

REPORT ON THE WARATAH MINING DISTRICT.

Launceston, November, 1884.

This district was carefully examined in March last; and other pressing business requirements, including a tour to the West Coast and the North-Eastern Mining District, have prevented the compilation of the following paper on the subject.

The Waratah Mining District, already so famous for its extraordinary richness of the extensive tin ore deposits, occurring within, comparatively speaking, a limited area of ground, possesses other valuable features of interest to the mining community more immediately interested and to the Colony at large. These consist in other metalliferous deposits of a very promising character, leaving, however, the stanniferous formations predominant for the present and for a considerable time to come.

The tin ores occur here in well defined lodes; also in large deposits of hydro-thermal origin, and in drifts belonging to the Pliocene epoch.

The other ores represent galena, zinc, antimony, copper, iron, &c. and these occur mostly in veins or lodes, and also as impregnations of wall-rocks.

Though fluorspar occurs frequently, tourmaline appears to be absent.

All these metalliferous deposits occur in metamorphic schists and Silurian slates and sandstones, traversed by dykes of that species of porphyrite known as "eurite," a crystalline-granular mixture of quartz and orthoclase, of a white colour where exposed on the surface, but yellowish-brown where not exposed to the weather. Some of these dykes are heavily charged with iron pyrites of cubical crystallisation. The vicinities where these euritic dykes have protruded the schistose rocks is characterised by the prevalence of anticlinal, synclinal, and other sections with those sedimentary formations, as shown by the diagrams herewith. Strong evidence also exists of an ancient river system, now filled with Pliocene drifts and clays. The latter have become indurated, and exhibit in well preserved forms the pre-historic remains of plants so characteristic of that epoch. The diluvial drifts are in the north capped by very extensive sheets of basalts, viz., the upper and lower, intercalated by a stratum of scoriaceous clays and volcanic ashes, from white to black in colour. Near the Mount Bischoff Company's crushing works that lower basalt exhibits, in angular forms (brecciated), a layer of eurite evidently derived from the dykes referred to, and this basalt rests immediately on the diluvial drifts which, in that locality, have been found to be charged with tin ore.

In order to arrive at any fair deduction as to the permanency of these various metalliferous deposits, it is necessary to state the results of the examinations made for that purpose, and in this manner deal with the present aspect and the future prospects of the whole Waratah mining district.

That the protrusion of the euritic dykes through the Silurian and metamorphic rocks was antecedent to the formation in fissures of the metalliferous veins is proved by the latter frequently continuing to occur in those dykes (Stanhope Company's diagrams) for some distance, dwindling, however, to mere threads eventually. After the formation of these lodes and veins charged with tin ores, also of lead, antimony, zinc, copper, and iron, I opine the formation of those stupendous tin ore deposits at the "red face," or comprising that famous "mountain of tin," so well known all over the world, may be safely said to have taken place.

Careful study of this subject has resulted in the following:

The country rocks in the more immediate neighbourhood of that rich nucleus of tin ore has, it may be remembered, been proved to contain numerous metalliferous lodes and veins. On reference to the geological sketch plan furnished with this report, it will be seen that between the crests of Mount Bischoff and west of the "red face" a massive tin-bearing lode occurs, bearing S 27° E. This is almost vertical in position, and at considerable depths from the surface. All those remarkable aggregations of lodes, both in the Stanhope and Mount Bischoff Company's ground to

the north east, must eventually come into contact with the main lode, which is of a strong chloritic character, and over 120 feet in width at the surface. The occurrence of the "red face" stanniferous deposit immediately above that junction referred to, and the general features of the same, render it quite possible that those particular tin lodes, seated at great depths, have, by some means or other, enriched those well known surface deposits.

