

TASMANIA



REPORT

OF THE

SECRETARY FOR MINES

FOR

YEAR ENDING DECEMBER 31

1906

Including Reports of the Inspectors of Mines, Government  
Geologist, Mount Cameron Water-Race  
Board, &c.



Tasmania:

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1907

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## REPORT OF THE SECRETARY FOR MINES.

Mines Department,  
Hobart, 28th May, 1907.

SIR,

I HAVE the honour to submit my Report upon the Mines Department and the Mining Industry for the Year ending 31st December, 1906.

### GENERAL REMARKS.

The aggregate value of the minerals and metals raised during the year was £2,257,147, being an increase of £528,018 on the value of the output for the preceding year.

This exceeds that of any previous year, and is partly owing to the increased price of metals and partly to the fact that there has been an all-round increase in the output of all minerals and metals, except gold, wolfram, and iron.

The number of leases issued during the year was 730, embracing an area of 19,912 acres, as against 512 leases, of 11,491 acres, during the previous year. The total area held under lease on the 31st December was 53,222 acres.

A sum of £823 was expended by the Public Works Department in opening up tracks and roads to mining districts.

The expenditure of money in opening up tracks to unexplored and almost inaccessible country would prove of great advantage to prospectors, and would doubtless be the means of inducing many parties and syndicates to

send out prospectors into new country. At present the hardships of prospecting are so great that few have the strength and courage to contend with them, and cut their way through dense horizontal scrub and carry their swags and provisions.

When tracks are cut by the Government they should be kept open, as the fallen trees, together with the rapid growth of the scrub (which in many parts during the winter months is capped with snow, and borne to the ground with its weight), not only block the tracks, but completely obliterate them.

A sum of £150 was placed upon the Public Works Schedule last year for clearing tracks, but the amount is insufficient, and should, I respectfully submit, be considerably increased this year.

Keeping these tracks open is of the utmost importance to prospectors, and the annual expenditure of a small sum of money for that purpose is fully justified by the rapid growth of the industry, and every encouragement should be given to prospectors, while the high price of minerals and metals is maintained, to search for and open up new fields.

#### APPENDICES.

Appended will be found the following Reports:—

Annual Report of the Mount Cameron Water-race Board.

Report of the Government Geologist.

The Report of the Chief Inspector of Mines.

Reports of the Inspectors of Mines.

The Government Geologist's Reports on:—

The Mathinna Goldfield: Part I.

Ditto: Part II.

The Cox's Bight Tinfield.

The Renison Bell Tinfield.

#### GOLD-MINING.

The total quantity of gold won during the year was 60,023·397 fine ounces, valued at £254,963.

*Beaconsfield.*—The yield from this district was 30,484 ounces of retorted gold; and the number of men employed was 693. At the Tasmania Gold Mine developmental work, which was proceeding apace, received a severe temporary check, owing to the flooding of the mine in June. On the 25th of that month the rainfall culminated in an unusually heavy downpour, causing an overflow of the deviation channel bank at Blythe Creek. The water overflowed from the channel to the old limestone quarries, and cut the surface soil away to such an extent that the channel banks gave way, and the whole of the water flowed into the quarries, cutting a channel 40 feet wide, and deepening the deviation channel by 4 feet. The whole of the flow disappeared in the bottom of the quarry, causing settlement over about 7 acres of ground. The construction of a dam across the 40-foot gap was at once started, but unfortunately was not successful, for on the 28th June the pressure of the water carried away the sheet piling and sand bags, and swept a large portion of them into the caves. A deviation channel and two dams were then started. All carpenters were set to work on the construction of fluming, the saw-milling plant being kept running day and night to supply the necessary planking. By the 7th July 900 feet of fluming, 14 feet wide and 9 feet deep, was completed, and the whole of the water turned into it. The total amount of water which flowed into the quarries was estimated at 820 million gallons, and the amount of soil at 240,000 tons, a total of 5 million cubic yards. The flow during the heaviest part of the flood was estimated at from 250 to 350 million gallons per day. The approach of water from the quarries was first felt in the mine twenty-three hours after the overflow of the deviation channel bank, by large volumes of  $\text{CO}_2$  gas being forced before it. On the 7th July the water rose to the 846-foot level, where it remained stationary for twenty-four hours. On the 21st July it reached the 800-foot level. The highest point, viz., 796 feet 3 inches below the collar of the main shaft, was reached on the 30th July. The

pumps and bailing-tanks were raising about 5,700,000 gallons a day, and by the 2nd of September the water was reduced to the 816-foot level. The eastern unit at Grubb's shaft then started, and a week later about 8,100,000 gallons a day were being raised. On the 30th September the water was reduced to about the 970-foot level. The flood-gates at the 1100-foot and 1000-foot levels stood the heavy pressure very well, and enabled the pump in Grubb's shaft to be put in. At the main shaft the lower set of poles were under water for eleven and a half weeks (that shaft being too near the lode for flood-gates to be of any use), and this caused much anxiety, as the failure of any of the valves would have placed too great a pressure on the flood gates, and drowned the pump at Hart's shaft. The winding-engine at Hart's shaft and the steel head-gear which were made of exceptional strength, in case they should ever be required to deal with a burst of water, saved the situation.

Mining Operations.—1100-foot level. The necessary flood-gate having been built, the main crosscut was continued for 117 feet, cutting the lode at a point where it proved to be 9 feet wide, value 27 dwts. of gold per ton. No. 151 rise was started in hanging-wall stone as an escape pass, and holed to 1000-foot level in 107 feet, width taken  $2\frac{1}{2}$  feet, value  $14\frac{3}{4}$  dwts. of gold per ton. Everything was ready for rapid development at this level when the flood occurred at Blythe's Creek on the 25th June, but nothing further could be done until about the middle of October, when the mine water was reduced to a normal condition. Mining operations were not fully resumed until the 3rd November. The 3rd unit of the company's magnificent pumping-plant was started on the 6th December, so that with the enormous pumping capacity now available it is improbable that any future burst of water would cause serious damage.

Shafts.—Grubb's shaft was sunk during the year 400 feet, to a depth of 1028 feet, which was reached on the 30th April. Sinking was again resumed early in Decem-

ber. It is now to be sunk to 1250 feet, and a crosscut extended from the bottom level to cut the lode. The two pit-work chambers at the 500-foot level have been finished, as well as those at the 1000-foot level. The balance-weight chambers at the 350-foot, 400-foot, and 800-foot levels (two each) have been completed, and the two remaining ones at 900 feet are nearing completion. The size of this shaft is 8 feet by 32 feet 1 inch in the clear; speed of sinking last 400 feet being  $13\frac{1}{2}$  feet per week. The large chambers at 500-foot and 1000-foot levels are, over all, 112 feet by 14 feet wide and 25 feet high. The total cement foundations placed in the various chambers was 3782 cubic yards. The timber from the surface to the 500-foot level is 15 inches square, and below that level 12 inches square, placed throughout in frame sets, 4-foot centres. In the two chambers at 350-foot level the ground proved too heavy for the timber, and had to be secured by concrete. The heavy pressure of the swelling ground above this level buckled a number of the frame sets, and broke some. The swelling has now ceased.

Hart's Shaft.—This shaft has been sunk a further depth of 31 feet; total, 1139 feet. At the 400-foot level two balance-bob chambers, each  $37\frac{1}{2}$  feet by  $12\frac{1}{2}$  feet by  $28\frac{1}{2}$  feet, have been completed; two chambers at 900-foot level have also been completed. The shaft has been enlarged from 1050-foot level to 1100-foot level, to make room for two 20-inch plungers. The water at 1100-foot level is at present held by one 14-inch bucket. The crosscut from 1100-foot level to Grubb's shaft has been completed, and is used when required as a water-way between the two shafts, also as a means of filling the stopes with material from Grubb's shaft.

The foundations for the 2nd and 3rd units of the pumping-plant have been completed and both engines erected, together with air-separators, condensers, and auxiliary engines.

The purchase of Wyett's tramway, 3 miles and 30 chains in length, with plant, was completed in December, 1905.

This tramway connects the mine with Beauty Point wharf. During nine months 18,802 tons have been carried, of which 554 tons were on account of the public. Mine development has been carried on vigorously at the different levels, footwall drives extended, flood-gate at 1100-foot level put in, air connections made, and the ventilation of the mine much improved.

*The Bonanza Gold Mining Company* had sunk its shaft to 600 feet in the early part of the year, since which time work below has been suspended, pending the erection of a steam-winding plant. When this is completed sinking operations will be resumed down to 1000 feet, at which level it is expected the continuation of the Tasmania reef will be cut.

*North Tasmania Mine* has been worked by a tribute party, with only moderate success.

*Moonlight-cum-Wonder Mine.*—Some trenching and costeening has been done, but nothing payable has been discovered.

*Tasmanian Alluvial.*—T. B. Williams and party. Tributers from Tasmania Company sunk a shaft 55 feet on Block 166, but have not so far met with any success, water being too heavy.

*Tasmanian Tailings Syndicate* has been running the cyanide plant consistently, and is getting fairly good returns.

*East Tasmania Company* is boring on its property for the Tasmania lode. The Australian Goldfields Diamond Drilling Company has the work in hand.

*Lefroy.*—No development of value has taken place during the past year. The New Pinafore Company has done a good deal of prospecting at Specimen Hill and other places, but without discovering anything payable.

*The Nugget Prospecting Association*, after considerable work, sinking and driving, failed to cut payable stone.

*Tregurtha P.A.* fixed up a small steam-winding plant to unwater an old shaft at what was once known as the New

Monarch Gold Mine, but its efforts were unavailing. A recent discovery made by Mr. George Barker near Back Creek has caused a move to be made in that direction.

*Mount Victoria.*—The Long Struggle Company, after getting a few small crushings, was eventually driven out by water. The company has recently sunk an underlay shaft 30 feet on another portion of the lode, and got a crushing out. The New Ringarooma Syndicate has not succeeded so far in getting capital into its mine, although the prospects are very encouraging. At the New River Freehold shaft sinking had to be suspended owing, it is said, to want of funds to erect a pumping-plant; the mine is now idle.

Mr. Williams' cyanide plant had a successful run for a time, until the tailings on his claim were used up. There are other heaps of tailings on the field which would probably pay to cyanide.

*Mathinna.—Tasmania Consols:* New steam-winding plant complete and air-compressor have been installed during the year. Poppet-head gear has been erected, and the equipment of the mine generally improved. The shaft has been sunk from the 1200 to the 1600 feet level, and crosscuts have been driven from the 1500-foot and 1600-foot levels respectively. Towards the end of the year Mr. R. A. Canning was appointed general manager.

*New Golden Gate.*—Work during the greater part of the year was confined to getting stone from small veins at two or three places in the old levels; also prospecting in the southern end, by extending a long crosscut east from No. 5 level, sinking a winze north of the crosscut at No. 17 (1600-foot) level, and driving south on the lode at the same place. No discovery of value was made at any of these places. The winze at the bottom level (No. 17) was sunk on a good body of stone carrying gold, payable for the first few feet but not so good as depth was attained. The question of sinking the main shaft to a greater depth, probably to 2000 feet, remained in abeyance for a long

time. Finances and other matters had to be adjusted before this work could be undertaken. It is, however, gratifying to know that all obstacles have been removed, and that the further sinking of the shaft below No. 17 was commenced early in December.

*Volunteer Group.*—Work at these mines has ceased altogether, save for the cyaniding of tailings at the Volunteer Mine, which has been carried on since the mine shut down a year ago. Work at the other two mines, Volunteer Consolidated and Volunteer Consolidated Extended, was discontinued in the latter half of the year.

*Scott-Pickett Gold Mine Company.*—The adit level was extended 84 feet south on the lode, and some stoping done. Main shaft was started, but proceedings had to be suspended owing to the influx of water. A small steam pump was put in, and sinking resumed at the close of the year.

*Burns Creek Gold Mine, Blessington.*—Work was discontinued for a time towards the close of the year, more capital being required. The prospects of the mine appear to warrant further expenditure.

*Waterhouse Field.*—Another trial is being given to the Prince Imperial Mine. Mr. John Wren, of Melbourne, has taken up a lease, and a mine manager has been appointed, and the work of unwatering the old shaft is now proceeding.

At Woody Hills the Murray Bros., and at Lynchford the May Gold Mining Company, have each crushed small quantities of quartz, for returns which have no way advanced the position of quartz mining on the West Coast.

*Alluvial.*—A limited number of men eke out an existence at Flannigan's Flat, Harris Reward, the Queen River and its tributaries, and at and around Darwin.

#### SILVER-MINING.

The past year has witnessed the firmer establishment of the Zeehan field as a mineral-producing centre. Very marked increases have taken place in the production of ores. The mines generally are in excellent condition, and

the stage of development at which they have arrived will enable them to raise larger quantities of ore, and at less cost than heretofore. The principal producing mines are the Mount Zeehan (Tas.), Zeehan-Montana, Zeehan-Western, Florence, Oonah, Silver Queen Extended, South Comstock, &c.; and at Mount Dundas, the Comet, West Comet, Ring Valley, Ring River, North Jupiter, Hercules, &c.; others are active, and give fair promise for the future.

The lowest level in the Zeehan-Montana Mine is now 800 feet deep. A more powerful winding-plant has been obtained from England for the deeper work.

The Zeehan-Western Mine shaft is sunk to 800 feet, and the lode at this depth, though not payable, has opened out to the width which it had in the profitable zone above the 300-foot level.

The main shaft at the Austral Valley Mine is being sunk, and it is intended to sink it to 300 feet, and then open out.

The Oonah Mine has been placed under option. The optionees have unwatered it, and are developing the stannite lodes with some degree of success.

The Mount Zeehan (Tas.) Mine has put out its usual product of high-grade galena.

Several galena lodes have been disclosed on the Queensberry property, with high percentages of lead and somewhat low silver contents. The property is being developed, and is said to have encouraging prospects.

*Rosebery District.*—Developmental work has proceeded on several properties, and upwards of 18,000 tons of zinc-lead ore have been consigned by the Tasmanian Copper and Primrose Companies. The Primrose Company has largely increased its holding, and has also acquired the old Mt. Black leases. The Colebrook Company is intending to erect copper-smelting furnace for its own ore, and anticipates a certain amount of custom work from other copper-producing mines in the vicinity.

*Mount Read.*—The Hercules Mine has been idle for the greater part of the year, but resumed work towards the end of the year, and the work soon disclosed larger reserves of ore than has been expected.

Work has been started at the North Jupiter Mine on a zinc-lead sulphide ore-body, carrying ore worth £5 or £6 per ton gross.

*Farrell District.*—The discovery of rich ore at the Mt. Farrell Mine has given a renewed impetus to prospecting on this field, which is in a valuable zone of silver-lead mineral.

The North Farrell Mining Company is steadily developing its mine, producing galena worth about £11 and £12 per ton at the mill. Preparations are being made for the construction of a steel tramway for the transport of the company's ore to the Emu Bay Railway line. A permanent water supply has been obtained from a lake on the summit of Mt. Farrell. This means a constant water supply for ore-dressing during the summer months.

The Murchison River Silver and Lead Company has opened up several thousand tons of ore ready for breaking. Several new companies are being formed to work properties in the Farrell district (White Hawk, South Murchison, Mountain Chief, &c.), and good results are expected from the prospecting which is now going on. There is little doubt that this is going to be an important field.

The Tasmanian Smelting Company has, during the year, purchased 47,754½ tons of ore from the surrounding mines, and exported 9380 tons of lead bullion, containing 1,449,386 ounces of silver and 3119 ounces of gold.

*Magnet Silver Mine.*—During the year 7787½ tons of silver-lead ore were won and consigned, of a gross value of £51,147. The No. 6 level has realised expectations fully, and opened up some of the best ore ever seen in the mine. The main underlay shaft has been deepened to No. 7, where the crosscut intersected the two lodes, 15 feet

and 6 feet respectively, carrying large quantities of highly profitable ore. The ore-shoot in this mine has now been proved to exceed 1300 feet in length, and is improving in solidity as it goes down. The presumed two lodes cut in the lowest level have merged into one, the whole having a total width of 36 feet. This drive so far has shown the existence between it and the level above of 10,000 tons of ore. Assays of the galena range from 132 ozs. to 161 ozs. per ton. A high-level water scheme for driving all the mining and mill machinery is approaching completion. Dividends amounting to £8000 have been declared during the year.

*Heazlewood.*—Work at the Long Tunnel Silver-lead Mine is being resumed, and other properties, both copper and lead, are being again taken up in this district. A new copper lode has been found below the Bald Hill.

This promising field is apparently about to be taken in hand at more than one point.

#### COPPER-MINING.

The total quantity of copper and copper ore produced was 10,924½ tons, valued at £934,924.

The output of the Mount Lyell Mining and Railway Company, Limited, has been steadily maintained, the mine having produced 8708 tons of blister copper, containing 8613 tons of copper, valued at £772,183 3s. 10d.; 701,018 ounces of silver, valued at £90,260 13s. 0d.; and 21,866 ounces of gold, valued at £92,930 10s. 0d.—a total of £955,374 6s. 10d., being an increase of £147,060 on the previous year. The amount paid in dividends was £420,000.

*Iron Blow.*—In addition to the usual pyritic extraction, prospecting was continued south from "No. 8," on the contact, and the South Mount Lyell ore-body was connected with the main workings. Beyond this, however, nothing of importance was done, and having abundant quantities of similar grade, and more conveniently pro-

curable, ore in the open-cuts to draw upon, underground operations were suspended.

*North Lyell and Lyell-Tharsis.*—The usual quantities of high-grade and fluxing ores were obtained from these two open-cuts. Exploratory and developmental work was continued underground, with satisfactory results. The sinking of both shafts was continued, and high-grade ore, similar to that followed and mined from the surface, was intersected, which should provide further profitable stoping for the ensuing twelve months.

*Royal and South Tharsis.*—These mines have been connected by a 2-foot gauge tram with the main haulage system, in addition to being suitably mounted with the necessary hoisting gear on a railed incline or underlie shaft for providing and economically handling the silicious fluxing ores which abound on these properties.

*North Crown Lyell.*—Prospecting for over 1000 feet was continued on the "contact," without disclosing any development of importance.

Other outside sections have received attention.

At the Reduction Works five alternating furnaces comply with the mine's requirements, and dispose of a greater daily tonnage than that accomplished at any previous period of these operations. For power purposes, two 600 B.H.P. steam turbine generators have been installed, to which has been added a turbo-blower capable of supplying 18,000 cubic feet of air per minute under a 54-oz. (mercury) pressure.

*Lyell Blocks Company.*—The principal work in connection with the mine has been the driving of the Consols or main (No. 3) tunnel to a total of 2255 feet, and connecting with the main shaft at the 450-foot level, where preparations are being made to attack the cupriferous clays which have been located in this vicinity. Over this level continuous stoping was carried on, and 70,790 tons of cupriferous clay were treated, and yielded 824½ tons of copper, valued at £65,422, out of which two dividends, amounting to £15,000, were paid to the shareholders.

*Tasman-Comstock Consolidated.*—During the year 20 tons of this mine's silicious ore were forwarded to London for special treatment, but the result has not yet been made known.

Prospectors Hyde and Siddler have reapplied for the old sections which formerly belonged to the Great Lyell South and Duke Lyell Companies, and bulk samples forwarded from both to the Mount Lyell Smelters gave satisfactory returns.

At Jukes and Darwin work has been intermittent. Mr. H. S. Muir has given attention to the Lake Jukes and Jukes Proprietary Mines, from which trial bulk samples have been forwarded to the Mount Lyell Smelters. An option has been taken over the section applied for in the name of George Hyde, known as the Hal Jukes Mine, which has been an inducement to others to take up abandoned sections in the vicinity, so that there is a probability of attention being renewed in this portion of the district.

At North Dundas the Ring River Company raised 1305 tons of copper ore, valued at £5838, and employed an average of 8 men.

*Burnie Copper Mines.—Blythe River.*—This was formerly the Copper King, which was worked on a small scale for one and a half years by Messrs. Clark and Sice, its discoverers. A main shaft is now being sunk to 160 feet. It is intended to open out at 150 feet, and crosscut to the lode 70 or 80 feet. The shaft is 14 feet x 4½ feet within timbers. Mr. Leigh J. Hancock reports:—A deep culvert has been made for the water 6 chains long in the basin of the mine. A road is constructed from the mine up to the main Blythe road for about 60 chains at a cost of about £400. The company has provided huts for the workmen, and settled them on its own freehold. Two substantial houses for manager and offices, &c., have been built. A small township, with post office, &c., is springing up. It is called at present Blythe Road, but the name Cuprona has been suggested. The shaft is being equipped

with winding-engine and a Root's blower for ventilating. During the year the mine produced  $105\frac{1}{4}$  tons of copper, valued at £1220.

#### TIN.

During the year the London market price of tin steadily rose until, on the 14th May, it reached £215 per ton, which appears to be the highest price ever reached for this metal. The lowest price during the year was £161, and the average, calculated from the weekly cables from London, was £181 2s.

In some quarters it is stated that the high price of the metal is the outcome of market manipulation, but the more generally received opinion is that the immediate cause of the appreciation in the price is the increase in the consumption, coupled with the fact that there has been no corresponding expansion in production. There seems to be no doubt that the *bonâ fide* demand for manufacturing purposes has overtaken the production, and the world's consumption is steadily and rapidly growing. Hitherto the highest price for tin was in 1888, when it reached £170; but this was the effect of a corner, and was quite temporary.

The quantity of tin ore raised during the year was  $4472\frac{3}{4}$  tons, valued at £557,266.

*North-Eastern Mining Division.*—The largest producer was the Briseis Tin Mines, Limited, the output from that mine being 1117 tons.

The Pioneer and Arba companies have worked persistently during the year, and with payable results. The Abbotsford Tin Mine is getting fairly good returns from old broken ground on Main Creek. A centrifugal gravel pump is being used.

The Moorina Tin Mining Company is using an elevator to lift the bottom or gutter wash, which is dipping to the north-west, or away from the Ringarooma River, into its tail-race. This mine, as well as many others in the dis-

tract, suffered a good deal of damage and loss (mainly to head-races, syphon columns, &c.) from floods during the exceptionally wet winter.

At the Mutual Hill Tin Mines preparations are being made for hydraulic sluicing on an extensive scale, and the Bell's Hill Mine is being reopened by a new company. The Tin Pot Creek Mine has worked with varying success; an additional 5 heads have been added to the battery, which is now a 15-head mill, and a Wilfley table has been added to the concentrating plant. There is a good deal of copper in the ore, and separating this from the tin increases the working expenses. The mine is worked by an open cut.

The Mussel Roe Tin Mining Company has constructed a head-race 21 miles in length, to bring water on to the mine. The intake is on the Mussel Roe River, just below the intake weir of the Mount Cameron Water-race, and several creeks are picked up, and brought into the main race.

The New Aberfoyle Tin Mining Company has in hand the construction of a long line of race, to bring water from the Boobyalla River, in the vicinity of White Rock, on to its mine, which is situated on the Ringarooma River about 4 miles from Boobyalla Port.

The North-Eastern Hydraulic Sluicing Company has installed a gravel pump and a 16 horse-power portable engine for elevating the wash. The original elevator had to depend on a continuous supply of water from the head-race to be effective, and, unfortunately, the supply from this source is only intermittent. There is a good supply of face-water from a large dam available, but there is not sufficient head-pressure for elevating.

*Eastern Mining Division.*—At Ben Lomond about 20 men are at work, in small parties, getting out tin and wolfram from some of the old Storey Creek Company's sections.

The Gipps Creek Mine is obtaining fairly good returns. At Briggs' Mine a limited output of about half a ton per

week is maintained. The Mount Rex Mine has, for the most part, been working on alluvial. Further prospecting at the No. 1 level in the mine has been done, and a drive has been extended about 100 feet south.

The Brookstead property is now being prospected by a South Australian syndicate, which holds an option over it. About 30 men are employed, and good results are, I understand, being obtained from both lode and alluvial.

*North-East Dundas.*—This district has come to the front lately, several deposits of tin-bearing alluvial and detritus being worked with marked success. There is reason to believe that the year's output has amounted to upwards of 80 tons of tin-ore, bringing up the total production since work was first started on the field to an estimated aggregate of about 240 tons.

At the Renison Bell Mine optionees have sluiced a surface deposit for over £3000 worth of ore. Several sluicing parties on various sections throughout the field have worked with highly satisfactory results. It now remains to open out work on the lode formations which exist in this metal-bearing belt. The Commonwealth tributes have turned out exceedingly well, the detritus being heavy and rich. Other sections with rich tin formations, both surface and lode, are Brumby's, Craze's, the Penzance, Sligo's, Kemp's, &c. A good track for the benefit of these mines has been constructed by the Public Works Department.

*Mt. Heemskirk.*—A moderate quantity of tin ore has been produced from this field, and recently some good discoveries have been made. It is becoming more and more apparent that this large tin-bearing mountain mass received very superficial prospecting in the early days.

*Mt. Bischoff.*—Dividends have been declared by the Mount Bischoff Tin Mining Company, Registered, during the year for £63,000, bringing the total up to £2,088,000.

The total quantity of tin ore produced by that mine to the end of December was 65,833 tons.

Somewhat disappointing results have attended the development of the mine, and towards the end of the year it was found necessary to reduce the output by 40 per cent. Measures are being taken to secure the utmost economy in working, and an exploration policy is being pursued with vigour.

The prospects of the Bischoff Extended (late West Bischoff) are far brighter than they have been for many years. Payable ore is being treated, and good development work is in progress.

*Mount Balfour.*—Tin mining has been prosecuted with vigour during the past year.

*Whyte River.*—A promising discovery of lode-tin has been made at the Whyte River, and the enterprise has been floated into a company, the Mount Cleveland. A small prospecting plant has been obtained to satisfactorily test the various lodes as they are intersected.

*Cox's Bight.*—This field is on the south coast of the island, near S.W. Cape, and alluvial mining is being carried on upon the flat terrace-land between the mountain ranges and the sea-shore. It has recently been examined by the Government Geologist, and his report thereon is appended hereto.

The tin ore has been shed from quartz veins in a spur of granite which descends to sea-level from the south end of the Bathurst Range. The Cox's Bight Tin Mines Company is hydraulicking the upper terrace drift, and has despatched for sale the last half-year  $4\frac{1}{4}$  tons of ore, of an assay value varying from 73 to 75.2 per cent. metallic tin. Messrs. Weber, Gourlay, and Hawson are interested in several lagoon sections along the coast of the western bay, and it is contemplated to test these by bores. Messrs.

Pender and Atkins hold a section comprising the high granite spur between the two bays. Altogether, considerable interest is being taken in this district, which, since mining work was first started on it, is responsible for an output of about 120 tons of tin ore.

#### IRON.

The Tasmanian Iron Company was the only company engaged in mining operations during the year, and raised 2600 tons of hematite iron ore, employing 17 men.

#### WOLFRAM.

This mineral has been mined in the following localities:—

Ben Lomond, 15 tons 18 cwts. obtained; 9 men employed.

Story's Creek, 2 tons 15 cwts. obtained; 6 men employed.

Middlesex, 1 ton obtained; 3 men employed.

#### COAL.

The total quantity of coal raised during the year amounted to 52,895 $\frac{3}{4}$  tons, valued at £44,962.

The raisings at the respective collieries were as follows:—

Mine.	Tons.	Average No. of men employed.
Mt. Nicholas... ..	25,061	70
Cornwall ... ..	21,741	61
Dulverton... ..	294	4
Spreyton ... ..	1584	7
York Plains ... ..	393 $\frac{3}{4}$	2
Mt. Cygnet ... ..	1036	2
Catamaran ... ..	1303	4
Sandfly ... ..	1483	59

## ANTIMONY.

At Hall's Creek, near Rinadeena, Messrs. Kemp and Thomas are prospecting a show, from the surface outcrop of which exceptional samples of marketable ore have been obtained.

## DIAMONDS.

A small diamond,  $\frac{1}{8}$  of a carat, has been found recently at the Donaldson Range, in washing creek sand for gold. This is not the first discovery of this gem in Tasmania, as one was observed in some gem sand sent to England for examination many years ago by the Van Diemen's Land Co. The parcel of sand was from near the Hellyer River district. Again, in 1894, several diamonds were found in the Mt. Donaldson district, under circumstances similar to those in which the recent find was made, but their authenticity was doubted at the time. The largest seems to have been about  $\frac{1}{3}$ rd of a carat. The locality of parent rock of the gems is unknown, and so little is known as yet respecting the actual discovery that it is impossible to say what it may result in, but it may be accepted as next to certain that there are more to be found, some of which are likely to be larger than the small specimens known hitherto.

The following return shows the quantity and value of mineral products for the State of Tasmania during the year ending 31st December, 1906:—

Mineral.	Quantity.	Value.
		£
Gold .....	60,023·397 ozs. (fine)	254,963
Silver Lead Ore.....	87,117 $\frac{3}{4}$ tons	462,443
Bliſter Copper.....	8708 "	862,444*
Copper Ore and Copper..	2234 $\frac{1}{2}$ "	72,480
Tin Ore.....	4472 $\frac{3}{4}$ "	557,266
Iron Ore.....	2600 "	1100
Coal.....	52,895 $\frac{3}{4}$ "	44,962
Wolfram.....	19 $\frac{3}{4}$ "	1465
Bismuth.....	6 cwts.	24
		<hr/>
		£2,257,147

\* Value of Gold contents deducted.

The amount paid in dividends was £636,409.

