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REPORT ON THE GEOLOGICAL STRUCTURE OF THE BEACONSFIELD GOLDFIELD.

Geological Surveyor's Office,
Launceston, 10th July, 1891.

SIR,

I HAVE the honor to report to you the results of my geological examination of the Beaconsfield District.

Maps.—In order to illustrate and render the report more intelligible, there are sent herewith the following maps :—Plan No. 1, a plan of the Beaconsfield Goldfield, showing the position of the principal mine workings and the strata in which they occur; Plan No. 2, a plan of the Tasmania mine and enclosing strata, the latter being shown on the horizontal plane of the main adit; Plan No. 3, a similar plan of the underground workings of the Little Wonder, Moonlight, and Amalgamated West Tasmania mines, and a section across the Cabbage-tree Hill, showing the order of superposition of the strata. These maps are compiled from the official maps of the sections held under lease and otherwise in the district, the plans of the underground workings of the mines furnished by the owners annually to the Inspector of Mines, and my own surveys. Mr. G. T. Eddie's valuable maps of the Tasmania mine were also used at times, and I have to acknowledge Mr. Eddie's great courtesy in allowing me the use of his original plan.

My first and principal examination of the district was in January and February, 1890, though several visits were made to it subsequently, hence the state of the mine workings shown on the maps is generally as seen at that time, later workings not having been in all cases plotted. The extensions of workings made since the beginning of 1890 have not, however, to my knowledge resulted in giving any further information as to the geological structure of the ground.

Previous Reports.—Two reports on this district have been previously made to the Government—the first by the late Mr. Charles Gould in 1866, entitled "Geological Surveyor's Report of the country near Ilfracombe, in the West Tamar District"; and the second in 1883 by Mr. G. Thureau, F.G.S., on the "Beaconsfield and Salisbury Mining District." Mr. Gould's excellent report deals with the general geology of the country, and more particularly with the large deposits of iron ore near Ilfracombe and at Anderson's Creek. A full narrative of the attempt to work these ores for iron is given by Mr. T. C. Just in the "Tasmanian Official Record, 1891." Analyses of the ore, the iron manufactured from it, and the slags from the smelting are given by Mr. R. M. Johnston in his "Geology of Tasmania," on page 28; and another analysis made for Mr. Gould by Mr. G. Foord, of Melbourne, is given in the "Monthly Notices of Papers and Proceedings of the Royal Society of Tasmania, 1866," page 84. To the full information as to these interesting iron-stone deposits given in these papers, I have nothing to add further than the remark that the increasing use of chromium steel bids fair to render what was formerly the defect in the iron made from them, namely, its percentage of chromium, its principal merit at some future, but perhaps not distant date.

As regards the present mining district of Beaconsfield, gold does not appear to have been found in it till long after Mr. Gould's survey, and consequently his report mentions only the general features of the country, and does not go into further detail than giving the succession of the strata seen in the Middle Arm Creek (now called Blyth's Creek). As a general report it is most excellent, and should be consulted before the later and more detailed and restricted examinations by Mr. Thureau and myself are taken up by anyone desirous of studying the district.

Mr. Thureau's report deals more particularly with the portion of the country forming the Beaconsfield and Salisbury goldfields, and gives valuable information about the structure of the district as revealed at the time, and more especially as to the alluvial workings on the surface, and in the "deep lead" which runs along the eastern base of the Cabbage-tree Hill. As giving a description of the mines in their earlier stages of the principal features of the reefs, and of the Salisbury portion of the field which the present report does not deal with, it also should be read before this one is taken up.

The report which I now have the honour to submit to you is the result of a still more detailed examination of the Beaconsfield Goldfield, with the following objects in view :—(1.) The obtaining of more definite knowledge as to the relations of the various beds of country rock to each other and to the auriferous reefs, and their influence on the gold value of the latter; (2) The determination as far as possible of the position and effect on the reefs and the country of the various crosscourses or faults that disturb them; (3) The collection of further information as to the "deep-lead" or buried river channel running along the eastern base of the Cabbage-tree Hill; and (4) The noting in general of all facts connected with the geological structure of the district likely to be of interest and value either practically or scientifically.

General Topography and Geology.—Without going over the ground already traversed by the reports of Messrs. Gould and Thureau unnecessarily, it seems advisable to begin by recapitulating the principal facts as to the general topography and geology of the goldfield. The main feature in both respects is the low range known as the Cabbage-tree Hill, running N.W. and S.E. about two miles inland from the Middle Arm of the River Tamar, and approximately parallel to it. The hill is a little over two miles in length, and averages from 350 to 420 feet in height above sea level. The same range continues on to the south-east under the name of the Blue Tier, this and the Cabbage-tree Hill having once formed a continuous range, which has been cut into two parts by erosion of the deep gorge of Blyth's Creek, which now separates them. At its north-western end the Cabbage-tree Hill is separated by the Brandy Creek from rolling country, which forms the watershed between the latter and Anderson's Creek. From the Middle Arm the ground rises pretty evenly with a gentle slope to the base of the hill where the Town of Beaconsfield is situated. As the main street of the town is only about 100 feet above sea level, the slope from it seaward is so slight that the country may be called a plain. South of the Cabbage-tree Hill about two miles lies another hill known as the Blue Peaked Hill, and between them the ground is flat and somewhat marshy in parts. This flat extends up the Flowery Gully, an eastern tributary of Blyth's Creek, to a point about due east from the Blue Peaked Hill.

Several geological formations are represented in the district. The hills mentioned are all composed of hard metamorphic sandstones, slates, grits, and conglomerates, of probably Lower Silurian age. About a mile west of the northern end of the Cabbage-tree Hill old volcanic rocks are found, forming a large patch of serpentine country. The stratified Lower Silurian rocks are generally inclined at rather high angles of dip, and form some synclinal and anticlinal folds. Their general strike is about N.W. and S.E., corresponding with the long axes of the hills, the existence of the latter as hills being clearly due to the greater resistance offered to erosion by the hard sandstones and grits of which they are composed as compared with the softer slates skirting them. The distance to which the Silurian formation extends towards the Tamar cannot be accurately estimated as yet, as the surface is much covered with later deposits of gravels and clays. From the West Arm to the Middle Arm the shore is found to consist of sandstones, mudstones, and limestones of Carboniferous age, except at Beauty Point, where Tertiary basalts are found. The Carboniferous rocks cannot extend more than a short distance inland before the Silurian formation crops up from under them, but the junction of the two is obscured by more recent superficial deposits. These are of various ages, ranging from the early Tertiary to the Recent period, the gravels of the "deep lead" being probably of the former age, while the shallower surface gravels are more recent. The deep alluvial ground of Flowery Gully and the flat between the Cabbage-tree and Blue Peaked Hills may contain deposits belonging to the older Tertiaries as well as the recent ones visible at surface, and may perhaps in places also cover the Carboniferous formation.

The general history of the locality may be sketched thus :—Sediments of gravel, sand, mud, and calcareous matter laid down on the floor of a sea in the Lower Silurian period were hardened into grits, sandstones, slates, and limestones, crumpled into highly inclined folds, elevated into mountain ranges, and greatly worn away by sub-aerial and marine erosion in the immense interval of time intervening between their deposition and that of the later Carboniferous beds. The latter were deposited as shell-banks and beds of sand and mud at a much later date on the upturned edges of the older strata at a time when the surface of the land was relatively lower than at present, and the sea came well up to the flanks of the Cabbage-tree Hill, which at that time must have been an island or peninsula, as the Carboniferous beds are found now nearly surrounding it. No great contortion of the strata has taken place since these beds were laid down, as they still lie almost horizontal, and show no signs of metamorphism or strain due to pressure. However, between the date of their deposition and that of the early Tertiary deposits, elevation of the land must have taken place to a height probably quite 300 feet above the present level, as the next evidence of geological work which is met with in the district is the formation of the channel of the "deep lead." This is an old river channel, and the water that scooped it out must have run downhill to the sea; hence, as the bottom of the lead is proved by the Ophir Company's borings to be now 270 feet below sea level, it must at one time have been more than that distance vertically higher than its present position. This elevation of the land subsequently to the laying down of the Carboniferous beds very probably took place during the Mesozoic period, when the immense outflows of diabase greenstone, which are so prominent a geological feature, throughout the whole colony, were being emitted. This greenstone occurs very abundantly on both sides of the River Tamar from Middle Island up to Launceston. The channel of the lead was doubtless

eroded deeper and deeper as long as the movement of elevation proceeded, but after a time, the ground remaining stationary or beginning to subside, it began to become filled up with deposits of gravel. A movement of subsidence now appears to have set in, for the old channel became more and more filled up. At one stage it appears to have been a swampy estuary or valley, as there is in it a deposit of black mud mixed with fragments of timber, leaves, and other vegetable remains. It is from this portion of the alluvial beds that specimens were obtained of fossil fruits (see Johnston's Geology of Tasmania, page 278), which enable the age of the lead to be certainly referred to the Older Tertiary (Palæogene) epoch. This lead is therefore contemporaneous with some of the oldest deep leads of Victoria and New South Wales. As subsidence went on the old channel at last became entirely filled up. There is reason to believe that the subsidence did not cease when the ground had reached its present level, but continued until the sea reached a point on the flank of the Cabbage-tree Hill at least 250 feet above the present tide-mark. The evidence for this is that we find at 250 feet above sea-level on the Moonlight Company's section (No. 349) heavy rounded water-worn stones and coarse gravel, and at the same height on the eastern slope of the range there are heavy deposits of similar gravel in Eastman and King's and Bruen's old workings. The deposits in these consist of boulders, heavy gravel, and clay, all more or less horizontally bedded or dipping slightly seaward. Their being found on both sides of the hill up to a fairly constant level creates a great likelihood that they are remnants of a large body of gravel which once surrounded the hill up to that level, but has since been almost entirely removed by erosion. The level of the highest occurrences of heavy gravel, therefore, probably represents the sea level at the end of the last period of subsidence. From the evidence obtainable in other parts of the colony it is known that the extensive outflows of basalt which cover a large area in the northern districts, forming the best farming land, took place towards the end of the Palæogene or Older Tertiary period, and it is possible that the disturbance caused by these resulted in elevating the land again to about its present level. During the progress of this elevation (a slow movement in all probability) the deposits of gravel which had accumulated round the Cabbage-tree Hill have been swept away nearly down to the bed-rock, leaving only the remnants above mentioned and occasional gravel mounds on the plain to attest their former existence. There is some of the basalt just mentioned at Beauty Point and at Point Effingham, in the immediate vicinity of the Beaconsfield District, and a little further away, at Lefroy and Back Creek, it is again found, and this time covering auriferous deep leads. There is a possibility that the Beaconsfield deep lead may also run under the basalt towards Ilfracombe.

From a consideration of this history the obscure and patchy character of the alluvial deposits will be understood, and it will be seen that the configuration of the present surface can afford little, if any, indication of where the deep ground lies.

