



MR. THUREAU'S REPORT ON THE NORTH-WESTERN MINERAL DEPOSITS.

- I. *Auriferous deposits* at the Minnow River, near Sheffield; quartz reefs (non-auriferous) at Castra road, near Ulverstone (Leven). [Plans 1, 2.]
- II. *Argentiferous lead ores* at Mount Roland and Mount Claude, near Sheffield; also, at Penguin (with combinations).
- III. *Cupriferous ores*, near Penguin, and near Barrington, on the River Forth.
- IV. *Other minerals*—black hematite, near Penguin.

I. AURIFEROUS DEPOSITS AT THE MINNOW RIVER, NEAR SHEFFIELD.

These deposits are situated about eight miles in a direct line S.S.E. from Sheffield, but, by a newly cut track, twelve miles. The prevailing formations of rock for about three miles consist of basalts, furnishing the fertile soil in that locality. It appears farther on, however, that these volcanic rocks form the higher parts of the hills only, their bases being composed of grey sandstones, here and there protruded by the plutonic dykes of porphyries. The Minnow is a southern tributary of the Dasher River.

Gold has been found here in several places, but it appears that the sources are confined principally to the south side of the Minnow. Several tunnels have been driven under a very high hill there, owing to the circumstance of a number of specimens having been found on the surface, besides alluvial gold in the gravels along the base of this range. The principal country rocks are represented by grey and deep green slates, which dip to the north at angles from 75 to 80 degrees, and which are of an almost non-quartziferous character. For this slate, which has an almost due west by east strike, a tunnel has been driven by a company (the workings of which were first visited), to a length of 220 feet, and though one or two small veins of quartz were intersected therein, but slight traces of gold, of no prospective value, were obtained, as far as their present workings are concerned. A few chains to the east, but lower down the range, a shaft has been sunk by the Star of the West Company, also in slate (as first), to a total depth of 57 feet; at about 35 feet from the surface a change in the strata occurred, which has been maintained to the bottom mentioned. This new formation consists of a reddish rock, granular in parts, and it is intersected by quartz veins from 1/2 in. to 14 inches thick; these veins dip north. The northern wall, as disclosed in the cross-cut driven from the bottom of the shaft in a southerly direction for a length of 20 feet, exhibits but very faint traces of alteration at the junction of the two rocks. After close examination I found this rock to be a porphyry, in which small crystals of felspar and hornblende were sparsely distributed, with some mica. It is of considerable importance for the future prospects of the locality to draw attention to the fact that this gold occurs both in the quartz leaders referred to and also in the porphyritic matrix, which latter, owing to its decomposed and friable state, can be worked at a very economic rate, or otherwise the ascertained average yield of only 3 dwts. of gold per ton would be the reverse of payable. As stated before, the southern wall of this "dyke" of porphyry had already been intersected, but the opposite or northern wall has not in these two mines been traced, though the discovery of specimens at the surface seem to mark its probable course, and offer inducements for its being traced to its permanent position.

northern wall of the slate
southern
compare

Altogether this auriferous porphyritic dyke cannot be under 200 feet in width from wall to wall, and should it retain its present decomposed character to greater depths, even the low per-centage of gold, which is somewhat alloyed with silver, as mentioned above, would prove moderately payable, if the rock is manipulated on a large scale by means of suitable machinery that will not only crush or grind extra large quantities of same, but likewise save the very fine gold, which forms so large a

portion of the bulk. Owing to the peculiar and irregular mode of occurrence of this massive dyke, or the fissure enclosing this plutonic formation, forming a curve of which the apex extends farther north than its eastern and western continuations, it appears that the tunnel first examined was started and driven in the southern slate country, or "past" the southern hanging-wall, and, therefore, considerably too high up the range for the intersection of the dyke in question. [Plans 3, 4.]

The discovery of gold on the surface and in the alluvial gravels, as well as in the dyke, has given an impetus to other prospecting parties, and probably more so on account of the evidently greater development of larger quartz veins in the porphyry east of the mines described. Of these, the Star of the East Company have driven a tunnel for a total length of 325 feet south, starting in the "northern" slate or foot wall of the dyke, which is here well-defined, and of a similar decomposed character as in the other two mines; quartz veins stained black by ferro-manganese ores, traverse this matrix (porphyry) with a northerly dip of both walls, but towards its centre a synclinal mode of occurrence was observed. These veins, and also the dyke itself, were found, from numerous tests made, to contain gold up to the average of that of their neighbours, thus extending the gold-bearing area beyond that held by the original prospectors and discoverers; farther down the Dasher River alluvial gold has been obtained in several places, so that it is probable other dykes occur, from which the fluvial gravels derive the gold they now contain. As to the permanence or otherwise of these primary auriferous deposits they depend, in my opinion, on two contingencies; viz.—The continuance or duration of the "decomposed" character of the porphyritic dyke containing the gold, both along its course and in depth, principally the latter, because if this auriferous matrix should at any time resume its original character—of which I observed indications—as a hard, flinty, dark green rock, the gold would probably be confined to the veins of quartz traversing same exclusively, and these would not then pay to work owing to the much increased mining expenses.

The nature of this soft matrix also demands that its reduction by ordinary mechanical appliances previous to the concentration and subsequent amalgamation of gold it is charged with should be both swift and adequate. It is questionable whether crushing under stamper heads would answer the purpose perfectly, owing to the friable nature of the material, which would produce a thick pulp requiring too much water in the operation without resorting to other means, such as pans, or arastras being added to the process, in order to save and collect the finer gold.

The Quartz Reefs at Castra Road, near Ulverstone, Leven.

These quartzose formations have been included amongst the auriferous class because they are being prospected for gold, though such metal had not yet been discovered at the time of my inspection. The principal reef was discovered S.S.E. of the township, Ulverstone, at a distance of seven miles, and west of W. L. Jordan's purchased land, at an elevation of 400ft. above sea level.

A prospecting association, having in view the great advantages arising from having the mineral resources of this district tested and thoroughly developed, are employing some miners at a place where a very massive quartz reef (Reid's) crops out at the side of a gully emptying into the Clayton Rivulet. This reef observes a strike of W. 3° north, and the strata in which it is embedded of N. 38° west. The reef, as already stated, is a very massive one, being over 15ft. wide at the surface, with a northern underlay of 65°. The quartz is hard, coarsely laminated, and reddish in colour near the surface; where the stone has been followed beneath the surface it assumes a bluish hue, owing to the presence of crystalline cubical and hexagonal iron pyrites, with which this quartz is, to an unusually abundant degree, permeated.

In a tunnel started west of the surface outcrop the strata passed through changes from brown and highly micaceous schists and slates to those of dark blue and grey in colour, with occasional bands of white feldspathic clays. These rocks are infrequently traversed by "leaders" of quartz more or less charged with iron pyrites, and these subordinate veins, trending in the direction of the reef, ultimately join the same. The country rocks are considerably contorted near the reef, and iron pyrites are also disseminated through them in the vicinity of the main body of quartz. The tunnel intersected the reef at a distance of 60ft. from its mouth, and the quartz broken down exhibits a more favourable appearance, though gold has not yet been seen or obtained from the quartz in the reef, leaders, or the alluvial in the gully.

The character of the whole formation is, in my opinion, notwithstanding the absence of gold, sufficiently encouraging to have warranted the work done in the past, and offers also inducements for continuing same for some time longer. The quartz assimilates to that of other reefs in Victoria and California, where "shots" of gold occur sometimes in such quartz. Driving along its course would alone solve the mystery, and I would suggest that frequent pestle-and-mortar tests be made, from quartz previously calcined, to ascertain the presence of gold from so strongly developed and mineralised a reef.

The metamorphic and crystalline schists underlying in many places the basalts of this neighbourhood appear to be favourable to the formation of large quartz reefs. Two of these were

(3)

examined on Colonel Warner's ground, about three miles from Ulverstone; and should they be opened and proved auriferous in the future, the quantity of quartz available is undoubtedly very large. These two reefs possess a similar character to Reid's reef, and they occur within very short distances from each other. One has, however, a north by south strike, and the other runs north-east by south-west.

Five miles up the Castra Road from Ulverstone, on Mr. Hastie's property, I inspected, in a deep ravine, an outcrop of blue, fissile, micaceous slate, with a strike of N. 35° E. The beds, like others hereabouts, are more or less vertical in position. This slate is traversed by narrow veins of quartz-carrying iron pyrites, more or less decomposed into brown iron ore. On several occasions, I was informed, scaly particles of gold had been washed from crevices in this slate; but these most likely came from some higher localities on the creek, because I could not discover any indications whatever of gold in the locality, though some workings were also shown me in a gully located south over the ridge of the ravine, which were excavated on a supposed quartz reef represented by a hard, whitish, indurated, siliceous rock—metamorphic sandstone—intercalated between the beds of slate prevailing in the district, in which sandstone, yecept "reef," the usual indications for gold, were of course altogether wanting, thus rendering the expense incurred useless and of no practical value whatever.