## GEOLOGICAL BRANCH.

During the year the Government Geologist has prepared reports upon the coal at Mt. Rex, and on the North-West Coast mineral deposits. He has also prepared quarterly reports on the mining industry of the State, and was also engaged examining the Mathinna Goldfield. The quarterly progress reports of the mineral industry have been issued, as usual. For these, as well as for the special district reports, there is a considerable demand from abroad, and from visitors arriving in the State. Our publications lying upon the tables of public libraries and institutes throughout the world may be regarded as of distinct service in directing the attention of investors to the mineral resources of Tasmania.

## INSPECTION OF MINES.

The three Inspectors have satisfactorily discharged their duties in the districts severally allotted to them. Their reports are appended.

## MINING MANAGERS' EXAMINATION.

The annual examination of candidates for mining managers' certificates was held in March. Three candidates only presented themselves for examination, two of whom succeeded in obtaining sufficient marks to entitle them to receive second-class certificates.

Copies of the papers set at the examination are appended.

INTERSTATE CONFERENCE OF BOARDS OF EXAMINERS OF  
MINING MANAGERS.

It has always been the practice of the Board in this State to issue certificates to persons taking up their residence in Tasmania upon production of equivalent certificates granted by the Boards of the other States.

Some of the other States reciprocated in the same way, and in order that a system might be adopted, a conference of delegates representing all the States except Western Australia met in Melbourne on the 23rd March, 1906, and

passed the following resolutions for submission to the Boards of each State:—

1. That the conference deal only with metalliferous mines, some delegates not having power to go further.

2. That it is advisable that the holders of mining managers' certificates issued in any one State be (on payment of a moderate fee) registered as the holder of a certificate of equal grade in the other States in which they take up their residence.

3. That on any State advising the Boards of Examiners in the other States that arrangements have been made to adopt the resolutions which this conference will submit, the holders of certificates then issued, and the holders of certificates which may be subsequently issued in that State, will be registered as the holders of certificates of equal grade in the States so advised. In the event of any State being unable to adopt any resolution of the conference, the other States should be advised.

4. That this conference affirms that it is desirable that all managers of metalliferous mines in which more than twenty men are employed underground should be compelled to hold a certificate, either of service or competency.

5. That this conference is of opinion that the service certificates of one State should be registered in the other States, provided that the qualifications required for the granting of the certificates are similar.

6. That in the case of certificates of competency, only first-class shall be recognised for the purposes of reciprocity.

7. That the certificates of competency as mining manager issued by the State of New South Wales under the Mines Inspection Act, 1901, shall be regarded as first-class for the purposes of the previous motion.

8. That no certificate of competency be issued to any candidate under the age of 21 years.

9. That all candidates for certificates of competency shall have at least three years' practical experience.

10. That the conference recommend the Boards of Examiners for the various States to grant a certificate of competency to any person who shall produce a certificate of having passed the requisite examinations from and under the seal of any School of Mines or educational institution whose curriculum, training, and subjects for and mode of examination are approved of by any of the Boards of Examiners.

11. That the syllabus of subjects be agreed to.

12. That a separate examination be set in each heading of the syllabus which has been agreed to, and that the

total length of the examination be not less than six sittings of three hours each. Also, that the time allowed for the examination on the subjects of mining, blasting, and ventilation be not less than six hours.

13. That for the purposes of reciprocity, the experience, within or without the State, necessary in applying for a certificate of service shall be three years as manager of mines employing on an average twenty men underground, provided that the whole or portion of the experience be obtained within a period of five years prior to the passing of the Act.

14. That the Mines Department of each State should publish in its annual report the names of candidates who have received certificates, or who have been registered in each year, and that each State should receive advice from the other States of certificates issued.

15. That a copy of the resolutions and minutes be forwarded to the Minister for Mines for Victoria, with a request that copies be sent to all the States of the Commonwealth, with the recommendation of the conference that the resolutions be adopted. Also, that copies be sent to each member of the conference.

These resolutions were subsequently submitted to the Board of Examiners, and after due consideration were agreed to, as follows:—

Resolution No. 1.—Agreed to.

Resolution No. 2.—Agreed to, with the substitution of the words "equal value" in lieu of "equal grade."

Resolution No. 3.—Ditto, ditto.

Resolution No. 4.—Not agreed to, as it was considered outside the province of the Board's powers and duties.

Resolution No. 5.—Agreed to.

Resolution No. 6.—Agreed that only certificates of equal value should be recognised for the purpose of reciprocity.

Resolution No. 7.—Not agreed to, as one year's practical experience is not considered sufficient.

Resolution No. 8.—Agreed to.

Resolution No. 9.—Ditto.

Resolution No. 10.—Agreed to, provided candidates have had three years' practical experience.

Resolution No. 11.—Agreed to, subject to further elaboration.

Resolution No. 12.—Agreed to.

Resolution No. 13.—Ditto.

Resolution No. 14.—Ditto.

Resolution No. 15.—Ditto.

Appended will be found a list of persons to whom certificates of competency have been granted since the inception of the Board.

The list is published in accordance with Resolution 14.

#### DIAMOND-DRILLS.

The diamond-drills were not in operation during the period under review.

#### MOUNT CAMERON WATER-RACE.

The report of the Board is appended.

#### DEPARTMENTAL STAFF.

The only changes which took place in the staff during the year were the appointment of Mr. J. Lonergan as Registrar of Mines at Waratah, *vice* Mr. J. Donohue, and the temporary employment of Miss Rotha Higgs as Clerk and Typiste to the Government Geologist, during the absence of Mr. F. S. Grove, whose services are on loan to the Mt. Cameron Water-race Board.

#### REVENUE.

The net revenue for the year amounted to £24,136 12s. 5d., being an increase of £3927 15s. 5d. on the previous year. This amount does not include the sum of £6023 9s. 5d. deposited as survey fees with applications for leases.

#### CONCLUSION.

In conclusion, I desire to thank the officers of the Departmental staff for the loyal and efficient manner in which they have performed the duties allotted to them.

I have the honour to be,

Sir,

Your most obedient Servant,

W. H. WALLACE, Secretary for Mines.

The Hon. DONALD CAMPBELL URQUHART,  
Minister for Mines.

## DIAMOND - DRILLS.

*Statement of Work done to 31st December, 1906.*

Year.	Locality.	Direction of Bore.	No. of Bores.	Total Distance Bored.	Average cost per foot, inclusive of Labour and Fuel.
No. 1 DRILL.					
1882-3	Back Creek—For Gold .....	Vertical	7	feet. 1330	£ s. d. 0 10 9
1883	Lefroy—For Gold .....	Ditto	4	1011	0 5 3
1884	Tarleton—For Coal.....	Ditto	1	401	0 5 6
1886	Longford - For Coal .....	Ditto	2	1585	0 4 0½
1886-7	Harefield Estate—For Coal .....	Ditto	1	725	0 6 5
1887	Cardiff Claim, Mount Malcolm—For Coal.....	Ditto	1	562	0 17 11¾
1888	Killymoon Estate—For Coal.....	Ditto	1	504	0 4 7¾
1888-9	Seymour - For Coal .....	Ditto	5	2266	0 7 8½
1889 } 1890 }	Beaconsfield (Phœnix G.M. Co.) - For Gold .....	Ditto	1	781	2 0 2
1890	Beaconsfield (East Tasmania G.M. Co.)—For Gold	Ditto	1	978	0 14 9½
1891	Spring Bay—For Coal .....	Ditto	4	937	0 6 10
1891	Ravensdale—For Coal .....	Ditto	1	114	0 11 1½
1891-2	Back River, Prosser's Plains—For Coal.....	Ditto	2	854	0 6 1¾
1892-3	Lefroy (Deep Lead Syndicate)—For Gold.....	Ditto	4	979	0 15 9
1893	Lefroy (East Pinafore Co.)—For Gold .....	Ditto	1	317	0 10 3
1895-6	Sandfly—For Coal .....	Ditto	4	2130	0 11 5
1898 } 1900 }	Blue Tier (Anchor Co.)—For Tin .....	Ditto	9	876½	0 9 1¾
1901-2	Llandaff—For Coal.....	Ditto	3	1944	0 7 4
1902	Recherche (Catamaran Co.)—For Coal .....	Ditto	2	956	0 9 3
1903	Ditto (Moss Glen Co.)—For Coal .....	Ditto	2	667	0 7 6
TOTAL.....			54	19,917½	

		No. 2 DRILL.			
1882	Beaconsfield—For Gold .....	Horizontal, underground	1	68	No record.
1883	Mangana—For Gold .....	Ditto	1	546	0 15 1
1884	Guy Fawkes Gully, near Hobart For Coal.....	Vertical	1	612	0 5 6
1885	Malahide Estate, near Fingal—For Gold .....	Ditto	5	1397	0 5 6
1886	Carr Villa, near Launceston For Coal .....	Ditto	1	571	0 5 4
1886-7	Waratah (Mount Bischoff Alluvial T.M. Co.) For Tin .....	Ditto	7	1548	0 6 1½
1887	Waratah (Mount Bischoff T.M. Co.)—For Tin ....	Ditto	7	841	0 11 8
1887	Ditto .....	Horizontal, underground	1	53	0 7 8
1888	Old Beach—For Coal .....	Vertical	1	593	Abt. 0 10 9
1888	Campania—For Coal .....	Ditto	1	600	0 7 7½
1888	Richmond—For Coal .....	Ditto	1	500	0 5 1¾
1889	Back Creek—For Gold .....	Ditto	4	787	0 8 5½
1891	Macquarie Plains—For Coal.....	Ditto	2	989	0 4 5½
1891	Jerusalem—For Coal .....	Ditto	1	344	0 4 9½
1892	Langloh Park—For Coal .....	Ditto	4	1249	0 5 3¼
1893	Southport—For Coal .....	Ditto	1	612	0 5 3
1894	Zeehan (Tasmania Crown S.M. Co.)—For Silver ...	Horizontal, underground	2	319	1 0 2½
1902	Eden—For Coal .....	Vertical	2	566	1 0 7½
1902-3	Farm Cove—For Coal .....	Ditto	1	571	0 5 6
TOTAL.....		...	44	12,766	

Aggregate number of bores ..... 98  
 Total Distance bored ..... 32,683½ feet.

W. H. WALLACE, Secretary for Mines.

## No. 1.

*RETURN showing the Quantity and Value of Gold won during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, and 1906.*

Year.	Quantity.	Value.
	ozs. dwts.	£
1880.....	52,595 0	201,297
1881.....	56,693 0	216,901
1882.....	49,122 6	187,337
1883.....	46,577 10	176,442
1884.....	42,339 19	160,404
1885.....	41,240 19	155,309
1886.....	31,014 10	117,250
1887.....	42,609 3	158,533
1888.....	39,610 19	147,154
1889.....	32,332 13	119,703
1890.....	20,510 0	75,888
1891.....	38,789 0	145,459
1892.....	42,378 0	158,917
1893.....	37,687 0	141,326
1894.....	57,873 0	217,024
1895.....	54,964 0	206,115
1896.....	62,591 0	237,574
1897.....	77,131 0	296,660
1898.....	74,233 0	291,496
1899.....	83,992 0	327,545
1900.....	81,175 0	316,220
1901.....	*69,491 0	295,176
1902.....	*70,996 0	301,573
1903.....	*59,891 0	254,403
1904.....	*65,921 0	280,015
1905.....	*73,540 10	312,380
1906.....	*60,023 8	254,963
	1,465,321 17	5,753,064

\* Fine Gold.

Diagram showing Total Quantity & Value of Gold won in Tasmania during the years 1880-1906

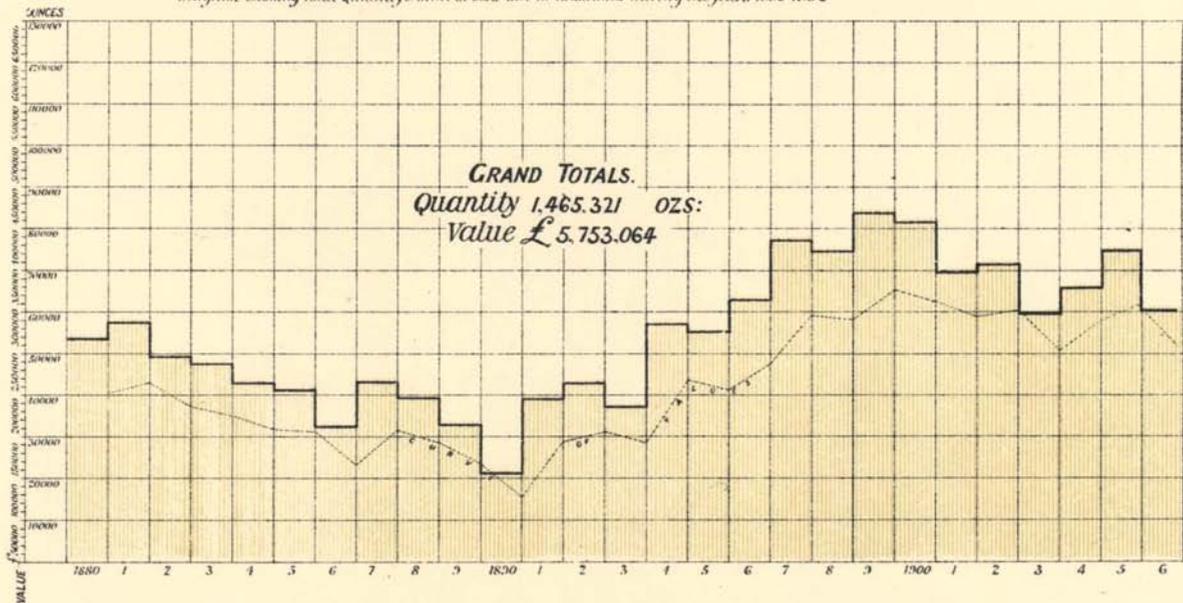
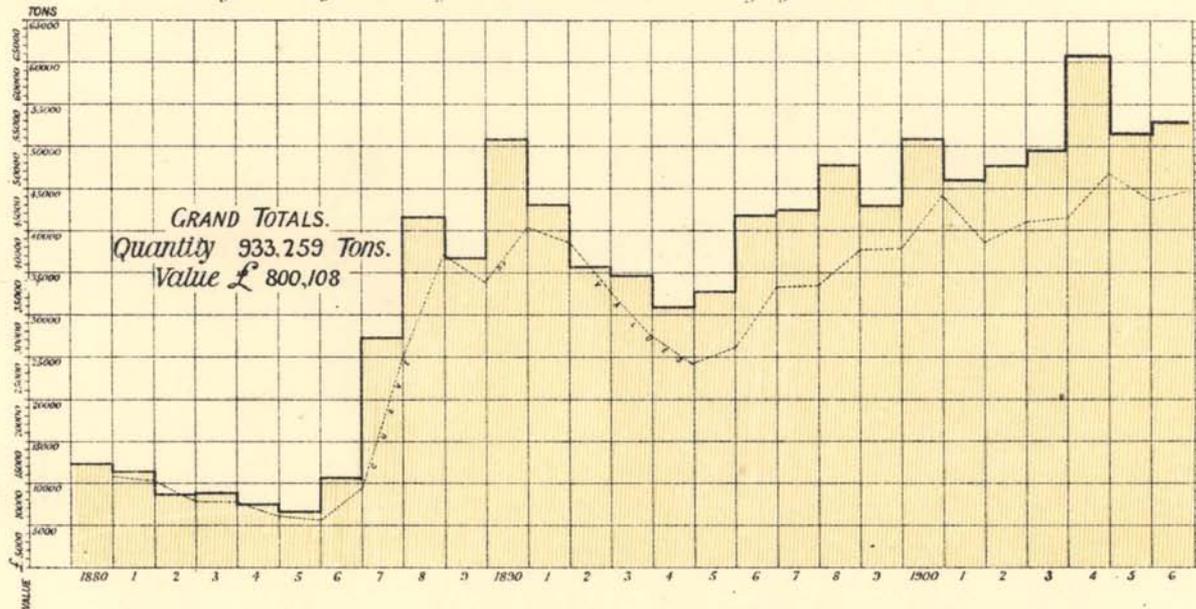


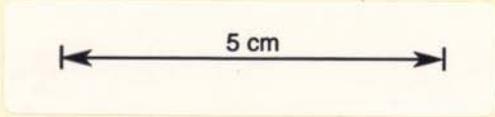
Photo-graphed by John Vail Government Printer Hobart Tasmania

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*Diagram showing Total Quantity & Value of Coal mined in Tasmania during the years 1880-1906*



*Photo-algraphed by John Foul Government Printer Hobart Tasmania*



## No. 2.

*RETURN showing the Quantity and Value of Coal raised during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, and 1906.*

Year.	Quantity.	Value.
	Tons.	£
1880 .....	12,219	10,998
1881 .....	11,163	10,047
1882 .....	8,803	7,923
1883 .....	8,872	7,985
1884 .....	7,194	6,475
1885 .....	6,654	5,989
1886 .....	10,391	9,352
1887 .....	27,633	24,870
1888 .....	41,577	37,420
1889 .....	36,700	33,030
1890 .....	50,519	45,467
1891 .....	43,256	38,930
1892 .....	36,008	32,407
1893 .....	34,693	27,754
1894 .....	30,499	24,399
1895 .....	32,698	26,159
1896 .....	41,904	33,523
1897 .....	42,196	33,757
1898 .....	47,678	38,256
1899 .....	42,609	38,349
1900 .....	50,633	44,227
1901 .....	45,438	38,451
1902 .....	48,863½	41,533
1903 .....	49,069	41,709
1904 .....	61,109	51,942
1905 .....	51,993	44,194
1906 .....	52,895½	44,962
	933,259½	800,108

## No. 3.

*RETURN showing the Quantity and Value of Tin exported from Tasmania during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, and 1904, compiled from Customs Returns only, and Tin Ore produced during the Years 1905 and 1906.*

Year.	Quantity.	Value.
	Tons.	£
1880 .....	3954	341,736
1881 .....	4124	375,775
1882 .....	3670	361,046
1883 .....	4122	376,446
1884 .....	3707	301,423
1885 .....	4242	357,587
1886 .....	3776	363,364
1887 .....	3607 $\frac{1}{2}$	409,853
1888 .....	3775 $\frac{1}{4}$	426,321
1889 .....	3764	344,941
1890 .....	3209 $\frac{1}{4}$	296,368
1891 .....	3235	291,715
1892 .....	3174	290,083
1893 .....	3128 $\frac{1}{2}$	260,219
1894 .....	2934	198,298
1895 .....	2726 $\frac{3}{4}$	167,461
1896 .....	2700	159,036
1897 .....	2423 $\frac{1}{2}$	149,994
1898 .....	1972	142,046
1899 .....	2239 $\frac{1}{4}$	278,323
1900 .....	2029	269,833
1901 .....	1789 $\frac{1}{2}$	212,542
1902 .....	1958 $\frac{1}{4}$	237,828
1903 .....	2376 $\frac{3}{10}$	300,098
1904 .....	2171 $\frac{1}{2}$	255,228
1905* .....	3891 $\frac{1}{2}$	362,670
1906* .....	4472 $\frac{3}{4}$	557,266
	85,172 $\frac{13}{40}$	8,087,500

\* Tin Ore produced : Customs having ceased to issue Returns.

Diagram showing Total Quantity & Value of Tin exported from Tasmania during the years 1880-1904 and Tin ore produced during the years 1905 and 1906

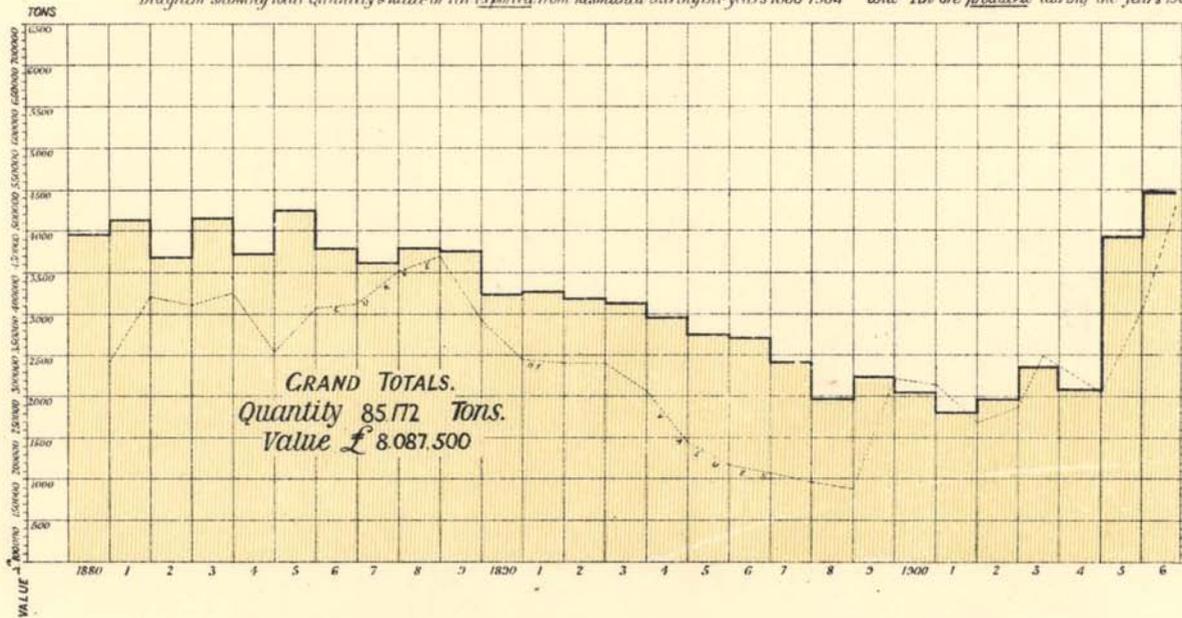


Photo-algraphed by John Vint Government Printer Hobart Tasmania

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## No. 4.

*RETURN showing the Quantity and Value of Silver Ore produced during the Years 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, and 1906.*

Year.	Quantity.	Value.
	Tons.	£
1888 .....	417	5838
1889 .....	415	7044
1890 .....	2053	26,487
1891 .....	4810	52,284
1892 .....	9326	45,502
1893 .....	14,302	198,610
1894 .....	21,064	293,043
1895 .....	17,980	175,957
1896 .....	21,167	229,660
1897 .....	18,364	200,167
1898 .....	15,320	188,892
1899 .....	31,519½	250,331
1900 .....	26,564	279,372
1901 .....	28,774	207,228
1902 .....	46,480	218,864
1903 .....	42,422	192,492
1904 .....	51,138	203,702
1905 .....	75,270½	246,888
1906 .....	87,117¾	462,443
	514,503¾	3,484,804

## No. 5.

*RETURN showing the Quantity and Value of Blister Copper produced during the Years 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, and 1906.*

Year.	Quantity.	Value.
	Tons.	£
1896 .....	41½	1245
1897 .....	4700	322,500
1898 .....	4955½	400,668
1899 .....	8598	735,305
1900 .....	9449	907,288
1901 .....	9981	879,625
1902 .....	7745	*462,151
1903 .....	6684	*478,023
1904 .....	8371	*582,540
1905 .....	8610	*704,287
1906 .....	8708	*862,444
	77,843	6,336,076

\* Value of Gold contained deducted.

## No. 6.

*RETURN showing Quantity and Value of Copper Matte exported during the Years 1902, 1903, 1904 1905, and 1906.*

Year.	Quantity.	Value.
	Tons.	£
1902 .....	2500	50,112
1903 .....	3727	83,624
1904 .....	--	--
1905 .....	--	--
1906 .....	--	--
	6227	133,736

## No. 7.

*RETURN showing the Quantity and Value of Copper Ore produced during the Years 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, and 1906.*

Year.	Quantity.	Value.
	Tons.	£
1896 .....	34	1020
1897 .....	75	2250
1898 .....	394	8128
1899 .....	1695	26,833
1900 .....	4221½	63,589
1901 .....	11,221	130,412
1902 .....	5994	65,270
1903 .....	102	790
1904 .....	104	1640
1905 .....	1150¾	52,939
1906 .....	2234½	72,480
	27,225¾	425,351

## No. 8.

*RETURN showing the Quantity and Value of Iron Ore produced during the Years 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, and 1906.*

Year.	Quantity.	Value.
	Tons.	£
1897 .....	894	812
1898 .....	1598	1598
1899 .....	3577	3474
1900 .....	5375	5995
1901 .....	612	417
1902 .....	2386	1075
1903 .....	5980	2905
1904 .....	6840	2975
1905 .....	6300	2600
1906 .....	2600	1100
	36,162	22,951

## No. 9.

*RETURN showing the Quantity and Value of Asbestos produced during the Years 1899, 1900, 1901, 1902, 1903, 1904, 1905, and 1906.*

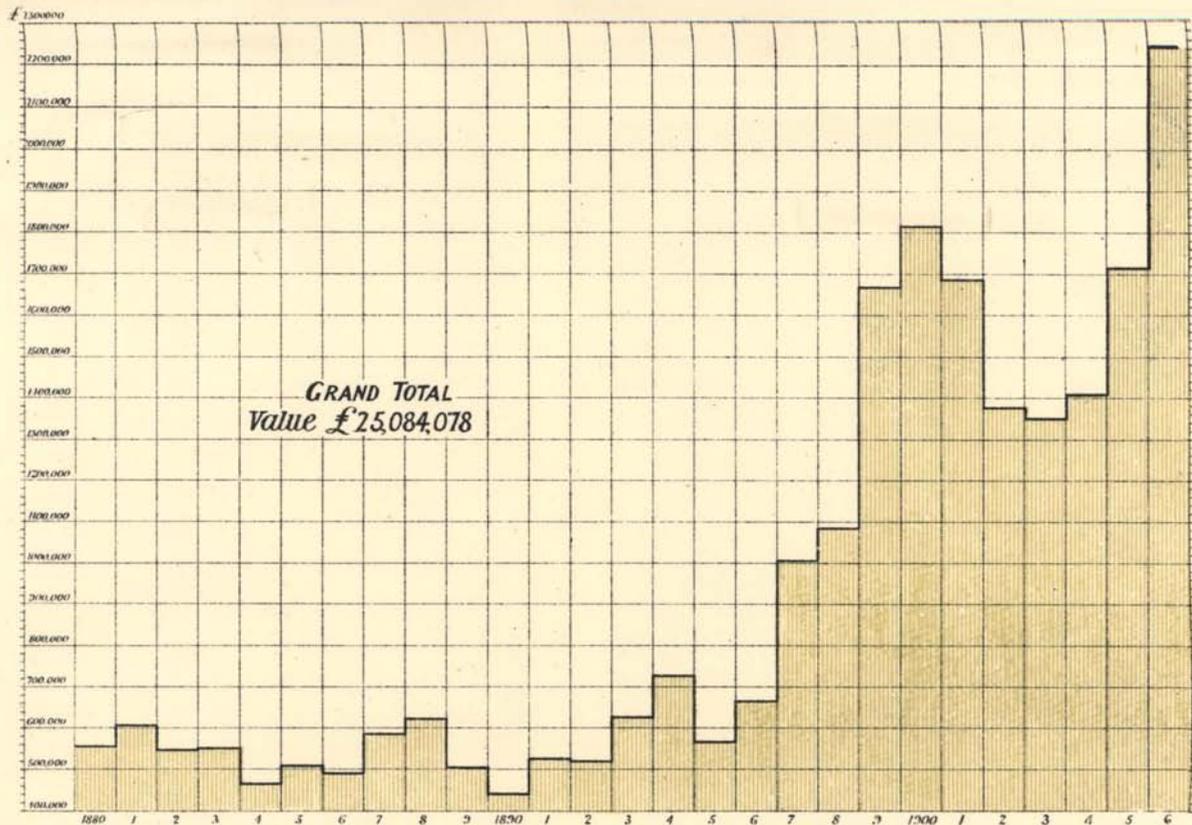
Year.	Quantity.	Value.
	Tons.	£
1899 .....	200	363
1900 .....	128	113
1901 .....	46½	45
1902 .....	—	—
1903 .....	—	—
1904 .....	—	—
1905 .....	—	—
1906 .....	—	—
	374½	521

## No. 10.

*RETURN showing the Quantity and Value of Wolfram produced during the Years 1899, 1900, 1901, 1902, 1903, 1904, 1905, and 1906.*

Year.	Quantity.	Value.
	Tons.	£
1899 .....	3½	99
1900 .....	53¾	2058
1901 .....	—	—
1902 .....	—	—
1903 .....	—	—
1904 .....	15½	1147
1905 .....	32¼	2371
1906 .....	19¾	1465
	124¾	7140

Diagram showing the Annual Value of Minerals & Metals raised in Tasmania from 1880-1906



5 cm

Photo-ographed by John Veil Government Printer Hobart Tasmania

## No. 11.

*RETURN showing the Quantity and Value of Bismuth produced during the Years 1904, 1905, and 1906.*

Year.	Quantity.	Value.
1904 .....	6 cwt.	£ 15
1905 .....	3½ tons	800
1906 .....	6 cwt.	24
	4 <sup>1</sup> / <sub>10</sub> tons	839

## No. 12.

*RETURN showing the Quantity of Silver-Lead and Copper Ore smelted for period 25th June to 31st December, 1896, and 1st January 1897, to 31st December, 1905.*

Year.	Ore Smelted.	Products.			Yield.			
		Silver-Lead Bull'n.	Blister Copper.	Matte.	Copper.	Silver.	Gold	Lead.
	Tons.	Tons.	Tons.	Tons.	Tons.	Ozs.	Ozs.	Tons.
1896	26,028 <sup>1</sup> / <sub>10</sub>	—	—	2417 <sup>5</sup> / <sub>10</sub>	1235 <sup>1</sup> / <sub>10</sub>	75,951	4707	—
1897	90,773½	—	3476 <sup>1</sup> / <sub>10</sub>	257 <sup>1</sup> / <sub>10</sub>	3583 <sup>1</sup> / <sub>10</sub>	334,349	16,485	—
1898	170,933	—	4992	—	4783	606,123	24,418	—
1899	275,230	2295	8463	89 <sup>5</sup> / <sub>10</sub>	8362	1,089,657	27,617	—
1900	363,113	4817	9449	—	9341	1,215,036	26,255	—
1901	355,528	1839	3982	50	9880	800,317	21,717	—
1902	411,736	6825	7727	2882	8841	1,674,816	24,719	6654
1903	399,032	7560	6683	3413	8094	1,855,158	25,238	7529
1904	433,366	—	8371	—	8265	1,896,134	26,809	7754
1905	466,578	9422	8611	—	8596	2,075,431	26,469	9086
1906	479,775	9380	8768	—	8613	2,150,405	24,986	9300

## No. 13.

*RETURN showing the Average Number of Persons engaged in Mining during the Years 1880 to 1906 inclusive.*

Year.	Number.	Year.	Number.
1880.....	1653	1894.....	3433
1881.....	3156	1895.....	4062
1882.....	4098	1896.....	4350
1883.....	3818	1897.....	4510
1884.....	2972	1898.....	6052
1885.....	2783	1899.....	6622
1886.....	2681	1900.....	7023
1887.....	3361	1901.....	6923
1888.....	2989	1902.....	5934
1889.....	3141	1903.....	6017
1890.....	2868	1904.....	6194
1891.....	3219	905.....	6581
1892.....	3295	1906.....	7005
1893.....	3403		

No. 14.