Deep Lead.—While this history is fresh in mind, it is well to finish our consideration of the "Deep Lead." It has long been known that along the eastern base of the Cabbage-tree Hill there exists deep alluvial ground, this being proved by numerous shafts and prospect holes. The main street of Beaconsfield (Weld-street) is almost fairly upon the centre of this ground. The principal workings have long since been abandoned, and it is hard now to fix the sites of even some of the old shafts with any certainty. Such as I could determine are shown on Plans Nos. 1 and 2. All these old workings were either on the "high reef" or sloping edge of the lead, or on false bottoms. The lowest workings were 112 feet from the surface on a false bottom of black ligneous clay. None of the workings have yet reached the "gutter" or bottom of the old river channel. I have not been able to obtain much really reliable information about the old mine workings, the accounts given by various presumably well-informed persons being very conflicting. It would seem, however, that the workings on the "high reef," that is, on the Silurian bed-rock forming the sloping sides of the channel, were fairly payable, and that there was also a good deal of gold on the black false bottom. No good section of the lead has yet been obtained. The diamond drill bores recently executed by the Ophir Company do not give a satisfactory section, as the greater part of the boring was done without bringing up any solid core, and consequently the exact nature of the strata passed through is somewhat doubtful. Two bores were put down, marked D and E on Plan No. 1, and Ophir bores No. 1 and 2 on Plan No. 2, to a depth of 375 feet and 286 feet respectively. The following section of the deeper bore was given by Mr. Bowen, the Director of the Company, who superintended the boring :—

"First bore, 375 feet, passed through from surface sandy clay with gravel to 40 feet, then pug 200 feet, then gravel containing gold at two ounces to load, then boulders to 300 feet intermixed with clay, then black clay, 50 feet, then decomposed timber, &c., then wash to bottom." Elsewhere in his report Mr. Bowen says that at the bottom of this bore there were 9 feet of wash with gold at the rate of 4 ounces to the load. The second bore bottomed on limestone at 286 feet, and had "about 12 feet wash, giving returns at 2 ounces to load." If these results are reliable the richness of the lead would be phenomenal.

The Ophir shaft, which was sunk to a depth of 300 feet in the alluvial and bottomed on sandstone, ought to have given an excellent section of the lead ; but I have not been able to obtain any more definite account of it than that it passed through a succession of beds of gravel, sand, and clay, occasionally containing a little gold. The surface of the sandstone bottom sloped to the north-east, showing the shaft to be on the south-western side of the gutter. Orchard's shaft (see Plans 1 and 2) struck limestone bottom at 192 feet, dipping south-westerly, and between it and the Ophir shaft the bores E and D strike bottom at 286 feet and 375 feet ; hence the "gutter" is evidently close to bore D. Owing to the swelling nature of the ground the Ophir shaft has become twisted and more or less useless, and no work has been done on the lead from it. The policy of sinking a shaft in the solid rock to a depth well below the lead, and then driving out under it being adopted now by the Ballarat Company, is a much safer one than that of attempting to sink in the drift itself, and much more conducive to the economical working of the gutter.

To the east of the Tasmania mine workings the lead evidently passes not very far from the Lefroy shaft. The No. 4 and No. 5 levels of the Florence Nightingale mine were driven out into it, encountering drift and gravel in the face, at depths of 270 and 330 feet. The Lefroy shaft itself seems to have been in alluvial material for about 70 feet, and then to have been sunk in soft clayey slate. The East Tasmania bore and the workings of the Dally's United mine prove that the alluvial channel keeps close in to the foot of the hill going south-east from the Lefroy shaft, and it most probably hugs the foot of the hill right to the Blyth's Creek in this direction. Alluvial material was passed through in the first 300 feet of the

Tasmania main adit, and for 412 feet in the mouth of the lower Cosmopolitan adit. Past this point I have not been able to trace it as yet to the south-east; but from the outcrops of solid bed-rock it almost certainly must pass under Blyth's Creek near the bridge on the road from Beaconsfield to Launceston. The northerly extension of the lead from the Ophir bores probably runs N.W. and then N.N.W. out under Brandy Creek. Mr. Thureau in his report gives a sketch map showing two leads coming together from the N.W. and S.E. at the Ophir ground, and then breaking out north-easterly towards the sea. There is deep ground in this latter direction, for J. T. Allen bored some 170 feet at a spot approximately marked on Plan No. 1, and was forced to stop without reaching the bed-rock by coming upon a bed of hard conglomerate boulders. The drives from the East Tasmania and Dally's United shafts, the shaft of the old Duke of Edinburgh mine, and the occurrence of solid bed-rock near the intersection of Weld and Crowther streets, together with several wells and shallow borings put down from time to time by various persons, have, however, pretty conclusively proved that there is no outlet for the lead in this direction, and Allen's bore must be in a different lead. It is probably connected with a run of deep ground found to the eastward of the Beaconsfield Public School, and perhaps this second lead may prove to be a branch of the Ophir one.

The further tracing of the lead will probably be left until such time as the works now in progress will have demonstrated the payableness or otherwise of the part about to be worked. Should the result be favourable the extensions of the lead will be of very great importance. The tracing will be rather a slow and expensive matter, as it will require series of lines of borings across the most probable courses of the old channel.

As to the prospects of the gutter proving payable there is much difference of opinion. There is no doubt that the upper portions of the gravels have been auriferous, but a very general opinion appears to prevail locally that under the false bottom on which the deepest workings are situated there will be no payable gold. The grounds for this notion are difficult to imagine. Rightly or wrongly a belief is very prevalent in the district that the good results got from the recent Ophir bores, and from a previous bore called Orchard's bore on Plan No. 2, were not genuine,—in fact, that the bores were "salted." No good reason is ever given for this belief, which is a most unfortunate one for the district, as a mere suspicion of such a thing acts as an absolute bar to investment of capital, and I quite fail to see any reason why gold should not have been genuinely got from the bores. On the contrary, there are good *a priori* reasons for thinking that the lead ought to be richly auriferous.

The channel has been eroded through the auriferous Silurian rocks. We know that the reefs existed before this erosion, for the Tasmania reef, as above stated, has been found to be cut through by the lead in the most easterly workings. It is clear, then, that a large piece of this reef has been cut out and sluiced in the old channel. But all the time that the latter was being eroded the surface of the Cabbage-tree Hill and its numerous contained auriferous veins was being also worn down, and in natural course the contained gold would find its way into the channel. The fact that the gravels filling the lead are all derived from the Silurian grits and sandstones disposes of any objection that perhaps at the time of formation of the channel the adjacent hill slopes were covered with coatings of more recent rocks, of the Carboniferous period for example. If these had existed they would have contributed their share of the gravels. Now, all the time that the river channel was being cut down, which must have been considerable, it acted as a sluice to concentrate the gold brought down from the adjacent hillsides. The later gravels derived from these same hillsides have been proved to be auriferous, then why not also the earlier ones? Further, it may be observed that while the later gravels were deposited during a period of subsidence when the channel was slowly filling up, and therefore the gravel once deposited was but little disturbed afterwards, in the earlier stage the gravel never could accumulate, but was swept out by the force of the stream which was cutting its way down through the bed-rock. While this action must doubtless result in carrying a great deal of gold down the river, at the same time it affords much greater opportunity of concentrating the gold into the bottom of the gutter than in the subsequent stages when the latter was filling up. In my opinion, therefore, there is every reason to expect that the bottom of the lead will be rich. Like all such leads it is to be expected to vary very much in quality, and no surprise and alarm should be felt if the first truck-load of wash extracted from it does not realise expectations. Patient work may be required before rich deposits are found. This is no news to anyone knowing anything of deep leads, but may be useful to other investors.

Cabbage-tree Hill.—Turning our attention now to the rocks of the Silurian system, we find that it is in those of the Cabbage-tree Hill that the most important gold discoveries have been made. Auriferous reefs have also been found at the Blue Tier, but the mines here have practically been at a standstill for a long time past. Not having examined this portion of the field, this Report will not refer to it further. The ridge of the Cabbage-tree Hill is composed of coarse-grained grits or fine quartz conglomerates, alternating with beds of hard metamorphic sandstone. On either side of the hill softer slates and sandstones are found. The general strike of the formation may be taken as that of the ridge, N.W. and S.E., though, as shown by the Plan No. 1, this is not uniformly preserved. Though a certain amount of folding of the strata can be seen in the crown of the ridge (see section) the general dip is to the north-east, the average angle of dip lying between 45° and 75°. The lowest beds of the series are therefore those seen on the western side of the Cabbage-tree Hill. The plans and section show the succession of the strata. The bluish slate, which is the lowest rock seen, is found in the Britannia shaft and in some old shafts to the north-west of the Little Wonder workings. In the extreme end of the deep crosscut at 422 feet level from the Moonlight shaft a band of fine-grained black sandstone is encountered, which must lie between the slate and the next band seen on the section, namely, a very peculiar jointed, shining, graphite-like slate. This is made up of small fragments polished brightly and striated on every face, showing the results of extreme pressure. The black colour of this rock is due to carbonaceous matter. It is encountered again in the drive south-west from the Moonlight No. 3 or most westerly shaft, and in the mouth of the Little Wonder adit, though here somewhat altered by loss of its black colouring, also in the old Garfield shaft. Upon it lies a bed of soft clayey tenacious slate, locally known as "pug." This is found with the graphite-like slate in the mines just mentioned. The next beds in the ascending series are shown by the workings of the Little Wonder, Moonlight, Amalgamated West Tasmania, and Tasmania mines to be a succession of layers of metamorphic

sandstones, grits, and conglomerates. There appears to be, as shown on Plan No. 3, a layer or series of layers of black grits overlaid by another series of similar beds of much lighter colour. The lower black grits are highly charged with carbonaceous matter. In a new crosscut now being driven east from the Moonlight shaft, and in the No. 5 level of the Tasmania Mine, west of the second crosscourse, there is a great abundance of a substance, to which I can give no better name than a soft coal, mixed up with the gravel and sand forming the grits and sandstones, and often thus preventing the material from cementing together into the usual hard stone, and lying between the layers and in the joints of the rock. Though all apparently containing a large percentage of earthy matter, pieces can be readily got which will take fire in the flame of a candle, and burn like charcoal, without flame, for some time after being withdrawn from it. Heated in a closed tube a little tarry matter is given off, but so little as to show that the substance must be almost all carbon. The purest pieces are bright and shining, very soft and friable, and burn to a white ash. From the way in which the carbonaceous substance is not only interspersed through the substance of the rock, but also through joints and fissures in it, I am in some doubt as to its origin, but think that most probably there was a great deal of organic matter among the sands and gravels when originally deposited as sediments, and that, during the processes of metamorphism to which the rock has been subjected, part of this has been volatilised as oil or tar through the joints in the rock, and afterwards been completely carbonised, while part remained as carbon where originally deposited in the sediments.