II.—ARGENTIFEROUS LEAD ORES AT MOUNT ROLAND AND MOUNT CLAUDE, NEAR SHEFFIELD. [Plan 5.]

Ascending the northern slope of Mount Roland, the workings of the company named after this Mount, the Mount Roland Silver-lead Mining Company, are found at an altitude of 1300ft. above the sea-level. The base of this and the other mountains, Mount Van Dyke and Mount Claude, are strewn with huge masses of rock rolled down from the heights above, where coarse and fine conglomerates ("lower devonian or upper silurian," no petrifications discoverable) rest upon pyritous talcose, or better, hydromica schists. These schists are of a greenish hue, and they are, like the metamorphic sandstones, highly quartziferous. It is quite evident that the formation of the argentiferous lead ores which occur here in these schists took place at a period subsequent to the deposition of the conglomerates already referred to, because the latter, when in contact with these metalliferous veins, have become impregnated with argentiferous lead ores—hereafter designated as "galenites"—to a moderate extent. The workings of the above-named proprietary consist of a number of surface cuttings down the sides of a steep ravine and elsewhere. At present they are driving a tunnel N. 15° E., which is 70ft. in length. At the entrance of this tunnel the continuation of a surface outcrop in the ravine was again intersected, traversing N. 47° W. This formation consisted of irregular impregnations of very rich galenite, and a perceptible per-centage of "zinc blende" ("black jack" of the miners—"sphalerite"), associated with calcites and siderite—spathic iron. Near the end of this adit another stronger and similar formation accurs, with a strike of N. 60° E., in hard sandstone. These ores are better defined along the ore wall, there being no defined wall opposite; they appear to be richer in the bunches of ore met with, and the whole occurrence is of a very promising metalliferous character.

Owing to the as yet limited output of galenite available from the undefined veins opened at this mountain side, though the veins carry a good per-centage of silver in the ore, besides some lead, the workings, carefully enough planned, do not admit of any satisfactory opinion being formed regarding the future permanency of the deposits in question. To arrive at such a conclusion more work underground is needed, in order that these characteristics there and of other similar deposits in the vicinity may be examined more minutely and over a larger extent of workings than those at present available for such a purpose.

Passing along the same slope in a westerly direction, fronting the tributary of the Dasher River, two other prospecting parties' workings were examined, also engaged upon deposits of "galenite." Of these the Messrs. Atkinson and Co. were engaged upon impregnations of a less decided character than those just now described. A short jointed talcose schist, nearly the same as before mentioned, standing on edge, forming the enclosing rock of the ores, which had less silver mixed with the galena, which latter was heavier, and containing a greater percentage of lead, besides iron pyrites. Their tunnel was about 20 feet in length, bearing due east from a small gully which joins the Dasher lower down. The conglomerates already mentioned overlay the metamorphic schists here close to in beds more or less disturbed from their original horizontal position, forming those abrupt escarpments so boldly picturesque, and over 1000 feet high, along the flanks of this range of mountains, comprising Mounts Roland, Van Dyke, and Claude: these conglomerates resting on the metalliferous schists, and here found to be sensibly impregnated by galenites, thus constituting an interesting geological feature. In these schists the ores form narrow and irregular veins and small bunches, and the whole formation appears to be impregnated with them, but not sufficiently frequent or in good quantities to render present mining of same profitable.

Still higher up the valley on one of the spurs of Mount Claude, and at a height of 1456 feet above sea level, a cutting made into the hillside (by the Gilbert Prospecting Co.,) discloses a grey and greenish metamorphic schist traversed by numerous veins of white quartz; in the whole of

(4)

these iron pyrites occur, either in their natural state or decomposed, as evidenced by the ochreous water exuding in many places from this rock. Quartzose veins, exhibiting carbonates of iron, calcspar, and cubical crystallised galena, have been detected in small detached bunches against and in connection with a hanging-wall, which is accompanied by a divisional band of clay selvage or "dig."

It may be observed that these separate and so far isolated efforts for developing these scattered mineral deposits are ventures deserving of every commendation; but, to judge from their nature, including the want of well-defined formations in the shape of large veins and irregular lodes capable of yielding large quantities of argentiferous lead ores, it would be perhaps more judicious on the part of the present prospecting companies to combine in the systematic search and exploitation now initiated by each.

And in this connection it would likewise deserve the attention of all concerned in the testing of these promising metalliferous deposits to confine in future their operations to the tracing of same "down" the slopes of the mountains, instead of tunnelling upon same near their outcrops under the conglomerates, where but a limited extent of "backs" could be worked overhead, and at a great deal more expense than if nearer the base of these ranges. As I observed several ferruginous outcrops ("gossan"), so often indicating the existence of these and kindred deposits, attention to same would probably result in new discoveries.

At the head of the Dasher River, or a tributary of that watercourse, the track leads due south over the main divide of Mount Claude, which there is located 735 feet above Claude Creek (south of the divide), and on the banks of that creek, is where the principal (county of Devon) mining operations are being carried on, owing to the discovery of rich "galenites" in ore bodies more profusely distributed in a belt of rocks peculiar to same, and in more satisfactory quantities than elsewhere hitherto examined and reported on.

The Mount Claude Silver-Lead Co. are confining the sphere of operations upon the localities where the original prospectors first discovered the absolute existence of silver-lead ores. Since then the other discoveries have been made, but altogether the operations of the latter are on a limited scale in comparison with those in progress at this mine.

It is in the precipitous banks of the Claude Creek, a tributary of the River Forth, that these rich ores were much more strongly developed than anywhere else; and the subsequent mining operations have disclosed satisfactory evidence as to the continuance of these deposits over a greater scope of ground than was at first anticipated. Beside the denser, and therefore richer, varieties of "galenites," the following minerals occur in combination with the same, viz.—Copper pyrites (chalcopyrites), quartz, and carbonates of iron (siderites). The rocks, especially those in which these deposits occur, include metamorphic schists (chloritic) and porphyritic beds, exhibiting garnets, and their strike is from north east to south west, thus nearly identical with the direction observed of the enclosed ore bodies, which, generally speaking, run parallel with and within the bedding-planes of these country rocks; thin beds of slaty structure intervene occasionally with the larger bedded and coarser schists. These rocks constitute the local "ore carriers," and their width, within which ores have been found (at right angles with their strike), cannot be less than 400 feet. It should be understood, however, that in that space the deposits occupy but a very limited part, inasmuch as the ore veins are irregularly distributed throughout, and that they (the veins) vary from half an inch to not more than 7 inches in thickness. In the whole formation divisional and bedding joints occur, the former often distinguished by a clay selvage here and there, but regular and well defined walls are wanting. The only perceptible difference I observed was that in the lower workings on the creek the strata became more and more quartzose than at any other part of this formation. The workings just below the second waterfall on this creek exhibit an anticlinal section. Fine grained porphyritic schists, alternating with bands of more slaty schists, occur here; and the latter having been removed by the action of water, formed caverns in the rocks arching overhead. A main level is following at this place one of the divisional joints already alluded to, which is indicated by a clay selvage, but as the beds have not suffered any dislocation in their position, such cannot be taken for a wall. [Plans 6, 7.]

The other workings consist of shallow shafts, cuttings, and a tunnel near the highest point of the formation, or about 250 feet above the creek. The banks on both sides of the creek have also been subjected to a great deal of mining operations, all of which tend more or less to exhibit the presence of argentiferous lead ores.

The ores comprise "galenite" (lead sulphide) principally; and as they occur, as elsewhere, in crystalline metamorphic rocks, they are distinguished by the presence of, or rather admixture with, the sulphide of silver. The larger veins of ore show a streaky and rich appearance from the coarser granular variety, with a brilliant fracture, to the very fine-grained, steel-like, or compact, with scarcely any lustre. Owing to the great solidity and hardness of these ores, only traces of anglesite (lead sulphate), or the white lead ore (cerussite), could be found. The mineralogical character of these ores is such as to class them with those rich in silver. Assays have been made, I believe, to support that view.

(5)

The workings were laid out principally, it would appear, for the purpose of ascertaining the limits of these deposits; and it is intended to test same likewise by means of a low level adit, to be driven across that metalliferous belt, so as to facilitate the delivery of the ores mined at the proposed reduction works to be built in the near future.

Considering the peculiar character of the ores, and their mode of occurrence in the shape of irregular veins, bundles, or pockets (stockwork), I submit that the ordinary methods for mining same economically may not be found to answer with "backs" over 200ft. vertical above the creek. The driving of levels, sinking of winzes, etc., etc., upon such irregular runs of ore would become a very expensive feature in future. Open face cuttings following the more extensive and regular veins, reserving the less richer ores for special dressing and cleaning, would, in my opinion, answer the purpose better, because of the less trouble in tracing the veins, etc., and of the greater facilities for securing the ground without much timber.