RETURN showing the Number and Area of Leases held under "The Mining Act, 1900," in force on 30th June in Years 1900 to 1903 inclusive, and on 31st December, 1903, 1904, 1905, and 1906.

Nature of Lease.	In force on 30th June, 1900.		In force on 30th June, 1901.		In force on 30th June, 1902.		In force on 30th June, 1903.		In force on 31st December, 1903.		In force on 31st December, 1904.		In force on 31st December, 1905.		In force on 31st December, 1906.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.
For Minerals, Silver, Tin, &c.	1487	Acres. 70,500	1388	Acres. 60,865	1063	Acres. 45,399	950	Acres. 40,068	826	Acres. 33,325	868	Acres. 33,824	944	Acres. 34,325	1307	Acres. 43,036
For Coal, Slate, Shale, &c.	52	7258	55	7566	52	7819	66	10,767	54	9119	47	7546	45	7185	35	6025
For Gold Dredging Claims	647	6623	566	6091	425	4166	310	3117	243	2505	222	2268	195	2087	167	1836
Mining Easements	—	—	—	—	—	—	—	—	15	124	29	469	51	1196	91	2027
Water-rights Mineral and Gold	—	—	—	—	—	—	—	—	84	225	39	234	45	282	47	298
	225	1004 sluice-heads	267	1318 sluice-heads	300	1691 sluice-heads	299	1514 sluice-heads	281	1460 sluice-heads	346	1495 sluice-heads	251	1477 sluice-heads	391	1606 sluice-heads

No. 15.

*COMPARATIVE Statement of Revenue from Mines, being Rents, Fees, &c. (exclusive of Survey Fees), paid to the Treasury for the Years ending 30th June, from 1880 to 1903, and for Six months ending 31st December, 1903, and for the Years ending 31st December, 1904, 1905, and 1906.*

Year.	Amount.			Year.	Amount.		
	£	s.	d.		£	s.	d.
1880.....	8944	5	11	1894.....	16,732	7	7
1881.....	20,636	5	5	1895.....	15,323	1	9
1882.....	23,077	1	9	1896.....	20,901	13	2
1883.....	15,439	14	5	1897.....	25,631	0	3
1884.....	6981	11	10	1898.....	33,661	13	9
1885.....	11,070	5	7	1899.....	24,96	10	5
1886.....	12,523	10	4	1900.....	28,380	11	10
1887.....	14,611	11	5	1901.....	21,569	5	2
1888.....	23,502	8	4	1902.....	19,471	0	1
1889.....	17,254	9	0	1903.....	17,776	14	3
1890.....	26,955	4	9	1903, 1 July to 31 Dec. ....	14,758	17	1
1891.....	37,829	16	5	1904, Jan. to Dec. ....	16,631	8	2
1892.....	17,568	18	4	1905.....	20,203	17	0
1893.....	16,971	9	2	1906.....	24,136	12	5

The above Statement does not include Stamp Duties upon Transfer of Leases and Registration of Companies, nor the Tax payable upon Dividends, from which sources large sums are derived.

## No. 16.

*RETURN showing the Total Number and Area of Leases in force on 31st December, 1906.*

Minerals.	Number.	Area.
		Acres.
Gold .....	167	1836
Minerals .....	133	7622
Silver .....	154	8169
Copper .....	24	1252
Tin.....	970	24,811
Coal .....	23	3985
Limestone.....	4	383
Iron.....	11	528
Slate .....	1	200
Wolfram .....	8	394
Precious Stones .....	1	80
Lithographic Stone.....	1	97
Marble ....	1	317
Shale.....	4	1040
Phosphate of Lime .....	1	3
Nickel .....	6	180
Machinery Sites .....	27	98
Dredging Claims.....	91	2027
Mining Easements .....	47	298
Water Rights .....	391	1606 sluice-heads, and 1128 acres dams

## No. 17.

*RETURN showing the Average Number of Miners employed during the Year ending 31st December, 1906.*

	Europeans.	Chinese.
Northern and Southern Division .....	886	1
North-Eastern Division.....	717	102
Eastern Division .....	615	66
North-Western Division .....	524	...
Western Division .....	4094	...
	6836	169

## No. 18.

*RETURN showing the Mining Companies registered during the Year ending 31st December, 1906.*

Number of Companies.	Capital.
14	£178,090

In addition to the above, 24 Agents for Foreign Companies and 4 Syndicates, under 60 Vict. No. 51, were registered.

## No. 19.

*TOTAL Area of Land and Number of Sluicheads of Water applied for during the Year ending 31st December, 1906.*

Mineral.	No. of Applications.	No. of Sluicheads.	Area.
			Acres.
Antimony .....	3	...	160
Coal .....	8	...	3245
Copper .....	55	...	3861
Galena .....	8	...	440
Gold .....	85	...	1076
Iron.....	1	...	80
Limestone .....	1	...	1
Minerals .....	141	...	8150
Silver.....	51	...	2994
Sulphide .....	1	...	77
Shale .....	19	...	2935
Tin.....	602	...	15,794
Wolfram.....	1	...	120
Machinery Sites .....	9	...	42
Dredging Claims.....	43	...	848
Water-rights .....	231	1050	171
<b>TOTAL.....</b>	<b>1259</b>	<b>1050</b>	<b>39,994</b>

## No 20.

*RETURN showing the total Amount of Rents, Fees, &c., received by the Mines Department during the Year ending 31st December, 1906.*

Head of Revenue.	Amount.
	£ s. d.
Rent of Auriferous and Mineral Land.....	21,505 14 3
Fees, ditto ditto .....	2630 18 2
Survey Fees .....	6023 9 5
<b>TOTAL</b> .....	<b>£30,160 1 10</b>

## No. 21.

*RETURN showing the Amounts paid in Dividends by Mining Companies during the Year ending 31st December, 1906.*

Mines.	Dividends.
	£ s. d.
Copper .....	360,000 0 0
Gold .....	...
Tin .....	208,846 0 0
Silver .....	67,563 0 0
<b>TOTAL</b> .....	<b>£636,409 0 0</b>

REPORT OF THE MOUNT CAMERON WATER-  
RACE BOARD FOR THE YEAR ENDING  
31ST DECEMBER, 1906.

14th February, 1907.

SIR,

WE have the honour to present the report of the Board for the year ending 31st December, 1906.

*Water.*—The quantity of water sold during the year was  $4147\frac{7}{12}$  sluice-heads, which was sufficient to satisfy all requirements.

In response to the request of the Board, the Government, on the 25th of October last, passed a short Bill to amend the Mount Cameron Water-race Act, suspending the operation of Section 6, and enabling the Board to retain the whole of the moneys received during the period commencing the 1st day of July, 1905, and ending the 30th day of June, 1908, from the sale of water supplied by the race without making any payment thereout for the purposes of "The Public Debts Sinking Fund Act, 1881," and to use and apply the whole or any part of revenue so received and retained as it thinks fit in or towards maintaining, managing, repairing, or improving the water-race and the works connected therewith.

In addition to this, the Government provided a sum of £4000 on the Public Works Schedule for the purpose of renewals and repairs. If a similar amount is placed upon the estimates this year, and is available when No. 4 syphon is well in hand, the pipes could be delivered to the ground, and work commenced on No. 5 syphon immediately on completion of No. 4.

*Flumings.*—At the beginning of the year there were 23 flumings to be replaced by earth and rock-cuttings. Of these, 1, 2, 4, 8, 9, and 11 were completed, at a cost of £1612 10s. 6d., and should there be no serious break or other unforeseen accident cutting off the water-supply for any length of time, it may be reasonably expected that the revenue derived will be sufficient during the current year to cover the cost of replacing most of the remaining flumings.

*Syphons.*—There has been an increase in the number of breaks in the pipes, and these have been of a more serious nature than hitherto. There are 6 syphons in use. Of these, 4 and 5 require constant attention, bursts being of daily occurrence, which have necessitated repairs by means of iron bands to the extent of 269 on these syphons alone. Nos. 1, 2, and 3 syphons are shorter and of smaller dimensions, and it may be found possible by rock and earth deviations to dispense with Nos. 1 and 2.

The quantity of water supplied this year was  $4147\frac{7}{12}$  sluice-heads, as against  $4325\frac{1}{4}$  sluice-heads last year; and the quantity of tin ore raised was 94 tons 7 cwts. 1 qr.  $23\frac{1}{2}$  lbs., as against 75 tons 13 cwts. 15 lbs. last year, being

an increase of 18 tons 14 cwts. 1 qr. 8½ lbs. The revenue was £2835 17s. 11d., against £2581 0s. 10d. the previous year, being an increase of £254 17s. 1d.

The report of the Engineer-in-Charge on the work performed during the year is appended.

The statistics for the year are as follow :—

Average per week of claims supplied, 16.	
Greatest number supplied in any one week, 21.	
Total number of heads supplied :—	
Under fixed or cash scale ... ..	3189 $\frac{1}{12}$
Under royalty or credit scale ... ..	958 $\frac{1}{2}$
<b>TOTAL ... ..</b>	<b>4147 <math>\frac{1}{12}</math></b>

Tin ore raised for the year :—Royalty scale, 15 tons 0 cwts. 3 qrs. 23½ lbs.; fixed scale, 79 tons 6 cwts. 2 qrs.; total, 94 tons 7 cwts. 1 qr. 23½ lbs.

Total receipts for the year :—Fixed scale, £2375 ls. 0d.; royalty scale, £460 16s. 11d.; total, £2835 17s. 11d.

Expenditure : Cost of maintenance and management :—

	£	s.	d.	£	s.	d.	
Salary and wages... ..	593	14	0				
Repairs to syphon-pipes ... ..	128	7	4				
Repairs to flumings ... ..	18	16	0				
Race-cleaning ... ..	57	16	0				
Travelling expenses ... ..	35	19	0				
Stores and tools ... ..	16	7	4				
Stationery and printing ... ..	5	19	0				
Insurance ... ..	3	6	0				
					860	4	8
Renewal of flumings ... ..					1612	10	6
<b>TOTAL ... ..</b>					<b>£2472</b>	<b>15</b>	<b>2</b>

The payment to the Public Debts Sinking Fund of the profits made for the year ending 30th June, 1906, was suspended, under 6 Edward VII. No. 13.

Moiety of rents of mineral land served by the race paid to Public Debts Sinking Fund, £35 10s. 10d.

Total amount paid to Public Debts Sinking Fund to 30th June, 1906, £9869 5s. 5d.

Total cost of purchase and construction, £34,281 19s.

W. H. WALLACE, Chairman of the Board.

EDWARD L. HALL,

W. H. TWELVETREES,

S. HAWKES,

JOHN SIMPSON,

} Members of the Board.

The Hon. the Minister for Mines, Hobart.

## ENGINEER'S REPORT.

Hynes' Camp, 3rd May, 1907.

SIR,

Report of alterations and repairs, Mount Cameron Water-race, for year ending 31st December, 1906 :—

I have to report that, acting under instructions from you, I resumed work in connection with alterations and repairs to the Mount Cameron Water-race on the 29th of March, and on the 31st I proceeded to Gladstone to obtain the necessary information to enable me to submit to you an estimate for work up to £1000, and to lay out such work, so that it might be let by tender if the Board so decided.

I returned to Launceston on the 12th May, and on the 13th June I submitted to you an estimate for work totalling £984 18s., *ex* supervision, with plans and details of cost.

The work dealt with was alterations to flumes Nos. 1, 2, 4, 8, 9, and 11.

On the 3rd July I again left Launceston, with your instructions to carry out these works, arriving in Gladstone the same day.

Owing to the very rough weather I was unable to move out till the 8th. The heavy weather delayed the arrival of the boat which was bringing tools, &c., from Launceston. Ogilvie's bridge, over the Ringarooma River, was washed away, and, in consequence, the things had to be carted by a road about 6 miles longer than the direct one. The Mussel Roe River, which has to be crossed by ford on the way to the intake of the race, was rendered impassable for some days by floods, and it was not till the 19th that I managed to get tools and start work.

The above works were completed on the 16th November, at a total cost for labour, plant, and material, of £933 7s. 5d. (*ex* supervision), and a statement of cost supplied to you.

Just before the completion of these works I was favoured by you with instructions to proceed with the more urgent of the other works, with a view to cutting out all the old flumes where possible.

Work was temporarily suspended on the 18th December, on account of the men unanimously wanting Christmas holidays, and up to that time the following additional work had been done :—

No. 12, complete, at a cost of, approximately, £112.

No. 3, almost finished, at a cost of, approximately, £105.

No. 7, in progress.

The total amount expended up to 31st December was £1652 5s. 2d., inclusive of plant, supervision, and all charges.

In all cases the old flumes have been replaced by permanent works, the creeks being picked up, thus adding to the available water-supply.

Yours obediently,

FRANK SNEYD GROVE,

Engineer in Charge of Works.

W. H. WALLACE, Esq.,

Chairman Mt. Cameron Water-race Board, Hobart.

## MINE MANAGERS' EXAMINATION.

MARCH 20, 1906.

### SUBJECT A.—MINING.

1. Discuss the relative methods of the following and explain under what circumstances you would use each—(a) Horse tram, (b) aerial tram (c) gravity tram (d) electric motor tram, (e) steam loco. tram.
2. You are prospecting for a deep lead. What surface indications would you consider? Describe the methods you would adopt and the precautions you would take.
3. Under what conditions would you expect to have to work in compressed air when tunneling? Describe, with sketches, an air-lock for the purpose.
4. Under what conditions would you use each of the following :—  
(a) Blasting powder, (b) gelignite, (c) blasting gelatine, (d) rack-a-rock. What are the qualities required in a good fuse? For driving a heading in a hard homogeneous rock, show with sketches how you would place the holes, and state in what order you would fire them.
5. Describe, with sketches, any safety-cage.
6. Describe the ropes or chains you would use in the following cases, their construction and quality, the factor of safety you would adopt, the methods of testing, and the fastenings you would use :—(a) Haulage tram, (b) deep shaft, (c) block-and-tackle, (d) fib or travelling crane, (e) aerial tram, (f) guy for derrick in erecting machinery.
7. Explain how you would timber and maintain a drive in swelling ground.
8. Make a sketch of a head-gear 45 feet high for use with cages. Give explanation of details.
9. The outcrop of a lode has been traced 200 yards with trenches. How would you continue to prospect it with the sum of £1000 available?
10. Describe how you would work a vertical lode—30 feet to 40 feet wide—in good standing country—  
(a) When lode was picking ground.  
(b) When lode was solid quartz.
11. A shaft on a tin mine is to be sunk 1000 feet to contain a 12-inch Cornish pump. The trucks used in the mine carry three-quarters of a ton each, and are well designed. What size would you make the shaft, and how would you timber it? Give a sketch showing how you would place the pit-work.
12. Describe the way in which you would open up an alluvial lead about 200 feet below flat country.

### SUBJECT B.—ORE-DRESSING AND SAMPLING.

1. How would you sample an irregular lode-tin formation, extending over a surface area of 15 or 20 acres, which has not been exploited to any extent by shafts or adits?

2. Describe the latest slime-concentrating appliance you are acquainted with—describe its action, and state under what conditions you would consider it suitable. Illustrate your answer with sketches.
3. Describe an automatic tailings sampler for use in connection with a battery, and explain how it is used.
4. Describe the different types of stone-breakers and their relative merits.
5. A 40-ton lot of rich ore is expected to arrive in railway trucks: explain how you would sample it.
6. What process of concentration would you use for silver-lead ore consisting of galena, carbonate of iron, and slate; the galena in part finely disseminated and part in masses? Describe the different machines you recommend.

#### SUBJECT C.—MINING GEOLOGY.

1. What are joints in rocks? Explain how they are produced.
2. Define the term "false bottom." Explain the origin of this phenomenon and how it affects the deposition of ore.
3. Describe possible natural conditions which may bring about the precipitation of metals in ore deposits.
4. Give some instances in which the presence of one metal in a lode may be looked upon as an indicator of another.
5. Describe how you would go to work to determine and represent the geological structure of a district.
6. Define the terms dip; hade; monocline; reversed fault; erosion.
7. Describe the characteristic features of replacement deposits.
8. Give an account of how you suppose gold quartz reefs to have originated.
9. Explain fully the essential differences between granite and serpentine; between conglomerate and slate.

#### SUBJECT D.—MINING SURVEYING.

1. A tramway between a main shaft and mill is about 12 chains long. Give a sample of a field-book showing reduced levels each chain.
2. Give a longitudinal section of the above tramline (Question 1) complete for construction purposes.
3. How would you lay out a curve on the above (Question 1) 5 chains long and 10 chains radius? Give all calculations.
4. Describe carefully the adjustments of the transit theodolite.
5. Describe fully a stadic method of contouring an approximately semi-circular quarry face of about 150 ft. rad. and 40 ft. high.
6. An incline shaft is sunk a vertical depth of 300 ft. on a lode underlying  $45^\circ$ , and levels have been driven at 100 ft., 200 ft., and 300 ft. from the surface. Winzes connect each pair of levels. How would you determine

the bearings of the drives without using a magnetic needle below the surface, and how would you check the bearings so obtained?

7. A quartz lode with an underlay E.  $20^{\circ}$  N.  $70^{\circ}$  carries a shoot of ore 200 ft. long pitching northerly. A vertical shaft cuts the southern end of the ore at a depth of 500 ft. Levels exist at 300 ft. and 700 ft. from the surface. Make a rough set of plans showing the above clearly.
8. In the above Question, make an estimate of the ore above the lowest level, assuming quartz in place to weigh 165 lbs. per cubic ft.

SUBJECT E.—SURFACE WORK.

1. A self-acting incline on a 1 in 20 grade is intended to lower 5 tons of mineral per trip in a truck weighing 2 tons. What sized rope would you use? Assuming a frictional resistance of  $\frac{1}{30}$  of the total load, will the tram work?
2. Give sketches of a bridge 15 ft. high with 12-ft. spans, for a tramway on which the heaviest load is an 8-ton locomotive.
3. Give sketches of the arrangement you would adopt at a shaft for breaking 100 tons of quartz per day, and storing 300 tons.
4. What do you understand by the terms—

Entry Head.  
Velocity Head.  
Friction Head.  
Total Head.

Calculate the discharge of a 12-inch water-pipe, 100 ft. long, under a total head of 10 ft.

5. What is the safe working head of water for a 20-inch single-riveted wrought-iron pipe  $\frac{1}{4}$ -in thick?
6. You wish to generate 250 horse-power by means of water. You have 150 horse-power available under a head of 300 ft., and 100 horse-power under a head of 180 ft.; you require to drive an electric generator direct by means of two Pelton wheels on an extension of the generator shaft: if the revolutions are to be 420 per minute, what diameters must the wheels have?
7. Outline the most economical scheme you can to transmit as much of the power mentioned in the previous question as possible over a distance of 10 miles, for the purpose of driving a stamper battery by means of one large motor, saying what losses you would expect in each part of the apparatus.
8. What size Cornish boiler would you require to give 100 indicated horse-power? Calculate the approximate weight for 100 lbs. pressure per square inch.
9. Two steel plates are lap-jointed, and rivetted together by one row of  $\frac{7}{8}$ -in. rivets pitched at  $2\frac{3}{4}$  in. apart: what is the lowest percentage of the strength of the joint?
10. In a rope and pulley arrangement, having one quadruple and one treble sheaved block, what weight could you raise by applying a force of 150 lbs. on the fall of the rope? Neglect friction.

## SUBJECT F.—BOOKKEEPING AND MINE ACCOUNTS.

1. When your company sends you stores for use at the mine, how do you arrive at the cost figures at which you enter them in your Stores Received Book?
2. Extract the square root of .000525 to three decimal places.
3. Give some examples of pay-tickets issued to miners showing the net amounts due to them.
4. How do you reduce recurring decimals (pure and mixed) to vulgar fractions? Give examples.
5. Prepare a tabular statement showing an analysis of expenditure at a mine and battery, such as you would prepare periodically for the head office.
6. If 10 men earn £15 in eight days, what will 25 men earn in 40 days at the same rate?
7. Describe methods of forming an account for writing off depreciation on plant.

## SUBJECT G.—MINING LAW.

1. What weight or strain is required to be used when testing new ropes or chains to be used in the shaft of a mine?
  2. What is the maximum quantity of gunpowder or other explosives which may be stored in any mine, and what distance should same be stored from any travelling road?
  3. What quantity of detonators is allowed to be kept in any one level in a mine, and how should same be stored?
  4. Frozen nitro-glycerine compounds are required to be thawed or softened previous to use. How should this be done?
  5. What constitutes a "sluice-head" of water under the Mining Regulations?
-

The following Lists of Certificates granted since the inception of the Board of Examiners for Mining Managers' Certificates are published in accordance with a resolution passed at the Interstate Conference of Boards of Examiners held in Melbourne in March, 1906 :—

*SERVICE Certificates of Competency granted by the Board of Examiners.*

No. of Certificate.	Name.	Date of Certificate.
1. 92	Davies, Joseph	28 Sep. 1892
2. 92	Ruffon, Geo. Donald	28 Sep. 1892
3. 92	Sinclair, George Peace	28 Sep. 1892
4. 92	Heighway, John Felton	28 Sep. 1892
5. 92	Irvine, Peter	28 Sep. 1892
6. 93	Daniel, John	29 Mar. 1893
7. 93	Marshall, John Henry	29 Mar. 1893
8. 93	Aaron, Gabriel	29 Mar. 1893
9. 93	Webb, George	29 Mar. 1893
10. 94	Payne, John Greaves	3 Apr. 1894
11. 94	Wesley, William Henry	3 Apr. 1894
12. 94	Andrews, Thomas	3 Apr. 1894
13. 95	Richards, Moses John	17 Apr. 1895
14. 95	Richards, Stephen Eddy	5 Nov. 1896
15. 98	Stubs, Joseph Thomas	20 Jan. 1898
16. 98	McCrackan, John	20 Jan. 1898
17. 98	Heery, Luke	5 Mar. 1898
18. 98	Curtain, Cornelius Henry	13 Apr. 1898
19. 98	Clerk, Frederick Malcolm	14 Apr. 1898
20. 99	Craze, John	25 Jan. 1899
21. 99	Tilley, George Reynolds	17 Apr. 1899
22. 99	Hooper, Thomas Martin	17 Apr. 1899
23. 99	Vincent, Thomas	17 Apr. 1899
24. 1900	Brown, William	9 Jan. 1900
25. 1900	Rosewarne, David Davey	4 Oct. 1900
26. 1901	Buddon, William	1 Mar. 1901
27. 1901	Yeates, Alexander	29 Apr. 1901
28. 1902	Ireland, Mark	22 Apr. 1902
29. 1902	Woolcock, John	23 Sep. 1902
30. 1903	Powell, Robert William	5 May, 1903
31. 1904	Muir, John James	27 July, 1904
32. 1904	Moyle, John	5 Dec 1904
33. 1904	Ridley, John	12 Dec. 1904
34. 1906	Brough, Daniel	23 Apr. 1906
35. 1906	Berrill, Samuel	23 Apr. 1906
36. 1906	Barker, George	24 July, 1906

*COLLIERY Certificates of Competency granted by Board of Examiners.*

No. of Certificate.	Name.	Date of Certificate.	Class of Certificate.
1. 92	Brain, Austin Lionel Bennet	28 Sep. 1902	First class
2. 1907	Wallace, Archibald Campbell	23 Apr. 1907	Second class
3. 1907	Williams, Thomas James	8 May, 1907	First class

*CERTIFICATES of Competency granted by the Board of Examiners.*

No. of Certificate.	Name.	Date of Certificate.	Class of Certificate.
1. 92	Dunstan, Alfred John	28 Sep. 1892	First class
2. 92	Ekborg, Benjamin Pher- son	28 Sep. 1892	Second class
3. 92	Hill, Charles	28 Sep. 1892	Second class
4. 92	Booth, John Robert	28 Sep. 1892	Second class
5. 92	Stapleton, Michael	28 Sep. 1892	Second class
6. 92	Lewis, Philip	28 Sep. 1892	Second class
7. 92	Hanlon, Christopher	28 Sep. 1892	Second class
8. 92	Williams, Luke	28 Sep. 1892	Second class
9. 92	Macandrew, Harold	28 Sep. 1892	First class
10. 92	Harris, William	28 Sep. 1892	First class
11. 93	Stapleton, Michael	29 Mar. 1893	First class
12. 93	Hanlon, Christopher	29 Mar. 1893	First class
13. 93	Potter, Joseph Matthew	29 Mar. 1893	First class
14. 93	Hilder, Alfred	29 Mar. 1893	Second class
15. 93	Matthews, Peter	29 Mar. 1893	Second class
16. 93	Richards, Stephen	6 Sep. 1893	First class
17. 94	Brain, Austin Lionel Bennet	3 Apr. 1894	First class
18. 94	Thorpe, Walter	3 Apr. 1894	Second class
19. 95	Williams, Luke	17 Apr. 1895	First class
20. 96	Levings, Joseph Henry	6 May, 1896	First class
21. 99	Goodall, Thomas Charles	14 Apr. 1899	Second class
22. 1900	Schloesser, Robert	19 May, 1900	First class
23. 1900	Nicholls, Charles Berres- ford	19 May, 1900	First class
24. 1900	Sale, William Robert	19 May, 1900	Second class
25. 1900	Williams, Richard	19 May, 1900	Second class
26. 1900	John McPeake	1 Aug. 1900	First class
27. 1901	Sawyer, Basil	20 Feb. 1901	First class

## CERTIFICATES of Competency—continued.

No. of Certificate.	Name.	Date of Certificate.	Class of Certificate.
28. 1902	Provis, John	22 Apr. 1902	First class
29. 1902	Bird, Robert Chisholm	22 Apr. 1902	Second class
30. 1902	Briggs, William Albert John	22 Apr. 1902	Second class
31. 1902	Bartlett, William Henry	22 Apr. 1902	Second class
32. 1902	Phoenix, William	22 Apr. 1902	Second class
33. 1902	Wright, Herbert E.	22 Apr. 1902	Second class
34. 1902	Craze, John	30 Apr. 1902	Second class
35. 1903	Waller, Richard Fitz- arthur	5 May, 1903	First class
36. 1903	Brickhill, Hector Gordon	5 May, 1903	First class
37. 1903	Barker, Reginald Fredk.	5 May, 1903	First class
38. 1903	Vincent, Thomas Henry	5 May, 1903	First class
39. 1903	Crittendon, James Henry	5 May, 1903	First class
40. 1903	Weston, Eustace Moriarty	12 Aug. 1903	First class
41. 1903	Clark, Lindesay Colin	31 Aug. 1903	First class
42. 1904	Martin, Edward Patrick	17 Feb. 1904	First class
43. 1904	Herman, Hyman	29 Apr. 1904	First class
44. 1904	Murray, Russell Mervyn	29 Apr. 1904	First class
45. 1904	More, George Allan	14 Oct. 1904	First class
46. 1905	Beamish, William Abra- ham	3 Jan. 1905	First class
47. 1905	Andrews, Thomas J.	1 May, 1905	Second class
48. 1905	Hitchcock, William E.	1 May, 1905	First class
49. 1905	Smith, George Oliver	18 July, 1905	First class
50. 1906	Rockett, Hildreth Peyton	23 Apr. 1906	Second class
51. 1906	Hales, Richard Chilman	23 Apr. 1906	Second class
52. 1906	Debenham Arthur John	28 June, 1906	First class
53. 1906	Coote, Charles Edward	18 Oct. 1906	First class
54. 1907	Marks, Oscar Sidney	8 Mar. 1907	First class
55. 1907	Phelan, Bernard Fredk.	23 Apr. 1907	Second class
56. 1907	Moline, Arthur Howard Pritchard	23 Apr. 1907	First class
57. 1907	Macartney, Ross Kenneth	23 Apr. 1907	First class
58. 1907	Williams, Thomas James	8 May, 1907	First class

## REPORT OF THE GOVERNMENT GEOLOGIST.

Government Geologist's Office,  
Launceston, 31st December, 1906.

SIR,

I HAVE the honour to present my Report as Government Geologist for the year ending 31st December instant.