Overlying the beds of grit and conglomerate comes a large band of very hard black crystalline sandstone, seen very well between the two main cross-courses in the Tasmania mine. In parts this contains layers of coarser grit, and sometimes the grain is so coarse that the rock would be rather called a grit than a sandstone ; still, on the whole, sandstone predominates in this portion of the strata. The differences in lithological character exhibited by different parts of the same bed of sediment often render it difficult to be sure of their identity. On the plan I have shown by similar marking the beds which appear to belong to the same horizon in the series, even though they do not appear to be altogether the same in character at different points. This black sandstone, for example, is more a grit towards Blyth's Creek, and also towards Brandy Creek. On the eastern side of the main cross-course in the Tasmania mine it is met with close to the fault in No. 6 level, and the diamond drill bore of the Phœnix Company went into it after passing through the reef. The lower position of this black sandstone with regard to the strata met with in the main body of the Tasmania mine workings is therefore well assured. The Phœnix diamond drill bore, the workings of the Tasmania mine, and the long adits of the Olive Branch, Bonanza, Leviathan, and Cosmopolitan Companies, give numerous excellent sections of the strata lying above the black sandstone. Three bands may be distinguished—the lowest, a white sandstone often containing numerous but very imperfect fossil casts ; next, a dark bluish sandstone which forms a well marked band in the Phœnix bore, but owing to variation in colour is not always easily recognised in the other sections ; and above this a long series of small beds of light bluish, light grey, and yellowish sandstones, with thin partings of mudstone or slate. The higher (more easterly) beds become more and more slaty in character, and thin beds of impure limestone make their appearance. These limestone beds, however, do not as yet appear to be continuous over long distances, the limestones lately struck in the Ballarat shaft, at and below 250 feet, not apparently having extended into the Tasmania mine, but been changed to mudstone and sandstone. The strata lying between the eastern workings of the Tasmania mine and the next section, that seen in the East Tasmania diamond drill bore, may be seen in places on surface in the alluvial workings west of the Ophir shaft, and are still sandstones and slates. The workings of the East Tasmania bore, the Dally's United mine, and the East Tasmania mine nearly complete the section visible. The most notable feature in this portion is the thick band of limestone met with for over 500 feet in the bottom of the bore. This is again struck in the southern drive from Dally's United shaft, and probably is identical with the large band of limestone worked in Dally's quarry, on Blyth's Creek. Beds of slate, impure limestone, slate, and sandstone succeed the main limestone mass. The next known rock in the series is a bed of hard blue limestone met with in the bottom of the East Tasmania shaft. On this again lies an arenaceous, often calcareous slate, with bands of soft schist. From this point eastward the exact succession of the strata has not been revealed. A shaft to the north-west of the Police Station shows blue slate, and the Middle Arm Creek shows a few exposures of schist, sandstone, and limestone, from which we may conclude that the higher beds are a succession of these rocks. The whole formation is evidently of immense thickness, the section now given showing over 3000 feet of rock, all on one side of an anticlinal axis running somewhere to the west of the Cabbage-tree Hill. The beds seen in the Middle Arm Creek render it probable that the thickness is very much greater still.

A very hurried visit to the Blue Peaked Hill showed it to be composed of sandstones similar to those of the Cabbage-tree Hill, and it seems possible that the strata there may be those of the latter repeating themselves on the other side of an anticlinal axis. Against this supposition, however, is the occurrence of a large quantity of solid blue crystalline limestone at the head of the Flowery Gully, which has the same strike and the same north-easterly dip as the strata of the Cabbage-tree Hill. The exact similarity of the stone to that in Dally's quarry and the East Tasmania bore leads one to suspect some connection between these beds, but as yet none has been demonstrated. I hope to have an opportunity of running a section over the Blue Peaked Hill from Beaconsfield to the Flowery Gully caves in order to elucidate this matter. It is of practical importance, as a recurrence of the auriferous strata of the Cabbage-tree Hill would probably be accompanied with similar quartz veins.

Flexures of the Strata.—Though, on the whole, the strata seen in the section across the Beaconsfield field are dipping to the north east, there are several flexures in them which in places reverse the usual dip. As seen in the section these flexures lie under the crown of the ridge of the Cabbage-tree Hill. From Plan No. 2 it will be seen that the strata in the extreme western workings of the Tasmania mine are dipping south-westerly, and from Plan No. 3 it is seen that the south-westerly dip continues to be found throughout the Amalgamated West Tasmania Mine and in the workings of the Moonlight Mine east of the shaft. Throughout the Little Wonder workings, however, the strata dip to the north-east, as they do

also in the Moonlight deep south-westerly crosscut. That there is more than one fold in the beds between the synclinal axis shown on plan No. 3 and the Tasmania Mine is seen from the section exposed in the Garfield Company's old adit. In this the strata are seen to dip towards the north-east for about 130 feet from the mouth; at 145 feet their dip is to the south-west, and continues so to about 320 feet, when they become much broken, and the dip is not clear. At the end of the adit, 447 feet from the mouth, the strata are again dipping to the north-east. Near the south boundary of Section 112, two shafts sunk by the Garfield and Little Wonder Companies show proof of further flexures, the dip of the beds in the former being south-westerly, and in the latter north-easterly. The eastern crosscut from the Moonlight shaft now being made will, if carried far enough, throw a great deal of light upon the folding of the strata under the ridge.

The only other deviation from the general north-easterly dip of any importance seen during my examination of the field was in the East Tasmania Mine, in the northern drive at the 100-feet level. One of the small limestone beds appears to be folded back upon itself where cut in a small crosscut, but the section is not long enough to show if this is more than a small local fold. It is mentioned, however, to show the possibility of further flexures being encountered in the strata in this direction.

Fossils.—I was exceedingly unfortunate in obtaining fossil remains from the auriferous formation, only getting a few broken and imperfect specimens of species already catalogued in Johnston's "Geology of Tasmania." Very good specimens of a species of *Orthis* were obtained by Mr. Davies from 242 feet in the new Tasmania main shaft, but the fossiliferous bed proved to be a very small one. Imperfect and much broken casts and impressions are not uncommon in the bed of white sandstone lying just east of the main cross-course in the Tasmania mine, and also found in the Cosmopolitan shaft. The most interesting organic remains found were the carbonaceous deposits above described as occurring in the Tasmania No. 5 level, west of the second large cross-course, and in the new eastern crosscut from the Moonlight shaft. It is noteworthy that the only specimen of a vegetable fossil yet got in this country, or, to the best of my knowledge, in Australia, in rocks of Lower Silurian age, was found at Beaconsfield, in the Cabbage-tree Hill grits, viz., *Licrophycus Tasmanicus* (see Johnston's Geology of Tasmania). Very few undoubted plant remains have anywhere in the world been got in rocks older than the higher members of the Upper Silurian system, though the occurrence of graphite in the Laurentian rocks of Canada is generally believed to be due to vegetable matter; hence the carbonaceous beds of Beaconsfield are of very great interest scientifically. I think I am not wrong in saying that these are probably the most ancient beds containing anything of a nature approaching to coal that have yet been discovered.

The fossil evidence as to the age of the auriferous rocks of Beaconsfield is scanty, and therefore somewhat unsatisfactory, but, such as it is, it points to their being of Lower Silurian age, or even older. The crystalline limestones among them have not yielded the fossil remains that might have been expected, though Mr. Gould noted the occurrence in these of imperfect remains of what were once probably corals. Mr. R. M. Johnston, in his "Geology of Tasmania," refers the limestones found at the head of the Flowery Gully to a "Primordial Calciferous Group" of probably Cambrian age. The lithological resemblance of these limestones to the comparatively adjacent ones of Dally's quarry and Dally's United mine workings, which have now been proved to overlie and be conformably bedded with the sandstones and grits of the Cabbage-tree Hill, is so strong as to lead one to feel nearly sure of their being of the same age—a conviction strengthened by their having the same strike and dip as the Beaconsfield beds. It seems to me not unlikely that the limestones of Railton, Tarleton, and Chudleigh are also contemporaneous. As, according to Mr. Johnston, the limestones of the Primordial Calciferous Group appear to immediately overlie the trilobite beds of Caroline Creek, it would therefore seem likely that the Beaconsfield auriferous rocks are contemporaneous with the latter, and should be referred to the Cambrian Period, which has yet to be done to establish clearly the relations of their various formations to each other.

Faults.—The rocks of the Cabbage-tree Hill are traversed by several faults which disturb the country very considerably, and, as they are of the greatest importance to the miner, I have devoted much attention to them and to the effects they have upon the lodes. The most important is that generally known as the "main crosscourse," running about N. 30° W., and heaving the Tasmania Reef a distance of about 240 feet. Where exposed in the workings of the mine this fault is found to be a well-defined fissure, with polished and striated walls. It is often as much as six feet wide, but varies a good deal, and is filled with crushed and slickensided masses of rock. There are often several parallel polished surfaces between the walls of the fault, forming false walls Everything gives the impression of repeated motion having taken place along this fissure at intervals of time. The striations on the slickensided surfaces are not always vertical, and are sometimes inclined at considerable angles, showing horizontal as well as vertical movement, but I was not able to detect anything certain as to the direction of the motion from these. Proof of repeated motion is seen in the occurrence of fractured quartz along portions of the fault, which must have been formed in it, and subsequently crushed and broken by pressure during a later displacement. Some of this quartz contains gold, and in places there is enough of it to have led to the quartz being stoped out and sent to the battery. It has been considered that this quartz has been mechanically broken off from the reef and carried down into the fault fissure; but after seeing the continuous sheets and strings in which it generally occurs, I cannot accept this explanation, and must conclude that the quartz has been formed by deposition in the fault fissure from solutions. Somewhat similar quartz is found in parts of the other fault fissures in the district, and occasionally carries gold. The fault is met with again in the Olive Branch adit and in the Bonanza adit, though in these it is not so clear as where opened up by the Tasmania Mine workings, and probably it extends for a long distance. Though the dip is to the westward, it is clear that the eastern is the downthrow side of the fault, which is therefore a "reverse fault." On driving westward through it, with the exception of a small patch of white sandstone passed through in the No. 2 level of the Tasmania Mine, all the country met with in the workings is dense hard black crystalline sandstone. On the east side of the fault this is found in the lowest workings of the mine, dipping under the white sandstone, and in the Phœnix diamond drill bore after passing through the reef. The downthrow of the eastern side is therefore

clear, or would appear so at first sight. The same appearance would, however, be presented if the western side of the fault had been bodily heaved northward, and this I have come to believe is the true state of the case. As seen from the plans, there is a second crosscourse to the west of the one just described. The black sandstone is found in the Tasmania mine all between these two faults, but on driving westward through the second one grits and conglomerates are encountered, showing that though this fault also dips westerly the eastern is the downthrow side. Now, as the effect of a downthrow of the eastern side of the main fault would be to heave the reef to the north of the line of the portion on the western side, it would have been expected, in accordance with the law of faults, that the drives from the Golden Gate shaft ought to have turned to the left or south-east in order to recover the reef after passing through the crosscourse. But, as a matter of fact, it was necessary to go some 240 feet to the right or north-west. This heave of the reef to the right is incompatible with a downthrow of the eastern side of the main fault, and as the evidence of the strata is conclusive as to there having either been this downthrow or else a bodily heave of the wedge of country lying between the crosscourses to the northward, we must conclude that the latter action has taken place. This lateral displacement is probably the result of several more or less vertical movements, accompanied in every case with a considerable amount of lateral thrust to the north-west. The direction of the striæ on the slickensided surfaces shows that the general direction of movement was more or less up and down, and not horizontal. In the Bonanza adit, however, a small branch drive along a slide, which is probably connected with the main fault, reveals striated surfaces with the striæ inclined towards the south-east at angles of only 12° from the horizontal, and, as above remarked, inclined striæ (in one case making angles of 30° with the horizontal) are found on some surfaces of the walls of the main crosscourse. These show that the lateral movement was at times considerable. The resultant effect of several up and down movements, accompanied with strong lateral thrust, might very well be such a sidethrow or heave as is found in the mine.