These compact ores require but little dressing to fit them for the market in bulk; and it may be observed that it has of late years been found in practice stamping such very brittle ores embedded in much harder matrices has been discarded, owing to the thereby greater production of metalliferous slimes that are passing away with the turbid water. Grinding by means of newly-designed machinery, and dressing the ores so as to intercept the clean portions of same at various successive periods during the process without the production of too fine a grain, has been found to be more economical and to achieve increasing profitable results.

As to the permanency of the ores enclosed in this extensive metalliferous belt, it may be stated that equally as rich ores cropped out at the surface 130 feet above the lowest workings on the creek as those in that lowermost cutting into the bank both westerly and easterly, the latter including the "Round Mountain."

The local water supply would be sufficient for all purposes if a weir or dam were constructed across the Claude Creek above the upper waterfall; ample water pressure could then be obtained for working a powerful turbine, the greater motive power of which could be utilised for driving the ore-dressing machinery and the other appliances requisite to work the mines. Owing to the absence of coal near the mines, and the necessary ingredients for "fluxes," the reduction of the ores by means of calcining, smelting the rough lead ores, and the cupellation of the regulus, and the refining silver resulting, need be postponed until these materials can be got nearer the mines. It will therefore be found more advantageous to dispose of the cleaned lead ores as per assay, because otherwise the construction and maintenance of expensive furnaces and other works, together with the employment of a skilled staff of workmen, would become a necessity, thus adding considerably to the preliminary expenses of a description of mining new to Tasmania, and not much understood; under these circumstances, I felt justified in drawing the attention of those interested in these valuable deposits to their possibly future obligations. Irrespective of all these matters, and ignoring for the present the assays made of the ores, it should be remembered that the experience of other countries has been that mines producing large quantities of low grade ores are more reliable than those yielding smaller quantities of high grade, the former proving the best investment. In Europe, lead ore, which contains from 6oz. to 9oz. of silver to the ton of lead, is worked for silver, the lead being a by-product, so that in the present instance a judicious blending of the richer with the poorer class of ores would have an encouraging result.

Should any coal measures exist at no great distance from the mines or of the coast, and should good fireclay, iron ore, and lime be found with same, then the reduction works could be built in the vicinity of that combustible and the other valuable mineral adjuncts.

The Tasmania Silver and Lead Mining Company are prospecting upon Messrs. Manley and Young's section, situate about half a mile nearer the Fork River. The country rocks differ from those in the Mount Claude Co.'s leases, thereby indicating, besides other evidence, a more northerly position of ground held by this proprietary, than if the metalliferous belt had been traced from that company's workings. Dark blue and hard slates prevail, showing imperfect petrifications, probably of the upper silurian period or age. These alternate with bands of sandstone, all of which dip to the west. A tunnel (or approach to one) has been commenced 150 feet beneath the summit of the range, which is almost vertical at this west side of Claude Creek, and rises to nearly 500 feet above the same. At the entrance a dyke of schistose greenstone occurs, at the back of which the lead formation is faintly indicated in its western underlay by the presence of strings of veinous mineral matter 2 feet 6 inches thick. These veins are narrow, and they contain very bright crystalline iron pyrites, with specks of cubical galena not rich in silver, in contiguity to a band of clay selvage. Owing to the limited extent of the workings, no proper and practical opinion as to the permanency or possible improvement of these indications could be arrived at.

Argentiferous Lead Ores (with combinations) at Penguin.

These deposits and the minerals they are associated with have been known to exist for some years past as occurring along the seashore, where they are exposed below high-water mark. The country rocks belong to the fragmentary section, composed of fine and coarse conglomerates, in

(6)

which red and yellow-coloured jaspers and black hornstone appear as essential ingredients. These rocks have been protruded by basaltic dykes near the Neptune mine, in the vicinity of which a friction breccia has been formed, which exhibits, besides the ordinary conglomeratic fragments, also those of slates, schists, and quartz. The coast ranges farther inland are in this locality capped by basaltic overflows, thus producing good arable soils on the slopes.

The workings at these mines, except the main shaft of the Neptune S. L. Mining Co., were all filled with water, so that my examinations were necessarily confined to what could be seen of the mineral deposits on the surface at low water.

The Neptune Silver-Lead Mining Co., profiting by their past experiences of their western neighbour, the Penguin Silver-Lead Mining Co., are sinking a main shaft above and beyond the reach of high water; this shaft is one of the best I have seen in this colony for strength and capacity. It measures inside the frame sets 8ft. by 5ft. 11in. in the clear. The sets are 3ft. apart, and the square timber used for same measure 8in. and 10in. in diameter respectively.

By means of this fine shaft the mineral deposits may be followed and worked with the aid of powerful pumping and winding machinery on a very extensive scale and to very considerable depths beneath its present bottom at 30ft. from the surface. A lode, having a strike of N. 30° W., with a westerly underlay, has been found 6ft. wide at the surface, and 3ft. in the bottom of shallow workings. In its northern course it has been interrupted by a dyke of basalt ("andesite"), which is enclosed on both of its walls by a friction breccia. It is a remarkable fact that the original lead ores become sensibly more argentiferous after being faulted by this dyke in the north. The underlay of this formation averages 1ft. in 6ft. On the foot-wall a very dense vein of lead ore, 3in. thick occurs; and another similar vein at the opposite wall; the remaining portions of the lode, 3ft. wide altogether, being impregnated by lead ores, with calcites and heavy spars. These lead ores, dressed by hand up to 60 per cent. of lead per ton, are besides assaying to 25oz. of silver per ton of lead, which would leave a very fair margin of profit. There are strong indications of other deposits of a similar character, which, however, require prospecting at lower levels in order to ascertain what value they may possess, and for these tests the main shaft is singularly well situated.

The Penguin Silver-Lead mine was the first that was discovered on the North-Western Coast of Tasmania, and some considerable amount of work appears to have been done periodically. These workings were all flooded, as this company's main shaft is subject to immersion at high water.

The country rocks are similar to those already described; in addition, a dyke of hornblende porphyry, interspersed by large patches of iron pyrites, traverses the ground, causing probably the transmutation of the argillaceous deposits into hornstone, which occurs here in a massive bed, made the more prominent on account of its containing native copper in scaly and hackly forms. At low ebb this coast presents a very peculiar appearance; ferruginous veins traverse the rocks there exposed to view as occurring in several places and at various angles to each other; and in the western portions, which appear to be more metalliferous than the remainder, huge blocks of hornstone and jasper crop out, containing large numbers of pyrites stained green, thus indicating the presence of copper along that channel of country.

The eastern lode in this company's ground has a strike of S. 26° W., with an underlay of about 80° W., at a distance of 124ft. east of the main shaft; the vein matter is impregnated by silver-lead ores; blue and green carbonates of copper stain this formation and the adjacent strata.

In their main (whim) shaft, which is 70 feet deep, a vertical leader 14 inches thick was followed to the 60-foot level, from which depth some rich ores were raised. There is, however, a great deal of difference in the ores in these workings and those obtained by the adjacent Neptune Co., because the former are mixed with copper pyrites; they are also very much richer in silver, and they contain less lead. The samples I was able to collect contained mostly "fahlores," or argentiferous grey copper ore, embedded in quartz, calcite, and heavy spar, and all these were accompanied by a considerable percentage of iron pyrites. The eastern lode, and the vertical leader in the shaft, run nearly parallel with each other; another leader was intersected 30 feet west of the shaft, at the 60 feet level, which gave rich ores, and in a winze sunk 30 feet deeper on its underlay a considerable improvement was observed. Still farther west another surface formation was discovered beneath a "gossan," carrying galenites and fahlores. This vein is about 2 feet wide, and occurs along one good wall. It produced, besides the other ores, a little native silver in contiguity to the hornblende porphyritic dyke already referred to as containing native copper, with associated ores, and some 500 yards west of the main shaft. Altogether, the mode of occurrence of these various metalliferous deposits at Penguin proved rich in valuable metals from a mineralogical point of view, and more so from assays; these constitute the basis of very satisfactory evidence in support of more extensive operations being undertaken at greater depths, either by means of ordinary mining operations, *i.e.*, shafts, cross-cuts, and levels, or, as a preliminary, to employ the mining diamond-drill, which would perforate and prove the value of these and deeper located deposits in a very short time, besides affording, inexpensively, substantial proofs of their permanency in depth or otherwise.