During the year I have prepared the following geological reports:—

1. On Mathinna Goldfield, Part I., 29th March, 1906.
2. On Mathinna Goldfield, Part II., 27th August, 1906.
3. On Cox's Bight Tinfied, 5th December, 1906.
4. On Renison Bell Tinfied, 18th December, 1906.

### *Mathinna Field.*

This important field, containing the deepest gold mines in the State, was visited three times, and its structure very carefully examined. The large reef at the New Golden Gate, the premier mine of the district, although continuing as a powerful body of quartz to below the 1600-foot level, has gradually fallen off in value, and the geological investigation of the reef features therefore assumed a considerable degree of importance. The conclusions arrived at were that capital may be expended advantageously in exploring at the 1600-foot level, and in resuming the sinking of the main shaft, to prove the reef at a still greater depth. This is now being done.

The important adjoining deep mine, the Tasmanian Consols, was also examined, and abundant reasons disclosed for further sinking and vigorous reef exploration and development of the mine. Shaft-sinking here is now also down to 1600 feet.

There are several partially developed mines at Mathinna, at which work has been abandoned for one reason or another, but which are nevertheless fair exploring propositions. If the New Golden Gate and Tasmanian Consols owners meet with success in their present exploratory policy, there is no doubt that the whole field will receive a powerful stimulus, and work be resumed at many of the mines now idle.

There is no sound reason for pessimism with regard to the district, for the quartz reef formations at the several mines are not mere haphazard, exceptional occurrences, but are the result of a great physical process, the evidences of which may be seen continuously all along a line from Mangana to Mt. Victoria, and apparently still further north.

This great gold quartz line is a permanent structural feature of the island, and its conservation for mining purposes should be jealously watched and secured, for within its limits mining for the precious metal may be expected to persist for a quite indefinite period.

*Cox's Bight Tinfield.*

I visited this little-known field in September. It is on the shore of a broad bay on the South Coast of Tasmania, about 12 miles from South-West Cape.

Alluvial tin-mining is proceeding on the property of the Cox's Bight Tin Mines, N.L., where there are terraces of wash yielding between 1 and 2 tons of tin ore per cubic yard. The tin is derived from quartz and greisen veins intersecting granite hills, which form the southern termination of the Bathurst Range.

Below the terraces are extensive alluvial flats, which have not been bottomed. The Kent Tin P.A. have a large area of lagoon flats, which it is intended to prove by bore-holes before placing any machinery on the property. This comparatively small granite area is surrounded by ancient quartzites and schists, which are in places intersected by mineral veins. They belong to the Port Davey series of rocks, in which district copper and antimony ores are known to occur. When this remote part of the country is better known and opened up, it is probable that discoveries of importance will be made. Means of overland communication are urgently required.

*Renison Bell Tinfield.*

I paid a visit to this field in December. Tin ore is found in the North-East Dundas district over an area of 3 miles long by about a mile or so in width. The sedimentary rocks have been penetrated first by basic eruptions and then by intrusions and dykes of granitic origin, the tin ore being casually connected with the latter. The detrital ore is tin oxide, and the lodes are either quartz-cassiterite or pyritic. Many large nuggets of ore have been found, weighing several pounds, and occasionally even huge boulders. One of these boulders from the Gormanston property, weighing 19 cwts., and assaying 58.7 per cent. metallic tin, is on view in the Tasmanian Museum, Hobart. It is estimated that the district has produced between 200 and 300 tons of tin ore, and mining at the present time is exceedingly active there. The Renison Bell property possesses some large pyritic lodes, and detrital tin ore deposits of considerable value. A scheme of developing and working these is being devised by the owners. Neighbouring properties are being worked, and others prospected, with the result generally of showing that the tin-bearing formations are more numerous and better than hitherto supposed.

*Visit to Lisle Goldfield.*

I paid a departmental visit to this field in June, in connection with applications for purchase of land within the Mineral Reserve. This was at one time the most productive alluvial field in Tasmania, and has yielded at least 80,000 ozs. of gold. At present only 20 to 25 ozs. per month are being won.

It has always been a puzzle where the great accumulations of gold came from, as the usual gold quartz reefs are absent. Very few stones of gold-bearing quartz have been found, and where quartz has been adherent to anything, sandstone has been the matrix. Soft granite bed-rock underlies the basin and rises up the slopes of the surrounding hills, and occasion-

ally small veins  $\frac{1}{4}$  to 1 inch or 2 inches in thickness of quartz, kaolin, and gold-bearing manganiferous iron oxide are met with in it. Such veins may have contributed to the general output, but a good deal of the gold originating in the field itself possibly came from the contact of the granite with the sandstone higher up the sides of the valley. The gold is usually fine, and the wash clayey. The stones are not much water-worn, and consist chiefly of sandstone from the surrounding hills, chalcedonised quartz, which has been released from the granite, and pieces of reef quartz. Quartz wash is not very abundant; clay and sandstone gravel appears in most of the terraces. A narrow gorge in slate forms the present outlet to the Lisle basin, but this outlet must be of modern date, formed subsequently to the deposit of the gold-bearing clays, some of which are below the level of the rocky bar at the entrance to the gorge. The width of the belt which has been worked is about 200 yards, so that the features are more those of a lake than of a gutter. At the same time certain runs are better for gold than others. The granite floor is perhaps a couple of miles wide. Terraces of alluvial occur at different heights up the surrounding hills, on the west as high as 300 feet and upwards, and the existence of a saddle on the hill crest on the west side opposite the township has suggested a local theory of the outlet having formerly been in that direction. The largest nugget found is said to have weighed 15 dwts. Other pieces have weighed from 1 to 2 dwts. The field deserves study and examination, with a view of locating the source of the gold, if possible.

#### *Progress Reports.*

Four of these have been prepared during the year. They show the output of mineral from the different mines in each district each quarter, and the value of the same, as well as the number of men employed. The obligation to furnish these statistics within fifteen days after the end of each quarter is imposed on mine owners and mining managers by "The Mining Act, 1905." It necessarily takes some time to collect them from remote parts of the State, and further time to compile the reports, but these have been prepared, as a rule, with tolerable regularity. However, sometimes their publication has been late, owing to subsequent delay in another quarter.

Mining information is earnestly solicited from legal or mining managers, prospectors, and all who are interested in disseminating knowledge of the mineral resources of the State. These reports are much sought after abroad, and are mailed regularly to institutes, mining engineers, and investors in different parts of the world, and from statistical publications which reach this office from time to time, it is evident that our reports are of use. Any definite suggestions for their improvement will be welcomed, and carefully considered.

#### *Office.*

In addition to the four geological reports and four progress reports issued during the year, correspondence consisting of 2493 letters, packets, &c., in and out, have been attended to.

A small collection of rocks was received from the Imperial Museum, Vienna, and individual specimens have been received

from Messrs. G. R. Bell, W. R. Bell, W. F. Petterd, Aug. Simson, and Dr. Thompson.

Numerous examinations have been made of gems and supposed gems, which have probably been submitted in consequence of the discovery of a diamond in Harvey's Creek, Donaldson Range. This small diamond,  $\frac{1}{2}$  of a carat, was found in washing for gold in the creek, but though others were found in the same district as far back as 1894, prospecting has not revealed any more.

Mr. F. S. Grove has been acting as engineer to the Mt. Cameron Water-race Board since 31st March, and consequently has been absent from the office from that time. To meet the requirements of the office, Miss R. E. Higgs was appointed shorthand writer and typiste on the 26th March, under the temporary employment section of the Public Service Act, and has discharged her duties satisfactorily.

#### *Government Drills.*

The diamond drills were not used this year. The alluvial boring plant was hired out on 27th March to Mr. H. Mackay, for testing ground in the Stanley River district.

#### *Assays and Analyses.*

The retrenched lines on which the Government Analyst's branch is being carried on has caused useful work to remain in abeyance. Under the circumstances, very few samples have been forwarded for assay. Inconvenience is caused thereby in several ways. In the first place, I am precluded from taking as many samples as I could wish of lodes and lode-formations on my visits to mineral fields. Then many specimens are brought to me by prospectors and others, concerning which useful information cannot be given without analytical tests. Again, no research work is possible under present conditions. Some of our ores and rocks require complete analysis, in order to determine what they really are.

The want of a standard analyses makes it impossible to publish definite statements and determinations, and places the geological branch at a disadvantage compared with other countries. For these reasons I should be glad to see the Government Laboratory made available for the work with which I could supply it almost continuously.

#### *Geological Survey.*

I touched upon this subject in a former report, and the reasons for initiating this which existed then hold good with increased force now that our industry is justifying the predictions which have been continuously made by the officers in charge of the geological branch of your Department. To initiate a survey on a modest scale would mean an expenditure of from £1000 to £1500 annually; but for that outlay, what was done would be well done. A surveyor and two men (with geological supervision and camp expenses) continually at work for the greater part of the year would cost about £30 weekly, and would survey a square mile or two per week in our usual bush country. This would be equivalent to £20 to £30 per square mile.

There are many mining fields on the West Coast which are in urgent need of such a survey, and which would very soon reimburse the State for the outlay. As instances, I would mention the West Coast Range, from Mt. Darwin to Mt. Farrell, the Dundas field, the Meredith Range, Mt. Balfour, and there are others.

An improved geological sketch map of the State is now almost a necessity, and it is highly desirable to adopt measures to collect information, and supplement that already in hand.

*Bulletins.*

For some time past I have recognised the desirability of issuing publications of this description, giving all the information available concerning the occurrences of the respective economic minerals of the State in a concise and useful form. A series of such bulletins, covering in turn the occurrences of iron, gold, copper, lead, tin, wolfram, asbestos, &c., would, I am convinced, be of considerable use to the prospector and investor, as well as to the Department itself. Want of assistance has prevented me from carrying out my intentions in this respect, but as soon as this drawback is removed I purpose making a start.

I have the honour to be,

Sir,

Your obedient Servant,

W. H. TWELVETREES,  
Government Geologist.

W. H. WALLACE, Esq., Secretary for Mines, Hobart.

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## REPORT OF THE CHIEF INSPECTOR OF MINES.

Chief Inspector of Mines' Office,  
Launceston, 31st December, 1906.

SIR,

I HAVE the honour to submit my Report on the inspection of mines during the year ending 31st December instant.

The appended statistical tables and diagram furnish information respecting the number and nature of accidents which have occurred at the mines and works attached thereto during the twelve months.

I beg to supply annual reports by the Inspectors of Mines, viz.:—Mr. M. J. Griffin, for the Northern and Southern, Eastern, and North-Eastern Divisions; Mr. James Harrison, Inspector of the Western and North-Western Divisions; and Mr. C. H. Curtain, Inspector for the Lyell District.

The number of persons employed this year in and about the mines and smelting works was 7004. The cases of fatal injuries were 4; and non-fatal serious injuries were 61. The death rate from accident was 0·57 per thousand, compared with 1·06 per thousand in 1905.

This ratio is the lowest that has yet been recorded in Tasmania. The appended diagram shows strikingly the improvement which has been attained in this respect in recent years, the death ratio per thousand prior to 1899 being for the most part higher than 1·5, and since that time always lower than that figure. On the other hand, the non-fatal accidents registered have been more numerous than usual, partly perhaps in consequence of increasing strictness in recording them, and partly, in all probability, owing to the increased pressure and magnitude of work at some of our larger mines. Thus, 15 out of the 17 accidents recorded in the Northern and Southern Division occurred at one mine; and on the West Coast one company figures for 18 casualties out of 33 occurring in the Western Division.

The individual reports on accidents which have been furnished by the Inspectors show that careful investigation has been made in each case, and they have been subjected to serious consideration by myself. I may mention that I am devoting increasing time and attention to the numerous matters constantly arising in connection with the regulation of mines. The work of the Inspectors has been materially increased, in consequence of the new Mining Act. It has taken some time and trouble to impress mine owners and managers with the urgency of the new working rules and provisions. In some instances there has been an unwillingness to appreciate them, and the Inspectors have had to overcome a silent and persistent opposition as tactfully as possible. I wish here to mention the satisfactory manner in which all the Inspectors have discharged their duties.

The Inspectors are giving special attention to the subject of underground ventilation, which so intimately affects the

health of the miners, and their reports deal with the matter in detail. On the whole, the ventilation and sanitation of our mines are fairly good; one or two exceptions as regards ventilation are engaging attention, and a remedy is being sought.

In one or two respects the necessity has been disclosed for amendments of the Act. One of these is that all lessees should be subject to Part VIII., which is the part of the Act dealing with the working and regulation of mines. The administration of varying rules and regulations under different Acts in one and the same district is excessively difficult, and imposes needless tasks on the Inspectors. Another is in connection with the duty placed on the mining manager of reporting the return to work of persons sustaining accidents which seem to be merely trivial. What is required is simply that their non-return within a stipulated time (fourteen days) be notified to the Inspector. It is only to be expected that in the working of such a comprehensive Act modifications of the working rules will suggest themselves from time to time.

With a view of checking gold-stealing, by making it more difficult to dispose of stolen gold, I venture to suggest for your consideration the initiation of legislation making it unlawful to sell or consign gold otherwise than through bankers, such bankers to furnish periodical returns of purchases or consignments of gold.

I have the honour to be,

Sir,

Your obedient Servant,

W. H. TWELVETREES,  
Chief Inspector of Mines.

W. H. WALLACE, Esq., Secretary for Mines, Hobart.

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Diagram showing the ratio of fatal accidents  
in mines in Tasmania.

Rate per 1000 men employed.



*Photo-ographed by John Vail Government Printer Hobart Tasmania*

5 cm

TABLE showing Rate per Thousand Killed and Injured in the different Divisions for the Year 1906.

Period.	Division.	Average number of men employed.	Number of Accidents.	Number of Persons.		Total number Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
				Killed.	Injured.			Killed.	Injured.
1 Jan. to 31 Dec., 1906	Northern and Southern ...	887	17	1	16	17	19.165	1.127	18.038
	Ditto North-Western...	524	1	Nil.	1	1	1.908	Nil.	1.908
	Ditto North-Eastern .....	818	5	1	4	5	6.113	1.222	4.889
	Ditto Eastern .....	681	9	1	8	9	13.215	1.468	11.747
	Ditto Western .....	4094	33	1	32	33	8.060	0.244	7.816
		7004	65	4	61	65	9.20	0.57	8.70

Analysis of Statistics for the Western Division.

Division.	Average number of men employed.	Number of Accidents.	Number of Persons.		Total Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
Mount Lyell .....	2424	24	—	24	24	9.90	—	9.90
Zeehan, &c. ....	1670	9	1	8	9	5.38	0.59	4.79
Total .....	4094	33	1	32	33	8.06	0.24	7.81

TABLE showing the Number of Persons Killed and Injured in and about the Mines of Tasmania during the Year 1906.

PLACE OR CAUSE OF ACCIDENT.	INSPECTION DISTRICTS.												TOTAL.	
	Northern and Southern Division.		North-Eastern Division.		Eastern Division.		North-Western Division.		Western Division.					
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Zeehan and other Districts.		Lyell District.		Killed.	Injured.
UNDERGROUND—														
Falls of Ground .....	...	3	...	...	...	1	...	...	...	2	...	2	...	8
<i>Shaft Accidents—</i>														
Machinery .....	1	...	...	...	...	...	...	...	...	1	...	...	1	1
Things falling down shafts .....	...	2	...	...	...	1	...	...	...	...	...	...	...	3
Buckets .....	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Lowering material .....	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Falling down passes .....	...	...	...	...	...	...	...	...	...	...	...	3	...	3
Total .....	1	4	...	...	...	1	...	...	...	1	...	3	1	9

<i>Miscellaneous (underground).</i>	...	...	...	...	...	...	...	...	...	...	2	...	2	
Haulage—														
Trams, &c. ....	...	3	...	...	...	...	...	...	...	...	1	...	4	
Explosives .....	...	...	...	...	...	1	...	...	...	...	...	...	1	
Total .....	...	3	...	...	...	1	...	...	...	...	3	...	7	
<i>Total underground . . .</i>	1	10	...	...	...	3	...	...	3	...	8	1	24	
<b>ON SURFACE—</b>														
Smelting Works .....	...	...	...	...	...	...	...	...	3	...	11	...	14	
Machinery .....	...	2	...	...	...	...	...	...	1	...	...	...	3	
Falls of ground.....	...	1	...	2	...	...	...	1	1	...	1	1	5	
Falls of stone.....	...	...	...	...	...	1	...	...	...	...	...	...	1	
Tramways .....	...	1	...	...	1	1	...	1	...	...	1	1	4	
Explosives .....	...	...	...	...	...	1	...	...	...	...	1	...	2	
Dredges .....	...	...	1	...	...	...	...	...	...	...	...	1	...	
Fall of Trestles .....	...	...	...	1	...	2	...	...	...	...	...	...	3	
Chemical works.....	...	1	...	...	...	...	...	...	...	...	...	...	1	
Miscellaneous.....	...	1	...	1	...	...	...	...	...	...	2	...	4	
<i>Total surface .....</i>	...	6	1	4	1	5	...	1	1	5	...	16	3	37
<b>GROSS TOTAL .....</b>	1	16	...	4	1	8	...	1	1	8	...	24	4	61
<b>Total during 1905.....</b>	3	13	...	3	...	3	...	...	1	5	3	6	7	30

*COMPARATIVE Table of Statistics of Accidents in and about the Mines of Tasmania from 1st July, 1892, to 31st December, 1906.*

Period.	Number of Miners employed.	Number of Accidents.	Number of Persons.		Total killed and injured.	Average per 1000 killed and injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
1 July, 1892, to 30 June, 1893	3295	28	4	25	29	8·8001	1·214	7·586
" 1893 " 1894	3403	25	7	20	27	7·934	2·057	5·877
" 1894 " 1895	3789	26	4	24	28	7·390	1·058	6·332
" 1895 " 1896	4160	22	7	16	23	5·529	1·682	3·847
" 1896 " 1897	4303	36	7	31	38	8·831	1·627	7·204
" 1897 " 1898	5530	36	13	33	46	8·318	2·351	5·967
" 1898 " 1899	6180	35	9	34	43	6·957	1·456	5·501
" 1899 " 1900	6834	19	7	16	23	3·365	1·024	2·341
" 1900 " 1901	7017	29	8	23	31	4·417	1·140	3·278
" 1901 " 1902	6438	38	7	35	42	6·524	1·088	5·437
" 1902 " 1903	6484	44	6	43	49	7·557	0·925	6·632
" 1903, to 31 Dec., 1903	5604	27	8	20	28	4·977	1·428	3·569
1 Jan., 1904 " 1904	6192	73	9	65	74	11·951	1·454	10·497
" 1905 " 1905	6586	34	7	30	37	5·618	1·063	4·555
" 1906 " 1906	7004	65	4	61	65	9·280	0·571	8·709

## REPORTS OF INSPECTORS OF MINES.

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MR. INSPECTOR GRIFFIN (stationed at Launceston) reports :—

I have the honour to submit my annual report on mines inspected in the Northern and Southern, North-Eastern, and Eastern Divisions during the year ending 31st December, 1906.

*Accidents.*—Three fatal, and 28 non-fatal accidents have been reported and recorded during the year. Of the non-fatal accidents, some 15 or 16 were of a serious nature, such as broken limbs, severe cuts on head, bruises and contusions on body; also burns from explosions in 2 cases. The remaining 12 accidents could be considered serious only by their coming within the definition of "Serious"—enforced absence from work for fourteen days—as set forth under Section 181 of the Act. As a matter of fact, this fourteen days' absence from work does not always indicate that such absence is altogether caused through the injuries received. Men very often take advantage of their apparently enforced absence through accident, and go about other business, or take a holiday, knowing that their place on the mine will be kept open for them. It is impossible for the managers to keep the run of every man who leaves after, perhaps, some trivial accident, and say whether the absence of fourteen days is due to the injuries received or not. He has, nevertheless, to report the accident as serious if the man does not return before fourteen days have elapsed. Cases are known where the doctor has pronounced the injured person fit to return to work, yet he had not returned to his place on the mine for several days afterwards.

*Fatal Accidents.*—William Anderson, a young man, single, was employed at the Ringarooma Company's bucket-dredging plant, and was filling barrows and otherwise assisting to get gravel ballast aboard the barge, when, on walking forward on the barrow-plank to trim down the heap of gravel on the barge, and having thrust his shovel into the heap, he lost his balance, and fell into the water, immediately disappearing beneath the sloping end of the barge. Some thirty minutes elapsed before the body could be recovered; life, of course, was extinct. No person was to blame for this unfortunate occurrence, which was purely accidental. It was after nightfall, but the place was well lighted by electricity.

William Cairns, a young married man, was employed at the 400-feet in the capstan division of Hart's shaft, at the Tasmania Gold Mine, landing and tipping trucks of material for making concrete, which was being hoisted from the 900-foot level. The catches in some way got damaged, probably through not being fully open to allow the ascending cage to pass through. Cairns, instead of reporting the matter to the proper authority, and getting the necessary repairs effected by the men whose duty it was to attend to such things, set about the work himself, first having signalled the cage up some 8 feet above the flat, where it was suspended for the time being. He succeeding in getting some of the bolts out

of the catch-gearing, and whilst stooping to get at the other parts was struck by the descending cage, sustaining a very severe wound on the chin, also fracture or breaking-out of portion of the lower jaw-bone, with 4 teeth. He was attended by Dr. Johnson, who removed the fragment of broken jaw and teeth, and ordered Cairns' removal to the Launceston Hospital, where he was received on the following day, and where he died five days later. The body was taken back to Beaconsfield, and a *post-mortem* made by Dr. Gmelin, who gave a certificate attributing the cause of death to septic pneumonia. The coroner's inquest in this case lasted seven days, a lot of evidence being taken, principally in connection with the Beaconsfield doctor's treatment of Cairns immediately after the accident occurred. The jury gave a verdict, "That William James Cairns met his death at the Launceston General Hospital on the 9th day of June, 1906, from suffocation and septic pneumonia, resulting from an accident received at the Tasmania Gold Mine, Beaconsfield, on the 4th day of June, 1906," but could not agree as to the cause of the accident, or whether any person was to blame for it. Subsequently, action was taken against the Tasmania Company by the widow of the deceased to recover damages for the loss of her husband, through alleged carelessness on the part of the Company's enginedriver, who, it was said, lowered the cage without having received a signal to do so, or allowed the cage to creep, it being held by steam without the application of the brake. The jury gave a verdict awarding Mrs. Cairns £500 damages, they being of opinion that the cage was allowed to creep. Against this decision the company has now appealed to the Full Court, on the grounds that the verdict is opposed to the evidence of several expert witnesses, who gave it as their opinion that it was quite safe to hold the cage with steam, and that no creep took place. In this latter opinion I entirely concur. The enginedriver may possibly have lowered the cage without getting a signal, but from tests made, and from the construction of this capstan engine, with its multiple gearing and regular steam supply, I am satisfied that no creep took place. Cairns alone was, in my opinion, to blame for the accident that caused his death.

William Nichols, aged 58, married, was employed at the Cornwall Colliery, at surface-work. He placed a packing-box used for galvanised iron on the top of two skips loaded with coal, for the purpose of getting it down to the bottom of the self-acting incline tramway. Having lashed the box with a rope tied down to the drawbar between the skips, he got on to the hindmost skip of the set, standing with one foot on the buffer and the other on the drawbar. When the set of loaded skips had almost approached the passing-place, about half-way down the line, the brakesman, Wm. Bullock, from his position at the top of the incline, noticed that Nichols was handling the end of the box, which appeared to be slipping to the side on which the set of empty skips would pass, and fearing a collision he suddenly applied the brake and stopped the set. Nichols was thrown off, and was found a few minutes afterwards on the side of the line about 10 feet back from the skip on which he was riding. He was sensible when picked up, but it was evident that he had received severe injuries

about the region of the liver and pit of the stomach. He was removed to the Launceston Hospital, where he died two and a half hours after being admitted, or twenty-five and a half hours after the accident occurred. At the inquest the jury returned a verdict, "That deceased met his death accidentally on the self-acting tram at the Cornwall Company's Mine, whilst riding on a skip, through the sudden application of the brake by the brakesman, while trying to avert an accident." I quite concur with this decision as to the cause of the accident. The sudden application of the brake would have the effect of jerking the rope and lifting the last skip off the rails, and at the same time breaking the box across the middle where the rope lashing passed over it. Half of this box was found on the ground near where Nicholls was lying; the other half was still on top of the second coal skip. There was no printed or written regulation on the mine prohibiting persons from riding on the skips loaded or empty; nevertheless it was known and understood by the brakesmen and employees generally that they would not be allowed to ride on the self-acting incline. Some blame is attachable to the brakesman, Wm. Bullock, for having allowed Nichols to ride on the skips, but having done so, he could not be blamed for suddenly applying the brake to avert what he believed to be an impending collision with the box on the loaded skips and the empty skips coming up on the other side. The deceased was, on a previous occasion, warned by the brakesman that he must not ride on the skips, but being an old hand at the colliery, and a man of a rather obstinate disposition, he did not heed the warning.

*Serious Accidents.*—Ernest Page, age 23, single, was working a knocker line at the bottom of Grubb's shaft (Tasmania Mine), when he was struck in the eye. Subsequently he went to the Launceston Hospital, where the doctors found it necessary to remove the injured eye. Three months later he returned to work at the mine.

Oscar Radcliffe, age 25, single, was employed in the sluicing-face of the Mutual Hill Tin Mine. A fall of earth took place, and he was caught by a large boulder, which rolled over him. He sustained severe bruises about the hip and ankle, which caused him to become an inmate of the Launceston General Hospital for several weeks.

Thomas Hall, age 23, single, was employed driving a heading in the Sandfly Colliery. There was some slight faulting of the seam, which caused a "canch" of stone to rise in the floor. Short props were used on one side, and proper care was not taken to secure the ground when these were being replaced by the full-length timber. Hall and his mate had just commenced work, when they noticed signs of insecurity in two sets. They had scarcely set about remedying this, when a heavy fall of the stone roof occurred. Hall was caught, and had his leg broken below the knee; also received a severe cut in the groin. His mate, Alf. Doran, escaped uninjured. Hall was conveyed to the Hobart Hospital. There was some lack of proper inspection of the place before the men went to work; this, coupled with their inexperience of dangerous ground caused the accident to Hall, which might easily have been avoided had he known how to set about his work properly.

Horace Spargo, age 15, was running a truck at the 1000-foot level, Tasmania Mine, when his foot was caught in tram rail, and the small bone of his left leg was fractured above the ankle. He was off work for seven weeks.

R. Kelly, age 50 years, married, employed at the Anchor Tin Mine, was riding on a truck hauled by a horse. The gearing became detached and the truck ran back. Kelly jumped off, and sustained a broken collar-bone.

James Dunstan, age 50, married, was assisting to lift a long cap into position in one of the stopes in the Tasmania Gold Mine; a large fall of quartz suddenly took place close at hand. All the other men escaped, but Dunstan was caught by rolling lumps of quartz, and had both his legs broken. He recovered from the effects of these injuries, but having caught a cold whilst lying in the Beaconsfield Hospital, died from pneumonia.

James H. Waters, age 62, married, was, with his mate, ascending on the bucket used at Lefroy shaft, Tasmania Gold Mine, when the swaying of the bucket brought his head in contact with a projecting stage-board. He sustained two severe cuts on the head, and it was seven weeks before he returned to work. The stage-boards referred to were at a place of refuge, to where the men were hoisted during blasting operations. They could easily have kept the bucket from swaying to the side had they taken ordinary precautions.

James Herrick, age 41, married, was charging a drill-hole at the foot of the open-cut face at the Anchor Tin Mine. A falling stone struck him on the head, inflicting a wound that caused him to be off work for four weeks.

Wm. Geo. Hodges, age 41, married, was assisting the sluicer on an elevated tail-race at the Transit Tin Mine, when a general collapse of the trestle-work and boxes took place. He sustained a severe shock and injuries to the back, which incapacitated him from work for over six weeks, the greater part of which time he was in the Launceston Hospital.

John Breen, single, was engaged as sluice-man at the Weldbrook Tin Mine. The trestling supporting the boxes gave way, and he fell with the boxes and sustained injuries to his back which kept him from work for some considerable time.

William Lucas, single, was charging and firing some blasting-holes at the Fancy Creek Tin Syndicate Mine. In spitting the fuse at one hole he carelessly ignited some loose grains of powder, which, in turn, caused the explosion of some 5 or 6 lbs. of powder in a keg close by. He received some severe burns on his hand and arm, and was off work for three weeks.

Joseph Hunkin, married, had a small bone of his left arm broken, caused by a stone falling down a pass he was emptying at the Tasmania Gold Mine. He was off work about five weeks.

Thomas Gordon Peden, married, was engaged shaft-sinking at the Tasmanian Consols Mine. He and his mate, Wm. Blair had fired some pops to make room for an opening set at the 1600-foot flat. They descended before the smoke had cleared away, and were standing on the frame-set when a large piece of rock fell from the side-wall about 8 feet up, and

brushing Peden knocked him into the well. He sustained a fracture of the leg-bone above the ankle. These men could not have properly tested the ground as they descended after firing, otherwise the faulty nature of the side-wall would have been noticed.

M. J. Breen, single, was engaged excavating in the open-cut at the Burnie Copper Mine. He eased a large boulder with his pick, which rolled on to his leg, breaking the small bone above the ankle. He was off work for four weeks.

J. Williams, married, stopping in the Tasmania Gold Mine, was easing a large lump of quartz, which came away, breaking a cap piece, and he fell about 7 feet, sustaining a nasty cut on his head and bruises on his leg. He had not returned to work at expiration of fourteen days from the date of the accident.