Were it not for the position in which the reef is found, there would be no reason to search for a further explanation of the position with regard to each other of the strata on each side of the main fault than the apparent one of a downthrow of its eastern wall, but, as above remarked, this is incompatible with a heave of the reef to the northward. The unusual nature of the case, therefore, leads us to inquire if there is no other possible explanation than that just given. The occurrence of quartz, occasionally gold-bearing, along the slide in considerable quantities suggests that the break found in the lode is really a "deviation," not a true "heave," and this suggestion gains further probability when the behaviour of the reef at the second crosscourse is examined into, for we find that immediately after passing this the reef appears to run off in quite a new direction, changing its course from S. 48° W. to about N. 56° W., thus turning through an angle of 76°. The current local belief that the Little Wonder, Moonlight, and West Tasmania lodes are part of the main Tasmania reef is an expression of this theory. If it be true the reef fissure must have been formed subsequently to the faulting of the country by the crosscourses, and the deviation would be due to the fissuring force partly rending open the old fractures, and being altered in direction thereby. Such deviations of lodes are not uncommon.

The question as to whether these breaks in the Tasmania reef are due to true faults or to deviations is not one of merely scientific importance, and to be regarded as of no practical moment by the commercial mining world,—on the contrary, a very practical issue is involved in it. It is this: if the breaks are only deviations it is most probable that the Tasmania and Moonlight lines of reef are one and the same; but if, on the contrary, the reef has been faulted, the western extension of the Tasmania reef has never been seen on the west side of the second crosscourse, and an important part of it has yet to be discovered.

As far as the main crosscourse is concerned, the following considerations seem to me very conclusive as to the reef having been faulted and not deviated:—(1.) The heave, or lateral displacement, of the reef remains as nearly as possible constant at the various levels from the surface down to the deepest or No. 6 level. This is characteristic of true faults, but almost, if not quite, unknown in deviations. (2.) It happens that the main crosscourse has cut through the Tasmania reef at a place where it has, in mining parlance, "taken horse," that is, has divided into two branches which have united again further on, enclosing a mass of country rock. The fault goes fairly through the middle of this horse. At every level the distance between the two branches, where they abut against the fault on its eastern side, agrees almost exactly with the distance between them, where they are found again abutting against its western side. (This is also an argument in favour of the belief that the resultant effect of the faulting motions has been simple horizontal displacement of the country northwards, as it is not likely that in any other case the widths of the horse at different levels would correspond when brought opposite to each other by vertical displacement.) It is quite incredible that a fissuring force should split the country on each side of the cross-course deviating it with such accuracy. But it is easily understood that the ends of the branches must correspond if the horse has been cut across by a fault. The horse is shown on Plan No. 2, at No. 6 level, but not at the other levels, except partially. (3.) The reef is cut cleanly through by the fault, and does not turn partly into it or drag along it as is usual in deviations. The quartz above mentioned as being found in the fault does not appear to me to be similar to the quartz of the main reef, and I believe it to be a quite separate growth.

The position of the beds of country rock on either side of the crosscourse is compatible with either theory, as they could be brought into their present relations either by simple downthrow of the eastern side or by sidethrow of the western one. If the faults existed before the reef the former supposition is most likely to be true; if not, the latter must be true. As we have seen, the evidence at the main crosscourse is all in favour of its being a true fault, formed subsequently to the reef and cutting through it.

Taking now the second cross-course, we must consider how it bears upon the question of deviation or faulting of the reef. Like the main fault it is clearly a fault as far as the country is concerned, its eastern side being black sandstone and its western one grit and conglomerate, where cut through by the mine workings. The downthrow or northerly sidethrow of the eastern side is here as plain as at the main cross-course, and again either motion would explain the relative positions of the strata on either side of the fault. The latter has beautifully defined well-polished walls, runs about N. 46° W., and dips S.W., at an angle of about 80°, being thus apparently a "reverse fault," like the main cross-course. If the reef has been faulted by this slide the continuation of it on the western side would have to be looked for to the left on going through the latter, that is the levels should turn off to the southward. They have, however, gone to the

8/10

northward, and a reef has been found which has been assumed to be the continuation of the Tasmania reef. The evidence in favour of the deviation theory seems stronger here than at the main fault, for the heave is different at different levels, an unusual thing in case of faults but normal for deviations. The reef appears to be heaved 40 feet at No. 1 level, 61 feet at No. 2, and 100 feet at No. 5. This increasing heave at different levels may, however, to my mind, be accounted for without accepting the theory of the reef having deviated, by the explanation that the stone met with on the western side of this cross-course belongs to a different reef from that left on the eastern one,—in fact, that the stone on the western side is the Moonlight reef, and on the eastern one the Tasmania reef. It will be seen from Plan No. 1 that, taking the general line of the series of viens forming the Little Wonder, Moonlight, and West Tasmania reefs, it is due to strike the cross-course very near to where the Tasmania workings have struck quartz as above described. The increasing heave of the fault would then be simply due to the differences of dip of the intersections of the two lodes with the plane of the fault. On this supposition it would only be a coincidence that the two bodies of quartz were found so near to one another at the fault. The explanation gains in plausibility when the evidence at the main cross-course is taken into account, for this, as has been shown, almost certainly proves that the reef with its enclosing country has been heaved to the northward. This implies the existence of two faults, one on each side of the heaved country. The pre-existence of the two faults is equally implied by the deviation theory, and their general or approximate parallelism would render their being of contemporaneous origin probable in any case. If we assume this to be true, and believe that the wedge of ground between the two faults has been heaved nearly horizontally northward, it will be seen that the Tasmania reef would thus be brought 240 feet nearer to the Moonlight one. If the wedge is supposed to be forced back southward till the Tasmania reef is again continuous at the main cross-course, the ends of the two reefs at the second cross-course would be 280 feet apart at No. 1 level instead of 40. There are certain considerations with regard to the nature of the reefs themselves that make it more likely that the reef west of the second cross-course is the Moonlight one and not the Tasmania. East of the main cross-course the latter, though subject to minor bendings and sinuosities, preserves a fairly straight line of strike (N. 48° E.) throughout its length. Between the two cross-courses this same strike is fairly well preserved, though several small heaves break the continuity of the line. We may therefore say that all the reef east of the second cross-course preserves a straight line of strike. In the same way the reef, or run of reefs—for there appear to be a number of more or less parallel veins—in the Little Wonder, Moonlight, and West Tasmania mines, which for convenience I have been calling the Moonlight reef, preserves a fairly straight course (N. 56° W.) up to the cross-course. It seems almost impossible that this fault should cause the reef to veer through such a large angle as 76°. The theory that the reefs are different ones seems far more probable. This probability is increased when the difference in the character of the reefs is taken into account. The Moonlight reef is notoriously bunchy, consisting of blocks of quartz which rapidly thin out to mere strings both in strike and dip, while the Tasmania reef, though sometimes pinched, preserves with great uniformity a continuous body of stone. It would be a curious and unlikely thing that the mere deviation of a lode from its former course should effect such a change in its character. The only feasible explanation of such a fact would lie in the statement that while the Tasmania reef runs across the strata of the country, the Moonlight one runs nearly with them (though crossing them on the underlay); and while the former traverses sandstones, the latter lies in grits and conglomerates, which might be expected to break more irregularly. The workings of the Tasmania mine on each side of the second cross-course show the difference in the nature of the two reefs; on the eastern side the stone is fairly continuous, but on the western one it had the same character as the Moonlight line—blocky and irregular. Immediately west of the cross-course there was good auriferous quartz from surface down to No. 2 level, but below that point the stone gave out, and at No. 3 and No. 5 levels only a "track" of the reef was visible. On driving westward also along the reef at No. 1 level the quartz soon dwindled to strings, and though these were found to lead on to several bunches or blocks of quartz, no regular body of stone could be got; in fact, the behaviour of the lode in this part of the Tasmania mine has been exactly the same as in the mines on the Moonlight line of reef. From all these considerations taken together, I feel nearly certain that the workings of the Tasmania mine, by going northward at the second cross-course, have left the Tasmania reef and struck a portion of the Moonlight line.

If we suppose, then, that these two lines of reef are separate, and existed before the faults broke them, they must have either joined together or crossed one another, the latter being the more probable on account of their directions being so nearly at right angles. Should they have done so, traces of their extensions past the intersection should be met with. No sign has yet been seen of the Tasmania reef west of the second cross-course, but no great amount of prospecting for it has been done. There appear to me, however, to be reasons to believe that extensions southward of the Moonlight line of reef have been found. Ever since the opening of the field a good deal of gold in quartz has been got along the eastern slopes of the Cabbage-tree Hill from end to end. The long drives into the ridge of the Beaconsfield, Bonanza, Leviathan, and Cosmopolitan companies testify to the general local belief in the existence of lodes running with the ridge, that is, across the line of the Tasmania reef. Auriferous quartz veins have been cut in various places, the most important workings on them being those of the Cosmopolitan Company. Bearing in mind that the Moonlight reef appears to consist of a number of veins running with the ridge, and that these are very irregular and bunchy, it seems very probable that the leaders found to the south of the line of the Tasmania reef are an extension of the run of veins found north of it.

If, then, the Tasmania reef has been lost west of the cross-course, where would be the most likely place to find it again? Owing to the sidethrow above mentioned, and to a twisting round of the strata east of the main fault so as to make their strike more westerly than that of those on its west side, it is not possible to accurately estimate the amount of downthrow of it, and hence the heave cannot be predicted. Any heave, however, should be to the southward, hence the most probable position of the faulted portion is to the south of a line connecting the Golden Gate and Britannia shafts. It is most likely to pass through either the most southerly section held by the Amalgamated West Tasmania Company or that of the Bonanza Company, but it may even be heaved to the south of the Bonanza section altogether, though this is not likely. It may seem incredible that the reef should have remained so long undiscovered if it

passes out through any of these sections, but an examination of the ground shows that very little systematic prospecting has been done, and on the western slope of the hill there is often a good deal of surface *débris*. Should the reef happen to be thin at its outcrop it might easily escape notice. The prevalent notion, too, that the Tasmania and Moonlight reefs are one and the same might have a good deal to do with diverting attention from this part of the ground. The first discovery of gold, if I have been correctly informed, was made west of the second cross-course, and on what I consider to be the Moonlight lode ; the fault was then encountered, and soon afterwards the Tasmania reef was picked up on the other side of it. The belief once held (if my information is correct) that the Phœnix shaft was on about the line of the reef shows that it was not till a good while after the lode had been first found that its true direction was ascertained. The discovery of the identity of the reef near the Golden Gate shaft with the one in the workings near the top shaft, as it is called (see Plan No. 2), was required to disprove the belief that it had not continued on or about the line of Dally's first discovery.

