 6 feet wide. (Diagram 3.) Having been proved auriferous, a shaft was sunk upon its vertical course to a depth of 33 feet; there this solid stone suddenly terminated, and rested immediately upon the schistose rocks without any indication of its probable course or continuance. Owing to this reef having been cut off, as it were, at right angles, it required some skill to recover the lower portion of the lode. This search was eventually found to be successful, and the missing part was found, measuring from centre to centre 12 feet in a northerly direction from the shaft, and by sinking a farther depth of 30 feet it came into the bottom of the shaft from the north, at a total depth of 63 feet from the surface, having then a width of 6 feet.

This stone has a fine appearance, and during my stay at Mount Cameron a marked improvement was being observed.

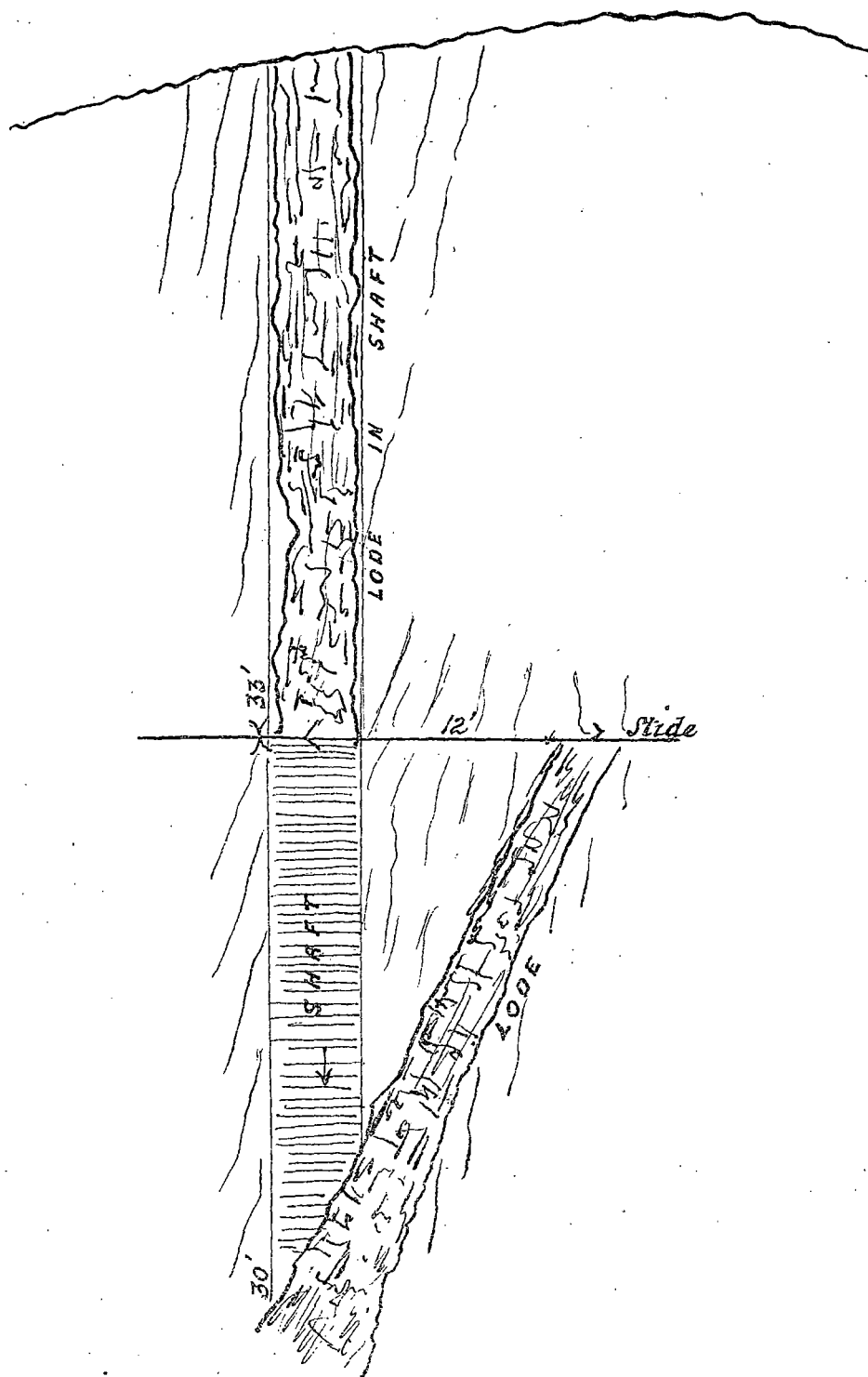
The workings on the first reef are connected by means of tramways with this company's crushing plant direct, for which an ample supply of water has been secured. The machinery consists of an engine with a cylinder of 18 inches in diameter, stroke of piston of 36 inches. Three new batteries, of five revolving heads in each, constructed upon the latest improved principles, and weighing 800lbs. each head, are employed in crushing. The gold-saving apparatus consists of copper plates, ripples, and besides 14 feet of blanket strakes. The strakes are about to be replaced by three of Halley's patent percussive tables (for concentration generally), so much in use with Victorian crushing machines; a tailings and water pump, together with a proper retorting and smelting furnace, complete a very effective, well-designed, and strongly constructed plant for crushing purposes.