Robert Croft, jun., age 24, single, was charging a hole in a cross-cut at the Mangana (Tas.) Gold Reefs Mine, using a heavy copper tamping bar. He must have applied some force when pressing the first plug of gelignite home in a 20-inch hole, as it exploded. Croft received some rather severe burns on his right arm and a slight peppering of grit. Fortunately, the drill-hole was obliquely to the line of face, otherwise the consequences might have been serious to Croft, and to his mate, who was standing behind him.

The seriousness of the remaining 12 accidents can be estimated only from the time the men were off work, and this, as already stated, is not by any means reliable.

John Gentleman, Tasmania Gold Mine, crushed thumb; off work fourteen days.

Wm. Croft, Mangana Gold Reefs, cut on head, stone falling in shaft; four weeks off.

Wm. Goninon, Tasmania Gold Mine, cut on back of hand; off work one hundred and thirty-six days.

George Quinn, Briseis Mine, struck by falling beam; off work four weeks.

John Broad, Tasmania Gold Mine, cut finger; over fourteen days off work.

Frederick Barrett, Tasmania Gold Mine, thumb jammed; over fourteen days off work.

Frank Hudson, Tasmania Gold Mine, burned with sulphuric acid; off work twenty-four days.

Hector Hellesly, Tasmania Gold Mine, finger crushed; off work seventeen days.

Hugh Parish, Tasmania Gold Mine, thumb badly jammed; off work sixty-eight days.

Peter Bews, Tasmania Gold Mine, hand torn by hook; off work twenty-nine days.

George Williams, Tasmania Gold Mine, fingers crushed badly; off work over fourteen days.

Thomas Summers, Cybele Tin Mine, bruises about body; off work over fourteen days.

Of the foregoing accidents, two out of the three fatal ones were due solely to the incautiousness and non-observance of rules on the part of the men themselves; the other, the death of Anderson by drowning was purely accidental, and no person is to blame. It is a coincidence that the accident list,

both fatal and non-fatal, for the past year is exactly the same as for the preceding year, 1905. I am glad to be able to state, however, that more of the accidents for the past year come under the heading of what might be termed "unavoidable," than hitherto. This shows that more care is being exercised both by managers and men.

*Accidental Explosions.*—Two cases were reported. The first of these was at Fancy Creek Tin Mine, and the cause was not far to seek. William Lucas carelessly threw down a match when spitting fuse and ignited loose powder in a keg close by. The second, however, is not so easy of explanation as to the real cause of ignition. Robert Croft set about charging holes in the face of a cross-cut drive at the 800-foot level in the Mangana Gold Reefs Mine. He placed the first plug of gelignite in a hole 20 inches deep, and pressed it home with a copper tamping-bar, 3 feet 6 inches in length, and weighing 6 lbs. As far as can be ascertained, the hole was of less diameter near the bottom than at the collar. A 2-inch vein of quartz had been bored through a few inches from the bottom, and with the use of a worn drill contraction of the hole would be likely to take place. Croft admits having used some force (a blow, probably) when the plug was near the bottom; and it exploded, sending the bar with great force diagonally against the side-wall. The gelignite (Nobell's) in use at the mine when the accident occurred was found to be in good order. As to the actual cause of the explosion, I am of opinion that the cartridge jammed in the hole, and that compression of the imprisoned air beneath it, causing a rise of temperature, would be sufficient, under the blows of a heavy tamping-bar, to cause an explosion. Premature explosions have been known to occur in this way. A similar explosion to this one occurred at the Volunteer Consolidated Extended Mine, Mathinna, a few years ago. A wooden tamping-stick was being used in this instance; the first cartridge stuck in the hole a foot or so from the bottom, force was used and an explosion occurred, causing rather serious injury to the man charging the hole. In this case it is possible that the walls of the hole got smeared with a thin coating of gelignite, as the cartridge was forced down several inches before the explosion occurred, and that friction of a dirty tamping-stick may have caused the accident.

Under our new Mining Act, 1905, First Schedule, Rule IX., wooden rammers only are allowed to be used when charging nitro-glycerine explosives. In the Mangana accident, however, no breach of regulations was committed by manager or men, as the company happens to be one of the very few mine owners who availed themselves of Section 5, Sub-section 1, of the new Act, 1905, and elected to hold its leases subject to the Act under which they were issued. This being so, they were working under and subject to rules and regulations of an old Act, which allowed the use of a copper tamping-bar when charging any kind of explosive.

*Accidents to Machinery, &c.*—At the Tasmanian Consols an accident occurred through the breaking of the bed-plate of the old air-compressor engine. It is supposed that a spanner was accidentally allowed to slip in between the end of the cylinder and the cross-head of the piston-rod. A new air-

compressor was being fitted up at the time, and this was finished and got to work without much delay, but unfortunately it did not run long before it broke down. It appears that some mistake was made by the makers; a recess that was not wanted in the inside of the cylinder being filled by a loose plate or piece of iron, which, getting loose, fell so as to come between the piston and cylinder-head, resulting in a complete smash of the latter.

At the Tasmania Mine, in June, the hoisting-rope, with timber shackle attached, was being lowered in the Lefroy shaft, with steam-winch out of gear. The key in the foot-lever of brake jarred out of place, rendering the brake useless; the rope uncoiled off the drum, shearing the knot at end, and fell down the shaft to a depth of 500 feet. Fortunately no damage was done, nor was anyone injured, the men employed retimbering below escaping without injury.

The collapse of about 50 yards of high trestle-work and sluice-boxes at the Transit Tin Mine was not reported by the manager for several weeks after its occurrence. Two men were injured, one slightly and one seriously. Proceedings were about to be taken against the mine manager for not reporting the accident forthwith, but as it was found he had suddenly taken his departure for Victoria, and that the mine had shut down, action was not proceeded with.

At the Weldbrook Tin Mine an accident in every way similar to that of the Transit Mine occurred to the trestle-work and boxes. One man was injured, but this accident was promptly reported. In both cases defective construction was the cause. The foregoing are the only machinery or plant accidents which were reported or recorded in the mine-book of any of the mines under my supervision.

Ropes, chains, shackles, buckets, and shaft-gearing generally, have been inspected, and condemned where found defective. The smaller mines give more trouble in this direction than the larger ones. In the former, 4 windlass-ropes, 1 bucket, and several hooks had to be condemned.

Safety-cages have been tested at regular intervals, generally by the mine manager, whose duty under the new Act it is to do so once in every two months. The inspector is not required by the Act to test cages, nevertheless I do test them on the occasion of each visit, unless the mine test had been made a few days prior to my arrival. Testing cages from the drum, as required by Section 41 of First Schedule of the Act, 1905, has not been found to work very well; to ensure that the safety-grippers shall do their work effectively, should the rope break at the drum, requires a nice adjustment of the springs, together with good skidways of uniform gauge, and a cage well hung. This is not so difficult of accomplishment where speed of winding does not exceed 800 feet per minute, but for faster winding, up to 2000 feet per minute, there is danger of the grippers or safety appliances, through oscillation, over-sensitiveness of springs, and close running, acting when not required to, and causing damage to the cage and rope, and, perhaps, machinery. The Tasmania Gold Mining Company objected or protested against being compelled to have its cages tested in this way, giving as a reason that they anticipated damage to the shafts, buildings, machin-

ery, and winding-ropes, either in making the test, or as a consequence of close-gearing, and sensitive springs arresting the cage when running at a high rate of speed. Tests made by me elsewhere, notably on the New Golden Gate and Tasmanian Consols mines respectively, showed that, although the grippers could be made to work effectively, overcoming the back-drag of rope from the pit-head pulley to the winding-drum, there was still danger of their coming into operation when not required, and thereby causing accident. It was, therefore, deemed advisable to have the last sentence of Rule 41 altered to read, "cages to be tested from the shackle or from the drum, as an inspector directs," and on the recommendation of the Chief Inspector of Mines, His Excellency the Governor was pleased to make this alteration, which came in force on the 2nd day of August, 1906.

*Compliance with Rules and Regulations.*—On the whole, I cannot say there is any marked improvement in this direction, especially so with regard to both managers and men in the majority of the smaller mines. As far as the owners of some of these are concerned, the managers' excuse for defective equipment is that there is not any money available to get what is required. As for the men, they are not, I am sorry to say, as careful as they should be. Especially is this the case with regard to the handling of explosives; that more accidents do not happen cannot be attributed to the care taken by some men. In the early part of the year two men employed winze-sinking at the 1600-foot level, New Golden Gate Mine, left two plugs of gelignite and some loose caps in the bottom of the winze. At change of shift these were found by men of the relieving shift, and the matter was reported to the manager, who promptly "sacked" the offenders. At the same mine, later on, I found several primers with caps and fuse; also a box of gelignite quite close to the face where two men were working, filling a truck with mullock. The only excuse they offered was that they fired one round of holes, and on returning brought the explosives along with them to charge another set of holes already drilled; but instead of doing this at once they proceeded to truck out the stuff broken by the first round of firing. I would have recommended prosecuting for a breach of the Regulations in this case, only that the manager stated that the offenders were ordinarily careful men, and that he believed what they said as to being under the impression that they were doing no wrong in keeping the explosives by them until they had cleaned up and were ready to fire the remaining number of holes. These cases are illustrations of how careless some miners can be in handling and using explosives. Many other instances could be cited of carelessness of a similar nature, but in a lesser degree, in other mines. In the large mines there is, I am glad to say, an evident desire on the part of managers to comply with the provisions of the Act and Regulations, so far as is reasonably practicable. The men, too, in these mines are beginning to understand that it is to their mutual advantage to comply with the law so far as they are able. If in the smaller mines there is evidence of less care being taken, and a desire to ignore Government rules, it is, I think, mainly due to a want of

knowledge, and perhaps some opposition to new enactments or amendments in existing regulations. Too many prosecutions for offences against the Act are not desirable, and are to be avoided if possible; nevertheless, this means of enforcing compliance must be resorted to, unless there is an improvement in some quarters during the coming year.

*New Mines, New Mining Plants, Equipment, &c.*—In gold-mining, the new mines opened are but few. At Beaconsfield, the Beaconsfield P.A. started on alluvial, near the old West United quartz mine. A tunnel was driven and wash tapped, which was said to be of a good, payable nature. The tunnel passed through the eastern rim rock of what appears to be an extensive deposit of wash, but was not deep enough to bottom or reach the gutter. A shaft is now being sunk.

At the Bonanza Gold Mine, the erection of poppet-heads and a new steam winding-plant was almost completed at the end of the year. The shaft at this mine was sunk during the years 1904-5 to a depth of 600 feet. Haulage was effected by means of a horse-whim, and the men were required to ascend and descend by means of the ladderway. Our new Act, General Rule 22, provides that "safety-cages shall be provided, kept, and used for raising or lowering men in any shaft when and wherever required by an Inspector of Mines." Advantage was taken of this rule to compel the owners of the Bonanza to provide the steam winding-plant referred to. The obsolete practice of sinking by means of horse-whim to depths of over a couple of hundred feet, and requiring men to climb long flights of ladders, or ride on the bucket—a dangerous practice—could no longer be tolerated.

The Tasmania Gold Mining Company has during the year completed its magnificent pumping plant. The fourth unit on west side, at Grubb's shaft, was started on the 6th December, 1906, and like the eastern unit at the same shaft, is working smoothly, and lifting from the 1000-foot level. On the 25th June, 1906, an unusually heavy rainfall took place. Blythe's Creek overflowed the banks of the deviation channel constructed a few years ago to carry its waters past the limestone quarries in Dally's paddock, about 1 mile south by east of the mine. As a consequence of this overflow, and the disappearance of the whole volume of waters into the quarries, the mine became flooded. It was soon discovered that the two pumps (the old one at the main shaft, and the new one at Hart's shaft), working to their full capacity of about 4½ million gallons per day, could not cope with the ever-increasing inrush of water. Large tanks were put to use in the winding compartments in Hart's shaft, and another half-million gallons added to the daily outflow from the mine. Even this was not sufficient, and it was not until the eastern unit of the new pumps at the Grubb's shaft was started that the water could be controlled and eventually reduced in the mine. It had risen to a height of some 15 or 20 feet above the plat at the 818-foot level. Nearly 8,000,000 gallons per day were being pumped in August, and by October the 1st the water was lowered to the 900-foot level, on the 8th to the 1000-foot, and a few days later the men were in these levels, and down to the bottom level at 1100-feet by the 16th. Thus, for sixteen weeks had the surplus water, the result of the overflow of

Blythe's Creek, to be fought before things could be reduced to a normal condition. No hitch occurred, nor was there any interruption from first to last. Everything was well ordered and supervised; the engineers and pit-men performed their duties with skill and judgment, and the result attained reflects credit on the Mine Superintendent, Mr. C. F. Heathcote, and speaks well for the skill and efficiency of the staff and workers under his command. An inspection after the water was got out showed that the mine suffered but little damage from the flooding. Footwall drives constructed at the different levels to take the place of the lode-channel-drives, which were constantly giving trouble through crushing of the timbering, saved the situation this time.

At Mathinna, the Tasmanian Consols Gold Mine has during the year erected new poppet-heads, and installed powerful and complete winding machinery; also an air-compressor. The shaft has been sunk from the 1400 to the 1600-feet level. Mr. A. R. Canning, at one time connected with the management of the Wentworth Gold Mine, New South Wales, and more recently with South African mining, has been appointed general manager of the Tasmanian Consols Mine, and took charge early in November.

Things have been very quiet at the New Golden Gate Mine during the year. A readjustment of finances has, however, taken place, and the shaft is to be sunk a couple of hundred feet, or perhaps 400 feet below the 1600-feet level. This work was commenced early in December.

The Volunteer group of mines on this field has been shut down for a long time past.

Scott and Pickett and the Miner's Dream mines are still working.

The Mangana Gold Reefs Company has sunk its main shaft to 800 feet, and is now engaged crosscutting; also driving on a lode cut in the shaft.

In tin-mining, no new developments of importance have taken place.

The Cybele Mine, at Gladstone, has constructed a barge and centrifugal gravel pump for lifting the wash on the Mussel Roe fall side of its property, and is now engaged in the construction of a powerful steam pumping-plant on the Ringarooma River, about 1 mile above the Esk dam. The object of this is to supply water for sluicing by gravitation from the higher portions of its property.

The Mussel Roe Tin Mining Company is just about completing a head-race 20 miles in length, with an off-take from the Mussel Roe River, just below the intake of the Mt. Cameron Water-race, to bring water on to its mine on the river, 6 miles south-east of Gladstone. The same company has a considerable area of tin ground in the Aberfoyle country, north-east of Gladstone, and a long line of race is being constructed to bring water on to this ground from the Booby-alla River.

At the Blue Tier, the Mount Lyell Company has been carrying out extensive prospecting operations by means of trenching and shallow pit-sinking. The diamond-drills were introduced about 20th August, and have been used freely since that time; results, however, are not made known to the

public. The company has, in the course of prospecting, obtained considerable quantities of tin, which, in addition to the output of several tons per quarter obtained from the Cream Creek sections will materially lessen the cost of prospecting.

The Anchor Tin Mine, by dint of good management, has reduced the cost of mining and milling to such an extent as to show better results than hitherto.

The shutting-down of the Transit Tin Mine, near George's Bay, has added another to the list of failures in tin-mining in the State. This mine commenced operations early in the year. A plant, consisting of a centrifugal gravel-pump operated by a portable engine, was erected for the purpose of raising and treating wash from extensive flats on Constable Creek. The ground is shallow, from 3 to 10 feet. Good prospects were said to have been obtained by the original prospectors, and it was believed that the ground would give splendid results when worked with efficient machinery. The first plant was not powerful enough. Another boiler and a larger pump were obtained at considerable cost, and work was recommenced at the end of August. A few days running, and then a serious interruption occurred, caused through the collapse of about 50 yards of high trestle-work, together with the iron sluice-boxes it carried. The boxes were buckled and spoiled, and had to be replaced by wooden ones. The erection of these iron boxes was a mistake. A couple of months sluicing with the improved plant showed that the ground was not payable. A considerable area was sluiced over, and this included a number of prospecting holes supposed to be in some of the best ground, but the result, on the whole, was not favourable. The mine is now shut down. The collapse of the trestle-work was owing to defective bracing. I had to partly condemn this company's conserving dam, which was in a defective state, and to order that depth of water be reduced, and by-wash enlarged. Heavy rain fell before this could be carried out, and the dam was carried away, happily, without injury to anyone.

Of other new tin mines opened, the Togo may be mentioned. This mine is on Gilligan's Creek, about 3 miles from Avoca. The lode was discovered by Messrs. Trotter and Counsel, and a strong company formed a little over a year ago.

There are several lodes traversing the company's property. The principal one, and that on which most prospecting had been done prior to flotation, outcrops on the top of a spur west of the creek, and was certainly a good show, so far as could be seen near the surface. It was not, however, tested by the prospectors to any depth worth mentioning. Expert reports were obtained, and so well satisfied was the company with its prospects that it was decided to immediately erect a crushing and ore-dressing plant. The Abbotsford Creek battery and engine were purchased and brought on to the ground. In the meantime, extensive work was going on. A tunnel was being driven to cut the No. 1 lode 250 feet below the surface; a large dam was in course of construction, battery-site was being excavated; road-making and other preliminary work in hand; all of which meant a large expenditure of

capital. The tunnel was driven. The lode was cut, but it had pinched, and was not payable. The dam—a large one, 30 feet high—constructed on the creek to supply water to the battery, carried away. This is just what might have been expected; the thing was badly designed, and indifferently constructed. I saw this dam when it was just finished, and pointed out to the mine manager its defects, and that it could not be expected to resist a hydrostatic pressure of 30 feet. The Togo mine is now practically idle. Some prospecting is being done, but that is all.

The Mount Rex Mine has been working the alluvial tin during the year. Further prospecting of the mine proper was resumed in November, driving north from one of the intermediate levels to test the ore-body in that direction.

Gipps' Creek Alluvial is doing fairly well.

Ben Lomond Tungsten.—Mr. Briggs, the proprietor of this mine, is still getting a regular output.

A number of small claims are being worked for tin about the head of Storey's Creek.

At Alberton (North Mt. Victoria), the New River Freehold G.M. Co. has erected a steam winding-plant, and is working a shaft to test one of the lodes on that property formerly worked to some extent by the Ringarooma G.M. Co.

The New Ringarooma Syndicate is getting good returns from No. 5 lode, but is only working in a small way.

*Magazines.*—The Anchor Tin Mine Company has had a large and well-constructed magazine erected at the mine, capable of storing 3 tons of explosives. The Pioneer Company has also constructed a new magazine, capable of storing 6000 lbs. of gelignite. All the large mines are now well provided with magazines, which are in good order and well ventilated.

*Inspection.*—I have visited and inspected all the principal mines, both coal and metalliferous, in my districts as often as practicable; generally once in two months for most of these, and at longer intervals for the less important ones; some, in the out-lying parts, once in six months. In September I visited Cox's Bight, on the south coast, with Mr. Twelvetees, Government Geologist. Special visits had to be made in a number of cases where fatal or other serious accidents occurred.

*Ventilation.*—The underground mines in the divisions under my supervision are of two kinds, viz., metalliferous and coal. Of the former the number that are now working is 22, with varying depths below the surface of the ground from 50 to 1600 feet, classed for depths as follows:—From 50 to 150 feet, 12 mines; 150 to 300 feet, 4 mines; 2 at 400 and 600 feet respectively; 1 at 800 feet; 1 at 1100 feet; and 2 at 1600 feet; total, 22. All worked from shafts, some of the smaller ones having adit connections also.

The coal mines (9 in number) with one exception (Cata-maran) are all worked from tunnels going horizontally beneath the hill, excepting Mt. Cygnet and Sandfly. The former is worked to the dip on an engine-hauling plane; the Sandfly Colliery is also being worked to the dip, but at a much less angle than the Cygnet, which dips at an angle of about 30° from the horizontal. The vertical depths of the workings of

these collieries below the surface of the ground varies from 25 to 500 feet.

*Methods of Ventilation in Use.*—The metalliferous mines depend almost entirely on "natural" ventilation, aided in some few cases by small "blowers" or by the exhaust from the machine drills worked by compressed air. The result, on the whole, is fairly satisfactory; in some few of the mines exceptionally good—two at least. Separate shafts, or main airways, are required; one to cause the air to circulate from the surface into the deepest part of the mine, "downcast," and the other "upcast," to return it by a different route to the surface. The outlet of the upcast requires to be at a greater elevation above the bottom of the mine than the inlet of the "downcast," for the reason that "natural" ventilation is dependent on or due to the differences of height and temperature of the air-columns in the different parts of the workings. All of these mines, with the exception of the Tasmanian Consols, have the dual shafts or openings required, as nearly all the reefs or lodes worked outcrop and are stoped to the surface, or if not a rise is put up or a second shaft sunk. As already stated, the ventilation is good. In the majority of cases—18 out of the 22—including all the shallower ones and some up to 600 and 800 feet depths, need not for the purpose of this report be further noticed, natural ventilation being all that is required for these, for the present at all events. I will therefore confine my remarks to the three larger mines, which are over a thousand and up to 1600 feet in depth, and to one other (the North Tasmania) which may call for special mention with regard to its ventilation.

The Tasmania Gold Mine, at Beaconsfield, is the largest, but not the deepest of the group. It has three large working and pumping shafts, pretty well in line from north-west to south-east. The first of these, at the north-west end, is the old main shaft, size 6 feet by 14 feet, three compartments, two winding and one pump; its depth is 900 feet. About 330 feet to the south-east of this is Hart's shaft, somewhat larger than the former, and divided into four compartments (cage two, also ladder and pump), its depth being 1100 feet. Then comes Grubb's shaft, 280 feet still further to the south-east. This latter is probably the largest shaft in the Commonwealth of Australia; it is about 30 feet by 8 feet, and has five compartments (two pumps, two cage, and one ladder). It was sunk to a depth of 1000 feet, and connected by a drive with Hart's shaft before the end of 1906. It is now (January, 1907) being sunk to a further depth of 250 feet. In addition to these three large working shafts, there are others for ventilation purposes, viz., the Lefroy, the Florence, and the old Golden Gate shafts. The Lefroy is about 200 feet north-east of Hart's shaft; its depth is 715 feet—minus the difference of surface brace level between this and the main shaft, which is about 20 feet, the latter being on the higher ground. It was recently retimbered from top to bottom of its old depth, 400 feet, and sunk another 315 feet, to bring it down to the 715-foot level of the main shaft, with which it is connected by a drive going out to the junction of the crosscut with lode channel. Its size is 12 feet by 6 feet in clear, no centres, and is used exclusively for ventilation. The surface brace levels of this, Grubb's and Hart's shafts, are even. Old main shaft,

Florence, and Golden Gate shafts, about 20 feet higher. The Florence shaft is 337 feet nearly due north of the main shaft; its depth is 500 feet; it is the principal upcast, being connected by passes down to the 715-foot level at the western end. The old Golden Gate shaft, now being cut down and retimbered, is 375 feet to the north-west of the main shaft. It will be sunk deeper to connect with the 715-foot level, and then used for upcast. The Phoenix, a small shaft in the same locality, used for a long time for mullocking, is now connected by a rise with the 715-foot level. So far, however, the air passing in this shaft is downcast; but this will probably be altered later on, when the scheme for ventilation is complete, as all upcast must then be at the west end of the mine, where the temperature is, on account of the limestone belt and pyritic formation, always much higher than at any other part. From the foregoing it will be seen that this mine now possesses great facilities for ventilating by natural means, and the great improvement effected in its ventilation in the past year or two warrants the assumption that there will be no recurrence of the troubles of the past, when anything like adequate ventilation seemed to be out of the question. As a matter of fact, little or no attempt was made under the old management to improve the ventilation of the mine, which could only be described, when I first made an inspection of it eight years ago, as deplorably unfit for men to work in. There was fairly good downcast, often even more than the regulation quantity per man, but there was no means of regulating the air-currents, not even a single door or piece of brattice cloth in the mine. Men working in winzes, rises, and dead ends could not get anything much short of a stifling atmosphere to work in, and had to be frequently removed to other parts of the mine, to do, very often, unprofitable work rather than that they should lose too much time. In very many cases they lost their health, which was of vastly greater importance than the money they earned. The records of the Beaconsfield Hospital show only too plainly the number of unfortunates who entered there poisoned by the "choke-damp" of the big mine. All this is now, I am happy to say, a thing of the past, and the ventilation of the Tasmania Mine when I inspected it a week ago was, as far as fresh air currents were concerned, all that could be desired. The main shaft, Hart's, and Lefroy were all downcast, delivering nearly 20,000 cubic feet per minute into the mine. Grubb's shaft had its own ventilation, short-circuited, and independent of the other three, or, more correctly, of Hart's and Lefroy shafts, as the main shaft was partly upcast and would have been wholly so had not the return been shut off at the 715-foot level. Temperatures taken with dry bulb thermometer were as follows:—At surface brace of main shaft, at 9.30 a.m., 70° F.; at 715-foot plat of same shaft, 78°; inside air down at bottom of Lefroy shaft, same level as foregoing, 66°; west of crosscut at same level, 76°; still further west, in limestone belt, 86°. Near to this latter place two men were at work, driving a short crosscut to facilitate the working of the mullock run in the limestone and to get better circulation of air. The temperature in face was 90° F., in an apparently dry heat. These men were perspiring freely, but evidently not much distressed. The great heat in this place, as compared with other parts of the mine, has its uses in assisting the return air current. Quite one-third of the air

circulating in the mine passes along this 715-foot level west, and ascends by a pass to the Florence upcast shaft. Temperatures in the bottom levels of the mine on the same day did not exceed 70°, which was to some extent phenomenal, as this was the surface temperature at the same time. The velocity of the air, 17 feet per second, passing through the flood-gate at the 1000-foot level may have had something to do with it. Natural ventilation under the most favourable conditions cannot be depended upon to meet every requirement in the circulation of air in a big mine. There are always places in developmental work, such as rises, winzes, and dead ends, which require mechanical means to ventilate them. This can be done in a variety of ways, such as by means of a small fan driven by electricity, compressed air, or even water where the latter in wet mines is sometimes passed down from a higher level to the bottom pumping station. A jet of water can also be used to blow air through a pipe into such places. Where machine drills driven by compressed air are used, the exhaust materially assists in ventilating the fall; but this is not much liked by miners, who hold that air from the compressor is inferior for breathing purposes. That it is at times objectionable there can be no doubt. This is probably due to the oil used at the compressor and condensed moisture in the air compressed accumulating for a time in low-lying parts of the air main, or in the reservoir, and becoming very foul, affecting the air blown off through the drills. Analyses, however, made by Messrs. Haldane, Martin, and Thomas, of compressed air in Cornwall, also by Mr. E. A. Mann, Chief Inspector of Explosives, West Australia, and by the Victorian Bonus Board on Ventilation, all go to show that the air from compressors is practically pure. No rock-drills are in use at the Tasmania Mine.

The two deepest mines in the State are at Mathinna, viz., the New Golden Gate Gold Mine and its very near neighbour, the Tasmanian Consols, both sunk to a depth of 1600 feet from the surface. The "Gate" mine has a single working shaft of rather small dimensions, divided into three compartments, two cage and one ladder; it has also pass and rise connections from the bottom levels right through to the surface, which act as an airway. There are in all 17 levels in this mine, and it has been worked on an extensive scale for many years past, giving good, payable results. Unfortunately, however, it has not been doing so well for the past year or two, the deeper levels not proving payable. At the present time the shaft is being sunk below the 1600-foot level and will probably be put down to 2000 feet. Ventilation is by natural means, aided to some extent by compressed air from the mains of the rock-drills used in the mine, and has been fairly adequate, but never very good. The mine is a dry one, very much so down to the 1400-foot level; even now a small electric pump suffices to keep the water out of the bottom levels. The cold air passes into the mine by an adit 50 or 60 feet below the level of surface brace of main shaft, and also by a small air-shaft further south, which is downcast, the combined currents from both these sources circulating downwards through the workings, the main shaft being upcast. It would be much better if the air circulation was the other way about, and that the downcast were through the main shaft, as this is the principal travelling way by which men enter or leave the mine.

There is, of course, a means of escape through the passes and rises to the surface, but in the case of fire in the mine or fumes arising from any cause it would be unsafe to depend on this means of exit, and in all probability exit by the main shaft would be cut off, owing to it being upcast and the smoke or fumes passing in that way. The mine, owing to its extreme dryness, was often stale and unpleasant; sanitation not too good either. A good wash out would be beneficial.

*Tasmanian Consols.*—This mine adjoins the "Gate," property on the north side, the two shafts, Consols and Gate, being only 50 yards or so apart. It is down to the 1600-foot level; the last sink of 200 feet was completed at the close of the year 1906. There is only one shaft, and this is the only means of entrance to or exit from the mine. The working levels are from the 1200-foot downwards; no stoping has been done above this. Short levels were driven for prospecting purposes, but no connections made. The shaft is of fairly large dimensions, and divided into three compartments (two cage and one ladder). New poppet-heads have recently been erected; also a powerful steam-winding plant and large air-compressor. The ventilation is "natural," and on the whole fairly adequate. The workings are not extensive, extending only some 150 feet to 200 feet north of the shaft, and on the south side about 50 feet to the boundary between the two mines. The mine is fairly dry, bailing occasionally being sufficient to keep the water out. Rock-drills are in use, and air from these helps ventilation considerably. Although fairly satisfactory so far, it is not likely that this mine can continue to work at such a depth when its works are more extended without being provided with some mechanical appliances for ventilation, or a connection with the surface apart from the main shaft. The difficulty can be got over by connecting the two mines, this and the "Gate," as provided for under "The Mining Act, 1905." This could be done without any great outlay on either side, and would prove beneficial to all parties concerned, not only so far as ventilation is concerned, but also as a means of escape for the men employed. The "Gate" mine, too, will, in the event of payable stone being struck at the deeper level now being sunk to, have to provide more adequate ventilation, the downcast air at present passing through the old workings, where there is so much decaying timber, cannot be expected to be anything like pure. If the upcast were in this direction it would not matter.