It is on record that other mineral and metalliferous districts, notably in America, at the Yellowstone River, for instance, and also near Carson City, State of Nevada, are now covered with "dead" or dying hot water springs or "geysers," to which class also belong the hot mud volcanoes or springs of South America. All these resemble to a very great extent what is observable now at Mount Bischoff. Some of these "geysers" leave a deposit of fine black mud or fine sand, with irregular blocks of rock, at the outer margins of these remarkable "vents" of the earth's crust, whilst others, deprived for ages past in all probability of their former hydro-thermal activity, are now entirely closed by siliceous deposits, which differ altogether from the country rocks in their immediate vicinity. Near Carson City, Nevada, U.S.A., on the same line of country as the celebrated Comstock lode, I observed several mud-springs in action, which are depositing concentric layers of siliceous matrix around the "vents." These have, on assay, been proved to contain both gold and silver, similar, but poorer, than the quartz matrix of the Comstock lode.

The red face deposit of tin ore resembles in many respects what has been said of the American deposits. We have here, on the outer margin, on three-fourths of the sides of the depression now filled in, fine sand, blocks of porphyry and detritus, with occasional layers of rich tin ore, which here takes the place of gold and silver; then follow greyish muds and clays, which are distinctly observable on the way to and at the Don Company's workings, where they pass eventually into a channel beneath the basalts. Lastly, the central portion, or the "red face" workings proper, disclose a siliceous deposit stained a brownish red by the decomposed iron pyrites, which occur in their original state and unaltered, at the 33-foot levels driven beneath the present working level. When that brown matrix, now so extensively mined, is carefully examined under powerful lenses, it will be seen that the whole of it consists of small crystals of quartz closely impacted together; and this mass eventually closed the "vent" in which, by means of hydro-thermal action, the tin ores ascended as metalliferous vapours, together with mineral and acidic gases, which, on condensation nearer the surface, caused the impregnation of the matrices, now worked, with the cassiterites, that give so great a value to this tin ore deposit. If such an underground outlet or "vent" existed,—and of which there is such very strong evidence,—then in its ramifications it must have broken through all those strong stanniferous veins and lodes when such were in course of formation; and in this manner the origin of those secondary deposits (red face) may be accounted for, whilst at the same time affording substantial evidence of the future permanency of same. The intrusion of the euristic dykes caused a very considerable amount of dislocation in the Silurian and metamorphic strata, and, consequently, the now observable irregularity also of the metalliferous veins and lodes, thus exhibiting a variety of those deposits which, with cheaper labour, a regular supply of suitable fuel for the reduction of those ores in furnaces on the spot, or, at any rate, at Emu Bay, will afford employment to many persons for a considerable time to come.

The diluvial (Pliocene) deposits have not yet been exploited to any great extent, and in two places only, about a mile apart, were they proved as tin-bearing; at the same time, that ore has been traced from the southern extremity of the "red face" down the hill into the Don Company's workings, where this wash disappears beneath the basalts already referred to. Its probable continuation has been rediscovered at the western side of the Waratah Falls, at the bottom and underneath of the same basaltic sheets. And here their character and age has been clearly demonstrated by the occurrence of abundant fossilised leaves, &c. in the clays superincumbent on the Pliocene drifts and below the basalts. This stanniferous deposit therefore deserves attention, as it can be wrought at moderate expense.

Overlying the Pliocene drifts, especially where the bed-rock (Silurian) approaches or crops to the surface, the line of the former is indicated by a more or less extensive porphyritic boulder drift in which tin ore occurs also, right from the "red face" to the Don Company's workings.

A concise description of the various mineral and metalliferous deposits proved to exist on the several mining companies' leaseholds may not be altogether uninteresting, as by that means the capabilities of the whole region as a metal-producing district will be demonstrated.

The Mount Bischoff Tin Mining Company, Registered, are engaged in working the red face and white face principally; at a depth of 33 feet below their present working level, that deposit appears to have contracted at least on two sides, and, apparently, the width of the red face at the upper level of 1000 feet does not extend to that distance at that additional depth. At the same time, there is at the working level years of work in sight. The tin ore occurs at the 33 feet level, either in pure granular deposits or intermixed with a great deal of pyrites, which are slowly decomposing on contact with the air, causing meanwhile a rise in the temperature and the production of, by

efflorescence, mineral salts of a light green colour and very acrid in taste. It would appear as if, in future, the ore would occur chiefly with pyrites at greater depths in the "vent." Besides this enormous ore deposit, 86 feet in height at the "face," this company has proved a lode of lead ore,—galena, with sphalerite,—and three or four lodes containing tin ore, all of which have been delineated on the geological sketch plan.