III. CUPRIFEROUS ORES NEAR PENGUIN.

The Whatcombe Prospecting Co. have been engaged in tracing the continuation of the hornstones inland, which, it will be remembered, were described as being charged with copper and its ores, and for this purpose a number of surface cuttings were made along the supposed course of same as observed by the compass. Indications were followed carefully as they presented themselves, and rough assays made from time to time, one of which gave 5 ounces of silver per ton and 3 per cent. of copper, thus demonstrating that the "gangue" still remained metalliferous, though it was filled between the walls, which were 6 feet apart, with fragments of rock and vein stuff. Subsequently, a prospecting shaft (5 feet x 4 feet) was sunk to a depth of 26 feet, (on the slope of the hill), in which the track of the lode was again cut in the western end of the shaft; here it was enclosed in metamorphic schists interspersed with iron pyrites. The lode is composed of pieces of wall rock, bluish hornstone, and the vein matter shows traces of silver ore, copper, and iron pyrites, and stains from carbonates of copper. As these features repeated themselves near to and for some distance along the surface, it would be judicious to test the deeper ground in preference to any more surface exploitation in future.

One and a half miles south of the Penguin township the Devon Consols Copper Mining Co.'s workings are located, 350 feet above sea level, on a western tributary of the Myrtle Creek, which flows into the River Leven. The deposit which is being tested observes a strike of South 60 degrees West, and is of quite a different character than any other I have observed in the vicinity. Several surface cuttings and two prospecting shafts sunk on the vein three chains apart expose the features of a well defined and good looking metalliferous deposit. This vein was discovered in the gully, and on being found to continue on both sides of that water-course it was noticed that the "cap" was formed of an ochreous, porous, and brittle rock, deep brown in colour. Curiously enough, native copper in long hair-like hexagonal prisms is diffused throughout this substance, presenting a very interesting feature. As the vein occurs in a dense green feldspathic porphyry, with large crystals of felspar, which, however, nearer the vein becomes soft or "kindly" and steatitic, the development of the deposit in such country, and under such favourable conditions, augurs well for the future at greater depths, as similar to other deposits. [Plan 8.]

Beneath the "cap" this vein, 2 feet in width, is parted into two ore-carrying bodies, a "horse" of greenish soft rock, strongly resembling the soft decomposed "lava dykes" of the Bendigo quartz reefs, 1 foot wide, occupying the centre. At a depth of 18 feet the vein has become 5 feet in width, having a slight western underlay, and every indication of forming eventually a strong deposit in depth. The intrusive mass or "horse" disappeared at this depth, and in place the vein matter becomes highly cupriferous in the centre of the formation. The ores consist of grey and black (soft) oxides of copper, mixed with particles of native copper; the former gave, as per Mr. C. Newbery's assay, 32 per cent. of copper, or, the ore taken from the vein as it comes, 19 per cent. to the ton, which is certainly a very satisfactory return; the ground can easily be worked in the initiatory stages of operation by means of adits; a good and sufficient supply of water for mining purposes can be secured at reasonable expense, and useful timber is abundant on the ground.

Cupriferous Deposits near Barrington, on the River Forth. [Plan 9.]

These are located about eight miles from the township of Hamilton-on-Forth, above the junction of the Wilmot with the Forth River, or nearly two miles south of the lately gazetted township Alma at that junction.

The country rocks in which these deposits, or, as they would be better described, indications, are found to occur, belong to the metamorphic series, consisting of schists, slaty in fracture, and coarser kinds, yet retaining evidence of their sedimentary origin; also, of porphyrites of a feldspathic character. The "indications," for they are such and no more at present, comprise the following; viz.:—Certain portions of the schists in the tunnel exhibit occasionally native copper in the joints; heavy spar (barite) occurs in conjunction with copper pyrites (chalcopyrites) in small veins, enclosed also by these schists, and some of the beds of rock are slightly stained by the green carbonate of copper.

The workings made by this prospecting proprietary include the usual description of cuttings from the surface on the course of the deposits, and a main tunnel driven in a north-westerly direction to a length of 281 feet; two cross-cuts extend from this tunnel to the west for a length of 33 feet and 32 feet respectively. In these workings the character of the ground required very careful timbering, and these and other requirements for carrying on mining operations speedily and economically have been completed in a good workmanlike manner. Throughout the whole length of this tunnel, and of the greater portion of the two cross-cuts, black, hard, short-pointed schists prevail, in which the veins of barite occur, which carry a small percentage of copper pyrites. Similar veins are likewise found in similar rock about six chains above the mouth of the tunnel. At both ends of the cross-cuts a new formation has been discovered; grey, hard, metamorphic sandstones, in which small rounded pebbles may yet be distinguished with some difficulty, and other features not necessarily important to dwell upon, demonstrate that these rocks belonged, previous to their metamor-

(8)

phism through plutonic action by the porphyries in their vicinity, to the "transition" (Laurentian?) series. In the divisional joints between those schists and those transition beds, a greasy soft clay selvage marks these formations as distinctly different.

Taking into consideration all the facts and features connected with the cupriferous deposits so indistinctly indicated at the surface and underground, and comparing same with mines producing ores in quantity, attention should be drawn to the fact that regular walls are here altogether absent, and that the only reassuring feature on the ground consists in the recurrence of outcrops of "gossan" in quartzose veins also containing barites (heavy spars) and carbonates of iron (siderite). These minerals are frequently found in connection with metalliferous deposits, and, therefore, I would suggest that the tunnel be extended a farther distance of 200ft., more or less, in the direction of and under the largest surface outcrop of ochreous gossan; it would be also judicious to cross-cut farther west from the tunnel, in order to test the contact of the porphyries there with those of the metamorphic schists.

IV. OTHER MINERALS.

Black Hematite, or "*Limonite*," I found on the beach at Penguin, and to judge from the outcrop, a considerable quantity of this ore could be obtained at little expense. The fibrous structure and botryoidal form of the surfaces were defined in the ordinary way of occurrence.

Near the Devon Consols Copper Mine a very large outcrop of a denser, and probably equally as valuable, iron ore obtains. This deposit would be useful if good coal, fireclay, and lime were found in the vicinity.

G. THUREAU, F.G.S.

GENERAL AND SUPPLEMENTARY REPORT.

From the above reports, and the charts, sections, and sketches accompanying same, it will be perceived that this tour of inspection to the north-western portion of the colony has not only been an interesting one, but that it has likewise furnished much information which can be turned to valuable account.

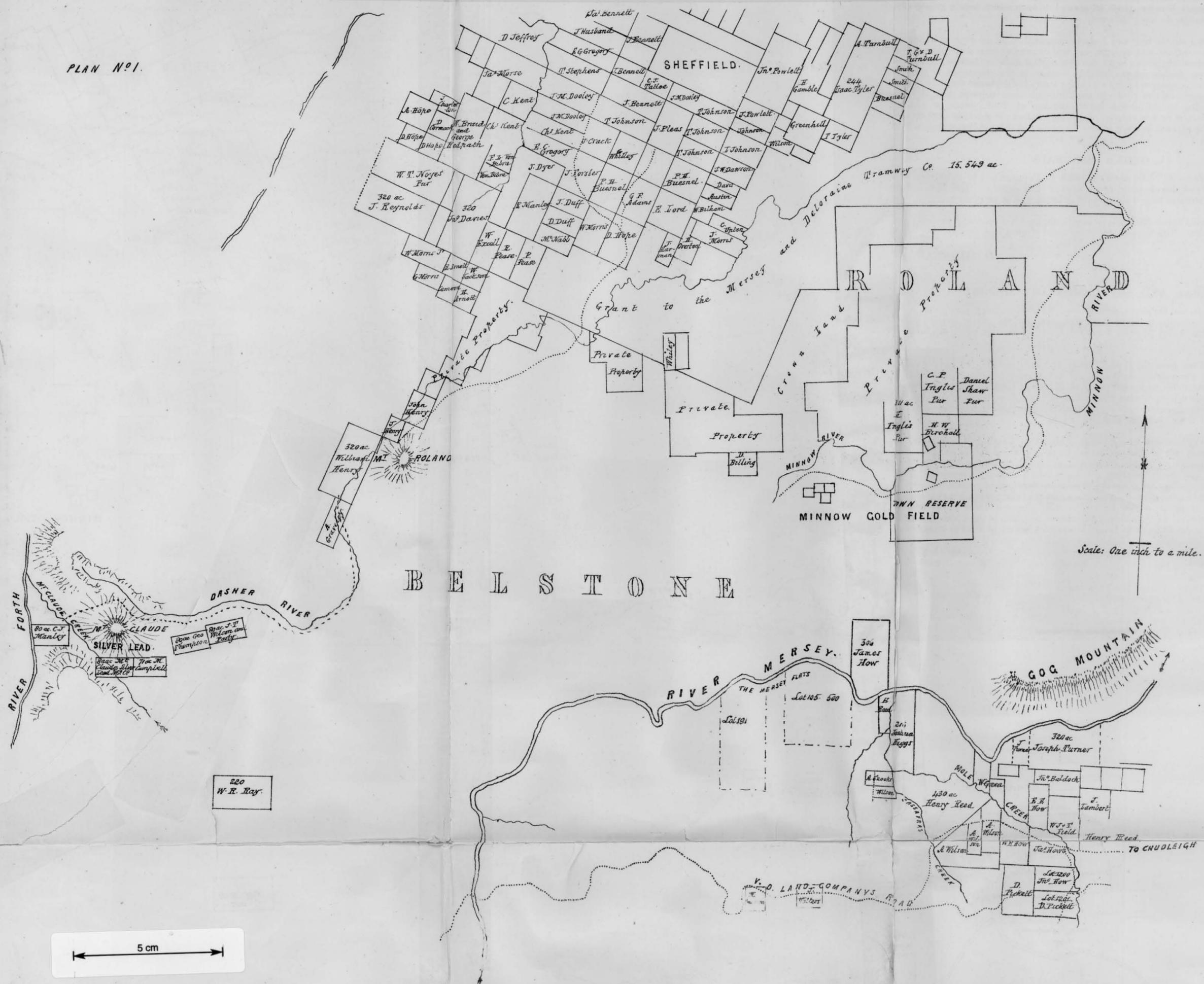
Hitherto my instructions from the Hon. Minister of Lands and Works have confined my labours to examinations of stanniferous, auriferous, and carbonaceous deposits; to these, however, must now be added the argentiferous lead deposits at Mount Roland and Mount Claude, and Penguin, and the cupriferous deposits also at Penguin, as of immediate commercial value; leaving the Castra Road reefs, and the indications for copper near Barrington, to be tested more thoroughly before they can be included in the above list as really valuable.

