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REPORT on the Mineral Resources and on the Permanency of the LISLE GOLD FIELD.

THIS Gold Field is situated about five miles N. 20° E. from the trigonometrical summit of Mount Arthur, or S. 15° W. from Bridport, twenty miles distant in a straight line. Approaching Lisle from Launceston, after passing the junction of the Scottsdale and Lisle roads, the formation of the country is similar to that of other auriferous localities.

Geological Features.

These comprise regularly bedded slates and sandstones from blue to grey in colour; in the former incomplete petrifications (*Diplograpsus nodosus*) were observed, resembling to some extent the Victorian series of Graptolitidæ. These schists are moderately interspersed with irregular and attenuated veins of quartz, from which the traces of gold were probably derived, after denudation, which occur in the vicinity of Falkiner's farm. On approaching that farm, however, a considerable change takes place, inasmuch as the crests of the hill on which that farm is located, and of others forming the summits of the leading range, extending towards the 'Gorge' at the lower end of the Lisle goldfield, and forming likewise the divide between the latter and of the Little Forester river, are composed of basalt, deep green in colour, and occurring in both schistose and columnar forms. The before-mentioned Silurian schists thus overlaid by the basalts, lose their characteristic modes of occurrence, and become more and more metamorphic in consequence. Descending the sideling track leading down to the Lisle township, a considerable thickness of talus, shed by both the basalts and by the metamorphic schists, makes observation difficult, especially as another and quite distinct formation obtains decided preponderance, and eventually becomes the bedrock of most, if not all, of the gold-workings. This rock is of considerable extent within the valley proper, which is drained by Bessell's rivulet and its tributaries; it is of a friable nature, and from light grey to reddish in colour, and contains a large percentage of blackish green mica, some iron pyrites (transposed into limonites), quartz, and hornblende. Its proper definition would appear as belonging to the Syenitic granites, owing to the presence of needlelike crystals of hornblende. In the Ural mountains a somewhat similar rock occurs, termed "*Beresite*," where it forms considerable dykes in the clay slates, and these dykes are themselves traversed by quartz veins containing gold. It would appear, after a limited examination (which I hope may be resumed as soon as practicable), that in the latter respects a very close resemblance indeed is established between the Ural granitoid rocks and those of Lisle. It should be borne in mind that under no circumstances can this "*Granite*" of the miners be compared with those granites of Tasmania associated with our stanniferous deposits. At the junction of the metamorphic schists (see Geological Sketch Map) and of these Syenitic granites, there are evidences of the latter having lifted the former from their original deposition, and not only are there narrow quartz veins accompanied by granitoid vein-matter, mica, and hornblende, etc., but distinct, though small veins of this granitoid rock, protrude and traverse the schists for a considerable distance from the main body. The auriferous quartz veins, which in some instances have given rise to prospecting, when occurring in this granitoid formation, are irregular, limited in size and extent,—the largest, "Anvil," not exceeding two feet in width—are found to interlace, so to speak, those rocks in all directions. The peculiar nature of these Syenitic granites offers, however, besides the low percentage of gold found in the quartz veins embedded, another obstacle to mining operations, in having been proved very wet and of requiring heavy timbering at the lower levels, not yet exceeding forty feet.

In extending my examinations in the direction of surveying several tunnels which were driven at various altitudes above the datum level at the "Gorge," which forms the present outlet of the drainage area of the Lisle Valley by means of the rivulet already alluded to, I became aware of further proof of the northern coast line of Tasmania having, in pre-historic periods, been gradually raised to its present position. In this case, which, in passing, closely resembles what I observed and reported of the North Mount Cameron district, not less than three successive deposits of gravel occur above each other, the highest being 600 feet above the much more recent and present drift alluvial in the "Gorge." Thus the Tasmanian coast line could not have been nearly so extensive as it

is at present. But what concerns us most is the fact of the remnants of these gravelly deposits proving *auriferous* to more or less an extent. At the entrance to Titmus' "upper tunnel," a sandy, quartziferous wash (O. N. on plan), *older pliocene*, is found, which, though limited in extent, is sufficiently developed to establish its position of having once formed a portion of a shingly beach, composed principally of rounded quartz and of hard metamorphic schists. It also contains gold (*vide* Geological Sketch Plan), which latter circumstance is of some importance, as this deposit occurs *above* the junction or contact of the schists with the granitoid rocks lower down.