No. 7. There are two good shafts on this lease, one in the north-east, and the other near the south-western corner; both, however, are located in the western portion of the lease. In the first named shaft the Royal Standard lode was found at the surface, and in sinking, the several bodies of stone that were intersected have been carefully prospected, with no practical result so far; in fact, that reef has not yet realised anticipations. The other shaft was started on account of some gold-bearing surface leaders having been found there, which appear to indicate the vicinity of the No. 2 Royal Tasman lode. This shaft is situated close to a tin-bearing dyke of mica trap-rock, and the country generally exhibits favourable features for the occurrence of metalliferous deposits. This shaft was opened out south-east at 70 feet.

No. 8. This company's shaft is situated so close to that of No. 7 as to make all remarks applicable to both. This shaft is 40 feet in depth.

No. 9. The workings in this ground are progressing at a depth of 53 feet 6 inches from the surface, leaving 5 feet for a well; a cross-cut has been driven 10 feet south east, in hard country interspersed with small leaders; on the opposite side the drive has been extended nearly 100 feet, showing leaders of quartz from 6 inches to 2 feet in thickness. Judging from the average bearings of the Royal Tasman reefs it would appear as if they would traverse north east of this shaft at a considerable distance into the hill.

No. 10. A very remarkable formation of a porphyritic dyke occurs here in the metamorphic schists; its uniform composition, however, does not admit of any certainty to decide as to whether it is of porphyritic or granitoid. Some very good prospects of rich gold were taken from same and washed, after crushing, in my presence. Another discovery of gold-bearing quartz has been made close to the Royal Mint Company's crushing plant, which latter occupies a portion of the surface area of the No. 10-lease. This appears to be a strong formation of quartz (4 feet wide), well impregnated





LONGITUDINAL SECTION on dotted line F. G.

Lands and Works Office. Oct 1888

with sulphurets, and exhibiting in the tests made gold similar to that found in quartz at No. 6. If this is a continuation of that proprietary's lode, there must have been some considerable disturbance, as the bearings of this new lode will not correspond with those of the lode mentioned above (No. 6). It may possibly be a new gold-bearing veinstone not hitherto known.

No. 11. Are driving for the Royal Mint lode at a depth of 70 feet from the surface.

No. 12. This claim or lease is located upon the Royal Standard line of reef, which crops out at the surface near its north-eastern boundary. At a depth of 64 feet a cross-cut was driven due west 68 feet, when the lode was cut for a width of 14 feet, and impregnated with sulphurets and also some fine gold. In driving along the foot-wall the cap of this formation dipped under foot at 24 feet distance, thus establishing a general dip of this body of quartz to the north.

Part of this ground, and especially so at the surface, is of a gravelly nature; in fact, judging from certain indications, these washes belong to the diluvial era. The coarsish gravel consists principally of granite detritus, red near the surface, and dark brown lower down, and the whole of it is stanniferous to a moderate degree. (Diagram 4.) Inasmuch as the old river channel is pretty well defined by the schistose rocks (river country, Cal.), and gold having been found in the adjoining gullies (coarse gold gully on plan), and as the gravel wrought for tin below this ridge, upon the higher portions the town of Gladstone has been built, a prospecting shaft (No. 16) is now being sunk to test the lowermost strata or wash resting on the schists. Several wells have been sunk in this vicinity without reaching the bed-rock, and therefore, if this prospecting should result in the discovery of gold at some depth (at 28 feet there was no bottom), a moderate extent of ground would be available for mining these deposits, whilst contributing at the same time to the interest felt by scientific and practical men in the unusually complicated occurrence of auriferous and stanniferous deposits at North Mount Cameron, as they are certainly not anywhere else to be found in other gold or tin mining countries.