There is one other mine in the metalliferous group which I desire to mention; that is the North Tasmania, at Beaconsfield. It is 400 feet in depth, with a well-timbered shaft, and now equipped with a steam-winding plant. There are the workings, levels, and a connection with the surface from the top one of these by means of an underlay shaft. For many years past this mine has been worked off and on by a few men, not more than four at any time. The ventilation is seldom good, as the country-rock here, as at most of the Beaconsfield mines, is charged with gas (carbon-dioxide), which exudes freely at times, perhaps after the firing of a shot or when fresh rock surfaces are exposed. A small blower is employed to help ventilation, but this is almost useless. Men, tributers as a rule, only make half-time at best, as for days at a time there is no getting into the mine on account of bad air. This mine is certainly not provided with an adequate

amount of ventilation, but it is not easy to enforce compliance with the Regulations under existing circumstances.

*Coal Mines.*—The two principal collieries, Mount Nicholas and Cornwall, are ventilated by separate return airways connecting with upcast furnace shafts.

The Mount Nicholas Colliery is worked on the "long-wall" principle, the farthest in workings being about three-quarters of a mile from the entrance of the tunnel; the seam is 4 feet. The air, after circulating through the different places, which are all connected with each other, returns to near the surface entrance by a separate drive connecting with the furnace shaft, and escapes to the surface. Fairly good ventilation is maintained in this way, so long as the return airway is kept clear of obstructions and the furnace is properly attended to, but if these are neglected, and they sometimes are, the state of the ventilation soon becomes bad. Latterly the ventilation has not been very good, on account of the frequent faulting of the seam interfering with the continuous line of face, and consequent obstruction of the air-current. The old workings will now soon be abandoned, on account of the faulting referred to. A new tunnel is being driven to open up another part of the tunnel seam (4 feet) further west from the old tunnel entrance.

*Gas.*—The only gas to contend with in the ventilation of our coal mines is carbon-dioxide, or, as it is commonly called, carbonic acid gas. There is no fire-damp, methane, or explosive gas, at least none discovered so far, excepting in one instance of recent occurrence, reported by the manager of the Sandfly Colliery, but this was of so slight a nature as to be scarcely worthy of notice. Further search is however being made in the daily inspection before work. This being so, the methods of ventilating are practically the same as in the metalliferous mines, as a gas of the same nature has to be dealt with.

Under our Mining Act, 1905, "an adequate amount of ventilation, that is to say, not less than 100 cubic feet of pure air per minute for each man and boy, and not less than 150 cubic feet per minute for each horse, employed underground in a mine, excepting in cases where noxious gases exist to a dangerous degree, when the quantity of air required shall be increased to 500 cubic feet respectively, shall be constantly produced in every mine, to such an extent that the shafts, winzes, levels, underground stables, and working places of such mine shall be in a fit state for working and passing therein." Two things have therefore to be considered, quantity and quality of the air supplied. To ascertain the first of these, quantity, an instrument, an anemometer, is used for measuring the velocity of the air current circulating in the mine. This can be done with a certain degree of accuracy where large or fairly large quantities of air are passing, but for velocities under 1 foot per second it is doubtful, and under half a foot totally unreliable, as I will explain later on. I must first refer to the ventilation of the Cornwall Colliery. This colliery is ventilated by artificial means in exactly the same manner as that described for the Nicholas Mine, viz., by a separate return airway and upcast furnace shaft. Its workings are, however, on a different principle, being the method known as "pillar and bord," which means that a certain amount of

coal in the shape of rectangular blocks is left in the mine to support the roof. The spaces worked out between these blocks or pillars is called a bord. The main heading, that is the main working road, whether leading from the bottom of a pit or shaft, or, as in this case, a tunnel from the surface, is also always the main intake for ventilation. There are also cross-drives from this, and again back headings running parallel to it; from these latter the bords are turned off, with a narrow entrance, generally 6 to 8 feet, but immediately opening out to the full width, which is as a rule about 8 yards, and for length extending through to the next back heading, a distance of from 22 to 28 yards. The difficulty of getting air to circulate in such places as these is not easily overcome. The Cornwall Company for several years, and before the works extended so far beneath the hill, managed to have fairly good ventilation; but now that the farthest workings are nearly a mile in from the entrance of the tunnel, and that settlement of the roof on the coal pillars is causing a "creep," or rising of the floor of the worked out ground, and consequent damage to the return airway, the circulation of air is not what it should be, and at times is far from being "adequate" within the meaning of the Regulations. The company has lately completed the installation of an electric hauling plant, for bringing the coal out of the mine. This will improve matters somewhat, as the horses formerly employed for this purpose raised much dust and otherwise interfered with the ventilation. I have frequently during the past year pointed out to the manager of this colliery the necessity for improving the ventilation, the first step towards which should be the enlarging, straightening, and generally improving the return airway. Something has been done in this direction, but not enough. The furnace, too, requires a large grate surface, and a better arrangement for draught. Referring again to the use of the anemometer, I may point out that in mines such as the above this instrument is almost useless for measuring any but the principal air currents. As an instance, take one of the bords referred to: the gate openings or entrance to these generally represents an opening of 40 square feet area. Two men are working within the bord, and it is desired to ascertain if they are getting the regulation quantity of 200 cubic feet per minute, which would mean a register by the instrument, in an area such as this, of 1 inch per second, a velocity altogether too low to even move the vanes on it. As a matter of fact, any velocity less than 6 inches per second cannot be taken as reliable on these instruments. The only way out of the difficulty is to apply the purity test, which after all is of more importance than quantity, so far as our mines are concerned, as the only gas to be dealt with in both metalliferous and coal mines in this State is carbon-dioxide ( $\text{CO}_2$ ). In his special report as a member of the Royal Commission on the Ventilation and Sanitation of Mines in Western Australia, 1905, Mr. Mann describes the methods employed in testing for the presence of different gases found in mines, and refers more particularly to the use of the bottle test for estimating the  $\text{CO}_2$ , which he says could be readily applied by inspectors of mines who have not had any special training in chemical manipulations. This is, I understand, the method used officially in Victoria, where the purity test is required

apart from any question of quantity. In "The Mines Act, 1904," of that State it is prescribed that the carbonic acid shall not exceed .03 per cent., or three pints in one thousand by volume, which is a little less than eight times the amount of this constituent normally present in the surface air (0.04), and that the oxygen shall not be less than 20 per cent. by volume, the surface air normally containing 20.96 per cent. Of course any test made for either purity or quantity should be such as could be sustained legally, otherwise enforcement of compliance could not be insisted on.

Of the remaining seven coal mines, the Sandfly is the only one of importance that is likely to develop into a fairly large colliery. The method of working is, for the present, "pillar and bord," same as the Cornwall, but it is, I understand, intended to work on the long-wall system as soon as the works get further in. Ventilation so far is by natural means.

Sanitation of the mines generally is fairly good. Pans and latrine accommodation is provided in most cases, in the big mines especially. It is not, however, so easy to get the smaller ones to observe the rules in this direction.

*LIST of Accidents in Inspector Griffin's District for Year 1906.*

Fatal, 3 ; non-fatal, 28 ; total, 31.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1906. 9 Jan.	Tasmania Gold Mine	Beaconsfield	Something dropping down shaft	Page, Ernest	Single	Loss of one eye	Was using knocker line in Grubb's shaft, and was struck in the eye by a particle of something dropping down shaft. Eye had to be removed.
20 Jan.	Mutual Hill Tin Mine	Derby	Caught by boulder from slip	Ratcliffe, Oscar	Ditto	Bruised ankle and contusions about hips	Was working in open-cut face ; a fall of earth took place, boulder caught him on the ankle, and rolled over his body.
22 Jan.	Tasmania Gold Mine	Beaconsfield	Stone rolling jammed his thumb	Gentleman, John	Married	Thumb badly crushed	Was working in the 500-ft. chamber, Grubb's shaft ; stone rolled and jammed his thumb ; was off work 14 days.
28 Feb.	Mangana (Tas.) Gold Reefs Mine	Mangana	Small stone falling down the shaft	Croft, Wm.	Single	Severe flesh wound on forearm	Was working in the shaft ; a small stone fell from some height, striking him on the arm and inflicting wound.
21 Mar.	Ringarooma Bucket Dredging Co's. Mine	South Mount Cameron	Accidentally falling off plank into water	Anderson, Wm.	Ditto	Suffocation	Was employed wheeling gravel on to deck of barge 12 feet from the bank ; went forward on plank to trim heap, missed his footing, fell into the water, and slipping beneath the bottom of dredge, was drowned.
2 April	Tasmania Gold Mine	Beaconsfield	Stone falling off truck	Goninon, Wm.	Married	Bad cut on back of hand	Was helping to fill stone into a truck in Grubb's shaft ; a piece rolled off and caught him on the back of his hand, inflicting a severe wound

5 April	Briseis Tin Mine	Derby	Collapse of a trestle	Quinn, George	Married	Injury to small of back	Was assisting to erect trestle-work; a bolt gave way, and a piece of the bracing fell on him; was off work about 4 weeks.
12 April	Sandfly Colliery	Margate	Fall of ground in heading	Hall, Thomas	Single	Broken leg and bruises	Was with his mate driving heading; work was carried forward on "canch" or jump up of floor; short props were used on one side and slipped, letting portion of roof down. Hall was caught and injured.
27 April	Anchor Tin Mine	Lottah	Jumping off a truck in motion	Kelly, R.	Married	Broken collar-bone	Was riding on a truck hauled by a horse on incline; truck became detached, and ran back; Kelly jumped off, and broke his collar-bone in falling.
2 May	Tasmania Gold Mine	Beaconsfield	Foot caught in tram-rail when running truck	Spurgo, Horace	Single	Fracture of small bone of leg near ankle	Was engaged trucking at 1000-ft. level; got his foot caught in tram-line, and broke small bone of leg; was off work 7 weeks.
7 May	Ditto	Ditto	Fall of quartz in big stope	Dunstan, James	Married	Both legs broken below the knees	Was assisting to lift a long cap-piece into place; a large mass of quartz fell from the backs close by; other men escaped, but Dunstan was caught by rolling stone.
9 May	Ditto	Ditto	Ascending on bucket, head struck projection in shaft	Waters, James H.	Ditto	Severe cuts on head	Was ascending on bucket with his mate in the Lefroy shaft; bucket swung to the side, and his head came in contact with projecting plank at side.
14 May	Ditto	Ditto	Piece of stone falling from backs	Broad, John	Ditto	Cut through sinews of first finger	Was working in stope picking down from back, piece of quartz struck him on wrist severing sinew of fore-finger; was off work 24 days.

*LIST of Accidents in Inspector Griffin's District for Year 1906—continued.*

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1906. 4 June	Tasmania Gold Mine	Beaconsfield	Loading timber, got thumb jammed	Barrett, Frederick	Single	Thumb badly crushed	Was helping to load heavy timber on to a trolley; got his thumb jammed; was off work 7 weeks.
4 June	Ditto	Ditto	Caught by descending cage	Cairns, Wm.	Married	Severe cuts on chin, teeth, and portion of jaw-bone knocked out	Was engaged as platman at 400 ft. level "Capstan division" Hart's shaft, got catches damaged, and attempted to repair them; cage descending, struck him. Died 5 days later.
6 June	Ditto	Ditto	Splash from sulphuric acid	Hudson, Frank	Single	Burns on face about eyes	Was lifting a jar of sulphuric acid, handle broke, and acid splashed over his face, injuring his eyes, but not permanently.
6 June	Anchor Tin Mine	Lottah	Stone falling from open-cut face	Herrick, James	Married	Cut on head	Was drilling a hole at foot of open-cut face. A small stone fell from some height and struck him on the head; off work 4 weeks.
13 July	Cornwall Coal Mine	Mount Nicholas	Coal-skip leaving rails on incline	Nichols, Wm.	Ditto	Injuries to chest, lungs, and bowels	Was riding on a loaded coal skip descending self-acting incline; a box he was holding slipped, and threw him off, causing injuries from which he died the next day.
31 Aug.	Briseis Tin Mine	Derby	Pipes rolled	Hellessy, Hector	Single	Top of one finger crushed off	Was loading pipes on to a trolley when he got his finger jammed; was off work for 17 days.

4 Sept.	Transit Tin Mine	George's Bay	Collapse of trestle-work	Hodges, Wm. Geo.	Married	Shock and injury to spine	Was at work on elevated sluice boxes, the trestle-work supports of which gave way; he went down with the boxes, and was injured.
12 Sept.	Tasmania Gold Mine	Beaconsfield	Timber being lowered	Parish, Hugh	Ditto	Finger jammed	Was assisting to lower timber in shaft, got his finger jammed; was absent from mine 68 days, but not altogether on account of accident.
22 Oct.	Weldbrook Tin Mine	Weldborough	Collapse of trestle-work	Breen, John	Single	Shock and bruises on back	Was employed as sluiceman working on elevated box-race; trestlework gave way, and he fell with boxes, and was injured; was off work over 14 days.
2 Nov.	Tasmanian Gold Mine	Beaconsfield	Hand caught on hook of machinery	Bews, Peter	Married	Nasty torn wound on palm of hand	Was cleaning drip-tins on pump-bob, got his hand caught on hook; was off work 29 days.
5 Nov.	Fancy Creek Tin Syndicates Mine	Weldborough	Explosion of powder	Lucas, Wm.	Single	Burns on hand and arm	Was charging a hole with powder when spitting fuse ignited loose grains of powder round collar of hole, and exploded 5 or 6 lbs. of powder close by.
12 Nov.	Tasmania Gold Mine	Beaconsfield	Stone falling down pass	Hunkin, Joseph	Married	Small bone of left arm broken	Was running a pass, a stone fell on his left arm, breaking small bone.
24 Nov.	Burnie Copper Mine	Blythe River, Burnie	Boulder rolling	Breen, M. J.	Single	Fracture of small bone of leg above ankle	Breen was working in open-cut excavation; used his pick to loosen a boulder, which came away suddenly and caught him on the leg.
27 Nov.	Mangana (Tas.) Gold Reefs Mine	Mangana	Explosion of gelignite	Croft, Robert	Ditto	Burns and slight laceration of arm	Was charging drill-holes with gelignite; used a heavy (6 lbs.) copper tamping-bar; used some force when pressing first plug home, causing it to explode.

*LIST of Accidents in Inspector Griffin's District for Year 1906—continued.*

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1906. 30 Nov.	Tasmanian Consols Mine	Mathinna	Fall of rock in shaft	Peden, Thos. Gordon	Married	Fracture of right leg bone above ankle	Was engaged shaft-sinking; neglected to test ground after shots had been fired. A large piece of rock slipped from side and struck him.
12 Dec.	Tasmania Gold Mine	Beaconsfield	Caught by slide-block of engine	Williams, Geo.	Single	Hand crushed, top joints of two fingers had to be removed	Was lagging cylinder of pumping engine at Grubb's shaft; placed his hand on guide-bar, and slide-block coming back, crushed it.
20 Dec.	Ditto	Ditto	Fall of rock breaking cap-piece	Williams, J.	Married	Cut on head and bruised leg	Was working with T. Cowie in stope block 54. Eased a large lump of quartz which came away—breaking cap. He fell 7 feet and was injured.
28 Dec.	Cybele Tin Mine	Gladstone	Fall of earth in open-cut	Simmons, Thomas	Single	Bruised about hips and back	Was deepening a tail-race when a portion of side-wall (decomposed granite) slipped down and caught him.

Mr. INSPECTOR HARRISON (stationed at Zeehan) reports:—

In submitting my annual report for 1906, I beg to state that the accident list was 1 fatal and 9 not fatal; a few of the latter were not of a very serious character.

*Safety Appliances.*—All the principal mines are well supplied with the necessary safety appliances, to avoid accidents.

*Hoisting Ropes and Cages.*—Several hoisting ropes have been condemned during the year. The cages have been tested at intervals, and when necessary sent for repairs.

*Ventilation.*—Ventilation in the mines is, on the whole, very good. Most of the managers are able to depend on natural ventilation, except when breaking through from one level to another, when other means are adopted.

*Magazines.*—Magazines, which are now 32 in number, are kept clean and in good condition. Ten of these are used for storing explosives for sale. A better system of importing explosives *viâ* Strahan is badly required.

*Health of Employees.*—The health of the miners will compare most favourably with any mining field in the Commonwealth. At the local smelters special arrangements have been made for doing away with the bad fumes, and cases of lead-poisoning are not nearly so numerous as formerly.

*Prospects of the Field.*—In nearly every direction the district is going ahead. At Heemskirk and North-East Dundas the output of tin is steadily increasing. At Mt. Read, Mt. Farrell, Rosebery, and the Henty River mining is going on most energetically; while in Zeehan proper several new mines have been started, which are adding to the output. At the Stanley River, I regret to say, that with the exception of a little prospecting by hand bores in the alluvial flats, nothing of consequence has been done, and this valuable tinfield is practically locked up.

*Ventilation.*—The systems adopted are as follow:—Natural ventilation, air compressors, blowers, and water jets.

Our deepest mines are only about 800 feet down, and I am pleased to state natural ventilation has been found quite sufficient in them, except in rising from one level to another or in putting in prospecting drives, when either a Root's blower or water jet is put in position. Some of the mines are fitted with air-compressing plants, but as they are seldom used for boring purposes (country not being sufficiently hard to require them), they are kept in readiness for ventilation, if required.

The lodes are not of a warm nature, the metal (galena) is usually damp, and there is an absence of dust.

In my opinion, air-compressors are answerable for a large percentage of the sickness amongst miners. The oil from the air-cylinders becomes impregnated with the air, and the air-receivers are generally in a filthy condition through the same cause. Where air has not to be carried any great distance, say, from 6 to 800 feet, I am a firm believer in the water jet, as the miner then obtains his supply cool and sweet. But natural ventilation, if possible, is best of all.

*LIST of Accidents in Inspector Harrison's District for the Year 1906.*

Fatal, 1 ; non-fatal, 9 ; total 10.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1906. 10 Mar.	Tasmanian Copper Co's. Mine	Rosebery	Fall of ore	Jones, Joseph	Single	Injured shin bone	Was barring down ore at surface when a piece struck the bar and forced it against his leg.
3 June	Florence Silver Mine	Zeehan	Fall of rock	Moyle, Wm. Thos.	Ditto	Crushed toe	Caused by fall of rock from side of drive.
25 Aug.	Zeehan- Queen	Ditto	Fall of bucket	Ledwell, Albert	—	Scalp wound	Bucket fell down shaft and struck him on the head.
15 Sept.	Tasmanian Smelting Co's. Wks.	Ditto	Fall of stage	Howe, George	Single	Cut head and broken nose	Was working as a carpenter when the stage on which he was standing broke.
11 Oct.	Austral Valley Silver Mine	Ditto	Oiling machinery	Smith, Chas.	Married	Lacerated arm	Caused while oiling water-wheel.
13 Oct.	Tasmanian Copper Co's. Mine	Rosebery	Fall of ore	Headlam, Allan B.	Ditto	Internal injuries	Fall of rock, crushing body badly. He lived 24 hours.
29 Oct.	Tasmanian Smelting Co's. Wks.	Zeehan	Fall of con- verter pot	Henderson, John	Single	Crushed foot and injury to leg	In filling converter omitted to secure it by stay.
1 Nov.	North Mt. Farrell Silver Mine	Tullah	Fall of rock	Herron, John	Married	Bruised ankle and face	While securing face, rock fell.
13 Nov.	Tasmanian Smelting Co's. Wks.	Zeehan	Fall of fur- nace door	Johnstone, N.	Single	Crushed toes	Furnace door fell on his foot.
6 Dec.	Mt. Bischoff	Waratah	Caught between two trucks	Linachner, Hector	Ditto	Wounded shin	Caused by being caught between two trucks.

Mr. Inspector CURTAIN (stationed at Queenstown) reports :—

In furnishing a summarised report on the inspection of the mines and works of this district for the past year (1906), I beg to particularise items as under :—

*Casualties.*—Mount Lyell Mining and Railway Company, Limited.—Barclay Wheldon, age 39 years, married, a feeder on the middle floor at the reduction works, had his right hand crushed by a skylight blowing out and falling on him, and his forefinger had to be amputated.

Stanley Brown, aged 18 years, single, a filler on the same feed-floor, had his left thumb crushed (necessitating the loss of two joints) by a piece of limestone falling through the ore-bin.

Sylvester Casey, aged 23 years, single, a vessel-man at the converters, had his neck and shoulders burned by an internal explosion or overthrow of matte from No. 2 converter. He was idle for 14 days.

William Howe, aged 21 years, single, a trucker at the 600-foot level of the North Lyell Mine, lost the middle finger of his right hand by a truck bumping off the line and jamming his hand against the "lip" of a chute. He was idle 19 days.

Thomas Menadue, aged 33 years, single, a blacksmith's striker, while cutting a rail at the converters, lost the sight of his right eye by a "splinter." He was idle for 75 days.

Walter Hewitt, aged 24 years, single, while working in bench IYB at the "Blow," lost the sight of his right eye by a spall from a fellow workman's hammer entering and destroying it. He was idle 92 days.

Edward Estcourt, aged 33 years, single, a carpenter, engaged renewing the roofs at the reduction works, stepping on a sheet of perished iron, fell through and broke his jaw. He was 56 days idle.

Ellis Blomquist, aged 29 years, single, a converter-hand, was connecting or joining a vessel, when its crown, which was suspended, swung round and jammed his right leg against the woodwork of the stand, severely cutting and bruising it above the ankle. He was idle 112 days.

Charles Mantick, aged 32 years, single, a labourer at the reduction works, was assisting to clean the main flue behind "No. 7," when a quantity of heated dust fell on him and burned his face, arms, and feet. He was idle 41 days.

James Harrington, aged 46 years, married, head yardsman on the top of the main haulage, was "shoeing" a rope, when the "white metal," while being poured into the socket, exploded, and receiving the charge on his forehead and eyes, the latter were permanently injured. Since the date (1st July) of the accident, which was the most serious in the district, Harrington has been incapacitated, but with the assistance of the company he has been enabled to open a boarding-house.

John Lydon, aged 34 years, single, a ganger in bench IY at the "Blow," put a pick into an old hole, when an explosion followed, which, in addition to inflicting wounds on his body, injured his eyesight, which necessitated his visiting Victoria. He was 109 days idle, and has again resumed his usual duties at the mine.

Richard Morley, aged 35 years, married, a head furnace-man, was assisting to remove a water-jacket from "No. 7," when it

slipped into a trough or furnace-well, and a connecting-shoulder striking the crowbar which he was holding, caused its end to rebound and inflict the injuries stated. He was idle 35 days.

Henry Ward, aged 51 years, married, a stoker at the converter boilers, had his right eye permanently injured by one of the water-gauge glasses of the boiler bursting. He was idle 12 days.

Arthur Caesar Cocks, aged 20 years, single, a tipper on the aerial terminus at the reduction works, fell into an empty bin, and sustained a general shaking and bruising, which incapacitated him for 34 days.

Edgar Walshe, aged 30 years, married, a mechanical hand at the reduction works, was assisting to skid a lift-shaft, when a board erected as a platform to hold his lamp fell, owing to the lift coming in contact with it, and produced a scalp wound which incapacitated him for 18 days.

Benjamin Dawson, aged 29 years, married, had his right eye injured while working in the stopes of the Lyell Tharsis Mine by a flying "spall" from his mate's hammer. He was only idle 13 days, but his eyesight is still impaired.

William Frederick Grant, aged 30 years, single, while working with an emergency gang at the No. IYA bench of the "Blow," had the small wrist-bone of his right arm broken while barring-down. The "crust" over an old rise which he was working on collapsed, and he fell with it. He was idle for 10 days, when the company found light employment for him as a signalman on the "incline" hoist-shaft.

Robert Phillips, aged 29 years, married, a casual on the haulage, was employed on the 12th of December filling aerial buckets at the mine end, when a loaded one, of which he had charge, left the main travelling rail, and toppling over him, inflicted bruises and cuts on his back and neck. Though convalescent, he has not yet returned to work.

Lyell Blocks Mining Company, No Liability.—Martin Charles Aitchison, aged 26 years, married, a shoveller, while assisting to place a heavy "blocking-out" cap in position, had his back and shoulder bruised by it falling on him. He was idle 15 days.

Thomas William Dann, aged 57 years, married, while having "crib" in "No. 1," had his right leg broken above the ankle by an unprotected piece of the roof coming away and falling on it. He was idle 136 days.

Frederick Temple Dingle, aged 34 years, single, a stope contractor, sustained a sprained ankle and bruised knee by falling through an incline pass which he and his mate had neglected to protect. This accident happened on the 17th of September, and some time later Dingle left Lyell to seek further medical advice. The most recent information respecting him is that he is working at the Glassfoot Creek Copper Mine, Miriam Vale, Queensland.

Thomas William Scallan, aged 42 years, single, a general hand, while proceeding to his place of work along an "intermediate" level, walked into an open and unprotected pass, and dislocated his left collar-bone. He was idle 13 days.

James Cumming, aged 32 years, married, a repairer, unconsciously walked into a pass he had been using. It was

obscured by smoke arising from a round of stope-firing. He fell about 25 feet, and in addition to a rough shaking, sustained a bruise to his right elbow, which kept him idle for 30 days.

William Stephens, aged 41 years, single, was injured by a fall of a piece of clay from roof, inflicting bruises to hips and back.

In addition to the foregoing there were other accidents of a minor degree, which need no enumeration in this category. But against these, however, there are others which, having incapacitated the injured persons much beyond the stipulated period, as stated in Section 181 of the Act, and though relating chiefly to finger and toe injuries, should have been at the time of their occurrence reported; and for this reason I would recommend that Sub-sections 2 and 3 of this Section be so amended as to make it obligatory on the part of the manager or his representative to notify the local resident inspector, in conjunction with the medical officer, of all casualties of this nature.

Dealing with the mines generally—probably, with one exception—they are working well within the limits of safety, and with proper surveillance should continue so. Unforeseen circumstances may arise, but the dangers arising from “soapy heads,” “balked ground,” unprotected “swinging backs,” and “sides,” &c., are vanishing.

Next in importance to the safety of the workings are the appliances whereby the men are assisted to reach their place of work. Owing to the number of men now residing in Queens-town who work at the mines, the main haulage is much requisitioned. As many as 50 men travel, and at times make a load which is too many, and therefore the number should be regulated, and restricted to not more than 35 in each empty rake of 5 trucks, or 7 passengers to the truck, which would not overtax the accommodation. The rope is an approved  $4\frac{1}{2}$ -inch wire one, with a breaking strain of 80 tons. Its most vital part is under frequent, if not constant, examination, and before half its life is exhausted it is transferred to the mine, or opposite side, where little or no riding is permitted, and is replaced with a new one.

*Ropes and Cages.*—At the North Lyell Mine, eight inspections, dealing with 32 ropes and 6 cages, have been made and recorded. In the majority of cases they were satisfactory, but instances have occurred in which, after the cage had been detached, it fell away, and was only arrested by the barricade, clearly demonstrating the necessity of constant attention to the efficiency of the safety appliances, as on examination it was invariably found that the fault lay with the springs being too slack, or the gripper points requiring to be cleaned. One “poppet-header” was recorded against a winch-driver, and its occurrence exemplified the efficiency of “Middleton’s safety hook,” which, in unison with the grippers, acted satisfactorily. The ropes in use are full  $2\frac{3}{4}$ -inch approved steel, and in ratio to their loads possess the required margin of safety.

*Brakes and Mechanical Gearing.*—I have rarely anything to do with these, as their inspection devolves upon the Inspector of Machinery.

*Signalling.*—A system of electrical gong-signalling, coupled with a corroborating or simultaneous "flashlight," has been introduced and installed at the North Lyell Mine. Its use is solely restricted to those having the cage directly under immediate command, and in no instance must it be used as a call or requirement knocker. The latter is relegated to a distinctly separate telephone service, with which each plat is provided.

*Ladders* throughout the main entrances fulfil the requirements of the Act; well-seasoned turned hickory taking the place of iron rungs, which are too susceptible to the deleterious influence of our highly mineralised water.

*Ventilation.*—Only in rare cases, and principally while connections were being made to provide it, has the air been found "sluggish," its general condition in all mines being from fair to excellent, and would compare favourably with the best mines I visited in the neighbouring State.

*Sanitation.*—One mine has introduced the pan system underground, which may be regarded as satisfactory there being only one occasion in which exception had to be taken to the want of deodorants. Repeated requests have been made to keep the underground workings free from waste food and crib wrappers. The men, in a measure, are somewhat blameless, as there are no suitable and convenient receptacles provided to receive this general waste and nuisance.

*Explosives.*—Complaints have been received respecting certain brands of explosives, but if these complaints have any valid foundation the fault lies in permitting the "brands" in question to enter the State, for once in circulation it is impossible to prevent their use on the mere assertion of persons who know nothing about their composition, and may be prejudiced against the "brand." An instance came under my notice, when a firm of manufacturers of world-wide repute happened to change the colour of each cartridge wrapper, and the consignment, though warranted free from any deleterious ingredient, was condemned throughout the district. The men, believing they were being poisoned, cited cases of sickness (feigned or otherwise) as having taken place amongst them; so that, in dealing with this matter, great caution has to be exercised.