The second auriferous deposit (V.V.), *newer pliocene*, occurs some three hundred feet down the range, and it, as well as the first, now appears to skirt the contour lines of the ranges, though the last one under view has preserved its features as a channel more clearly and distinctly. There is, however, another feature connected with the same, viz., this second auriferous deposit occurs within the decomposed Syenitic granite exclusively, and rests directly upon it. Owing to the clayey character of the re-deposited or "*secondary*" granitoid rocks, this auriferous gravel is of a much more tenacious description, and forms a distinct lead, which is, however, at its upper and lower ends, denuded and obliterated by the much more recent (*pleistocene*) auriferous drifts, which have been proved so remunerative to work by the miners. A reference to the Geological Sketch Plan, the cross, and the longitudinal sections accompanying this report, as drawn upon a scale of six inches to the mile, will elucidate the very peculiar features observed at this gold field, and afford information to the miners that should enable them to concentrate all their prospecting operations in such directions only as give the more favourable indications of the existence of permanent auriferous deposits.

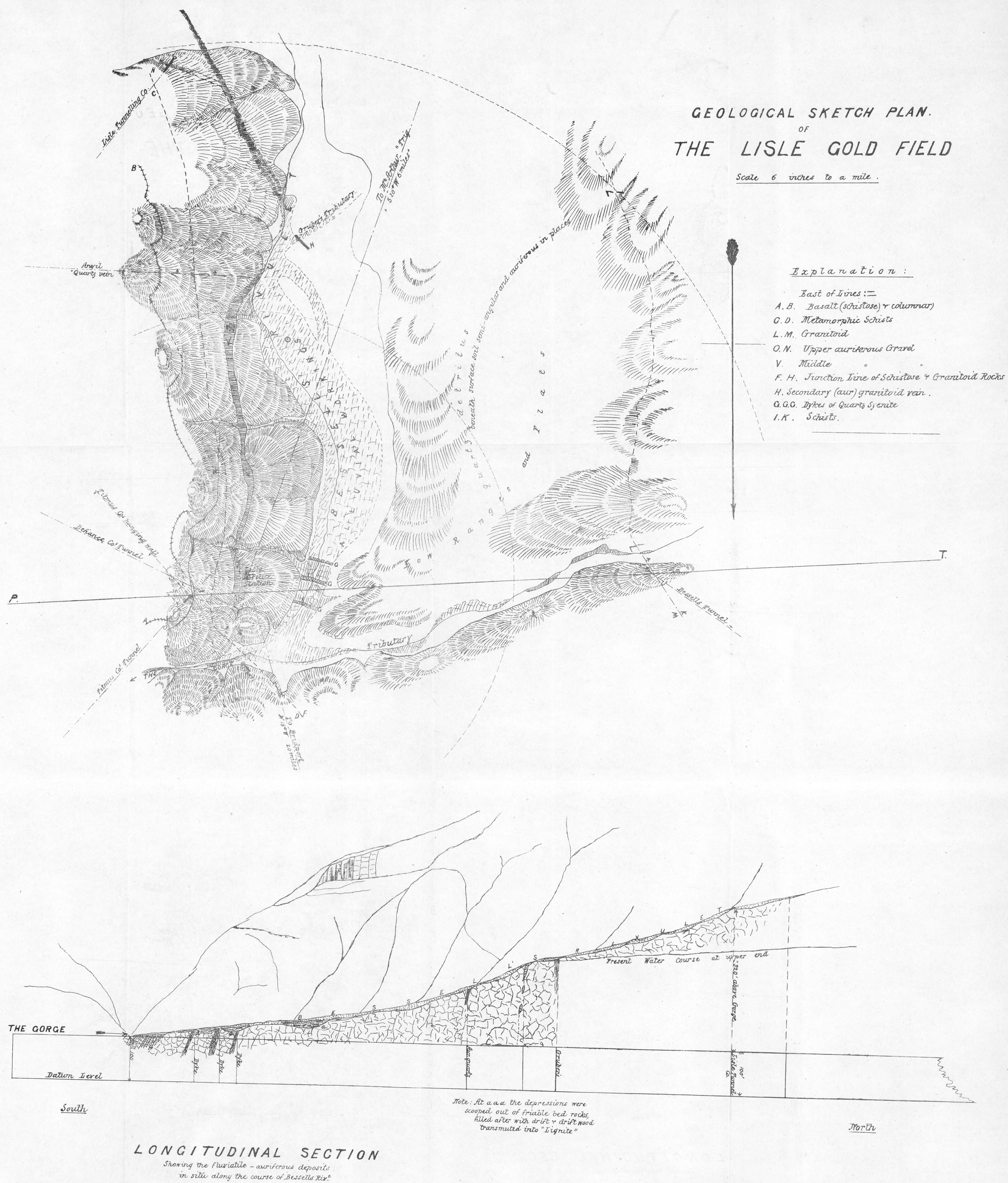
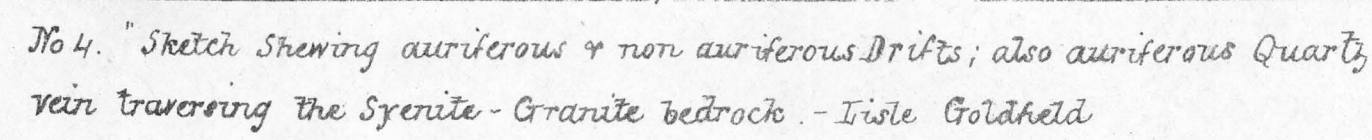
It will be found that with all the three auriferous drift deposits, the drainage occurred at three as different altitudes above each other, of which the higher ones were, geologically speaking, the older, and the present creek (Bessell's Rivulet) the more recent. In other words, it was necessary, in order to produce the gold deposits—tertiary—here, (which are estimated by high and competent authorities at over sixty thousand ounces of gold in the