No. 13. Within the boundaries of this lease the largest and most extensive outcrops of quartz occur, their width ranging from 10 feet to 18 feet on the surface, where it can be seen for the whole length of the lease. This ore has the same granular appearance as that of the Royal Tasman Company. It is charged with arsenical iron and copper sulphurets occasionally; and pure oxide of tin has also been found in the stone. A very considerable amount of prospecting has been carried on at this mine by way of surface cuttings and shallow shafts, taking down the full width of this massive reef. Two main shafts have likewise been sunk. Of these, No. 1 had reached a depth of 52 feet, including a well of 2 feet. The lode here is 18 feet wide at the surface; and the ore contains some good gold at the walls near and at the surface. The walls are vertical at first, but eventually they widen out so as to make the lode enclosed 22 feet thick at the 50 feet level. The No. 2 shaft is 105 feet deep; and, on driving a cross-cut to the east at the 100 feet level, a lode 3 feet wide only was found, with no indications of a stronger lode, which has not yet shown any gold. At present a level is being driven along its southern course.

RECAPITULATION.

Without repeating the data relating exclusively to the geological structure of the strata in the Mount Cameron mining district and vicinity, and confining myself in the following to those portions of my report which deal with the mineral, and especially the metalliferous deposits, as of more interest to a mining community, I would most respectfully offer the following for consideration.

Gold.—Taking these deposits first, the matrices of same deserve especial attention. Hemmed in by the North Mount Cameron granites in the south and east, the metamorphic country rocks of the quartz reefs form an extensive area at a short distance from the granites (less than half a mile in places). A second and lower belt of granite, situated half way between Gladstone and Boobyalla, raised the sedimentary rocks; and, in this case probably, carbonaceous beds. In the first region, described, some were promising looking outcrops of quartz occur worth while the attention of prospectors. The same may be said of the north-eastern portion of this district across the Ringarooma River where quartz reefs and the "contact margins" of granites and metamorphic schists deserve attention. Concerning the quartz mines now in full operation, after making allowance for the peculiarities every new mining district presents at the initiation of permanent mining, the details given above I hold to be in the main very encouraging. The quartz in Nos. 6, 4, and 10, principally, is so strongly developed, and the trial crushing which No. 6 has had with their new machinery, of over 300 tons, cannot but be regarded as satisfactory indeed. That the stone did not yield so well as those assays made in Victoria indicated, can be explained through the batteries and other gold-saving and concentrating apparatus requiring yet continual adjustment to adapt the same to the kind of ore passing through the same. Then, again, the yield was of *free gold* only, and the residues stored at the works still wait treatment for the extraction of the gold they contain; and it is not to be expected that a new battery will compare in saving of gold with a more scientific, and therefore more thorough, treatment of a small quantity of ore, as was done in the assays referred to.

From the appearance of the stone in Nos. 4 and 10 satisfactory results may be expected, thus establishing the fact of payable gold being obtainable from three leaseholds, and three distinct lodes (dyke incl.) on different lines of reef, and some distance apart. As the workings progress, and the nature and the characteristics of these reefs are being better understood by the mine superintendents, it is to be expected that the number of gold producing claims will be augmented, whilst a higher percentage of gold at per ton will likewise be secured.

At the same time it should be stated here, that owing to the peculiar character of the gold and of the quartz, together with the various minerals (sulphurets and oxides) the gold is associated with even at the upper levels, and which obstructive ingredients will doubtless increase with greater depths below the water level, it is incumbent on the mine owners to adopt gradually a more scientific and skilful treatment of the quartz and the resulting residues, than can be done by mere stamping the ore and passing same over copper plates, through ripples, and over blankets, or percussive tables. The specific gravity of these minerals, coating as they do or impregnating the free gold to so considerable an extent, varies so much as to make it imperative to adopt the best possible methods for effecting a satisfactory treatment, by means of which the value of the quartz crushed would be considerably increased. I am of opinion that these residues should be manipulated in pans, and subjected therein to the disintegrating influences of grinding, superheated steam vapours of mercury and chemicals, before the sulphurets are subjected to the final chlorination process.

Tin.—I have to repeat that the sources of the oxide of tin ("cassiterite") in the districts examined (Diagram 5) are principally confined to the "contact margins" between the granites and the metamorphic schists, likewise in some attenuated quartzose veins enclosed in decomposed granite, and in the dykes of mica trap traversing the schists.