Before leaving the subject of these two cross-courses, a rather noticeable feature in them should be mentioned. The hade of both gets flatter towards the north-west end of the workings on them, consequently the drives at the different levels diverge fan-like, when seen in plan. This divergence is plainly seen on Plan No. 2 at the second cross-course, but that at the main cross-course is not shown. Here, indeed, it would appear that the dip of the fault changes from easterly to westerly, the Nos. 3, 4, and 5 levels lying to the east of the line of fault at No. 2, while No. 6 is to the west of it. The plan of this part of the mine is taken from the surveys sent annually to the office of the Inspector of Mines, and ought to be correct, but I have grave doubts of its being so. In all the levels the hade of the fault is to the westward, and the underground captain of the mine, Mr. Swanston, told me he had never known it to be otherwise in the stopes on the quartz found there. The large plan at the mine made by Mr. Davies, the mining manager, shows all the drives on the cross-course as lying successively further and further to the westward of its outcrop on the surface, and also exhibits the fan-like divergence of the levels at the north-west end, just as in the second cross-course. I cannot but think there is some mistake here in the official surveys from which my plan is taken.

Besides these two principal faults there appear to be a great number of smaller ones running more or less parallel to the ridge of the Cabbage-tree Hill. A somewhat larger one, but apparently of no great importance, seen in the Cosmopolitan mine, is shown on the plan, and traces of numerous others are met with in all the workings along the hill from the Garfield adit to the Cosmopolitan mine. Quartz is often found on these slides, and occasionally carries payable gold. As the axis of a syncline running N. 37° W., which as seen on Plan No. 3 passes just west of the Moonlight main shaft, has much the course of the generality of these slides, there is some foundation for suspecting that these fractures were caused by the force which caused the flexures seen in the section. There is a certain amount of probability that the veins of the Moonlight line of lodes themselves are connected with this series of fractures. I have not, however, been able to detect any faulting of the beds of country rock by these lodes, yet lying as they do almost in the same line of strike as the beds, which in this part of the field are very similar to one another, a considerable amount of faulting might easily escape observation.

Going now to the eastern end of the Tasmania mine, we shall inquire if there is any evidence of faulting here which would give a clue to where to look for the continuation of the reef in this direction, for hitherto it has not been discovered. By actual working the lode has been followed to a short distance east of the boundary between the old Lefroy and Florence Nightingale sections. The deep lead previously described cuts it off in all but the deepest level. As the lead is manifestly of much later formation than the reef, and is simply a river channel cut through it, it is absurd to ascribe to it, as is often done, any inimical influence upon the lode. The simple erosion of a river channel cannot fault or disturb in any way the continuity of the solid country from which it is carved out. Something, however, has happened to this reef, for it is not cut either in the long cross-cuts of the East Tasmania Mine or in those of the Dally's United. If the reef had continued on its course it would pass a little to the north of the East Tasmania shaft, which would strike it at about 350 feet. But no sign of it has been seen in the cross-cuts from the shaft. It is evident that one of three things has taken place, (1) either the reef has been heaved a very long way to the north or to the south, or (2) it has dipped deep in the strike with what is known as an "endlong dip," that is, instead of the outcrop coming to surface it has only come partly up through the ground, and the drives have therefore passed over it, or (3) the reef has died out altogether. The first of these is the most likely supposition. The second was to have been tested by the East Tasmania Diamond Drill bore, but unfortunately this had to be abandoned without proving anything on account of breakage of the rods, and loss of a portion of them in the bore. The third supposition is possible enough, but not to be contemplated until the other two have been proved to be impossible.

My belief that a large fault exists between the Lefroy shaft and the East Tasmania bore is founded on the relative positions of the limestones met with in the bottom of the Ophir Company's bores, and in the Dally's United Mine and East Tasmania bore, also on the marked difference in the strike of the country in the East Tasmania Mine from that in the Tasmania Mine. A glance at the section given herewith shows that in this part of the field there are two principal limestone bands, one met with in the bottom of the East Tasmania shaft, the other, and much larger one, struck at 458 feet in the East Tasmania bore, and also cut in the south drive from Dally's United shaft. From the plan it may be seen that there is no room for another large limestone band to exist between this one and the eastern workings of the Tasmania Mine. Now, what appears to be a very large body of limestone exists under the deep lead in the Ophir ground, for the Ophir diamond drill bore bottomed on limestone, as did Orchard's shaft also. The assumption that this large limestone body is the same met with in Dally's United Mine is therefore a very reasonable one. To confirm this belief, another band of limestone is found at the crossing of Weld and Crowther-streets, at about the same distance from the Ophir limestone as that in the East Tasmania shaft is from that in the Dally's Mine. While this gives great probability to the theory I am about to bring forward, it is only fair to point out that the whole argument depends on the identity of these limestone bands. When we come to try to connect the Ophir limestone with Dally's it is at once apparent that something is out of joint. An

extensive series of observations of the strike of the country rock in the Olive Branch adits, Tasmania Mine and other long adits running into the Cabbage-tree Hill, of which more hereafter, has proved that the average strike of the strata in these is N. 53° W., while a careful examination of the north drive from the East Tasmania shaft shows that there the strata strikes N. 42° W. This difference of itself would suggest the existence of a fault. But neither of these lines of strike will connect the two bodies of limestone, thus again rendering the presence of a fault between them probable. I have accordingly on the plan drawn each limestone as having the strike of the nearest strata to it which have been measured. The exact position of the fault is of course doubtful, and its direction can only roughly be ascertained by noticing that it has not been cut in the East Tasmania, Dally's United, Tasmania, or Cosmopolitan workings. As it must, therefore, have much the same course as the main Tasmania fault, it has been drawn parallel to the latter on the plan. The commonness of the occurrence of parallel faults in disturbed districts makes it likely to begin with that these would be roughly parallel. Looking at the positions of the faulted portions of the main limestone on the plan, and remembering that the workings of the East Tasmania and Dally's United mines have shown that the strata here still have a north-easterly dip, it will be seen that the western must be the downthrow side of the fault to bring the strata into their present position. A downthrow of the western side of the fault would have the effect of heaving the Tasmania reef so that its continuation on the east side would be to the south of its line on the west. The amount of heave of the strata not being extremely great, the heave of the reef could not be very extreme either, but could easily be sufficient to allow of its passing between the north end of Dally's United and the south end of the East Tasmania drives. A somewhat unexpected confirmation of this theory was furnished on plotting the position of the limestone struck in the East Tasmania bore and that got in the Dally's United mine. The dip of the strata (63°) was easily ascertained by measuring the cores brought up by the drill, and consequently the position of the top of the limestone at the level of Dally's United workings was easily found. But on joining the horizontal traces of the bed in the two places they are found not to correspond with the average strike of the country, and lines drawn through them parallel to this are found to be 104 feet apart. It would seem, therefore, that there is a fault of some sort between these two points. Now, in examining the Tasmania reef I have frequently remarked that the beds of country on the hanging wall do not correspond with those on the footwall; that the reef itself, in fact, is formed in a line of fault. This is a common enough occurrence in lodes, movement of the walls having taken place after the opening of the fissures. At No. 6 level of the Golden Gate section of the Tasmania mine a good opportunity is afforded of measuring the amount of heave of the beds of country. For some little distance westward from the shaft dark bluish sandstone is found on both sides of the reef; on the footwall side this is underlaid by white sandstones, but the dark stone continues on the hanging wall for 104 feet further, when the white sandstone comes in under it also; thus the country rock beds are heaved 104 feet westerly by the reef. As above seen, this is just the amount of heave of the hypothetical fault lying between the East Tasmania bore and Dally's workings, which is strong evidence that the reef lies somewhere there. If, now, we further remark the difference of strike of the portions of country on each side of the large north-westerly fault, which for convenience we may call the Lefroy fault, it is seen that the amount is 11°. Let us also notice that the strike of the country west of the Tasmania second cross-course is as nearly as possible identical with that of the strata east of the Lefroy fault, and that the country between these two large faults has fallen downwards—the faults being thus "trough faults." It has been seen that there is evidence of strong thrust from the southward having accompanied the downthrow of this piece of ground, and it is likely that the difference of strike of the portion in the trough between the faults from that east and west of them is due to an oblique thrust having screwed it round more to the north-west. If, now, the country containing the Tasmania reef be screwed back again so as to have its strata with their original strike of N. 42° W., the course of the reef would be N. 59° E. instead of N. 48° E., as at present, and this is the course we should expect it to have east of the Lefroy fault, and in the extension west of the Cabbage-tree Hill as well. This line is laid down on the plan as the position of the hypothetical fault occupying the probable position of the reef above referred to, and it will be seen that it goes easily between the ends of the East Tasmania and Dally's United drives. The ground lying between these ought most certainly to be tested by extending them, best towards one another. The reasoning as to the reef lying between the ends of the two drives may appear to be only ingenious theorising, and I am quite well aware that many objections could be raised to the argument: still the belief that such is the case has been forced upon me in the endeavour to reconcile and explain existing facts. The strongest point in favour of it is that it is difficult to imagine where else the reef can go. A very great heave would be required to take it either south of the Dally's or north of the East Tasmania cross-cuts. The deductions from the position of the country rocks thus agreeing with *primâ facie* probability, I feel as certain as the nature of the case permits that the eastern extension of the Tasmania reef lies where indicated on the plan.

There appear to be at least two other large faults in the Beaconsfield district—one crossing the Cabbage-tree Hill to the south-east of the Cosmopolitan and Peru mines, and another running along the Brandy Creek between the Little Wonder and Brandy Creek mines. The existence of these is indicated by the difference in strike of the strata on each side of them and by the want of agreement in position of various recognizable beds. It is not claimed that either the position or direction of these faults is correctly represented on the plan, the lines being drawn to indicate only approximately where they may be met with. To locate them with accuracy would require a very close survey of the ground in their neighbourhood, and as sections, and even exposures of the solid rock are rather rare there, it might even then prove impossible to do so. The whole district seems to be much faulted, and there are probably many faults yet to be discovered.

Strike and Dip.—In the course of my survey of this field it was found necessary to ascertain as exactly as possible the strike and dip of the strata, and some hundreds of observations of these were taken. Though, as might be expected, there were considerable local variations due to petty disturbances, it was found that on the whole the average strike of the various blocks of country separated by the main slides was fairly constant for each, though that of each block was generally different from its neighbours. The average

direction of the strata as thus found is shown on the general plan, and actual observations in the mines are plotted on Plans Nos. 2 and 3, and some taken in the gorge of Blyth's Creek on Plan No. 1. Owing to the small scale of the latter, the actual observations in the Garfield, Olive Branch, Leviathan, and Cosmopolitan adits are not figured on it. The mean of the measurements in the Olive Branch gives a strike of N. 58° W., in the Leviathan N. 51° W., in the Upper Cosmopolitan adit N. 54° W., and in the Lower Cosmopolitan adit N. 47° W. These altogether give the same average strike as is found in the eastern part of the Tasmania mine, N. 53° W., but they also give reason to believe that the strike of this block of country becomes more westerly towards its northward end. This would accord with a flattening of the dips of the faults towards their northward ends, as observed above in the case of the two Tasmania cross-courses, and with the somewhat rotatory motion previously mentioned as being the course of the difference of strike of the strata east and west of the Lefroy fault. In the Garfield adit the rock is much disturbed and the strike very variable in consequence, but the measurements give an average strike of N. 40° W., which agrees very well with that calculated from those in the West Tasmania, Moonlight, and Little Wonder mines, viz., N. 42° W.