What with the very satisfactory developments of the West Coast gold and tin mines, and other mining districts reported on nearer home, the pursuit of economical and systematic mining in Tasmania deserves, doubtless, the unabated attention of all classes, as forming the lever by means of which, if honestly and judiciously handled, the whole Island would be materially benefited, because if the mineral resources now being developed continue to give good results, both capital and population will be attracted to these shores. And, in conclusion of this report, I may also state that during my peregrinations many favourable indications were observed which circumstances over which I had no control prevented me from thoroughly examining; and, in my opinion, there are yet many more places deserving the attention of skilled prospectors, where, by cutting tracks, valuable discoveries may be made.

G. THUREAU, F.G.S.

Hobart, 30th December, 1881.

PLAN N°1.



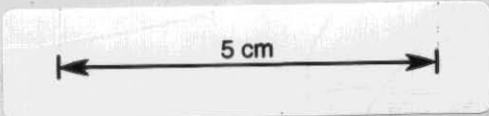
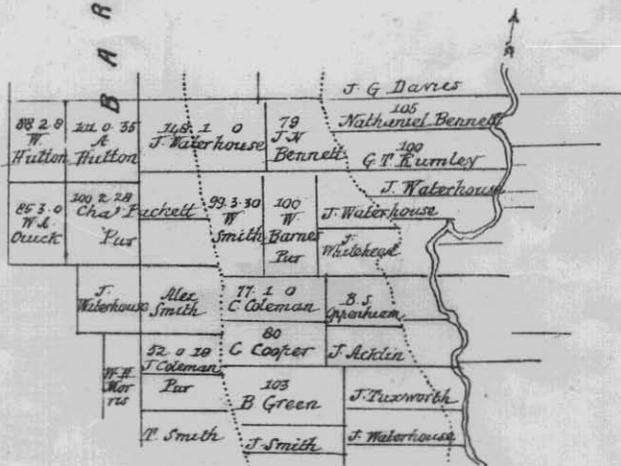
Scale: One inch to a mile.

5 cm

PLAN N°2.



COUNTY OF DEVON
 Parish of Barrington
 Scale One ch^r to an inch



(11)

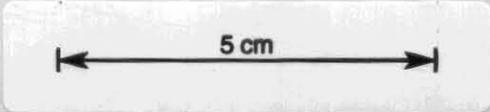
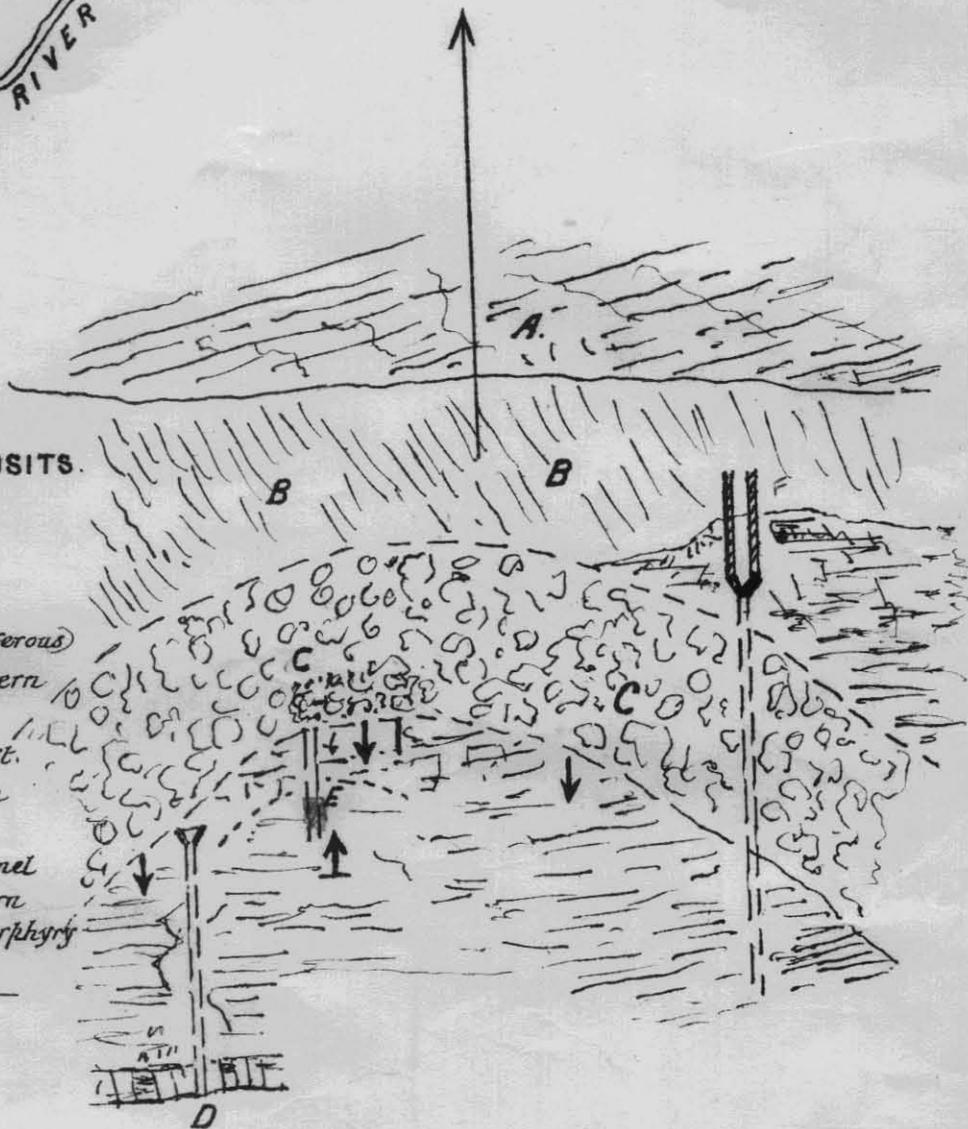
11/17



PLAN N° 3

GEOLOGICAL SKETCH OF
THE MINNOW GOLD DEPOSITS.

- A. Slates.
- B. Alluvial. (auriferous)
- C Dyke of Porphyry (auriferous)
- D Tunnel, driven in southern
Slate. (hanging wall)
- E Star of the West Co's shaft.
sunk in south slate, driven
into Porphyry
- F Star of the East Co's Tunnel
commenced in the northern
slate. driven through Porphyry
into southern slate.