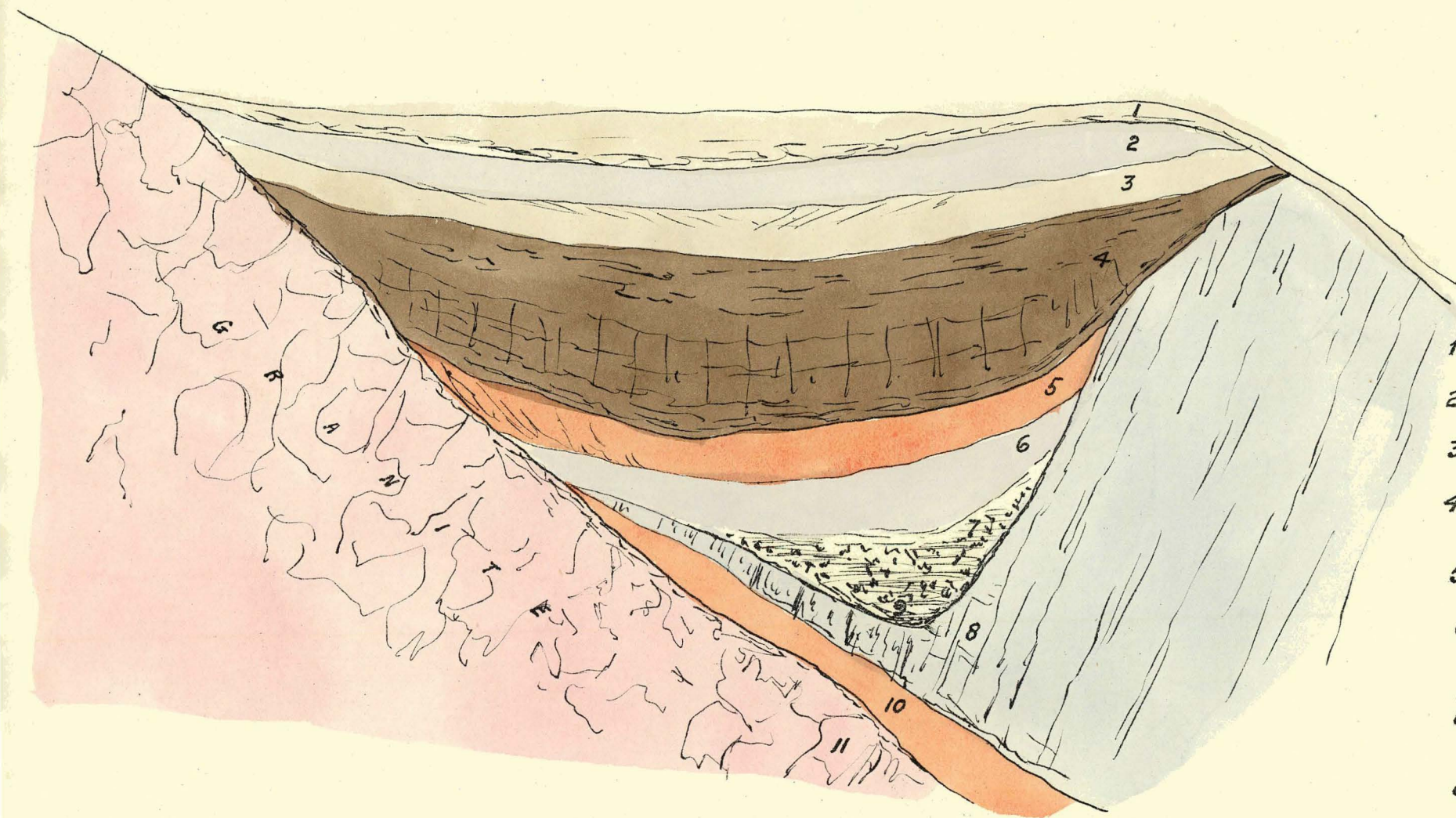
It is very doubtful whether these are the only sources of the heavy and extensive deposits of stream tin, and I am inclined to believe in the existence of lodes yet undiscovered in the granitoid country; the appearance of the ore, sometimes quite angular, supports that view. It must be borne in mind that the Ringarooma River and its tributaries form a very extensive watershed, in which stream tin abounds, derived doubtless from strong lodes or veins of tin ore.