aggregate) for the sea encroaching or forming an "inlet" at Lisle, by means of the "Gorge," at three successive levels above high water-mark, to denude, abrade, and carry away more than six hundred feet of strata more or less interspersed by auriferous quartz veins occurring in these Syenitic granites. The drifts, as worked and proved rich in gold in places along Bessell's Rivulet, are therefore, in my opinion, simply the result of the concentrating action of the waves having beaten down a friable rock, traversed by attenuated quartz veins, containing some gold occasionally, and of which latter several are existing now in those granitoid rocks. Judging from this it becomes obvious that the occurrence of permanent quartz reefs of good value ought not to be expected if enclosed in the Syenitic granites, and that more attention should be devoted to the exploitation of the metamorphic and of other schists in the vicinity which are so well known as favourable to the formation of auriferous matrices. There are one or more quartziferous formations in these granitoid rocks which it may be desirable to refer to at this part of my report,—viz., the Gruber's (H), the Anvil quartz vein, and another (Z) situated nearly opposite the *All Nations Hotel*, and to which the Defiance tunnel may also be added. Gruber's vein occurs with a strike from west to east, underlaying south; it is a quartziferous formation of very finely-grained granitoid rock, nearly two feet in width, and in appearance differs from any strata surrounding. It carries some fine gold, which is probably derived from some quartz veins permeating the vein, and which are stained by ferro-manganese. The general appearances of this vein are those of a secondary deposit only, as derived from the surrounding wall-rocks by infiltration or other mode of process.