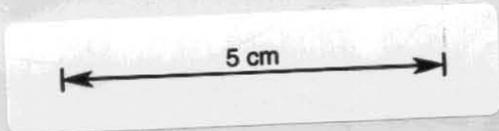
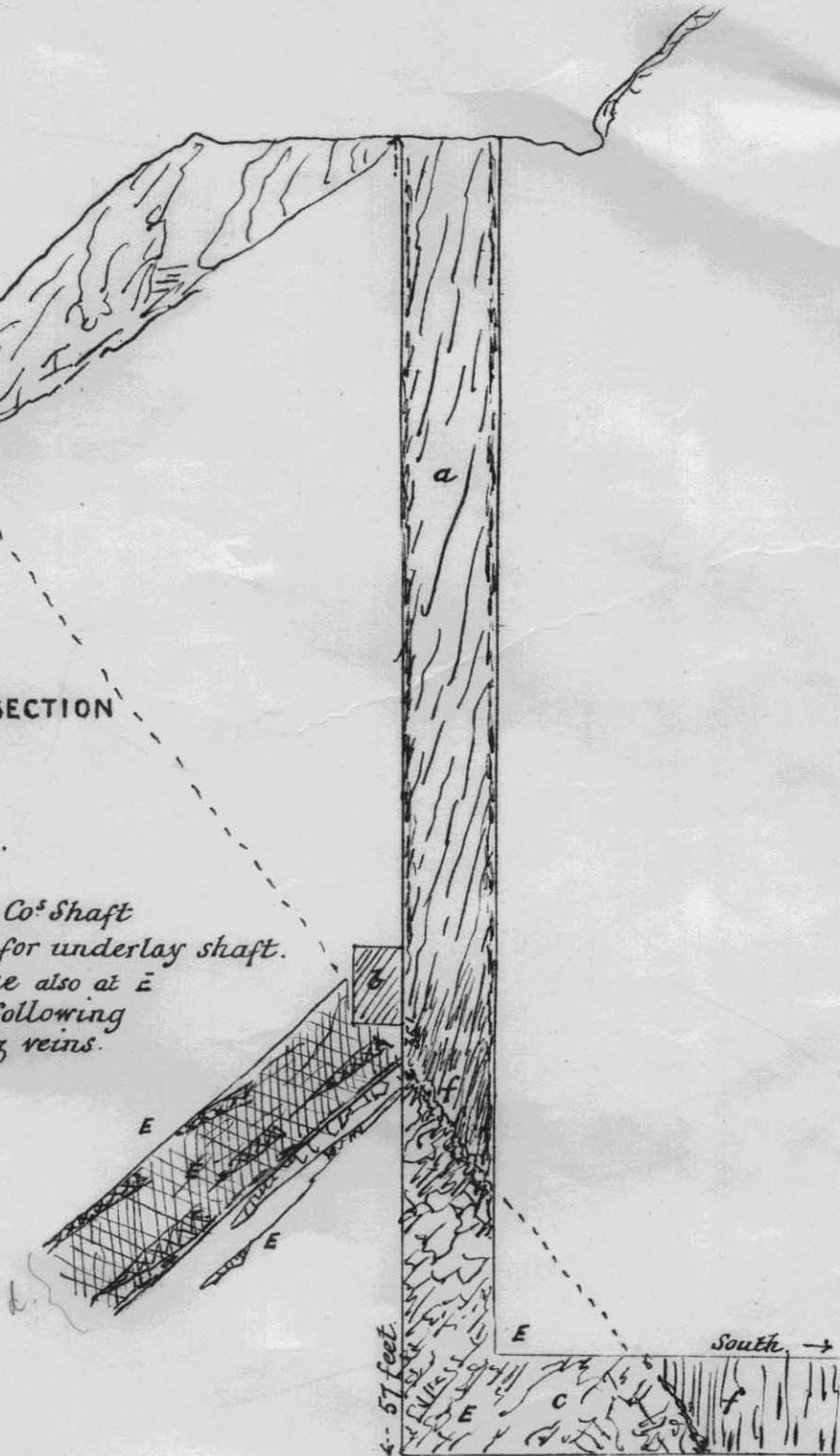


PLAN N^o 4.
 GEOLOGICAL CROSS SECTION
 AT THE MINNOW

GOLD DEPOSITS.

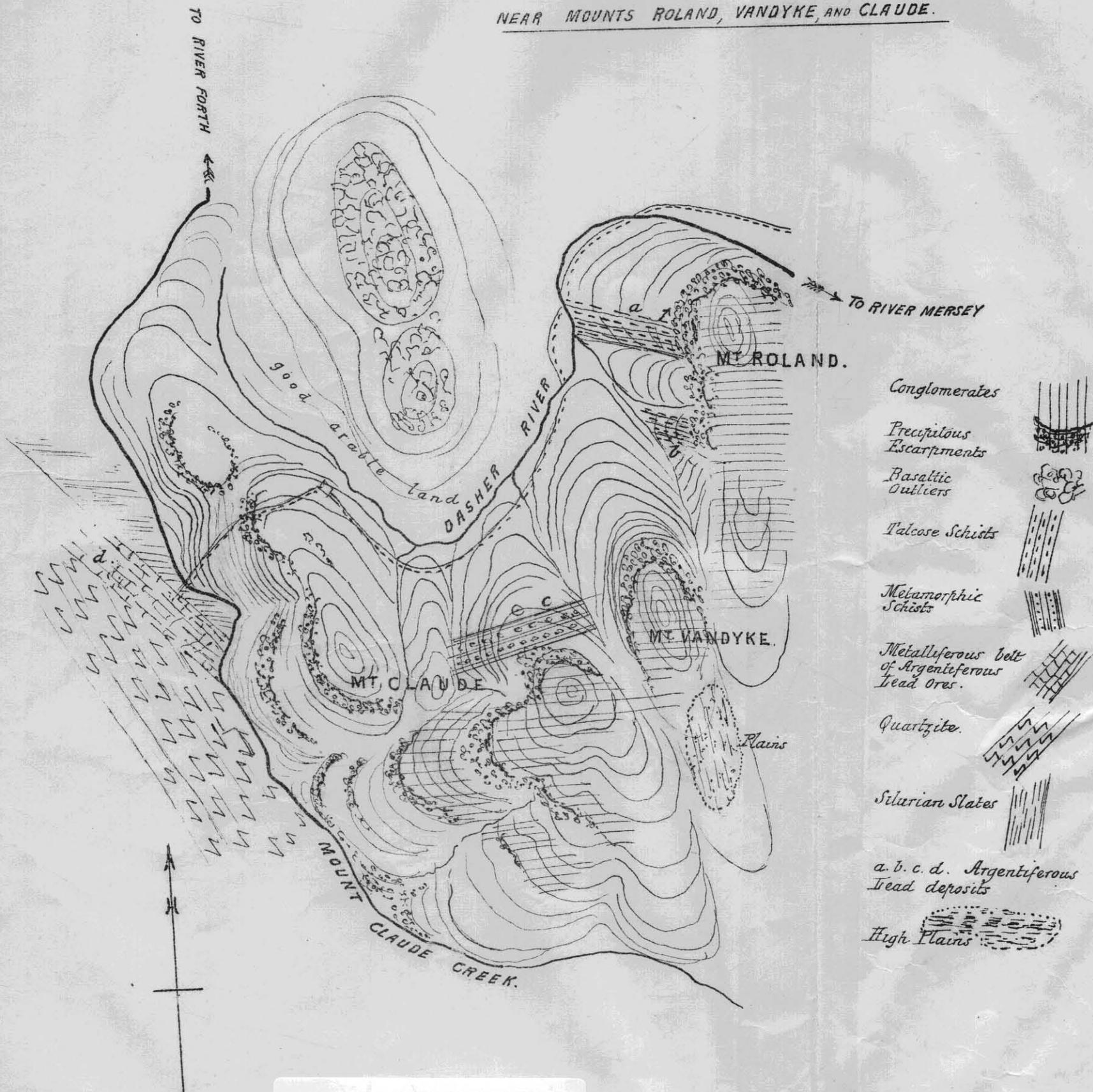
- a. Star of the West Co^s Shaft
- b. Upper platform for underlay shaft.
- c. Porphyritic Dyke also at \bar{e}
- d. Underlay shaft following auriferous Quartz veins.
- f. Slates

← North.



PERSPECTIVE GEOLOGICAL SKETCH MAP.
 OF THE MINERAL DEPOSITS (*Argentiferous Tread Ores*)
 NEAR MOUNTS ROLAND, VANDYKE, AND CLAUDE.

PLAN N° 5.