Putting together all these facts, it is scarcely possible to resist the conclusion that Tasmania possesses in the North Mount Cameron district, as examined, a valuable acquisition to its already numerous list of similarly undeveloped mineral regions. Though the auriferous quartz lodes have not yet been developed to any great extent in any direction of depth or along their course, yet their gold-bearing qualities are established satisfactorily, and by their undoubtedly assuming a more and more mineralised character at increased depths, present a very reassuring feature for future development. Under the very peculiar circumstances, from a geological point of view, and with special attention to the question of their reaching great depth in such close contiguity to the granites, I would most respectfully submit, for the consideration of the Government, the employment of one of the mining diamond-drills about to be received from America, for the purpose of testing the country from beneath present levels in different directions or at various angles. There should not be any hesitation on the part of local mine-owners in contributing towards the working expenses incurred whilst testing their ground, because after drilling some distance they would know what future expenditure they will be committed to for the development of their mines.

As regards the tin deposits, those located in the contact margins deserve further prospecting before any opinion can be given as to their permanency and future value. "Earth augers" could be advantageously used for testing alluvial tin deposits in the river beds or otherwise; they are not expensive to work, and do not cost much money.

I am glad to have it in my power to present a report of a satisfactory character; and, in conclusion, I would submit, for the consideration of the authorities, the following drawbacks, so seriously hindering the development of a district that would otherwise extend rapidly, and become the centre of a settled population.

It may be stated that, at present, fully two-thirds of the stream tin works are idle, owing to the scarcity of water, leaving alone the impossibility of testing untried deposits. Last year there were shipped from the port of Boobyalla alone about fifteen hundred tons of tin ore during a reasonably favourable season; and, judging of the capacities of the partially opened tin deposits I have examined, there can be no doubt but what that output could in time be trebled (if not more) were a constant and copious supply of water available. The present limited supply of water for sluicing is scarcely sufficient even in a very wet season; and water pressure for hydraulic sluicing is altogether out of the question, though it is by far the most effective and profitable mode to operate with on gravels for their mineral contents. The water is now conveyed in races owned by private parties; and those that are projected for the purpose of supplying this want are not of that comprehensive character that is needed, although they may serve the purposes and requirements of private parties limited in number.



1. Peaty Surface.
2. Grey Sand.
3. Brown Sand
4. Hard ferruginous conglomerate.
5. Brown Clayey Wash
6. Grey Wash. with small Quartz pebbles.
7. Tin bearing Yellow
8 or 9 inches thick
8. Metamorphic Schists
10. Feldspathic Clay
flesh colored
11. Granite.

CROSS SECTION. Diluvial (LEAD) TIN DEPOSITS,

A well considered and comprehensive rational scheme of Water Supply would alone suffice to develop this and the adjacent districts up to their fullest capacities.

The second difficulty to miners and others settled here is the want of good passable roads ; the road from here to Gladstone (11 miles) is in such a state in parts as to have raised freight or cartage to £2 per ton.

The country presents no obstacles to the construction of rail or tramways ; and if a good water supply was obtainable, there cannot be any doubt as to the outlay for such more rapid and cheaper means of transit for goods, minerals, etc., returning a profit.

G. THUREAU, *F.G.S.*

Lands and Works Office, Hobart, 19th September, 1881.

SIR,

I HAVE the honor to inform you that it is desirable, after completing your Reports on Gladstone and Mussel Roe (and other Reports on hand) that you should visit and report on the Waterhouse Gold Fields at Lyndhurst.

Plans will be forwarded by to-morrow's mail.

Further instructions will be forwarded to you at Gladstone as to your future proceedings.

I have, &c.

C. O'REILLY, *Minister of Lands and Works.*

G. THUREAU, *Esq., F.G.S., Gladstone,
North Mount Cameron.*

REPORT ON THE AURIFEROUS QUARTZ REEFS NEAR THE MUSSEL ROE RIVER.

Boobyalla, 17th October, 1881.

APPROACHING the above-named and northernmost quartz mining district in Tasmania from Gladstone, no immediate change in the geological structure of the country is observable, the Gladstone metamorphic rocks or schists still prevailing most of the way. Crossing the Ringarooma River at about two miles and a half from Gladstone, the remaining ten miles are exhibiting the following features :—The stanniferous, fluviatile gravel deposits attract attention ; but very few are operated upon in this season, owing to the want of an unlimited supply of water, either for ordinary sluicing, or, what has not yet been introduced here, viz., "hydraulic sluicing," i.e., by means of water under great pressure to reduce the tin-bearing gravels, which method is the more effective and remunerative of these two operations.

The country beyond the river becomes more and more level and marshy, the vegetation is confined to heaths and rank grasses, good arable land being very sparsely distributed ; here and there outcrops of quartz appear at the surface on the ridges, which look well for gold sometimes.