Influence of Country Rock on the value of the Reefs.—One of the objects of this survey was to ascertain as far as possible if there was any difference discernible in the gold value of the reefs as they passed through the various strata. It has often been noticed in the history of mining that certain bands of country appear to enrich the reefs passing through them, while others have the contrary effect. In the present instance the evidence on this head shows no marked influence of the different beds on the value of the reefs, except in one case mentioned below. The Tasmania reef has been auriferous throughout all the strata traversed by it. The richest stone is found in a number of distinct "shoots" or "chutes," which, according to Mr. Davies, the mining manager, are often distinctly separated from the rest of the quartz by small sandy and clayey partings or "selvages". Outside of the "shoots," however, the quartz has been generally payable. The shoots dip easterly, conforming pretty closely with the dip of the country rock. Some remain narrow and constitute roughly parallel bands in the quartz, but two or more widen out very much in the lowest levels of the mine. The strata that have proved "favourable country" for gold in this mine may be said to be all those between the lower beds of grits and conglomerates and the main limestone bed. Owing to the loss of the quartz west of the second cross-course below No. 2 level, it is not known if the black carbonaceous grits there carry any gold. In the Moonlight and Little Wonder mines these black strata have been almost altogether barren of gold, though recent discoveries of the metal in quartz leaders cut in the new eastern Moonlight cross-cut at 422 feet give hope that they are not always so. In the mines on the Moonlight line of reef rich stone has been got in the upper levels of all, and as long as the quartz was found in the light coloured grits and sandstones, but on getting down into the black country the stone has become unpayable in every case, and, with the exception just spoken of, very rarely contains any gold at all. According to experience up to the present, therefore, the lower beds of the grits and conglomerates have proved to be "unfavourable country."

The gold-producing capabilities of the strata lying east of the present Tasmania workings and of the slate underlying the grits, have yet to be ascertained. With the exception of the limestone bands, which are not generally considered to be favourable for gold, the bands of slate, schists, and sandstone seen to the east of the Cabbage-tree Hill are similar to those proved to be auriferous a little lower in the series, and will probably therefore also be favourable. The value of the reef in the limestone remains to be proved by actual workings. Gold has sometimes been found in limestone, and it is quite possible that the reef will not suffer in value in passing through it in the present instance; still, the difference between slate or sandstone and limestone country is so great, both chemically and physically, that some change in the contained reefs may be expected, and no great hopes should be entertained until the metal is actually proved by working to be present in them.

As regards the blue slate found west of the Cabbage-tree Hill there is no proof yet as to whether it is favourable or unfavourable country. No known auriferous veins have yet been found in it, but none of the proved auriferous reefs have yet been traced into it, and on almost every goldfield there are numbers of barren veins even in the most favourable country rock. Slate of similar character is generally regarded as good country for gold, and there is therefore reason to be hopeful as to the future of the reefs when traced into this. Should a western continuation of the Tasmania reef be discovered it will soon pass into this slate, and the auriferous nature or otherwise of this will then be soon proved. The same country will be found at a depth of from 800 to 1000 feet in the Little Wonder, Moonlight, and West Tasmania mines. It seems to me that the most useful work these companies could now do would be to combine to sink the Moonlight shaft, which is the deepest and best constructed of the three, to below the "black country" in the hope of the reefs improving when they pass through it into the slate. It is probable also that by sinking thus the reefs would be got further away from the contorted strata, and there would then be more hope of having them solid and continuous, and of the numerous veins combining into one lode. The upper levels are practically exhausted, and the present lower ones are barren, hence all that remains for these mines is to find new veins or to sink for better country. The latter course commends itself as a genuine mining enterprise of the sort that has saved many a mine from being given up, and led to great success.

Remarks on the Prospects of the Mines.—Passing on to the consideration of the light thrown by this survey on the future prospects of the mines as to permanency and value, it is seen that the Tasmania mine stands in a most favourable position. There is an undisturbed body of stone from the main cross-course to the Lefroy fault, going down in favourable country to at least 1000 feet, and probably much further than it can ever be followed by mining operations. The favourable country is dipping to the eastward, as also are the shoots of gold, and it is to the eastward that the ground held by the owners of the mine stretches furthest in the direction of the dip of the reef, and consequently contains it to the greatest depth. The Phœnix diamond drill bore proved that the reef was as strong as ever at over 700 feet and rich in gold. The lode is evidently a true fissure vein, or it could not have faulted the enclosing strata. There seems no reason to doubt that it will be as large a gold producer as in the past for many years to come. The powerful new pumping appliances now in course of erection will easily cope with the water which has hitherto retarded progress so much, and to be able to overcome a still greater inflow should such occur.

The Phœnix Company should have a valuable property, but have difficulties to overcome in working it, as it lies beneath the Tasmania workings, and hence the mine will be liable to get the water from these. Owing to the shape of the boundary between the two holdings the workings of the Tasmania mine will not be of much benefit to the Phœnix until they are down to about 800 feet, as there is only a small triangular portion of the reef belonging to the latter company above that level. There are thus years of work before the Tasmania Company, if they choose, before their pumping will help the Phœnix mine. The owners of the latter, if they wish to work it, will have to provide drainage plant of their own. This would require to be equally powerful with the large new plant of the Tasmania Company, for there can be little doubt that the lower workings would soon drain the upper ones dry. The strata are very loose and open, and water gets through them freely. This was shown by the diamond drill bores both of the Phœnix and East Tasmania Companies; in neither case could the bore be kept full of water, even when tubed to the bottom with iron tubes: this, too, when the bottom of the bore was 200 and even 400 feet below the level of the water in the Tasmania mine. Another proof of the porous nature of the country is seen in the fact that there is rarely any water in the bottoms of the Moonlight, West Tasmania, and Little Wonder shafts, though these are all a long way below sea level. During the recent flooding of the Tasmania mine, however, water rose in the Moonlight shaft and remained until the former was unwatered, when it drained out of the latter also. If water can communicate so easily through the rocks with points so distant from the Tasmania mine as the East Tasmania bore and the Moonlight shaft, it seems incredible that it would not get from the Tasmania into the Phœnix mine, on the same reef and closely contiguous. It would probably be possible enough to sink the Phœnix shaft to 900 or 1000 feet without a very large pump, but when the mine was opened out, and the "bleeding" or "weeping" surface much increased thereby, the open nature of the rock is such that it would be impossible to prevent the water from the Tasmania mine finding its way down. Some water might be cut off, and led to the Tasmania's shafts to be raised, but only a small proportion, and one getting less and less as the Phœnix workings are extended. The question of drainage would be a serious one between the two companies, even if both had powerful pumping appliances, as it would be perfectly impossible to fairly allocate the burden of pumping expense between them. Only by a mutual friendly arrangement between the two as to sharing the expense could endless disputes and litigation be avoided, as the extensions of the workings of both mines would cause the inflow of water into each to be continually varying, so that no hard-and-fast rule could with justice be laid down as to how much was the proper share of each party. The best way out of the difficulty lies in an amalgamation of the two claims. All the pumping could then be done from the New Tasmania main shaft. The Phœnix ground, lying further west than the Tasmania's future deep workings, is nearer than the latter to the lower deep strata of the country, hence in the western workings the Phœnix will encounter the grits and conglomerates long before the Tasmania will. The ground is so pegged out, indeed, that the latter mine will carry the bulk of the most favourable country with it eastward. While, therefore, the former mine will doubtless have a good deal of gold in it, it must be remembered that as it goes down it gets nearer and nearer to the unfavourable black grits, and to the yet unproved slates, and its future has nothing of the same certainty about it that its neighbour's has, in consequence.

The Amalgamated West Tasmania, Moonlight, and Little Wonder mines, being all on the same line of reef, may be dealt with together. Their prospects and future policy have already been referred to, but a few more remarks may be made upon them. The Little Wonder and Moonlight have been the best producers of gold, the upper levels having been very rich. There are several veins more or less parallel to each other in these mines, and as these often pinch to mere strings, and the ground is greatly broken and disturbed in addition, the following of them has been a matter of great difficulty, and they have been often lost and not always found again. The exact number and relationship of them is therefore doubtful. In the main workings of the Little Wonder two larger branches diverge northward from near the shaft, and in the opposite direction come together and run into the Moonlight ground. The old Olive Branch Company had a small portion of this reef in the south-west corner of their western section, and worked it with considerable success till it dipped away into the Moonlight ground. The general dip of this line of reef is to the south west. The Moonlight Company have been very persevering in their attempts to find gold at a depth, and have done a great deal of prospecting at their 422 feet level, assisted in this by a subsidy from the Government. Their long south-western cross-cut, though unsuccessful in cutting any reefs of value, has proved a considerable stretch of ground, and has afforded an excellent section of the strata that has been of the greatest service to me in preparing this Report. The old Olive Branch sections having fallen into their hands, they are now driving eastward from the main shaft, and have cut some leaders and bodies of quartz that give promise of greater success in the future. The development of these discoveries is suspended until the completion of a contract for driving this eastern cross-cut. One leader contains a little gold. In the workings near the surface the Moonlight reef appeared to dip north east—that is, away from the shaft,—then it became vertical, and finally turned towards the shaft and passed through it, dipping south-westerly.

This has often led to a suspicion that there were two "legs" to this lode, one dipping north-east and another south-west. Owing to the proximity of their boundary line, the Moonlight Company were not able to test this supposition until lately, when the Olive Branch ground was acquired, and these discoveries in the eastern crosscut give some support to it. The Olive Branch Company also drove easterly from their shaft, but did not get any lodes of importance. The belief in an easterly leg of the Moonlight lode seems borne out by last year's (1890) workings of the West Tasmania Company, who, after picking up the reef in the old surface workings of the Moonlight, followed it to the south-east, and extracted 507 tons of quartz, which yielded 549 ounces of gold. This stone was found to dip to the north-east, and at 200 feet passed through the West Tasmania shaft. Workings on it at the 150 feet level were carried on up to the Olive Branch boundary. This is the only gold-bearing stone of any consequence yet got in the West Tasmania Mine, with the exception of a little that was obtained in the 315 feet level where it joined the Moonlight 250 feet. All the other workings have been on thin veins and tracks not worth stoping out. This lode was of a very peculiar character, and extremely difficult to follow. The quartz was found in the most irregular bunches, connected by nothing but clayey "tracks" and occasionally thin veins of quartz, and was enclosed in a jumbled mass of sandstone and grit fragments, mixed with clay and sand. On examina-

tion I came to the conclusion that there was here a rather wide lode fissure filled with broken fragments of the wall-rock, amongst which the quartz had been deposited, thus accounting for the very irregular distribution of the latter. The filling of the lode is mainly composed of loose angular fragments of sandstone, grit, and conglomerate, sometimes crushed or disintegrated into loose sand and gravel. In places open spaces were found into which an arm could be thrust up to the shoulder. Throughout the broken formation no trace of regularity of stratification could be observed, but in one or two crosscuts through it the solid regularly stratified rock was to be seen, proving the nature of the occurrence to be of the "mullock lode" type. Where the main shaft had been sunk through it there was no definite body of quartz, and consequently the fact of there being a lode was not noticed. From the size of this formation I should expect that the fracture of the rocks shown by it is an important one, and, as lodes filled with fragments of wall-rock frequently are found on being followed to narrow and become filled with quartz or other proper lode material, I think that it would be well worth while to trace this one further, in the hope that it would so change. All the quartz so far found in it has been highly payable, and, should the filling change to a defined quartz reef, there would be every hope of it proving payable also.