The Stanhope Tin Mining Company, Limited, leases are situate immediately east, and, consequently, have had a portion of the surface deposit, and, at greater depth probably, a portion of the continuation of the red face adjoining. In this case it is quite possible that the close contiguity of the "vent" has caused the adjacent strata to be impregnated also with tin ores. North of the crests formed by the porphyritic outcrops, and for a considerable distance down towards the Waratah river, an aggregation of lodes and veins occur in conjunction with eurites, as underlying towards the south south east. The peculiarity of this occurrence in so limited an area consists, however, in the increasing angle of the lodes in question in their underlay from near the mouth of their main adit to the crested outcrops of eurite mentioned above, suggesting the existence of a central factor of activity in the shape of a "vent," as already described, as possible, and not otherwise capable of explanation. All the various metals shown on the plan occur in the ores contained in these lodes. At present, however, the company are successfully employed in the working of and the extraction from two principal tin lodes, for which they have driven a main adit and sunk a main winding shaft in order to facilitate operations. In that adit, 910 feet in length, several veins of lead ore were intersected, and, besides, the country rocks were largely impregnated for a width of about 30 feet. Assays of this ore gave as high as 80 per cent. of lead and 98 ounces of silver to the ton. Copper in its native state and ore were found to have impregnated the country nearly 100 feet in width. Another zone of tinstone, also of nearly the same width, has been followed to about 130 feet from the surface. The main and other lodes of tin ore have been opened up to that depth and for a length of over 740 feet, where, at a depth of 100 feet, it (the zone) passes into the Mount Bischoff and *ci-devant* North Valley companies' leaseholds. The underlay varies as considerably as the width of the other lodes and of the better defined main lode also, viz., from 15 degrees to 60 and 70 degrees from the horizon. Occasionally "floors" of iron pyrites obstruct the regular course of these tin lodes; but as these pyrites contain also tin, no serious difficulties have, so far, interfered with the increasing production of tin ores. This increase must be attributed to the systematic opening of the ground in blocks, thus allowing the mines to be wrought with expedition and economy.

The West Bischoff Tin Mining Company, Registered, have, at some considerable expense, tested their ground in a most systematic manner, and besides two lodes containing "stilbites" (sulphide of antimony), they have discovered three lodes carrying tinstone. Of these, that near their eastern boundary has been given most attention, and as it extends for a considerable distance right into the late North Valley Company's ground, it forms the most regular lode on Mount Bischoff, the only drawback being its low percentage and inconsiderable width. About 35 chains in length have been exploited on its course for an average width of 12 inches only. Even with the great height of backs made available, of 250 feet, the present market price of tin precludes any reasonable hope to make a profit unless it is worked at less expense by a party of tributors.

The Don Tin Mining Company, Registered, hold a lease at the southern base of Mount Bischoff; and this proprietary appears to have found the "head" of a deep lead filled in the deeper parts with pliocene drifts containing tin ore; the more shallow portions are, of course, of a more recent age, and they comprise beds of clay (indurated) of which one in particular was observed to be composed principally of decomposed chlorite. All these beds, from the surface to the bottom, have been wrought for tin ore with more or less success, and, at the present moment, when the deep shaft workings have temporarily been abandoned on account of a too heavy influx of water, some tribute parties are obtaining a fine coarse sample of ore in or under the porphyritic boulder wash towards the Mount Bischoff T. M. Company's properties.

The North Valley Tin Mining Company had just disposed of their leases and plant to the Mount Bischoff T. M. Company, and it is only now necessary to remark that the former proprietary had done a great deal of work on the continuation of the West Bischoff lode and on a second lode parallel to the former. The whole country is very much mineralised by acidic and sulphuretted substances, comprising large blocks of green, white, and violet-coloured fluorspars and chiefly iron and arsenical pyrites embedded in steatites and quartz. A small percentage of tin ore was found to be present, but at that depth the prospects were not very encouraging. Here, as in the Stanhope Company's mines, the vein-matter is frequently displaced by floors of solid iron pyrites, converted at the surface through decomposition into outcrops of "gossan," which carry tin ore in small percentages.