At about one mile from the Mussel Roe mines, at Parker's Station, a gradual change in the vegetation indicates likewise an alteration in the geological strata beneath ; the low rounded hills are covered with good grass growing upon a substratum of basalt stretching away to the east, and the metamorphic rocks are displaced by true upper silurian slates and sandstones, in which the quartz lodes, the subject of this report, occupy rather a peculiar position. As already stated, the slates and sandstones belong to the silurian era of formations, and they consist of finely laminated soft dark blackish slates, largely impregnated with iron pyrites, both in the crystalline forms and interspersed throughout the cleavage planes in thin tabular patches. The sandstones are darkish grey in colour, very dense and hard generally, thus forming distinct bands in the slates, all of which beds and bands have a strike of nearly due north by south.

The quartz reefs are simply cross veins traversing the country rocks from more or less east by north to west by south, and the whole of these reefs may be described as forming an intricate system of quartz veins interlacing each other at all angles and in all directions ; certain larger veins, however, occur, which tend to give the whole formation a more regular and defined aspect, and it is these veins that have principally given rise to the mining operations now carried on in two claims with a considerable amount of energy. These works, it may be observed, are now aided by the employment of steam machinery used for pumping, and which will be in a short time employed for crushing also after quartz is being raised.

The company employing this machinery holds a lease of about 18 acres, situate at the southern extremity of the other leaseholds held by various other parties, the majority of whom have not done any or very little work in order to develop this goldfield; and, apparently, these leases are held for speculative purposes. On D. Campbell's leasehold a promising formation of reef occurs, which has been tested by shafts and cross-cut worked some time ago.

The rough sketch (herewith enclosed) shows that there are two distinct cross-reefs cropping to the surface, running east by west, and about 130 feet apart from each other. The south lode, averaging 2 feet wide, was followed to a depth of 16 feet; and, from a shaft sunk to the north of the north lode, a cross-cut 40 feet in length cut that lode at the 32 feet level, the stone averaging 2 feet 6 inches in width. Trial crushings, consisting of one ton each from each lode, were made, which gave a result of 1 oz. 5 dwts. of gold from the south, and of 10 dwts. of gold from the north lode, respectively. The underlay of the south reef is at an angle of $80\frac{1}{2}$ degrees north, and that of the north reef 87 degrees south,—thus establishing a perfect geological "synclical" section, in which these two lodes will probably join in one lode at a depth of nearly 180 feet from the surface. Numerous gold-bearing leaders drop into the north reef, which appears to become, in time and depth, the main lode.

A very fine shaft has been sunk, measuring 11 feet by 3 feet 6 inches, to a depth of over 100 feet. After sinking a well, cross-cuts will be started north and south, in order to intersect both lodes, which, at that depth, are about 80 feet apart. A portable engine is employed at the main shaft at present; and, as soon as the lodes are cut, and prove to have maintained their value, heavier machinery is to be erected,—leaving the present engine to drive a new 10 head battery (heads, 650 lbs. each) lately erected, together with all the requisite gold-saving appliances.

The old workings in the other leases are nearly all filled with water; and none of these, with one exception, were worked during my visit. These workings all exhibit, in trenches, cuttings, and some shallow shafts, the same features; viz.—a network of small and large leaders (which I was informed were auriferous) intersecting the strata everywhere.

On Norman E. Geach's lease, which is situated on much higher ground than any of those mentioned above, the quartz reefs are found in a very hard crystalline sandstone and schist. The principal body of stone, 2 feet wide, underlays at an angle of 35 degrees south; it contains a little very fine gold, and in the main shaft which this company are sinking it was passed through, having a similar appearance. The shaft is 63 feet deep, and the miners now employed have opened same for cross-cutting at the 55 feet level. In the vicinity of this reef the wall rocks are very considerably impregnated with sulphurets, viz., of arsenic, lead, iron, and others, indicating that this reef is occurring in a highly metalliferous strata favourable for deposits of gold.

As regards the permanency or otherwise of this particular quartz-mining locality, it is certainly a satisfactory circumstance that the auriferous quartz occurs in the same slate formation which in Victoria specially is noted as the country rock of their rich quartz lodes. It is also possible that at increased depths a greater regularity in the occurrence, and an increased metalliferous character, will be met with. The country is very easy to work, and therefore, with strong pumping gear, mining operations can be carried on at much less cost than in many other and similar places in Tasmania.

Inasmuch as the characteristic features of these mines, as stated above, are in the direction of a large supply from an extensive net-work of gold-bearing quartz veins and leaders, &c., and not so much for strong lodes from gold-bearing quartz, it would perhaps be advantageous to take into consideration the question of the amalgamation of a number of these claims, with a view of conjointly obtaining a very powerful and extensive crushing plant, to manipulate very large quantities of quartz every month, instead of individual and limited proprietaries going to the expense of crushing much smaller quantities of their quartz by their own crushing machinery.