*Explosive Magazines* have been inspected periodically. Those in use are clean and satisfactory.

*Inspections.*—The mines and works herein stated have been visited as follows:—Iron Blow—surface 45 times, underground 4 times; North Lyell—surface 35 times, underground 42 times; Lyell Tharsis—surface 22 times, underground 31 times; Lyell Blocks—surface 40 times, underground 40 times; Flux Quarries—surface 5 times, underground 30 times; Tasman and Crown Lyell Extended—surface 37 times, underground 4 times; Copper Mines of Mt. Lyell West—underground 7 times; Lyell Consols—surface 5 times; Woody Hills—surface 7 times, underground 7 times; May Gold Mine—surface twice, underground 8 times; Antimony Sections—surface 3 times, underground 7 times; Crown Lyell—surface twice; Jukes Proprietary—surface 4 times; Comstock Tasman—surface once; Oonah Mine—

surface 7 times; Austral Valley—surface once, underground once; Reduction Works—surface 30 times; Concentrators—surface 8 times.

*Gold.*—Quartz-mining has been restricted to prospecting at Woody Hills and May's Mine, at Lynchford, with, in both instances, unprofitable results, which also applies to Darwin, and similar work done in its immediate vicinity.

*Alluvial.*—A fair quantity of gold has been obtained from Darwin, Owen, Queen River, Coronation, and Flanagan's Flats; but the work is pursued in such a desultory manner that no better results could be expected. Those so employed have settled down to a vein of contentment or "hatter" life, that was foreign to the men who opened this, and in fact all other mineral locations through Australasia. However, those remaining are scarcely blamable, for the "virgin" bush is impenetrable to all but the sturdy and adventurous, who in the past cut their way without reward and assistance, and opened up country for others to reap the benefit. Good tracks is the desideratum, and these, with Bischoff, Zeehan, Farrell, and Lyell as object lessons, should be put out in all directions.

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*LIST of Accidents in Inspector Curtain's District for the Year 1906.*

Fatal, nil ; non-fatal, 24.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1906. 10 Jan.	Mt. Lyell M. & R. Co.'s Reduction Works	Queens-town	Fall of window	Wheldon, Barclay	Married	Hand crushed, and loss of finger	Was working as feeder at Smelters. Skylight blew in and fell upon him.
18 Jan.	Ditto	Ditto	Stone rolling from truck	Brown, Stanley	Single	Crushed thumb	Was filling truck at Smelters, when a truck was emptied from above, and a stone rolled down and crushed his thumb, which had to be amputated.
20 Jan.	Ditto	Ditto	Overflow of matte	Casey, Sylvester	Ditto	Neck and shoulders burnt	Was working as leverman at No. 2 converter. In punching the vessel some molten matte flew out.
22 Jan.	Mt. Lyell M. and R. Co.	North Lyell	Derailed truck	Howe, Wm.	Ditto	Crushed finger	Was trucking at North Lyell Mine, when truck left the line and jammed his hand.
1 Mar.	Mt. Lyell Blocks	Ditto	Flying splinter	Menadue, Thos.	Ditto	Loss of one eye	As blacksmith's striker was cutting a rail, when a splinter of metal flew off and injured eye.
22 Mar.	Ditto	Ditto	Fall of timber	Aitchison, Martin Chas.	Married	Bruised back, shoulders, &c.	Assisting in the mine to place a heavy cap in position: it fell and bruised him.

26 Mar.	Mt. Lyell M. and R. Co.	Mt. Lyell	Flying spall from hammer	Hewitt, Walter	Single	Loss of one eye	Working at the Blow. Lost sight of one eye by a spall from fellow-workman's hammer.
14 April	Mt. Lyell M. & R. Co.'s Reduction Works	Queens-town	Roof falling in	Estcourt, Edward	Ditto	Fractured jaw	Was renewing roof at Reduction Works. He stepped on a sheet of perished iron, fell through, and broke his jaw.
23 April	Ditto	Ditto	Swinging of converter-vessel	Blonquiest, Ellis	Ditto	Leg cut and bruised	Was connecting converter vessel, when its crown swung round and jammed his leg against stand.
16 June	Ditto	Ditto	Fall of flue-dust	Mantick, Charles	Ditto	Face, arms, and feet burnt	Was a labourer at Reduction Works, and cleaning flue, when some heated dust fell upon him and burnt his face, arms, and feet.
27 June	Mt. Lyell Blocks	North Lyell	Fall of clay	Dann, Thos. Wm.	Married	Leg cracked or broken	While having crib in the mine, a piece of the roof fell and broke or cracked bone of leg above ankle.
1 July	Mt. Lyell M. & R. Co.'s Reduction Works	Queens-town	Explosion of white metal	Herrington, Jas.	Ditto	Forehead and eyes injured	While shoeing a rope on the main haulage, the white metal exploded in his face, injuring face, forehead, and eyelids.
15 July	Mt. Lyell M. and R. Co.	Mt. Lyell	Explosion of gelignite	Lydon, Jno.	Single	Eye injured	Put a pick into an old hole at the Blow, when an explosion followed, injuring his eye, &c.
17 July	Mt. Lyell M. & R. Co.'s Reduction Works	Queens-town	Blow from crowbar	Morley, Richard	Married	Fractured jaw	A head furnace-man was removing a water-jacket, when it slipped and struck Morley's crowbar, causing it to fracture his jaw.

*LIST of Accidents in Inspector Curtain's District—continued.*

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1906.							
3 Aug.	Mt. Lyell Blocks	North Lyell	Fall of clay	Stephens, Wm.	Single	Bruised hips and back	Hips and back bruised by a fall of a piece of clay from roof.
28 Aug.	Mt. Lyell M. & R. Co.'s Reduction Works	Queens-town	Breaking of gauge-glass	Ward, Hy.	Married	Eye-ball cut	Working as stoker at converter boilers, when a gauge-glass burst and cut his eye-ball.
6 Sept.	Ditto	Ditto	Fall from platform	Cocks, Arthur Cæsar	Single	General shaking and bruising	Was a tipper on the aerial terminus at the reduction works, and fell from platform into an empty ore-tin, sustaining a general shaking and bruising.
7 Sept.	Mt. Lyell Blocks	North Lyell	Fall through pass	Dingle, Fred. Temple	Ditto	Sprained ankle and bruised knee	Was a stope contractor and fell through an inclined pass by mistake.
11 Sept.	Ditto	Ditto	Walked into pass	Scallan, Thos. Wm.	Ditto	Collar-bone dislocated	Was a general hand, and while walking to his work in intermediate level walked into an open pass.
4 Oct.	Mt. Lyell M. & R. Co.'s Reduction Works	Queens-town	Fall of lamp-board	Walsh, Edgar	Married	Scalp wound	Was a fitter. Was skidding a lift shaft, when a lamp rest was knocked down, inflicting scalp wounds.
23 Oct.	Mt. Lyell M. & R. Co.'s Lyell-Tharsis	Mt. Lyell	Flying spall	Dawson, Benjamin	Ditto	Injury to eye.	Was working in stope, when his eye was injured by a flying spall from his mate's hammer.

22 Nov.	Mt. Lyell Blocks	North Lyell	Fall into pass	Cumming, Jas. Jno.	Married	Bruised elbow and shaken	Was a repairer and fell into a pass, 25 ft., which was obscured by smoke from blasting.
11 Dec.	Mt. Lyell M. and R. Co.	Mt. Lyell	Collapse of rise	Grant, Wm. Fredk.	Single	Broken wrist- bone	Was working at the Iron Blow, when the crust over an old rise collapsed, and he fell with it.
12 Dec.	Ditto	Ditto	Derailed bucket	Phillips, Robert	Married	Cuts and bruises to back and neck	Was filling aerial buckets, when one toppled over him and inflicted cuts and bruises.

# REPORT ON THE MATHINNA GOLD FIELD.

## PART I.

[With Eight Plans.]

Government Geologist's Office,  
Launceston, 29th March, 1906.

SIR,

IN accordance with your instructions, I proceeded to Mathinna on the 7th August last year, and remained on the field till the 17th of that month. Later in the year I visited the district, from 13th October to the 10th November, and again from the 7th to the 22nd December.

No departmental report on this field has been issued since 1892, and the work done since then on some of the large mines necessitated prolonged examination. Even now it has not been possible to finish inspection of the whole field. Consequently, it has been thought advisable to issue this part of my report as a first instalment, in preference to waiting for the completion of the whole.

Mathinna (the native equivalent for its original name of Black Boy) is a neat-looking township of some 800 inhabitants, situate 17 miles north of Fingal, at the base of the spurs descending from the Tower Hill range. Continuous aneroid readings in connection with simultaneous observations at the Victoria Museum, Launceston, gave for Mathinna a height of 1024 feet above sea-level. This figure probably approximates the truth as nearly as is possible with an aneroid, which, as is well known, cannot be relied upon for absolute readings. There is no use in giving aneroid readings a fictitious appearance of accuracy, and hence, for the purposes of this report, the height of the township above sea-level will be taken as 1000 feet.

The road to Mathinna from Fingal runs along the alluvial flat bordering the South Esk, in which gravels, carrying more or less gold at different places, have been deposited. These flats are part of the Malahide estate, extending nearly all the way from Fingal to Mathinna. At Mathinna they are joined by the deltas of the Long Gully and the Black Horse Gully, which are ravines or valleys scooped out on each side of the Gate spur or ridge.

The parallel of Fingal (250 feet below Mathinna) forms the southerly termination of the auriferous slate series, if we except the patches of slate between Bicheno and the

Schoutens. This slate and sandstone series, the carrier of innumerable gold-bearing quartz reefs, extends northwards without a break through Mathinna to Mt. Victoria, and is bounded on the west by Ben Lomond and on the east by the Tasman Sea. It is the basement rock below the drift of the valleys, and rises to the tops of the lower hill ranges, but towards the summits of the high mountains is overlaid by grits, sandstones, and shales of Permo-Carboniferous and Mesozoic age. Through these has protruded the eruptive diabase, which, in columnar form, builds the peaks of the dominant mountains of this area. The South Esk River takes its rise some distance west of Mathinna, and describing an immense sweep to the south runs a course of 140 miles before it empties its waters into the Tamar, at the Cataract Gorge, Launceston. The gravel of the Cataract Gorge carries a little gold, which has been carried there all the way from Mangana or Mathinna. The distance forbids any anticipation that payable quantities are to be found in the Gorge, which, moreover, is of too recent an origin for that, even if the distance had been less.

The auriferous series at Mathinna is assumed to be of Ordovician (or Lower Silurian) age, partly from its analogies with Victorian strata, partly because while elsewhere in Tasmania Upper or Middle Silurian beds are fossiliferous, this series has so far yielded no fossil remains. It is strange that no graptolites have yet been discovered. I looked over the surfaces of the tips at most of the Mathinna mines, but could find no signs of fossils, nor could I hear that any discovery had ever been made. Some of the difficulty in finding any is perhaps due to fossil impressions occurring mostly on the bedding-surfaces, whereas most of the fragments of slate on the mine heaps are cleavage-flakes. There is no real schist in the series, though some of the varieties of slate have improperly been called by that name. The rocks comprise clay slate, graphitic slate, arenaceous or sandy slate, sandstone, quartzite, argillaceous sandstone, and frequently of a mixed character, partaking of the characters of both slate and sandstone.

It is only occasionally that any difference can be detected between the bedding-planes and cleavage-planes. It is seen, however, in the upper tunnel at the Eldorado (now Ophir), where the former dip easterly at about  $45^{\circ}$ , and the latter westerly at a very steep angle. The latter strike throughout the field between N.  $25^{\circ}$  and N.  $30^{\circ}$  W., underlying to the east of the Golden Gate shaft, to the

east, and west of the shaft to the west. I attempted, during my stay in the district, to trace the directions of strike and underlay from one mine to another, hoping to be able to deduce some rule which might be useful in forming an idea of the lines along which mineral may be sought. I cannot say that I have evolved any complete theory, but some of the observations are, to say the least, suggestive.

The field must not be considered by itself, but must be regarded as part of a mineral belt extending from Mangana to Mt. Victoria, and even further north. The mean direction of the lamination-planes is approximately the same all through the belt (and these are probably cleavage-planes), and the bearing which this has upon reef-formation is apparent when we consider that in all probability the direction of the main reef is dependent upon the strike of these planes. Compressive lateral force produced the planes of separation, and thus formed channels for the passage of silica, which, relieved from superincumbent pressure by the secular folding and splitting of the strata, welled upwards into the beds along the linear directions created for it. There is a good deal of white mica (muscovite, sericite) in some varieties of the slate, and most of this mineral is probably not original, but the product of dynamic metamorphism. Some of it, on the other hand, may be derived from the waste of older granite, as must have been the fragments of feldspar which occur (in microscopic size) in the more sandy slates met with in some of the mines. The granite of which the mineral formed a part was obviously of much greater age than any of the known granites on the East Coast, which are approximately Devonian: and we can form no more than a very shadowy idea of where those ancient granite ranges can have been—certainly distant, for the Mathinna sediments were deposited in a comparatively, though not very, deep sea.

The main fractures on the Gate line at Mathinna strike north, or a little to the east or west of it, and these are naturally accompanied by others coursing south-east and north-west, in accordance with the laws of strains, but the former are the more important, and continue for long distances, not perhaps in uninterrupted courses, but overlapping each other. In the New Golden Gate Mine it seems to be a rule that when the reef is gold-bearing, its course is east of north, and when west of north it is barren. There must be a reason for this, and possibly it is that more resistance was met with in breaking through the strata in a north-easterly direction, and consequently

the conditions were more favourable to precipitation from a solution: while a north-westerly direction was nearer to the strike of the laminations, and the flow of silica would be less checked.

The axis of an anticlinal runs through the Tasmanian Consols shaft, and close to it at the 1000-foot and 1100-foot levels, and is also observable in the New Golden Gate Mine, from the 1100-foot level downwards, called saddle or horse country in the latter mine, the new make of quartz descending upon it and falling away into separate reefs east and west. In the Consols I was fortunate enough to see the central arching of the anticline. The centre does not show regular folding, but an abrupt junction, pointing to rupture. The Gate and Consols line of lode is closely connected with this anticline. On the east side of Long Gully the strata underlie easterly, on the western side they underlie westerly. The dominant underlay in the Gate ridge is westerly, and the laminations right across the Black Horse Gully and in the hills to the west of it have a continuous dip to the west. We have, therefore, in the Long Gully, an important anticlinal axis and an important lode-line, and it is difficult to believe that the two are not related, even if the course of each is not actually identical.

The strata exposed in the side of the new road below the Gold Estates shaft and Cemetery underlie westerly, and this dip continues southwards to the New Golden Gate, where it can be observed in the surface excavations west of the mine; thence to the Volunteer Consolidated Extended section the dip is westerly. The apex of the arch south of the South Gate shaft seems to be on the crest of the ridge, where vertical laminations are seen in the rock. Following the Long Gully southwards the easterly dip prevails at the South Miner's Dream, Telegraph tunnel, and Mountaineer. The Derby shaft of the Jubilee Mine is apparently on the axial line of the fold, for east of the shaft the strata dip to the north-east, while on the southern side of the creek and at the Mountaineer they underlie south-westerly. We have therefore an axial line persisting from Mathinna to the Jubilee having a strike of S. 20°-25° E., along or parallel to which a system of gold-quartz reefs is developed. This system has been traced as far north as the Golden Stairs sections, and continues into the reefing country on the north side of the Esk, beyond which indications of a similar stratigraphical fold, accompanied by numerous reefs, have been observed at intervals on the line of the

Dan and Dorset valleys, as far as Alberton. We are in the presence here of a geological fact which clears up a good deal of what was otherwise vague and uncertain, and which compels the belief that the various reef occurrences in the Mathinna field are not sporadic, or exceptional and casual, but are part of the results of an orderly and comprehensive, even vast, process which has involved the whole line of country from Tower Hill to Mt. Victoria. The recognition of this lends strong encouragement to continued work in this field, for such a far-reaching process must have produced deep-seated effects, and in my own mind I feel sure, viewing the question quite apart from the chances of mining in any particular spot, and in the dry light of geological science, that the deposits of gold which have already been worked have neither exhausted the possibilities of the field nor furnished any adequate idea of the sources of gold which yet await discovery.

The longest distances of reef actually followed are, perhaps, the east reef of the New Golden Gate and the west reef of that mine and the Tasmanian Consols. The respective distances are as follows:—On east reef, 511 feet; on west reef, 1020 feet.

But individual reefs need not be expected to be strictly continuous for extreme distances. It will be found that they come to an end at intervals, and parallel ones come in, either totally distinct or connected only by stringers of quartz. This indicates extensive fracturing of the country, and is now looked upon as more favourable for ore deposits than single fissure channels. This is a repeated phenomenon in the Mathinna field. Hence, the reefs which are found in distant properties along the line are not continuations of the others, but still are results of the same fracturing and filling processes. Thus slight variations in course are of no value in determining identity or otherwise of the various reefs, for the bearing of two overlapping reefs may be identical. These "splices" are of quite common occurrence, and explain how it is that the various reefs may vary in direction while the reef-zone or belt of strata within which they occur maintains a uniform strength for a long stretch of country. It can be understood, accordingly, how unsafe it is to stand on an outcrop and conclude that it is an actual continuation of a reef on the same course some distance away.

The general experience of the field is that the surface-rock, and down to a depth varying from 50 to 150 or 200 feet, is unsettled. Down to 50 or 70 feet it is weathered and broken, as a rule, though in some parts of the field

the unoxidised blue slate is met with sooner. In the New Golden Gate Mine the blue slate does not appear until the 116-foot level is reached. This broken nature of the ground near the surface, accompanied by numerous irregular vein-channels of no great importance in themselves, is only what has been observed in mining fields nearly everywhere, and has been explained by supposing superficial cracks and fractures to have been filled with silica brought by atmospheric water descending from the surface. Many of the crevices at the surface are believed to be due to shrinkage, arising from decomposition changes in the rock itself, and not to fractures connected with any reef system. At the same time, reefs which are strong and solid in depth show their channels right through to surface in a degenerate form, and often quite blank. Thus, in the surface adit of the New Golden Gate Mine, the track of the main reef at 20 feet from surface appears only as a line of pug, so that no wonder it was passed over at the time: and Loane's reef merely showed as a soft band a few inches wide, with a little quartz in the sole of the drive, where Mr. Loane sank upon it. The superficial rock of the district has been everywhere affected by atmospheric agencies, oxidised, often carbonated, hydrated, swollen, broken up in places, and its position changed by the action of gravity after cracking, so that surface observations of underlie and bearing of the strata are often contradictory and unreliable. A good deal of this superficial disturbance is noticeable on the crest of the Gate ridge, where blocks of twisted slate are exposed with their laminae bearing in different directions. An instance of how the simple weight of overburden may alter the underlie of strata locally occurs in the approach to the tunnel of the Victorian Golden Gate Mine, where the slates are flexed and broken by the mere swelling and weight of surface-soil.

It does not seem likely that the broken veins and quartzless reef-channels noticed so frequently at shallow depths were ever large, solid reefs comparable with some of those which have been met with at deep levels. I distrust the opinion which considers them as the superficial fragmentary remains of large and important reefs. Similar attenuations and disappearance of quartz from the reef-channel may take place at great depths, and *per contra*, huge reefs of barren quartz may occur cropping out at the surface itself. The most reasonable conclusion appears to be that an unfavourable condition of reef near the surface betokens simply weak parts in it, which may and do occur everywhere, both at upper and lower levels,

and are the more affected and altered when they happen to be within the zone of weathering. The experience of the New Golden Gate and Tasmanian Consols Mines shows that poor reef indications at surface may be replaced in depth by splendid bodies of stone. So long as there is a channel with signs of lode action at or near the surface, there is also the possibility of solid stone in depth. Mining companies should ever keep this consideration in mind.

If we seek to class these reefs among the types met with in different parts of the world, we must rank them in Dr. R. Beck's division of pyritic gold-quartz reefs, *i.e.*, reefs of gold-bearing quartz with dominant iron pyrites. An increase of arsenopyrite leads to another type laid down by Beck, *viz.*, arsenical gold-quartz reefs. Varying proportions of each pyrite connect the two types. Following Dunn and Curtis, I have sought by microscopical examinations of the fluid cavities in the quartz for some distinctly recognisable relation between structure and gold contents, but unsuccessfully. The presence of the associated minerals still remains the most favourable indication, though even this is not an infallible one.

In the neighbourhood are no basic or neutral eruptive rocks which could have any sort of connection with these reefs. The diabase, which crowns the summits of the adjacent high mountains (Tower Hill, Huntsman's Cap, Mt. Saddleback, Mts. Albert and Victoria) is of Mesozoic age, and long subsequent in date to the auriferous reefs. To the north-east of Mathinna, on a meridian 10 miles to the east, the granite region begins. It is there traversed by gold-bearing quartz reefs, which also enter the adjoining sandstones; and we must refer the Mathinna reefs in all likelihood to siliceous fluid expelled from the underlying granite magma in the last stage of its consolidation.

As for the source of the gold, it must be borne in mind that reefs in the granite carry gold also, which cannot possibly have been derived from any sedimentary country-rock. Any theory of origin must cover the case of the reef both in granite and stratified rocks. It would be unreasonable to contend that while the gold in the granite reefs was derived from the igneous magma, when the reef entered sandstone the igneous gold by some incomprehensible means became exhausted, and the reef began to collect gold from sea-borne sediments.

The few observations which I have been able to make in various parts of this State would tend to support the supposition that the origin of our gold-quartz is mainly

granitic, and that the formation of the reef is essentially connected with tectonic disturbance of the stratified rocks.

Facts connected with the mode of occurrence of the gold may be discussed with advantage.

The minerals associated with the noble metal in the reefs are pyrite, arsenopyrite, chalcopyrite, galena, and zinc-blende. We know that all these sulphides are precipitants of gold. In Prof. Liveridge's experiments\* their value in this respect was in the following order:—1. Iron pyrites. 2. Copper pyrites. 3. Arsenical pyrites. 4. Galena. 5. Zinc-blende. These have been proved to precipitate gold from solution in the laboratory, and the probability is that they have precipitated the gold found in the reef-channels. Van Hise† says:—"The gold is thrown down from its salts by the baser sulphides, not as a sulphide, but as metallic gold, because gold and sulphur have such weak affinity, and gold is so easily reduced to the metallic form."

The reefs in the Gate belt carry in their payable portions from 1 to 1½ per cent. of sulphides, containing from 5 to 10 dwts. gold per ton. For a long time the New Golden Gate sulphides which were contained in 1-ounce stone yielded 10 ounces gold per ton, and quite recently some pyrites from the 1600-foot level yielded 80 ozs. gold per ton.

Galena and blende are universally regarded on the field as good indications for gold; and colours of gold may sometimes be seen in hand-specimens close to those minerals, as well as to copper pyrites. The mottled and looser-textured quartz is considered more favourable for the occurrence of gold than is the white, tight, glassy variety, though on the other hand gold is sometimes seen in the most unkindly-looking stone. In the upper parts of the New Golden Gate reef the sulphides, when present, are distributed indifferently all over the stone, but in the lower levels they are apt to occur in bands, separated by bands of white quartz with scarcely a speck of pyrites. In the lower levels of this mine there is a noteworthy absence of the zinc-blende, which was one of the sulphides in the upper levels.

In some parts of the Mathinna field high returns have been obtained from small quantities of stone at shallow levels, notably at the Miner's Dream Mine, where yields are recorded of from 3 to 11 ozs. gold per ton. Some of the quartz from the City of Hobart adit is recorded as

\* Journ. Roy. Soc., N.S.W., 1893, p. 329.

† A Treatise on Metamorphism, by C. R. Van Hise, 1904, p. 1171.

averaging quite 2 ounces to the ton of stone; and there are other instances. The Eldorado in the old days had some crushings which returned from 2 to 3 ozs. gold per ton. These rich surface and shallow yields are the general experience in gold-mining everywhere, and from careful examination of innumerable specimens from mines in this State I feel almost certain that there has been an enrichment by re-precipitation in the zone of weathering. On this theory, once this zone has been passed through, although the stone will be poorer, there is no reason for anticipating any progressive impoverishment as long as a shoot lasts. The New Golden Gate stone has been remarkably uniform in quality down to the lower limits of the shoots in the reefs. The falling off which appears in the published accounts is only apparent, as the returns include quantities of stone which were probably outside the shoot, and this has reduced the average for many months past to 8 dwts. per ton. The gold-bearing shoot at the Tasmanian Consols is even better at the 1300 and 1400-foot levels than it has been anywhere at a higher level. Re-precipitation in the zone of weathering tends to explain the greater purity of the gold near the surface, as compared with that at greater depths. It has apparently been dis-associated from its accompanying silver, and the proportion of the latter metal is accordingly relatively greater in depth at any particular mine. Figures, which Mr. H. J. Wise kindly furnished me with in 1904, in reference to this question are highly interesting. They represent the average fineness of the battery-gold won from the New Golden Gate Mine between 1890 and 1903, and are as follows:—

<i>Year.</i>	<i>Gold.</i>	<i>Silver.</i>
1890 .....	·9035	·080
1891 .....	·9125	·073
1892 .....	·9055	·084
1893 .....	·9096	·080
1894 .....	·9022	·087
1895 .....	·9084	·079
1896 .....	·9057	·082
1897 .....	·9031	·087
1898 .....	·8978	·089
1899 .....	·8922	·092
1900 .....	·8843	·100
1901 .....	·8812	·100
1902 .....	·8849	·098
1903 .....	·8834	·099

The above shows that on the whole the gold was more free from silver in the upper levels. A similar result appears on examination of returns from another deep gold mine in our State. Mr. W. Radford was good enough to favour me with some figures compiled by Mr. J. T. Stubs, General Manager of the New Pinafore Mine, at Lefroy. These have been compiled from mint reports, extending over a period of fourteen years, and refer to battery-gold won from the New Pinafore reef.

Alluvial gold from the 200-feet level:—

<i>Gold.</i>	<i>Silver.</i>
·9535	·035

From surface to the 360-feet level:—

<i>Gold.</i>	<i>Silver.</i>
·9450	·045
·9550	·035
·9492	·040
·9005	·065
·9550	·040
·9375	·055
·9492	·040
·9175	·075

From 1100-feet and 1200-feet levels:—

<i>Gold.</i>	<i>Silver.</i>
·9040	·075
·9015	·070
·9255	·060
·8500	·055

These results are in accord with those obtained at Mathinna, and Dr. J. R. Don has established similar differences between shallow and deep gold in Victoria and New Zealand.\*

Discontinuous quartz-veins, which are frequently seen to close up and disappear, when followed down by shallow pits ("Native Cat reef"), are common on the hill range west of Black Horse Gully. These veins affect sandy zones of the general slate country, and have silicified the rock immediately adjacent, sometimes only for a few inches on each side, sometimes for a foot or two. The silicified

\* The Genesis of certain Auriferous Lodes, 1897, pp. 44-46.

wall-rock follows the vein, and thus the appearance is occasionally produced of a band of sandstone crossing the country-rock at an angle to the direction of the general laminae. There is no reason to suppose that the lode-channel really terminates where these veins disappear. Where they occur, they are usually numerous, and indicate a rather extensive zone of fracturing, which, if followed down to substantial depths, would in all probability give way to a zone with fewer fractures and more important reefs. It is in the highest degree improbable that they are independent vein-systems. Cracks and fissures in the rock will be found to connect them with the larger reefs in depth. Though they are often too narrow to be payable, they may be regarded as valuable indicators of more persistent channels below. It is matter of general observation that earth fractures, produced by regional strain, are most numerous near the surface, and most erratic; while they are fewer and more regular at a greater depth. The disappearance of these irregular veins may consequently often bring the operations of small working parties to a standstill, but should not discourage companies with capital from sinking to the lower zone.

Although folding of the rocks has been intense at Mathinna, and arches are formed here and there, the auriferous quartz-bodies do not appear to prevail in the apices and troughs of the country as in saddle reef. At the same time, the rock folding and rupturing have produced channels which have determined the deposition of the vein-silica. Examples exist of fractures due to compressive stress as well as to tension. These fractures or lode-channels have generally been subjected to a little movement after formation, producing a more or less smooth wall on one side, while on the other, more often than not, a ragged edge exists, caused by the silica wandering into the adjoining country.

From the New Golden Gate northwards the fracture or reefing-zone is indicated by the workings at the Tasmanian Consols, the reef under the Catholic church on the hill, the old works at the Spur Mine at the back of J. Polley's, and the reefs on the Golden Stairs in the extreme north. Going south from the New Golden Gate this zone is crossed by the main and second slides in the Gate levels, which represent fractures or breaks in the country, persistent from level to level. The main slide has been traced down to the 1400-foot level. Below that the workings have not advanced sufficiently to meet with it. As will be explained

later on in this report, there seem to be grounds for believing that these slides are not dislocators of the reef, but simply supplied channels for its deviation. They have certainly produced either a downthrow or upthrow of the country, but their direction is that of the slates, and the latter continues unchanged south of the fault. The reefing-zone also continues south through the South Gate, Miner's Dream, Telegraph tunnel hill, old City, Jubilee, and Mountaineer. This is a distance of  $2\frac{1}{2}$  miles in a direct line north-westerly and south-easterly. Further south not much has been done until the Sunbeam and Twilight old mines are reached, nearly half-way to Mangana.