G. THUREAU, F.G.S.

THE PENGUIN MINING DISTRICT.

This locality was again examined, and as all the mines were not in work, the additional information since my last inspection three years ago was kindly placed at my disposal by the Messrs. Clarke, Sullock, and Dale.

The Neptune S. L. Company had sunk a main shaft 50 feet deep, and at 75 feet east, in a cross-cut, they intersected a most promising lode formation yielding antimonial silver (dyscrasite) of good percentage. This lode was about 30 inches in width.

At the old silver mine fahl (argentiferous tetrahedrite) ores had been also met with, and a promising belt of lead ore was indicated at low level of the sea.

The Watcombe Copper Mine had been further exploited from two shafts sunk on the track of that lode, but the iron pyrites, on decomposition, gave but few indications of copper by stains. In contact with the adjacent beds of conglomerated rock the ore is more apparent, and occurs likewise as native copper in filagree blades, specks, and wires.

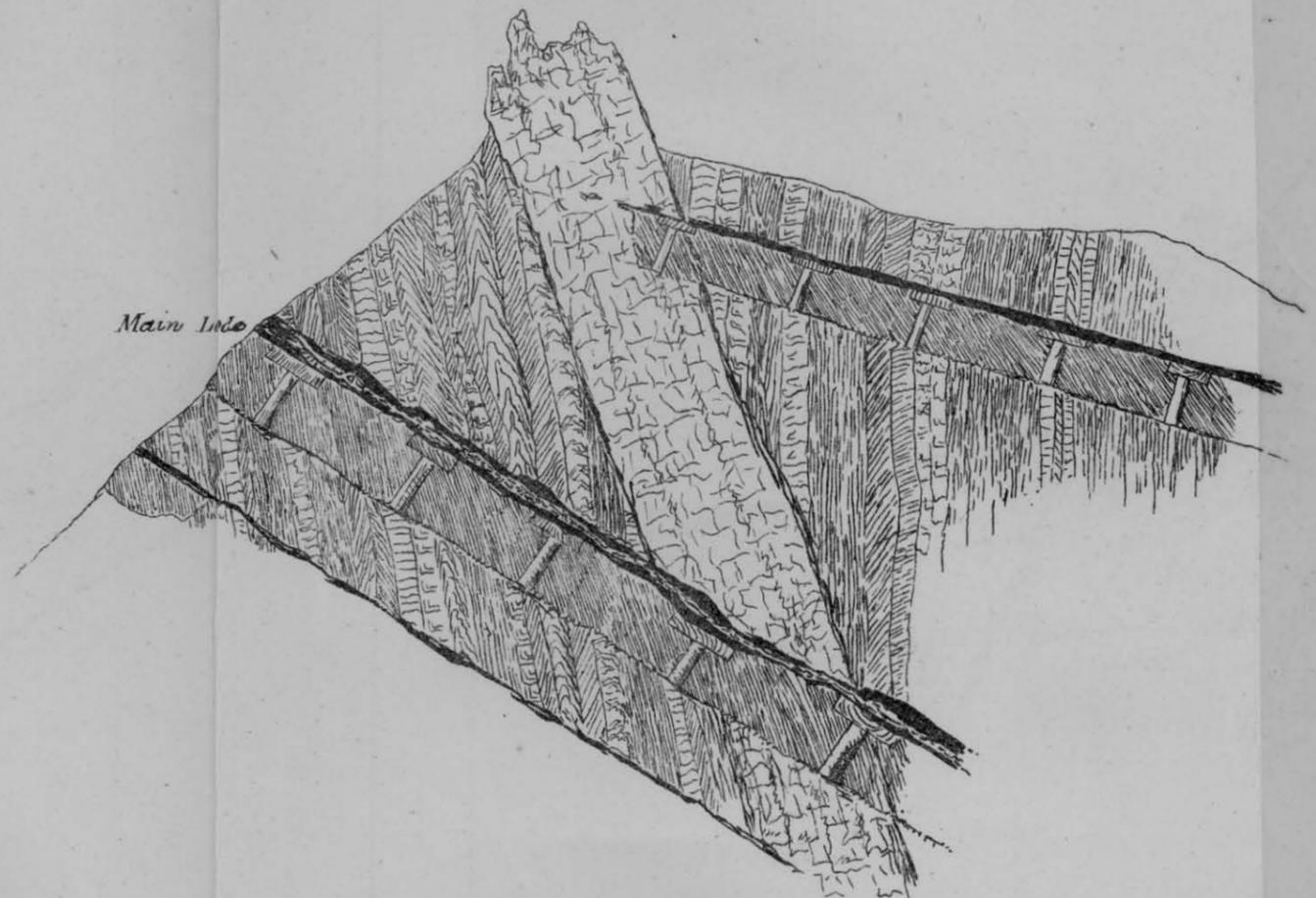
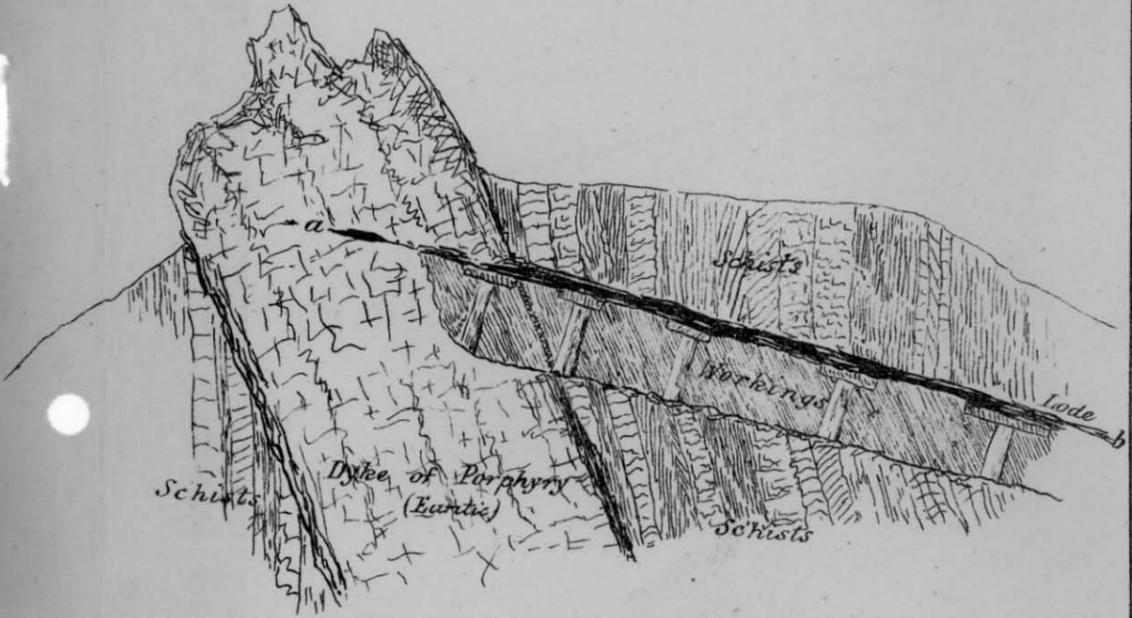
On another belt of metalliferous country, and more inland, the Devon Consols Company have sunk to a depth of 50 feet, but the influx of water made the examination of some heavy black mineral impossible for the time being. A tunnel was also driven along the course of this cupriferous and argentiferous formation for a distance of 75 feet, which disclosed blue carbonates of copper on several occasions at the footwall of this lode.

The whole region has been from time to time prospected and worked at great expense, chiefly to the inhabitants of that part of the coast; and as such praiseworthy efforts have been made periodically without obtaining actual proof of the value of these ore deposits at greater depths owing to the great influx of water at, comparatively speaking, shallow depths below sea-level, the No. 2 diamond drill should be obtained from the Government for the purpose of putting down systematically a series of bores, with a view of finally testing the promising indications already met with. I may presume so far as to recommend the Government to sink these bores at a reduced rate of charges, as the enterprise shown by these parties really deserves some such recognition at the hands of the authorities.