There is a somewhat similar lode to that just described, and also dipping to the north-east, found in some workings from what is known as the Moonlight No. 3 shaft. A drive on this lode at the 60 feet level showed it to be filled with a broken mass of country rock and occasional pieces of quartz. No gold was got in these, however. This mullock lode also should be traced further, in the hope of its changing to quartz.

As above said, the future of these three mines depends on finding new lodes or branches of those already known, or on sinking deeper. A good prospecting work would be a drive from the Little Wonder shaft south-west into the Moonlight ground far enough to make sure that none of the veins worked upon in the No. 5 level of the latter mine have turned off along the boundary of the two sections. A crosscut north-east from the same shaft would also prove some very likely ground. Sinking, however, seems to me the best policy of all.

Only two other mines now working have found reefs—the Cosmopolitan and the Brandy Creek. The latter was shut down on the only occasion when I had an opportunity of visiting it, and I was only able to go hurriedly through the former once, consequently I have little to say about them. The Cosmopolitan workings are unfortunate in being situated in what appears to be a regular network of small slides, which have cut off the quartz repeatedly. A great deal of driving has been done to get to the reefs, but very little real work on them. Good gold-bearing stone has been at times obtained, and, if the mine were opened up better, it might produce a good deal, but the numerous slides have hampered work very sadly. It will be necessary to get the reef in less broken country before work can be profitable.

Marble.—The blue-black crystalline limestone found in the East Tasmania bore takes a very good polish, and is really a very handsome marble. When polished it is nearly black, the bluish shade in the colour being only perceptible on close inspection, and numerous veins of pure white calcite give variety and beauty to it. The stone works well, being close-grained and hard. There should be no difficulty in getting blocks of uniform texture and any required size from Dally's quarry on Blyth's Creek (where this marble is being burned for lime), or more easily still from the large masses cropping out at the head of the Flowery Gully. If worked by skilled marble-workers I have no doubt that this stone could be sold profitably in considerable quantities for ornamental and monumental purposes. The quantity easily got at is very large, and the facilities for quarrying are good; while the proximity to a shipping place, and ease with which tramways could be constructed from it to the quarries, are very favourable for cheap transport to either the local or the Australian markets.

The pale bluish white marble found at the old limekiln at the second bridge on the road from Beaconsfield to Launceston would also be of commercial value if easily obtained. As the workings of the old quarry on this bed are now full of water I cannot speak as to the size of it, or as to whether large blocks could be got of uniform texture and free from flaws. If, however, the loose stones lying about fairly represent the general quality of the marble it would be well worth quarrying.

Besides the marbles there is another stone in the Beaconsfield district that would be very useful for ornamental work, namely, the Serpentine that occurs abundantly in Anderson's Creek. This is found of great variety and beauty of colouring, and could be made into a great number of highly ornamental articles. Various shades of green and very pretty mottled serpentine are quite common.

Appendices.—As no topographical features are shown on the plans accompanying this Report, I append a number of heights above sea level of various points throughout the district. These were taken by means of an aneroid barometer, and consequently are only rough approximations to the true levels, but will be useful for purposes of comparison.

I also append sections of the Phœnix and East Tasmania diamond drill bores.

Thanks.—During the course of my survey of the district I received much useful information and many courtesies from the mining managers and other gentlemen throughout the district, whose help and kindness is now gratefully acknowledged.

I have, &c

A. MONTGOMERY, *M.A., Geological Surveyor.*

The Secretary of Mines, Hobart.

14/10

Appendix No. 1.

HEIGHTS above Sea Level of Points in the Beaconsfield Goldfield, approximately determined by Aneroid Barometer.

	Above H.W.M. Feet.
Weld-street, opposite Club Hotel	105
Top of Lefroy shaft	125
Florence Nightingale shaft	153
Dally's United shaft	117
Golden Gate shaft	186
Ballarat shaft	168
Ophir shaft	127
New main shaft, Tasmania	159
East Tasmania shaft	86
West Tasmania main shaft	352
Moonlight main shaft	334
Moonlight No. 3 shaft	262
Little Wonder shaft	321
Little Wonder shaft on Garfield Section	321
Mouth of Little Wonder main adit	204
Garfield adit	213
Bonanza adit	172
Leviathan adit	195
Cosmopolitan upper adit	204
Cosmopolitan lower adit	96
Top of Old Britannia shaft	276
Phœnix bore	213
East Tasmania bore	86
Ophir bores	120
Denmark shaft	110
Bonanza air shaft	231
Cabbage-tree Hill on line of Bonanza tunnel	411
Old shaft near Phœnix and Bonanza boundary	330
Leviathan air shaft	321
Kohinoor shaft	375
Cosmopolitan shaft	258
Hematite shaft	195
Air shaft on lower Cosmopolitan adit	163
Old New Providence prospecting shaft	348
Tasmania open cast workings	348
King and Eastman's alluvial workings	249
Old Stanley shaft	101
J. T. Allen's bore	65
New Brandy Creek shaft	155
Pease's shaft	164
Old Brandy Creek shaft	177
Excelsior shaft	190
Dundee shaft	191
Mouth of London adit	155
Brandy Creek old surface drive	159

Appendix No. 2.

SECTION of Strata afforded by the Phœnix Company's Diamond Drill Bore.

Strata.*	Thickness.	Total Depth.
	ft. in.	ft. in.
Alluvial surface matter	4 6	4 6
Hard, brittle, whitish, and yellowish fine-grained sandstone, breaking into small rhombohedral fragments; very much jointed; would not form core; contained a few very thin quartz veins; flinty and somewhat crystalline in texture	368 4	372 10
Fine-grained, dark bluish, somewhat crystalline, sandstone, much jointed, and yielding little solid core; contained occasional specks of pyrites; a band of grey micaceous sandstone at 472 feet, but only very thin	119 8	492 6
Light grey and whitish sandstone, with occasional bands of grey slate; impressions of fossils rather numerous, but imperfect; sandstone more granular and porous than the preceding bands; gave a few inches of solid core at times	213 0	705 6
Tasmania reef—Quartz containing iron and copper pyrites; gold freely visible	24 6	730 0
Dense hard crystalline dark blue or black sandstone, with a good deal of pyrites in it	50 7	780 7
Total	780 7	780 7

* Dip of strata 58° (average of 12 measurements of angle of dip visible on cores).

15/9

SECTION of Strata afforded by the East Tasmania Company's Diamond Drill Bore.

Strata.*	Thickness.	Total Depth.
	ft. in.	ft. in.
Surface soil and clay	12 0	12 0
Brown, grey, yellow, and bluish sandstone, with small quartz veins; some grit as well as sandstone, also thin bands of slate	68 10	80 10
Slate similar to that found in the 100 feet level of the East Tasmania mine, rather soft, greenish, arenaceous, and calcareous; vein of calcite and pyrites 2 inches wide at 116 feet	35 2	116 0
Impure silicious limestone with calcite veins; vein of dense whitish grey hard quartz at 120 feet	64 0	180 0
Dark black, bluish grey, light grey, and dense blue grey fine grained slates, containing a little pyrites and a few small quartz and calcite veins	278 0	458 0
Dense dark blue fine grained crystalline limestone or marble, very solid as a rule, but occasionally fractured. The drill ceased working while still in this rock	520 4	978 4
TOTAL	978 4	978 4

* Average dip of strata 63° (mean of 19 measurements of angle of dip shown by cores).