G. THUREAU, F.G.S.

REPORT ON THE WATERHOUSE QUARTZ REEFS.

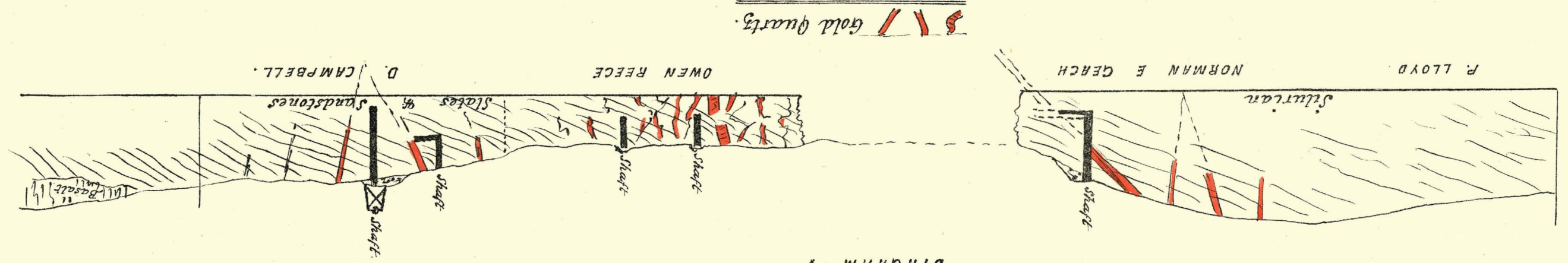
Lyndhurst, 22nd October, 1881.

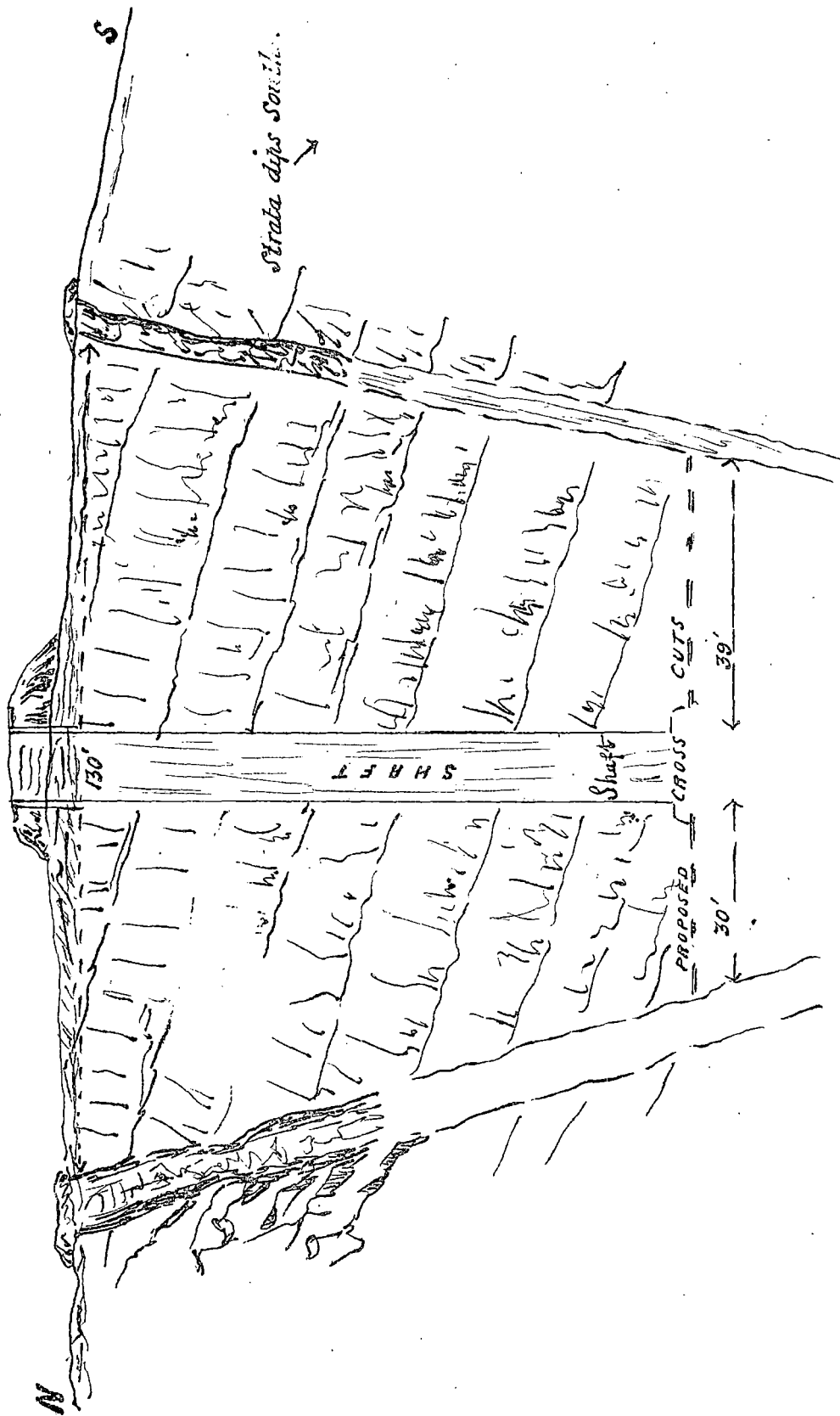
THESE reefs were at the time of my visit found to be totally unworked, and consequently my report is principally based upon what evidence I could gather from the character of the strata in the workings not yet altogether collapsed, and from the information I was enabled to gather on the spot.