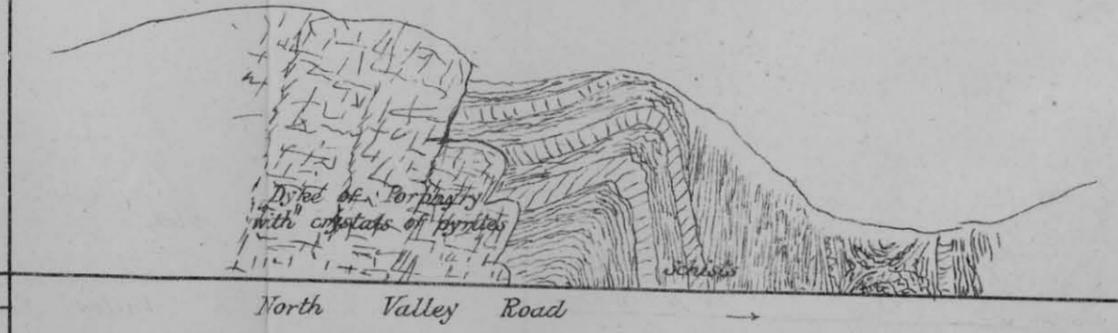
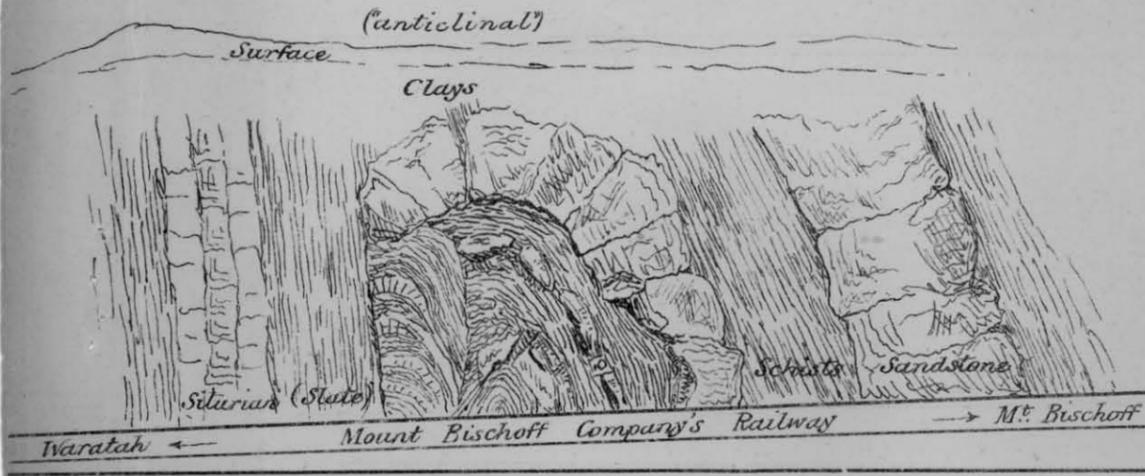
G. THUREAU, F.G.S.