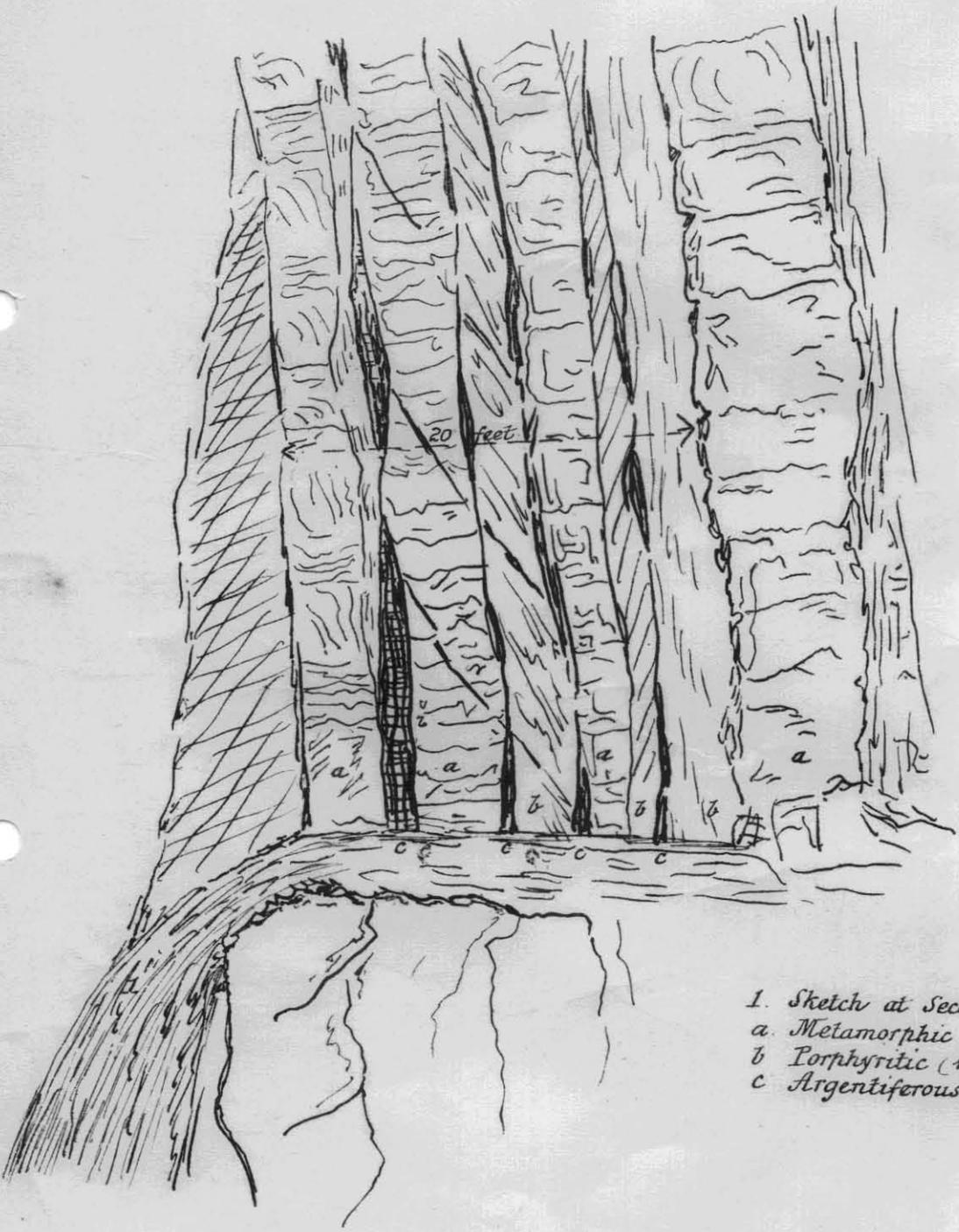


5 cm

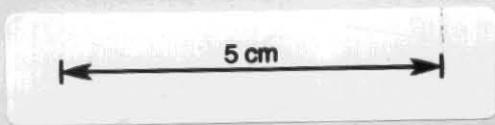
MT CLAUDE SILVER LEAD CO

(WORKINGS).

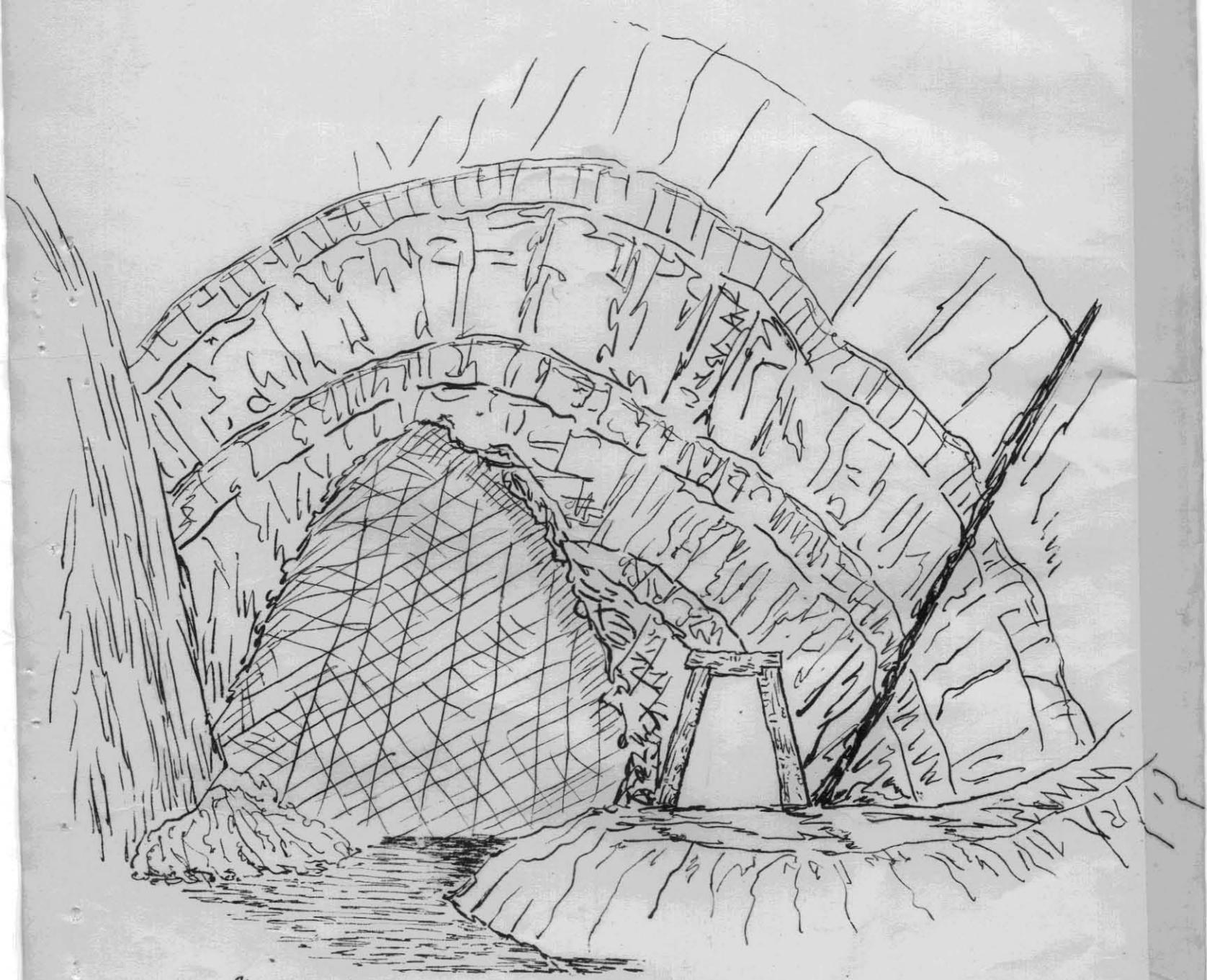
PLAN No 6.



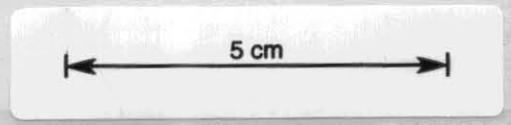
- 1. Sketch at Second Waterfall
- a. Metamorphic Schists (dioritic)
- b. Porphyritic (with Garnets)
- c. Argentiferous Lead Ores.