Proceeding from Boobyalla to Lyndhurst (where these reefs occur), for the first three miles marine sands prevail; then, at the low coast ranges, grey sandstones, coarsish in texture, succeeded in irregular outcrops; marshy lagoons, with intervening ridges, on which coarse granites were exposed for several miles in large boulders, followed. (This granite appears to be the continuation

N AND S SECTION MUSSEL ROE REEFS.

DIAGRAM 1





CROSS SECTION OF MUSSEL ROE REEFS

of that at Mount Cameron, and traces of tin ore have been discovered in the gullies, which, on that account, deserves further prospecting.) This formation (of granite) is principally of a coarse character, in which the crystals of felspar are very large, and those of mica likewise occasionally. It is a noteworthy fact that these granites do not extend down to the coast in places, because Waterhouse Island and a low range opposite same on the main island, on which the Waterhouse stations are located, are composed of a fine columnar basalt.

About two miles from Lyndhurst the auriferous slate formation overlay or "cap" the granite; the reefs that were at one time worked here occur in these upper beds of silurian sandstones (predominant) which alternate with thin bands of slates, both differing, however, much from those at Mussel Roe.

These sandstones and slates have nearly a due south bearing, whilst the reefs—the old Pioneer obtains a strike of north 20 degrees east; and what I could see of this reef and others at the surface in several places, the quartziferous formation is a strong one along its northern extension. Though I could not gather any reliable information as to yields (except that about 1800 lbs. (avoir-dupois) gave nearly 30 ozs. of gold) which came from below the surface formations or from the deeper levels, there are good indications of that lode and others yet proving remunerative if only systematically worked on an extended scale.

Other reefs, *i.e.*, the Southern Cross, Railway, and Dally's, have produced gold-bearing stone, some richer than others; and auriferous quartz has been discovered at the surface in several places; and the general features of the country rocks, and the auriferous veins in which they are imbedded, are such as would not be left for any length of time without some more prospecting work being done, if situated nearer mining centres in the other colonies. The country rock is easy to work; the water can be kept down with ordinary machinery and lifts; and the quartz is not hard to mine: so that moderate expenditure will attend any comprehensive system of mining that may be projected at lower levels, and in every probability will realise moderate anticipations.

At the Pioneer line of reef a good substantially timbered shaft is in a good state of repair; and if it was sunk to a greater depth from below its depth at present, of over 100 feet, with the aid of the necessary steam pumping and winding machinery required, would very considerably assist in the further development of a goldfield so totally neglected and abandoned as this has been during the last two years.

As already stated, this Pioneer shaft is over 100 feet in depth. Others, at the Railway reef, 25 feet, also show that, comparatively speaking, this locality has been very superficially tested only at the very insignificant depths mentioned; and just when the prospects were encouraging to persist in the mining operations, the mines and district were, from some unaccountable cause, deserted, and the pumping, mining, and crushing machinery (15 heads of stampers) removed. The Alliance reef is charged with an unusually large per centage of arsenical pyrites, which are always indicative of gold in quartz reefs; but it appears that no test was made of their value, nor were the workings so extensive as to prospect the ground properly.

In conclusion, I may state that the prospects of these quartz reefs at or near Lyndhurst are sufficiently encouraging for their working being resumed, with a view of testing same at lower levels.

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