CROSS SECTIONS OF THE STANHOPE COMPANY'S LODES

sect. G. Murchison F.G.S.
1884



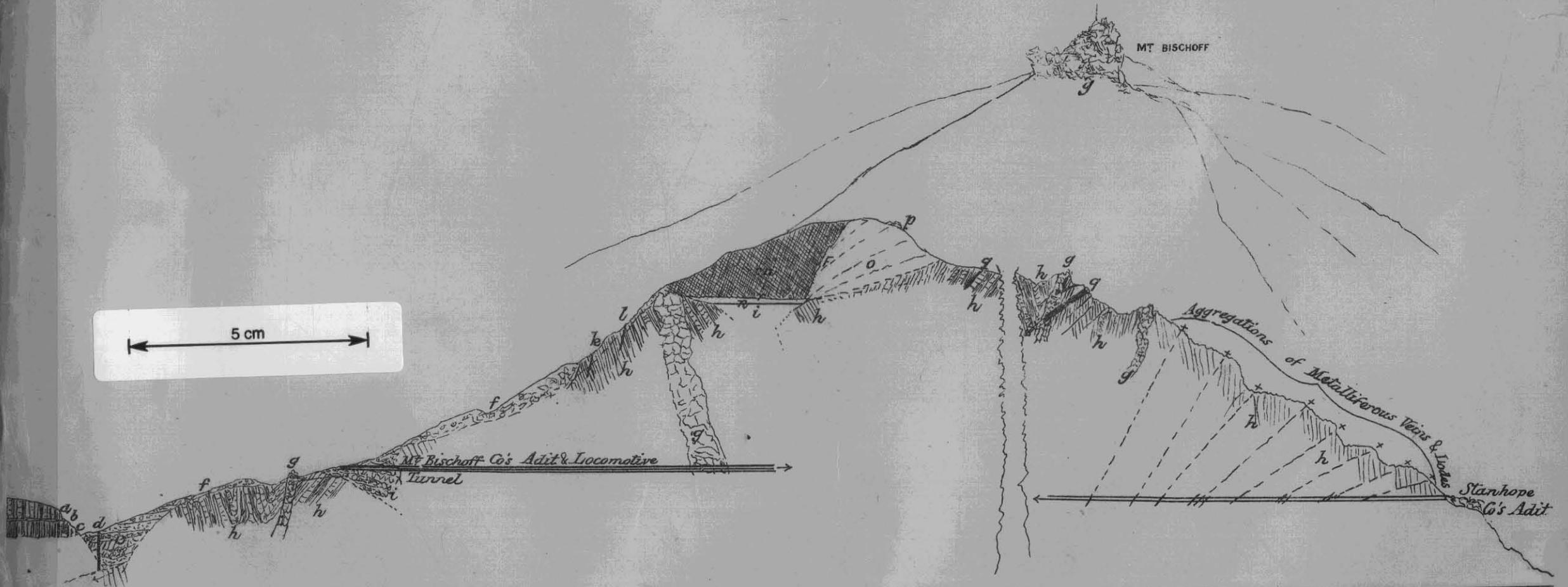
CROSS SECTIONS OF STRATA AS DISCLOSED ON THE NEW VALLEY ROAD



5 cm

GEOLOGICAL SECTIONS (SOUTHERLY) THROUGH THE DON, MT. BISCHOFF, AND STANHOPE CO'S TIN MINES.