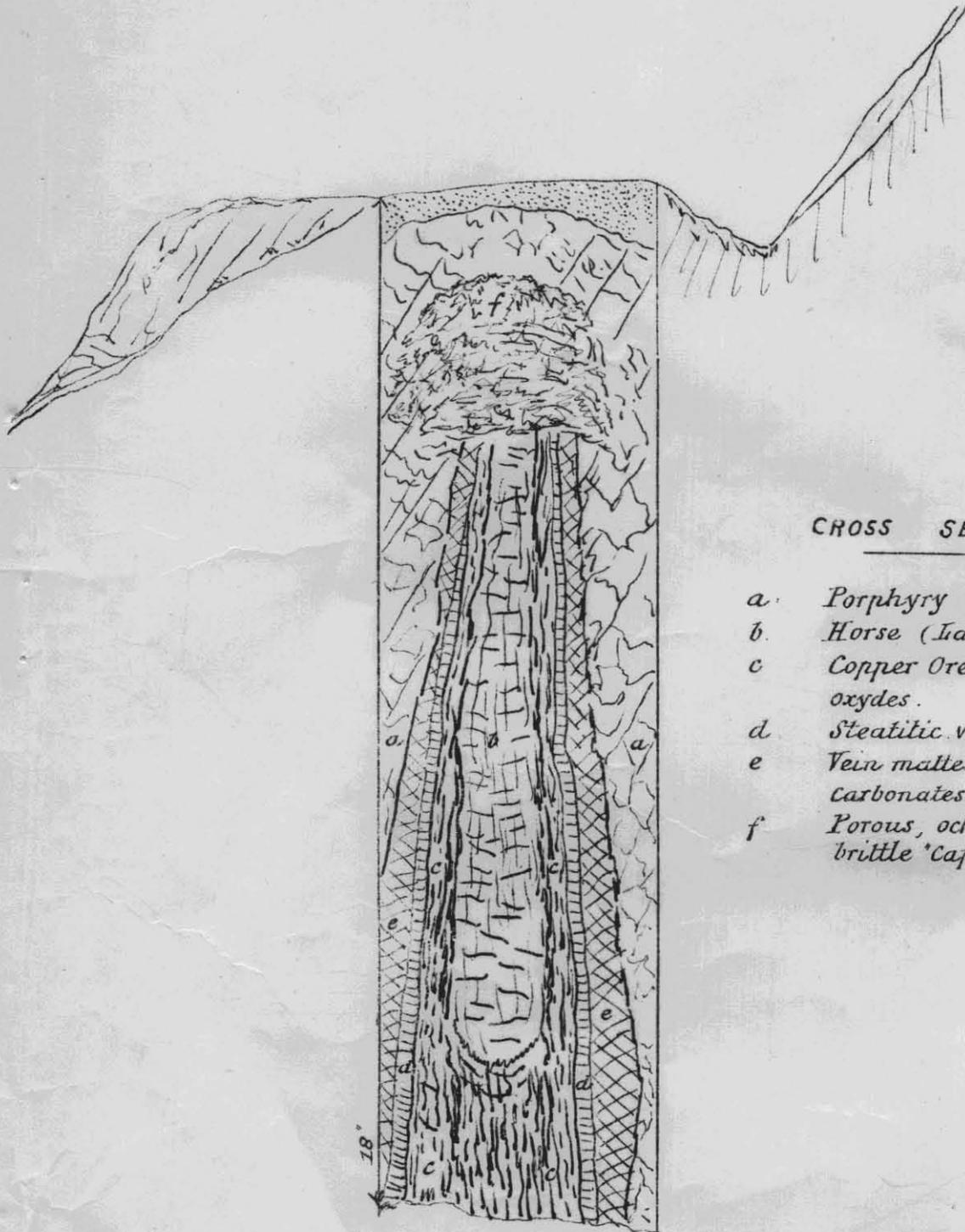
PLAN N° 7



Sketch at first Waterfall showing Anticlinal Section of Strata also level following divisional joint.

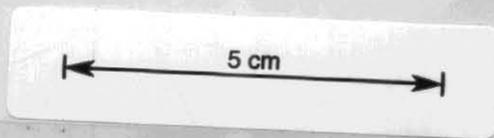


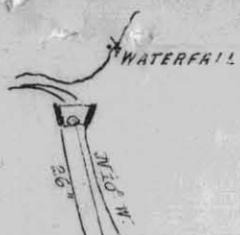
DEVON CONSOL CO'S MINE .
PLAN N^o 8



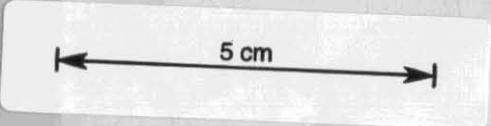
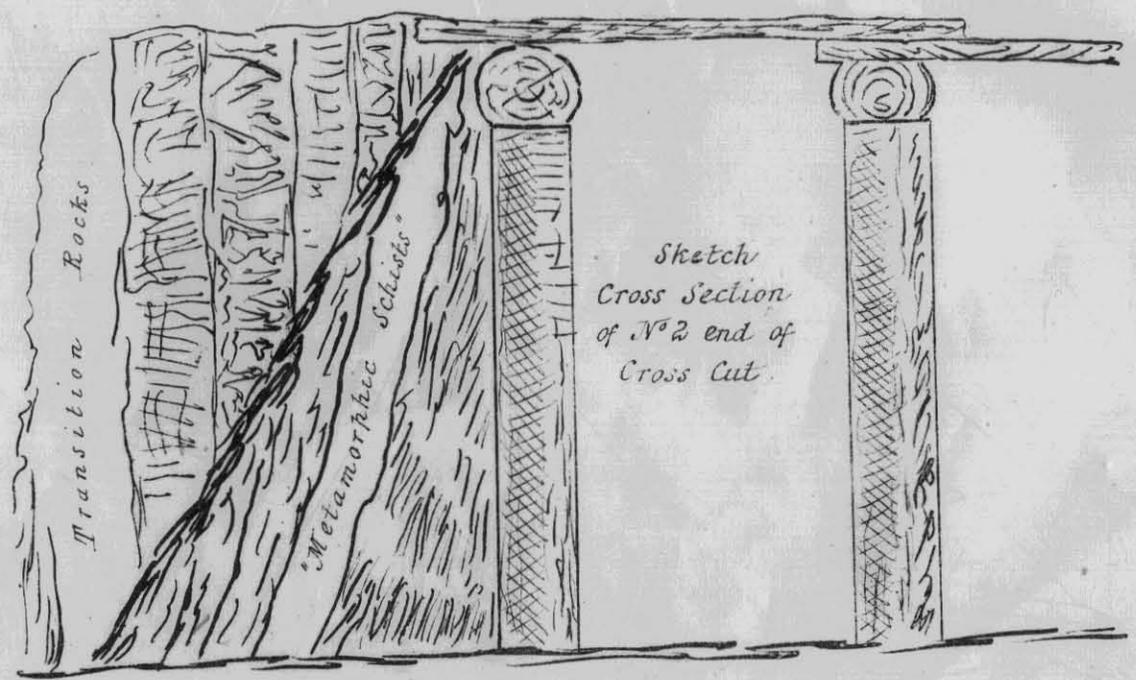
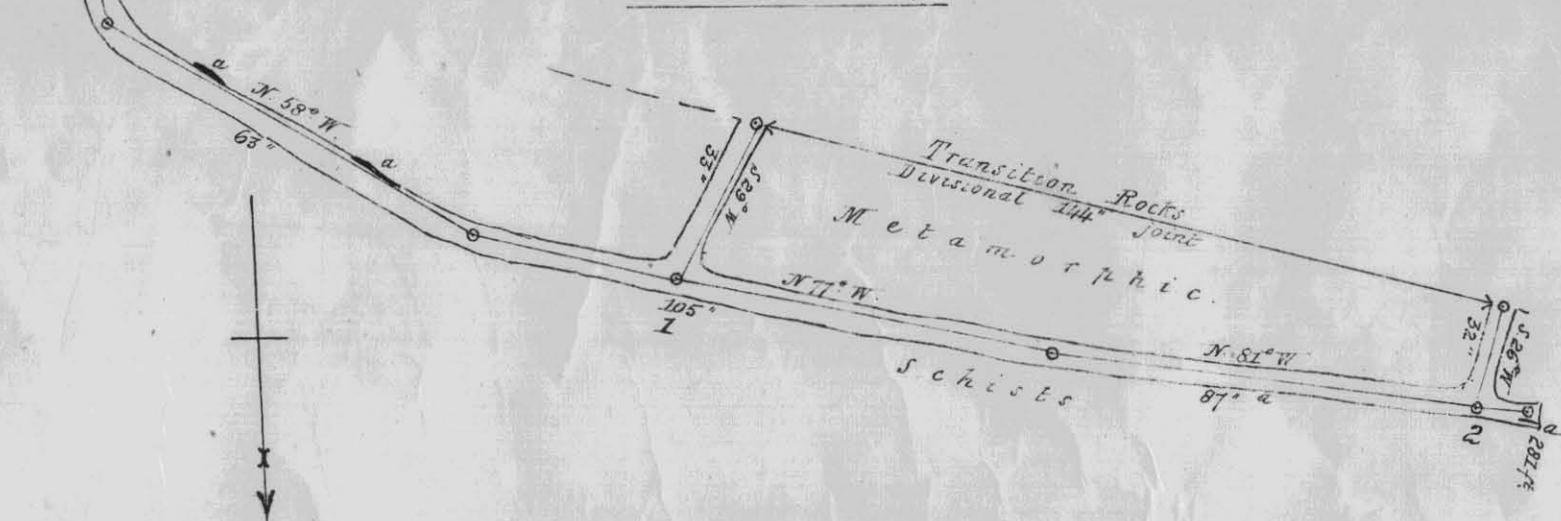
CROSS SECTION Sketch.

- a. Porphyry
- b. Horse (Java)
- c. Copper Ores = Grey and black oxides.
- d. Steatitic vein matter
- e. Vein matter stained by Copper carbonates.
- f. Porous, ochreous, and brittle "Cap" of vein.





PLAN No 9
 TUNNEL driven by the BARRINGTON PROSPECTING
 COPPER CO. a. a. a. Veins of heavy spar carrying Copper Pyrites
 Scale: 3 inches to 100 feet.



(17)

17/17