(167) 16/19

BEACONSFIELD

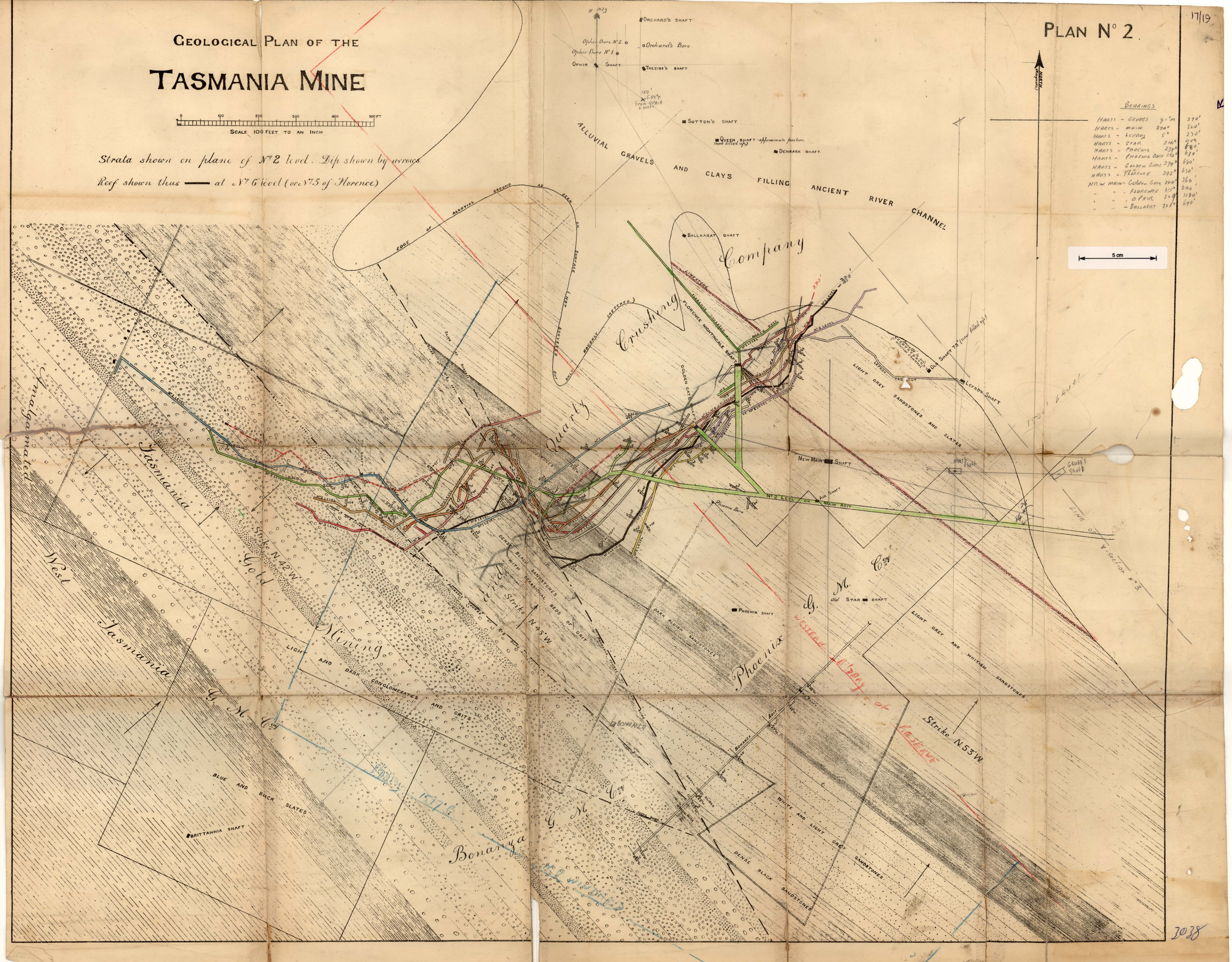
MAP SHOWING PRINCIPAL MINES WORKINGS AND STTRATA IN WHICH THEY ARE SITUATED

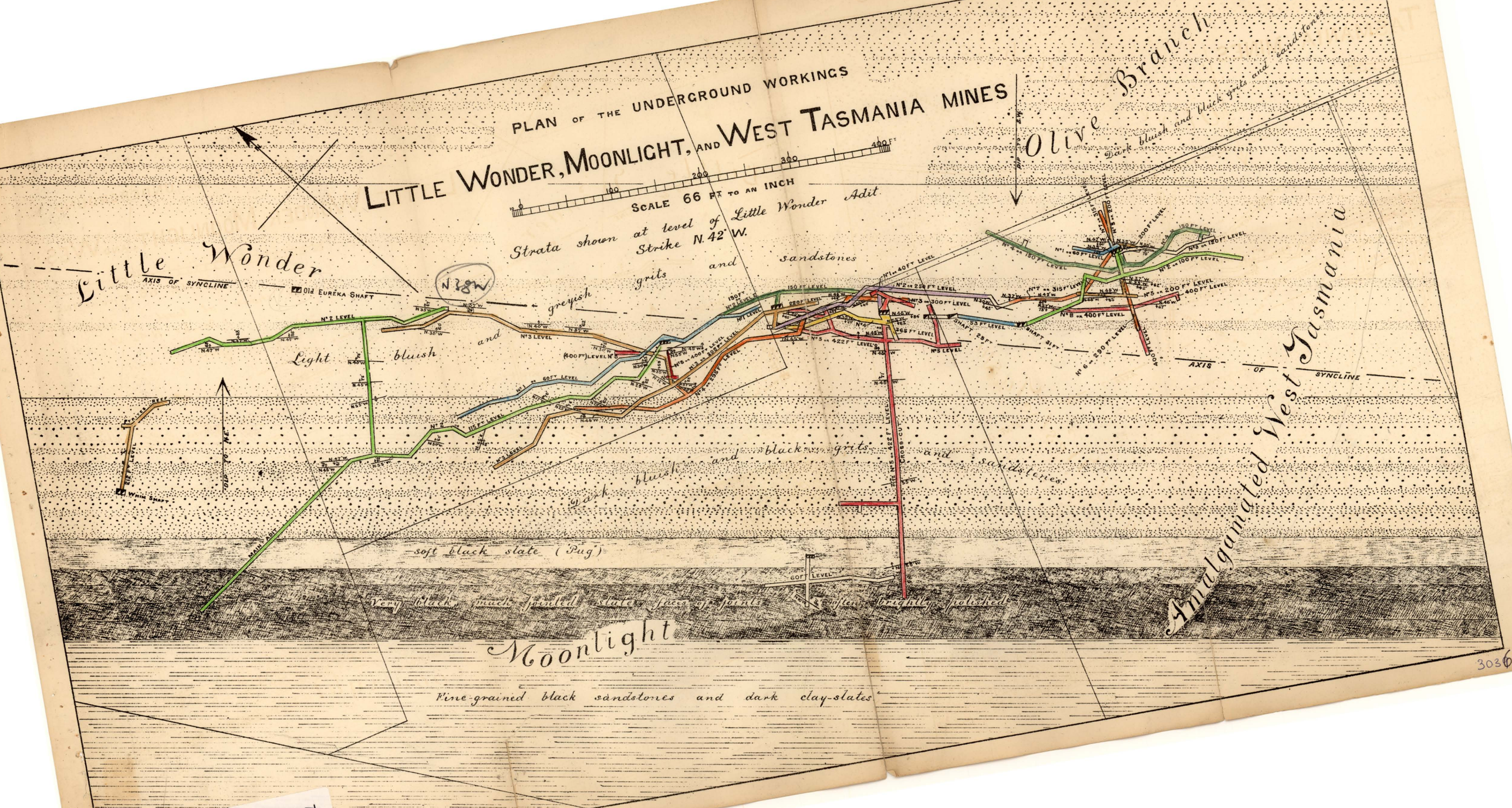
PLAN OF STRATA TAKEN ON PLANE OF TASSMANIA MINE MAIN ADIT

Scale 5 Chains to an Inch

PLAN N° 1

3037


Geological Plan of the
Tasmania Mine
Scale 100 Feet to an Inch
Strata shown on plane of No 2 level. Dip shown by arrows.
Reef shown thus —— at No 6 level (or No 5 of Florence)
Plan No 2
North
Bearings
Harts - Grubbs 91°m 270'
Harts - Main 274° 320'
Harts - Lefroy 5° 230'
Harts - Star 214° 400'
Harts - Phoenix 238° 680'
Harts - Phoenix Bore 262° 630'
Harts - Golden Gate 279° 680'
Harts - Florence 295° 630'
New Main - Golden Gate 284° 360'
" " - Florence 315° 340'
" " - Ophir 329° 1180'
" " - Ballarat 326° 690'
Orchard's Shaft
Orchard's Bore
Ophir Bore No 2
Ophir Bore No 1
Ophir Shaft
Trezise's Shaft
Sutton's Shaft
Denmark Shaft
Alluvial Gravels and Clays filling ancient river channel
Edge of alluvial ground as seen
Ballaarat Shaft
Company
Crushing
Quartz
Florence Nightingale Shaft
Golden Gate
Light grey sandstones and slates
Lefroy Shaft
New Main Shaft
Air Shaft
No 2 Level or Main Adit
Phoenix Bore
Grubb's Shaft
Phoenix Shaft
Old Star Shaft
Phoenix G. M. Coy
Light grey and whitish sandstones
Strike N53W
Dense black sandstones
Dark bluish sandstones
Strike N43W
Light and dark conglomerates and grits
Tasmania Gold Mining Company
Strike N42W
Amalgamated
West Tasmania G. M. Coy
Blue and black slates
Brittannia Shaft
Bonanza G. M. Coy
Bonanza Adit
White and light grey sandstones
Dense black sandstones
5 cm
3038


PLAN OF THE UNDERGROUND WORKINGS
LITTLE WONDER, MOONLIGHT, AND WEST TASMANIA MINES
SCALE 66 FT TO AN INCH
Strata shown at level of Little Wonder Adit
Strike N. 42° W.
Little Wonder
AXIS OF SYNCLINE
Old Eureka Shaft
N 38 W
Light bluish and greyish grits and sandstones
Olive Branch
Dark bluish and black grits and sandstones
Amalgamated West Tasmania
AXIS OF SYNCLINE
Old Reef
Whim Shaft
Main Adit
Old to N.E.
Dark bluish and black grits and sandstones
soft black slate (Pug)
Very black, much jointed slate; faces of joints often brightly polished
Moonlight
Fine-grained black sandstones and dark clay-slates
3036

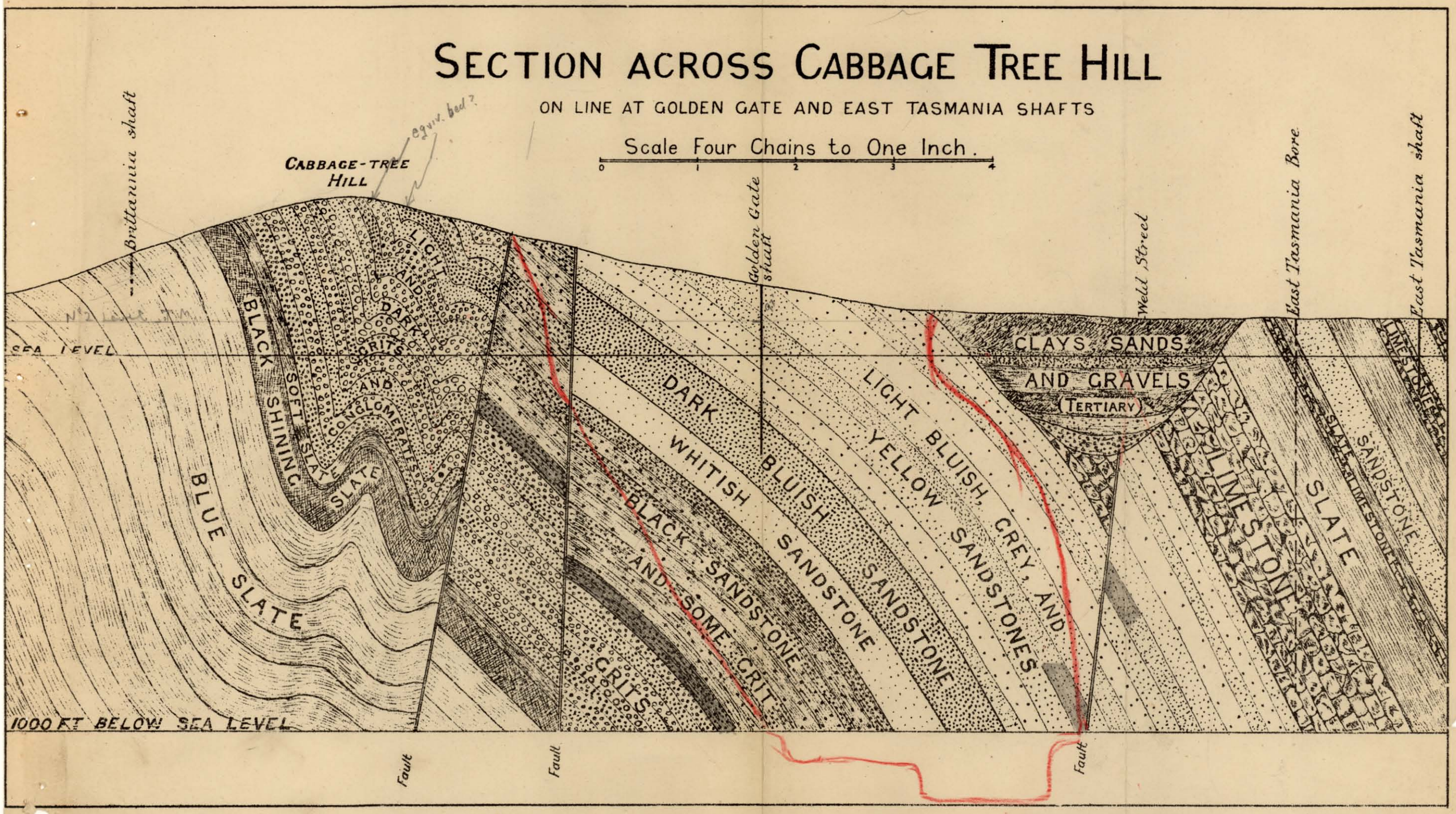
(19 19/19

SECTION ACROSS CABBAGE TREE HILL

ON LINE AT GOLDEN GATE AND EAST TASMANIA SHAFTS

Scale Four Chains to One Inch.

0 1 2 3 4



5 cm

Approx. outline of ore body as worked.