The Anvil quartz vein is likewise enclosed in the Syenitic granites; it has also been found gold-bearing, and as a peculiar feature the siliceous matrix occurs in oblong blocks, each block being separated from its neighbour by the closing walls or strata. This formation should be tested by means of an adit driven along its course from Bessell's Rivulet.

Opposite the *All Nations Hotel*, on the flat, a most vigorous effort was being made by a strong co-operative party in prospecting one of those many thin veins of quartz, interspersed, as explained before, throughout the Syenitic granite; as it had given more than usual proof of gold being present, this wet shaft—sunk night and day—should have afforded practical results, but as the vein remained thin, and the walls were not well defined with depth, the prospects are very doubtful.

In the Defiance Co.'s tunnel, 400 feet in length, which is partly driven through secondary or re-deposited Syenitic granite and the original formation, at 227 feet in and also at 300 feet, narrow leaders of quartz, stained black by ferro-manganese, were intersected—the same as in some shallow workings outside this tunnel. Owing to the absence of any well defined walls and other developed auriferous vein matter, the undertaking admits of speculation as to why this tunnel was discontinued farther to the east, where probably these leaders, on coming into contact with the schists, would experience a change of an encouraging character.

The Bessell's tunnel, on the western side of the valley, opposite the main divide at the back of the Lisle township, has also been driven in the Syenitic granite, in a south-westerly direction, to the junction with the *western* schists, with no other practical result than to have proved the width of these Syenitic granites from west to east of less than two miles.



The Lisle Tunnelling Company have started operations nearly opposite where the alluvial gold discontinues at the head of the alluvial workings. This proprietary have driven 450 feet in a north-easterly direction, in which distance they crossed a deeper alluvial drift for a width of 150 feet. This is evidently a tributary (see Plan) to the secondary (newer pliocene) channel of auriferous drift. In that vicinity the junction of the schistose with the granitoid rocks cannot be far distant, and deserves attention.

Having now succinctly described some of the characteristics of these auriferous deposits at Lisle, it remains but to allude to some remarkable dykes (G.G.G.) of more recent age than the granitoid formation which they traverse. They are of a hard dense nature, grey in colour, with a base of quartz in which a black (hexagonal) mica prevails, with some hornblende. These dykes are from 20 to 30 feet thick, and they may be found to contain opaque "corundum," as the latter are always found in the residues after washing the alluvial besides gold, and known amongst miners here as "black jack." They are useful for grinding hard metallic parts of machinery and fine cutting instruments, which by other means cannot be accomplished. They are now preferred to emery.

On examination, and from facts gathered at Lisle, miners have traced the gold up the eastern slopes of the Bessell's Rivulet, and I was assured, that approaching a certain line of altitude, coarser gold had occasionally been found than in any of the lower alluvium. On the opposite of this creek also, a coarsish quartz detritus occurs, and this has been found to contain both free gold and as associated with quartz. Bearing in mind that the whole of the granitoid formations are traversed by attenuated quartz veins charged with very fine gold, it may be inferred that if any vein matrices with coarse gold—of whatever form the former may assume—exist, the probability is that they occur at or near the points of contact of the granitoid with the metamorphic or other schists on the Lisle divide, and in the eastern foothills of Mount Arthur.

This view has been to some extent confirmed by the intersection of *auriferous vein-matter* at the entrance of the Titmus upper tunnel, and as this occurs entirely in the schistose country, at a considerable elevation above the Syenitic granite, the result of further prospecting thereabouts will be a guide to where these matrices occur which have shed the coarser gold down the range, and which heavier gold was eventually lost under the talus overlapping the rocks *in situ* beneath. At the opening cutting of that tunnel a short jointed metamorphic schist was penetrated, traversed by irregular quartz veins, exhibiting micaceous and distinguishable granitoid vein-matter. A red feldspathic band, dipping at an angle of 45° west, was then intersected, followed by a peculiar formation against a well formed and hard hanging-wall, also dipping 45° , but in the opposite direction, viz., to the east, thus forming an apex in the top of the said cutting. The gangue or vein-stuff contained within the walls, of which the eastern is the main and more regular, consist of quartz, broken schists, and feldspathic veins interlacing each other, and impregnated, so to speak, by thin veins and flakes of steatite, the whole being profusely stained black by ferro-manganese. This aggregation of yet irregularly formed vein-matter has been proved auriferous, though not remuneratively so, and it forms the highest gold-bearing formation in the vicinity.

After passing with the tunnel through the hanging-wall a further distance of 124 feet was driven without *any trace* of gold being found. The main east wall referred to, having a bearing of S. 42° E., would, in that direction, come into contact with the Syenitic granites lower down the range, a locality well worth careful prospecting for primary gold-bearing vein deposits. Whether these deposits, if found to exist, assume the ordinary forms or modes of occurrence of quartz reefs or lodes, cannot be determined, in as much as the metamorphic schists in which this aggregation occurs are very disjointed. Properly speaking, the "joint" in which such wall is found marks the disruption of strata, which dip is divergent from that joint.

The auriferous detritus has been referred to as derived possibly from the schists at the foothills of Mount Arthur, and as these quartziferous deposits are strongly represented, the junction of the Syenitic or other granites with the schists would, in my opinion, deserve to be likewise tested for auriferous vein matrices.

In conclusion, there is no doubt but what a well conceived scheme of water supply on a large scale, for hydraulically sluicing all these tertiary deposits for gold, would prove very remunerative for a considerable period.

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