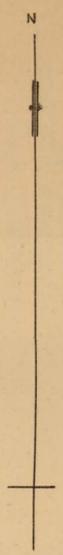
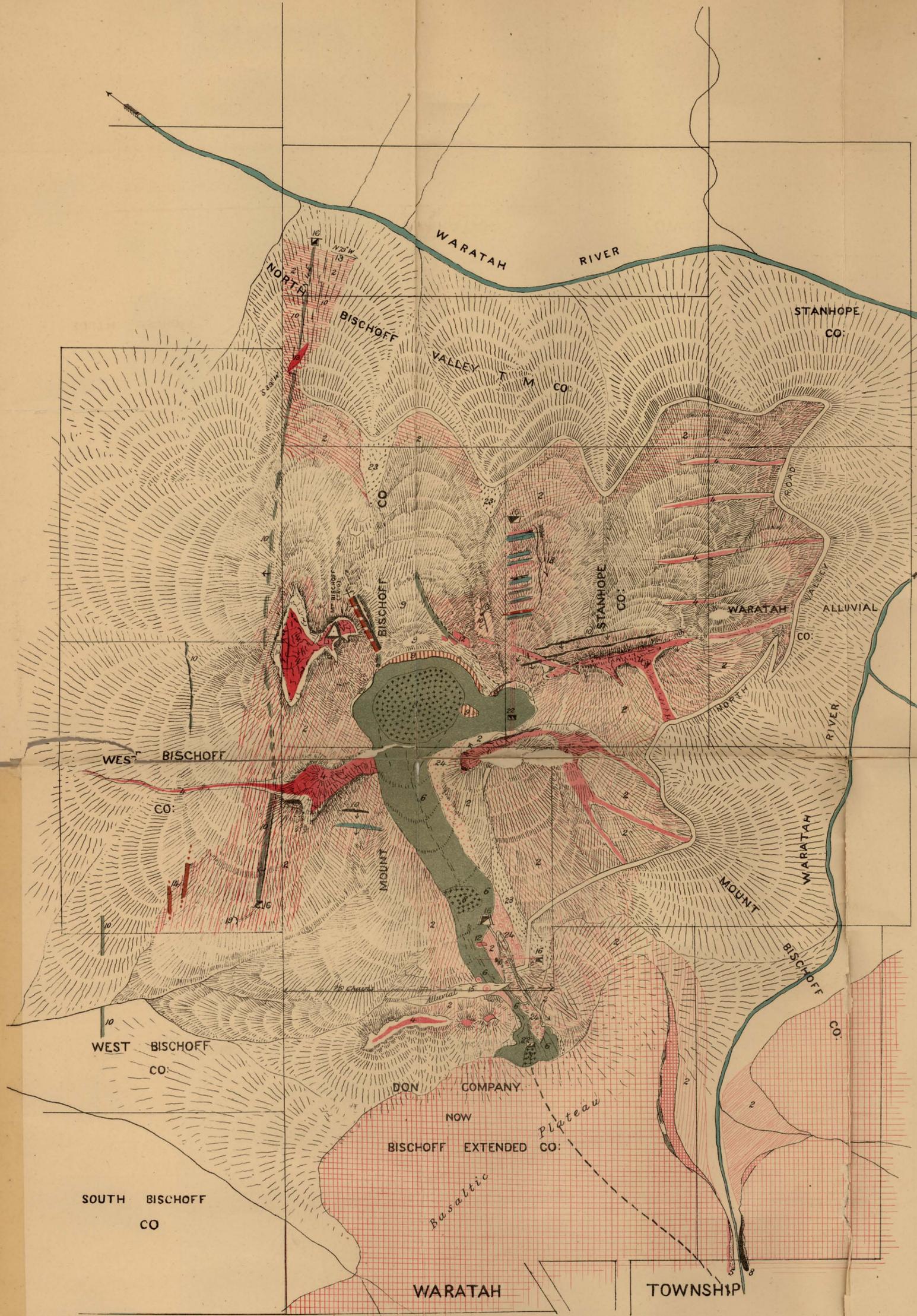
Leat. G. Thureau F.G.S.
1884.



- a. Upper Basalt b. Scoriae and volcanic ashes c. Lower basalt d. Shaft (Don Co) e. Pliocene drifts f. Porphyritic boulder drift g. Dykes of euritic porphyry
 h. Metamorphic and silurian schists (much contorted) i. Deep and unexploited deposits k. Galena lode l. Tin lode m. Worked ground n. 33 feet level
 o. Unworked ground p. Outcrop of gossan q. Tin lodes r. Working level to "red face F"

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GEOLOGICAL SKETCH MAP
 OF THE
WARATAH
MINING DISTRICT

Geo. G. Thureau F.G.S.
 1884.

REFERENCES.

- 2. Contorted metamorphic schists.
- 4. Tertiary (dykes of) porphyry.
- 5. Basaltic breccia.
- 6. Pliocene black gray and greenish chloritic indurated clays.
- 8. Deep and unexploited diluvial tin deposits.
- 9. Stanniferous deposits ("red face")
- 10. Tin lodes
- 12. Gossan (ferruginous) (out crops of)
- 13. Galena (vein or lode)
- 14. Antimony (stibite) (lodes of)
- 15. Bore Holes (not bottomed)
- 16. Tunnels and Adits
- 17. Massive tin lode (chloritic and vertical in position)
- 18. Aggregation of tin, galena, Zinc, iron antimony ores in veins and lodes underlying South
- 19. Self acting tramway
- 21. "White face"
- 22. Shafts
- 23. Talus
- 24. Porphyritic boulder drift (stanniferous)