Parallel reef-zones exist both to the east and west. On this visit I examined that to the immediate west, leaving the eastern line for my next journey. The central or Gate zone is perhaps 10 to 15 chains wide. The western zone is about double that width, and the reef-systems are more varied. On the Eldorado and Gladstone hills most of the reefs strike a little to the north of west, and on the City of Hobart the dominant strike is north and south, accompanied by subordinate fractures east and west. The Black Horse Gully separates this western zone from the Gate line. The gully does not denote any divisional line of faulting; still, the crosscuts from the Gate and South Gate mines tend to show that a barren strip of country separates the two zones. In addition, the strata on the two hills differ somewhat in nature, those on the Eldorado side being more sandy.

The Eldorado and Gladstone hills abound with gold-bearing reefs, running mostly in north-westerly or westerly parallels, none of which have been worked at more than shallow depths. The general strike of the strata is  $N. 25^{\circ}$  to  $30^{\circ}$  W., and the underlie south-westerly. This dip prevails through the hill, though there are some minor folds. Minor faults also exist in this tract, displacing the lodes here and there. A little further west on the City of Hobart and Martyn's line, the reef channels assume again a north and south direction for the most part, though the strike and dip of the strata remain unchanged. Strictly speaking, this line of country passing through the City of Hobart ground should be regarded as a parallel zone, distinct perhaps from the Eldorado zone of east and west reefs, though geologically the two are one. The City of Hobart main shaft was sunk to 660 feet, and the reef worked at 500 feet. A good many shafts of less depth

have been sunk on this property; but the above is the deepest reached on this zone. Mr. Martyn's shafts further south are down 60 and 72 feet from surface on a north and south reef. Outside these workings this reef-zone has not been explored; and its prolongation both north and south requires examination.

*New Golden Gate Mine.*

Sections 13-87G, 320-87G, 185-87G, 295-87G, 261-87G, 81-87G, 1441-93G.

The New Golden Gate Mining Company has been working its mine since 1888, during which time it has raised 267,140 tons of quartz, and produced 222,755 ozs. of gold, an average of 16 dwts. 16 grs. per ton of quartz, and realising £847,075 7s. 4d. Its share capital is £9600, in 32,000 shares of 6s. per share. The total amount which this famous mine has paid in dividends is £355,200, or £11 2s. per share.

The main shaft has been sunk to a depth of 1620 feet, and the reef opened upon at 17 levels, from 116 feet to 1600 feet from the surface. This is consequently the deepest mine in the State. It is what may be called a dry mine, and well ventilated, and the work and appointments throughout are creditable to both company and manager. Owing to the increasing depth and a little increase in the water, an electric pumping plant has been installed recently, and is giving high satisfaction.

The principal features of the mine are, (1) the two powerful gold-bearing quartz reefs, Loane's reef and main reef, going down from the surface adit to the 800-foot level (Loane's to the 900-feet); (2) the new make or east reef, beginning over the 800-foot level and descending to the 1600-feet; (3) the west reef (Nos. 1 and 2), about 60 feet west of the shaft, descending from about the level of the 1300-feet to the 1600-feet. This may be the same as the western reef intersected in the surface adit, but as nearly 1200 vertical feet of unproved ground exists between them, their identity is a matter of conjecture. It is probable that they are different reefs.

In the surface adit an ill-defined formation was passed through between Loane's and the western reefs, known as the central reef, but this has not been seen lower down. It most likely junctions with the western reef in depth.

Loane's reef is the only one which goes up to the surface. Mr. A. Loane, prospecting in the adit driven by the

old company, sank a winze on the reef-channel which had been intersected, and which showed a little quartz. A few tons of quartz were got out, yielding between 1 and  $1\frac{1}{2}$  oz. gold per ton, and the present company was formed in 1887. Mr. Thos. Andrews, the present manager, took charge of the mine, and insisted on sinking a main shaft, which was at once started. The oxidised soft rock persisted to about 100 feet from surface, and was then succeeded by the unaltered blue slate of the deeper zone. At that depth a new parallel reef was cut through in the shaft, which received the name of the main reef, and which has since been followed down parallel with Loane's to a depth of 800 feet, and distant from the latter 10 to 30 feet. This important reef is not recognisable in the surface adit. A line of "dig" in the adit-walls may possibly represent it, but an effort of the imagination is required to connect the two.

Above the 116-foot level neither of these reefs proved valuable; at most, only little short shoots occurred in the reef-channels. At the 176-foot or No. 2 level they were still very poor, but at 236-foot or No. 3 level the gold started to make in both reefs. At this level, Loane's reef strengthened to a width of 9 feet, and yielded quartz worth 2 ounces gold per ton. North of the shaft these reefs run parallel, but south they converge and finally junction, forming a fine body of gold-bearing stone where this takes place, attaining a width of as much as half a chain. As deep as 800 feet, Loane's reef when cut was over 28 feet of clean payable quartz, the average being perhaps 6 to 8 feet at the different levels. The average of gold contents of the stone won from the two reefs has been about 18 dwts. gold per ton. The underlay of both reefs is to the east, and its mean amount is 1 in 8; at the 800-foot level they are vertical. Loane's reef continued to yield gold down to the 900-foot level, and then dwindled to a track; the main reef also giving out at the 800-feet. In 1896 a new reef (east reef) from 4 to 13 feet wide, was struck at the 900-foot level. This was followed up to the 800-foot level, and has been worked in the lower levels, attaining a width of 22 feet of stone. From 800 to 1100 feet it descends vertically, about 50 feet west of Loane's reef, but thence to 1500 feet underlies east at 1 in 2. At 1600 feet the reef is again vertical, or underlying very slightly to the east. Large quantities of stone have been crushed from this reef down to the 1300-foot level, but below this the quartz has been poor, though undiminished in size.

The western reef has been driven on at the 1300, 1400, 1500, and 1600-foot levels. It may be regarded as a western leg of the new make, the eastern leg of which formed the east reef. Its underlay is to the west. Between the two reefs is the horse or centre country of the great axial fold mentioned earlier in this report. The western reef is a strong and persistent channel, varying from 4 to 15 feet wide, returning variable stone, some of it very good, but on the whole not realising expectations. It continues north into the Tasmanian Consols Mine.

The exact position of affairs underground may be best understood by considering some of the levels separately, and the following descriptive notes will assist in this. The upper levels were dealt with in Mr. A. Montgomery's report of the 12th September, 1892, since when the mine has been developed to a much greater depth, and the problem has become an entirely different one.

*500-foot Level.*—The crosscut from shaft has been driven 350 feet west, and intersected reefs which are assumed to be the central and western ones, which were seen above the 176-foot level and in the surface adit, but which here are of no value. East of the shaft the Main and Loane's reefs have been worked with advantage. West of the shaft is the perplexing slide country.

At 190 feet west of the shaft a slide traverses the crosscut. It is here a break in the country 4 or 5 inches wide, bearing S. 30° E., and dipping south-westerly at an angle of 3 in 7. A level has been driven along it in a south-easterly direction, and at 125 feet in, a strong reef was driven across, with 25 feet width of solid quartz. This was followed south for 70 feet, when a fault occurred, bringing the quartz round to the north-west, in which direction it was followed through three more subordinate faults. The reef is thus cut up into separate segments by these four breaks, each successive segment being removed further west and north. No. 1 segment was the large block south of the first slide, and appears to be cut clean off at the south end of the stope, the smooth slickensided wall of the fracture denoting movement. It is noteworthy that some of the quartz passes through the slide without deflection, and then dies out. Between this and the next slide a segment of reef striped with quartz has been to all appearance heaved north, a phenomenon repeated a little distance further north by a further slide. The quartz veins in these three blocks of stone are in parallel lines, but the stone between the two following slides is more

mixed with country, and the direction of the veins is not so evident.

The features of this occurrence are peculiar. The smaller segments of quartz are only partly divided by smooth faces or breaks, *i.e.*, the latter do not extend fully across the stope. In the fourth segment the quartz veins are not at right angles to its course as in the others, but in strings parallel to the walls of the fault; and the last slide does not appear to be so clearly cut as the others.

The long level further west is along the course of a long slide, only 50 feet south of this line of breaks; consequently, if we could replace the faulted segments in what seems at first glance their original position, they would form a reef crossing that level. But there is no sign of a break in the level-walls which would indicate the passage of any reef. How then account for the present positions of the reef segments? It must be confessed that this is difficult, and more requires to be known before a definite conclusion can be drawn. A possible explanation is that the quartz between the two main slides was deposited there in broken country subsequent to or simultaneously with the formation of the main slide-channels, following, perhaps, a somewhat tortuous course, and that the broken country-zone has afterwards been subjected to minor secondary faulting which has displaced blocks of country and reef.

At 348 feet west of shaft the crosscut enters the level driven along the long slide north-westerly for 200 feet and south-easterly for 500 feet. Towards the end of the north-western drive, 47 feet behind the face, a turn was taken due west, with a view of getting outside the broken country. At 30 feet from the end a slide consisting of one or two inches of white clay crosses the level north-westerly and south-easterly, and close to it is a band of intensely-folded slate. The level is apparently not yet beyond the disturbed zone. The south-east (or, as it is called, the south) drive from the crosscut follows a kind of soft slide running with the country between good slate walls. As the drive proceeds the slates become twisted, and carry eyes and lenticles of quartz; evidently a disturbed belt. For the last 260 feet the drive continues due south. Broken bars and arches of quartz here and there show the continuance of somewhat unsettled country.

At 108 feet behind the end crosscuts have been driven east and west on a reef formation. In the west crosscut, driven 38 feet, this consists of parallel quartz veins and

black slate 1 foot to 2½ feet wide, and the same formation has been followed for 64 feet in the east crosscut, carrying little lumps and veins of clean white quartz. In the face it has a twisted appearance, and does not look kindly.

The line of clay crossing the north drive towards its end is supposed to be the second main slide.

At 30 feet behind the end of the south drive an exploratory crosscut east is now being driven. At 290 feet it has entered a reef channel, which is being driven across. It has been fairly well established by west crosscuts in the Gate and South Gate mines that the country to the west of the disturbed zone is reefless for a good distance, while formations are known to the east (at the South Gate). This exploratory crosscut must be considered as a good piece of work.

*1200-foot Level.*—The deeper levels of the mine, where driven far enough, show features common to all, for from the surface downwards in each successive level going south a main slide appears to cut off the reefs. Its average bearing is N. 35° W.—S. 35° E., and its hade is 3 in 7 to the south-west; consequently, it interferes with the reef further south in each level as the mine gets deeper. This occurs with such unvarying uniformity at each level as to enable a pretty accurate forecast to be made of the behaviour of the reef at the level below. Strenuous efforts have been made to recover the reef beyond the slide, but so far its southern extension has not been found. The occurrence in the 1200-foot level is so typical that it may be discussed in detail.

The arched reef formation occurs at and near the shaft, dipping westerly in one direction and easterly further in the crosscut. The crosscut before reaching the east reef takes a bend easterly in hard slaty sandstone. It cuts the east reef and passes through it for over 12 feet. The reef was here found to be poor. The level was continued on the reef south nearly 500 feet, the last 170 feet being reported as 12 feet wide of clean stone, assaying 17 dwts. per ton. The shoot of gold-bearing payable stone in this level has a length from north to south of between 200 and 250 feet, and at its southern end is traversed by the main slide. Just north of the slide was very good stone—17 to 18 dwts.; but the quality fell off to half that value after passing through the fault. At the slide the reef bends round to a right angle with its previous direction, and follows the fault-line north-westerly, eventually dying out. This has always been called the "drag" of the reef, being

similar to what is frequently seen in the fault-channel of a dislocated reef. As, however, the strike of the country is practically unaffected by the slide, it is highly probable that the great bend in the reef is a deviation along the pre-existing slide-channel rather than a reef-faulting. If the reef has really been faulted, the faulted part ought to be recovered to the west, which has not been done, in spite of a long crosscut in that direction. The conclusion which I arrived at on examination of this occurrence was that the reef itself had not been faulted. It seems possible that the fracture of the country and the deposition of silica in it were practically simultaneous. The consequences of such a conclusion are far-reaching, for if it be true, search for a faulted portion of the reef would be unnecessary, and all that could be done would be to follow the deviation; which, in fact, has also been done for 200 feet north-westerly.

The level has been extended beyond the slide due south for 270 feet. At 200 feet it passes through a second slide, striking north-westerly and south-easterly, and dipping south-westerly. A few inches of slate and quartz are met with. The country between these two slides is disturbed, showing twisted and curved slates, but preserving the same general strike as that back north. Immediately south of the second slide the country is deflected to a due south strike, but recovers its normal bearing within a few yards. It is usually a grey slate with small bands of a darker graphitic slate, which continues to the end of the level.

At the end of the level a crosscut due west has been driven 260 feet, to explore the country in that direction and pick up any faulted part of the reef. The country passed through is mostly hard grey slate, with two hard quartz-veined bands of blocky stone, emitting some water. One of these water-channels marks an anticline. This crosscut is now suspended. The position of the end is 90 feet from the western boundary of the 3-acre section, and 180 feet from the southern boundary of same. This crosscut has carried out the useful work of testing the ground south of the slide in a western direction, and has proved the non-existence of a faulted reef within any reasonable distance. If the reef has been faulted at all, it has been heaved an extreme distance into O'Kelly's section on the western side of Black Horse Gully. Works on that section or in the Eldorado ground would have an off-chance of meeting with it. But, as said above, I doubt whether there has been any heave. It is more likely that a reef-

zone continues indefinitely to the south, within which crosscuts at intervals would disclose discontinuous reefs all along the north and south line. Within the limits of the zone, *i.e.*, within a short distance of the main anticlinal axis, reefs and makes of quartz undoubtedly exist, and if the Gate reef has for a time lost itself, as it were, in the slide-channel, there is every likelihood of it being succeeded further south by fresh splices and stretches of reef.

In the 1200-foot level, at 180 feet north of the slide, a crosscut east has been recently started, and at 190 feet east of the level is passing through a wide reef channel carrying bands of quartz from 6 inches to a foot wide. At the time of my visit a width of 20 feet of this formation had been cut into. The primary object of the crosscut is to cut a west leg dropping from the main reef; a further aim is to prove the country east of the Gate reefs, which is known to be in the reefing line.

*1300-foot Level: East Reef.*—The reef was struck in this level in 1899, where it showed 4 feet of gold-bearing stone. The same lode-channel of hard country and veins of quartz as met with above was passed through in the crosscut from shaft. The reef rapidly improved when driven on south to 6 feet of payable stone. At about 100 feet from crosscut it began to widen considerably, and soon reached a width of 16 feet, but of moderate value, *viz.*, 3 to 8, or sometimes 9, dwts. per ton. The value is said to have varied a good deal. Near the slide the reef formed a large body of clean stone, 15 feet wide and of variable quality; a rise put up proved a block of highly-payable quartz.

After driving 550 feet from crosscut the first main slide crossed the reef, bearing S. 27° E., and dipping south-westerly. A curious report exists on the mine that the slide still moves. Once a sound like a dynamite explosion was heard, and all the men left their places, but all that ground has been stoped since and nothing was ever seen. No doubt tension still exists in the strata, and is relieved by rupture now and then. The same thing has been noticed in other mines in the State. The ground has been stoped on the north side of the fault, but only a track, as it were, passes through to the south. At about 60 feet south of the fault the stone made again in a large shoot, at first barren, and further on carrying a few dwts. gold to the ton, but there is no stope south of the slide. The end of the drive south of the slide is now filled in, but I am told that it was extended through the second slide with a little stone, which died out.

The east reef, where struck by the crosscut from shaft in this level, is striking north and south, and is within 20 feet of the eastern boundary of Section 13-87c. Further south it bears to the west of south as much as from 10 to 20 degrees.

*West Reef.*—220 feet west of the east reef at the 1300-foot level the crosscut intersected the No. 1 west reef, as the main western reef is called. It is here small and poor, and the walls converge downwards, but the winze 10 feet to the north shows that it descends vertically to the level below. It only shows leaders of quartz in a 7-foot channel here, and carries no gold. It has been driven upon north 260 feet, or within 65 feet of the Consols boundary. The winze at the end of the drive goes down to the level below, and proves that the channel is identical with the one at the 1400-foot. Half-way in the drive is a blow of stone, which, however, is practically barren.

Twenty feet further west what is called No. 2 west reef has been reached by the crosscut, but the appearance of this wherever it has been cut in the mine tends to show that it is part of No. 1 west.

*1400-foot Level.*—At this level a long crosscut from shaft traverses north and south the whole width of Section 13-87, *i. e.*, to within 15 feet of the west boundary, and 20 feet outside the east boundary. At the latter point the east reef was met with, and has been driven on 33 feet north and south, to within 150 feet of the slide. Where it was intersected, it was 26 feet wide, white quartz, hard and poor. For the full distance driven the reef is well defined and clean, but the assays did not show more than 1 to 3 dwts. gold. The gold-bearing shoot at this level is apparently still ahead of the end, and will be shorter here than in the level above. This shortening of the shoot suggests its pinching out in depth, if nothing exists parallel with the level, and suggests search at deep levels for splices or parallel shoots rather than for a continuation of the present shoot downwards. On the other hand, some continuation downward along the slide-plane is probable.

*West Reef.*—At 112 feet west from the shaft the crosscut at this level intersects No. 1 west reef, and at 33 feet further No. 2 west reef.

This was a new discovery at the time. No. 1 reef has been driven on south for 440 feet to the slide, and north 197 feet close to the boundary. At the intersection a body of gold-bearing quartz was met with 12 to 15 feet wide, and continued for 100 feet south, varying from 4

to 12 feet wide, and assaying from 8 to 24 dwts. gold per ton. This stone was proved to go down 30 or 40 feet, and up about 50 feet, when the value and width of the reef declined. The reef in the drive between here and the boundary was reported as varying in size from 5 to 12 feet, and in value from 5 to 14 dwts. per ton. In the end it is 6 feet wide, clean stone, but for a chain back considered too poor to stope.

The south drive on reef showed the channel to be variable, from 4 to 12 feet wide, with stone sometimes highly payable, then bunchy and uncertain. A good block of stoping ground above this level was opened out for a length of 250 feet. In a great part of the drive the quartz is discontinuous—in nice little blocks of good stone, but too short to open out. The drive constantly receives heads and channels of pug from the west, which sometimes carry good stone, and seem to be of the nature of connecting spurs between No. 1 and No. 2 west reefs. For the last 200 feet in this level the only stone met with has been in little isolated bunches, but it is 6 feet wide a little distance behind the slide. The slide, which crosses the level 10 feet behind the end, on a north-westerly and south-easterly bearing, cuts off the large clean stone, but allows stringers and a band of quartz to pass through and curve round to the south-west. The rock-wall on the western side of the level passes through the slide with just a break, but no disturbance. I was told that the quartz was poor up to the slide.

Two crosscuts west from this level have intersected No. 2 west reef; one at 195 feet from flat sheet, driven 28 feet, and communicating by a pass with the level below; the other at 110 feet further in, and driven 40 feet. The first crosscut showed the reef with about 4 feet of stone in it, and the second exposed only a few inches of quartz with an easterly underlay.

The No. 2 reef intersected in the main crosscut is a mixed quartz formation, with a channel 6 feet wide at the end of the drive north, 54 feet from intersection. The quartz in this channel occurs as leaders and bands—about a foot of stone in the largest bands. Another 50 feet of driving would bring this drive into the main level north.

The indications are that what is known as the No. 2 west reef is an integral portion of No. 1, a long narrow horse of country dividing the two parts.

The long main crosscut west intersects at 135 feet from the west boundary a small break or slide, considered to

be the main slide. It is not quite on the line of that slide as cut at the end of the level south, which, if prolonged, would touch the western boundary. Having regard, however, to the distance between the two points, it is quite possible that the two faults are identical.

*1500-foot Level.*—Only the west reef has been driven on at this level, viz., for 370 feet south of the shaft and 180 feet north, or to within 30 feet of the north boundary. In the south drive stone 4 to 15 feet wide was proved of varying quality, a good deal of it low-grade. The ground above this level has been stoped up to the level above in the south drive. North of the shaft a shoot of gold-bearing stone for about half the length of the drive has been proved, beginning about half-way in.

*1600-foot Level.*—This is the deepest and most important level. The crosscut east of the shaft intersected the east reef at 150 feet, and that west of the shaft passed through the west reef at 140 feet.

The east reef where struck was 5 feet wide, and gold-bearing up to 5 or 6 dwts. gold per ton. It has been driven on 150 feet south without any improvement in quality—in fact, the gold going south has disappeared. When I saw the end, the reef was 6 feet wide, with 5 feet of quartz in bands, and there was still quartz outside the walls of the drive. Water from the reef channel was dripping from the roof; the stone was a little mineralised and of favourable appearance.

A drive north was recently started on this reef, and a winze begun 10 feet from the flat sheet. The stone showed gold freely, and a small crushing from the drive (43 tons) returned 1 oz. per ton. The gold in the winze is rather erratic, disappearing and reappearing at intervals. The north drive has been extended to 30 feet without improvement. The wall on the east side is well defined and smooth. A few feet back from the face a head crosses the drive and has checked the stone, but the face is black with mineral. The reef in the winze is 4 feet wide, stone clean, wall defined, and everything promising. The occurrence of gold here is the most important feature of the mine at the present juncture, but this will be referred to later on.

The crosscut west from the shaft at 140 feet cut the west reef, which at this point is 10 to 12 feet wide, with about 5 feet of lode-slate. The quartz is low-grade. This reef has been driven upon north for a distance of 140 feet, but has supplied nothing to the battery. The drive

is on a large reef, and the face carries a large formation on the footwall. On the west side at the end gold-bearing stone was found, worth about 5 dwts. per ton, and a rise goes up on this to the level above. A point of stone comes into the drive from the east, and at the end of the drive a crosscut east has been driven about 30 feet; the face of this is in quartz-veined slate. It is probable that the point referred to is the cap of a quartz body going down below this level. The end of this drive is 70 feet from the north boundary, and there is every reason to believe that the reef is the one upon which the Tasmanian Consols has driven north, only this drive is 172 feet below the 1400-foot level of the Consols, and 17 feet further west. The main crosscut has been carried some 20 feet further west through reef and lode slate formation. The indications are that the two parts of the west reef have junctioned here.

The solid and wide reef followed in the north drive with moderate, though not payable, assay values, augurs well for future work at a deeper level.

After the above review of the deeper levels we are now in a position to consider the general prospects of this great mine.

These at present are visibly dependent upon the east and west reefs. The former has been stoped roughly (neglecting certain gaps) a vertical distance of 250 feet from below the 1000-foot level down to the 1300-foot level for an average length of 250 feet; but below this no stoping has been done, as though the reef is powerful and clean, the gold-shoot seems to have thinned out. The pitch of this shoot is to the south, and the main slide is practically the southern end of it, though gold-bearing quartz continues westward a short distance in the slide-channel before it finally dies out.

Efforts have been made to pick up the heaved reef on the south side of the slide, but in vain, and after examining all the conditions, I am of opinion that there is very little chance of finding it, as the indications are that the reef has deviated along the channel, and has really not been faulted at all. It has been followed in various levels to the end of its deviation. This does not, however, preclude there being a continuation southwards south of the slide country; not the same reef perhaps, but in the same line. The reef-making process which was at work certainly extended southerly and south-easterly, forming the long north and south reefing-line referred to before in this

report. Consequently, it is quite possible that the South Gate Mine, deepened to 1000 feet, might open up reefs of the same character as those in the New Golden Gate. The reefing-line is in a direction east of south. The long crosscut west from the 1200-foot level has failed to pick up anything in its course, and this result is not encouraging for discoveries on the western side. Crosscuts to the east have a much better chance, and this has been recognised by the Gate management.

As regards the main shoot of gold in the east reef, it has not been proved below the 1400-foot level. A winze was commenced at the end of this level, in order to prove the reef down to the level of the 1600-feet, and in the event of success, the latter would be driven south to connect. Unfortunately, the walls of the reef at this spot showed signs of converging, and the funds available do not allow any risk of unprofitable work being taken. Consequently, sinking was suspended, and properly so, under the circumstances. All the same, however, this work is desirable whenever funds will permit it. Still, it would appear as if the gold shoot has been for some time contracting as it descends, and it is possible that it will have disappeared altogether by the time the 1600-foot level is reached.

It is useless to disguise that the company has to face the possibility of one of those blanks in the reef such as have occurred in other mines, and have been perseveringly passed through to payable stone at a greater depth. An uninterrupted gold-shoot in one reef or the other for at least 1200 vertical feet, as has existed in this mine, may be described as a persistent run of the precious metal, and a blank sooner or later would have to be expected; but both experience and theory teach us that the blank is only a passing phase. The magnitude of the scale on which gold has been deposited from the 1300-foot level upwards forms the very best reason for believing that deeper sinking will eventually lead to another gold-bearing zone.

The most important feature in the whole mine at present is the discovery of gold in the reef at the 1600-foot level, 400 feet north of the main shoot at the 1300-foot. Stone worth 1 oz. per ton was met with here, but the gold gave out and is now being sought by a winze. The fact of gold occurring at this point, unconnected with the south shoot, makes it nearly certain that the discovery is a parallel shoot. It may therefore be the cap of a new make of gold descending from this level indefinitely. The

management is doing its utmost to locate the shoot with certainty. When this is done the mine is likely to receive a new lease of life.

There are thus at least three or four directions in which capital may be expended advantageously, viz:—

1. Locating the new gold-shoot at the 1600-foot level.
2. Sinking the main shaft deeper, to explore and prove this shoot in depth.
3. Pushing out exploratory crosscuts east; and perhaps,
4. Sinking on the old south shoot from the 1400-foot level.

I am inclined to think No. 4 is the work of least immediate promise, and would be very likely to turn out disappointing; still there is a possibility.

Nos. 1 and 3 are being attended to by the management, and all that can be done is being done, and done thoroughly.

No. 2: The work of sinking the main shaft deeper, so as to get at the new shoot of gold below the 1600-foot level, is of prime necessity, and may be strongly commended to the owners.

From the above remarks it will be seen that the only policy which can save the mine is an exploratory one. It is ridiculous to talk of the mine as having come to an end while there is a strong reef with patches of gold at its deepest level. The situation would never have arisen if a strong reserve fund had been built up in the palmy days of the mine; but it must now be accepted, and funds provided for a definite policy of exploration.

From the behaviour of the reefs and a review of the structural features of the mine generally, one may feel almost sure that northern parallel shoots of gold exist, and there is no reason why they should not prove as important as the one already worked. It is for the mining engineer to search for them in the most profitable and approved way; and I would lay the greatest stress on this work. Immediate further sinking of the main shaft is involved in this view.

With reference to the west reef, it has, on the whole, been disappointing as regards its yield of gold. Still, it has sent a good deal of quartz to the battery from the 1300-foot level downwards; and the quantities of stone being taken from it in the Tasmanian Consols Mine further prove its importance. A comprehensive policy for the Gate mine must include the development of this reef. The fine body of quartz in it at the 1600-foot level, north

drive, invites further work. Although low in grade at that point, it may improve at increased depth; at any rate, it is too encouraging to be left alone.

The New Golden Gate Mine has a very complete gold-saving plant, consisting of 40 stamps, 8 boxes (5 stamps in each), 3 copper plates to each box (none inside), one Watson and Denny pan for the blanketings, a hydraulic classifier to each 10 heads, 1 Wilfley table and 1 Frue vanner to each 10 heads. The cyanide plant comprises 4 distributing and 4 leaching-vats (100 tons capacity), 6 slime-vats with agitators (12 tons), and 3 zinc-boxes. The quartz is tipped direct into hopper, and without passing through a stone-breaker is hand-fed into the battery, one feeder being employed for each 10-head of stamps. The stamps vary in weight. Mr. T. J. Andrews, the general manager, says that a few years ago stamps of 750 lbs. were in use, with a drop of 8 inches, and 75 blows per minute, but that some of them have been replaced by heavier stamps, increasing the weight by a heavier shank, and a solid disc instead of the screwed disc, and at present most of the stamps are a little over 900 lbs. in weight, with 6 inches drop, and 90 blows per minute.

The quartz is crushed through a 200-hole grating, and passes over two ripples, then over the copper plates and blanket strips. The blanketings are ground in a Watson and Denny pan, and amalgamated with mercury. After the blankets, the sand passes to the hydraulic classifier, and two classes are formed, No. 1 going over the Wilfley tables, and the slime-pyrites over the Frue vanners. The tailings are then pumped to the cyanide plant, each distributing-vat holding 100 tons of tailings, which are trucked into leaching-vats in front and below. The slime passes in the overflow, and is caught as far as possible in a series of 6 settling-vats, each provided with an agitator driven by an air-winch. The tailings are leached with cyanide; and being fairly clean, do not require any special previous treatment. The gold is extracted in zinc boxes. The tailings residues are trucked from the leaching-vats and drawn up an inclined tramway with air-winch for tipping. The slimes are agitated and allowed to settle before decanting solution; these are not rich enough to warrant filter-pressing.

The 40-head battery, crushing full time, treats 420 gross tons per week of six days. The battery amalgam is worth about one-third gold, and the gold realises about.

£3 16s. per oz. The cyanide bullion is worth a little under £3 per oz. The concentrates are sent for treatment to Cockle Creek, N.S.W.

An electric pumping plant has been recently installed in the main shaft, and is a complete success. The manager informed me that he could raise 2500 gallons per hour with it, but that the hourly quantity to be lifted was only about 1200 or 1400 gallons.

It may be mentioned that for several years the quartz raised and treated has cost between £1 8s. and £1 9s. per ton, including management expenses.

*South Golden Gate Mine.*—The Section 295-87c now belongs to the New Golden Gate Company, and the old South Gate shaft is situated in the north-eastern corner, 114 feet south of the north boundary-line. Work has been relinquished, and my information is derived from Mr. Andrews and the mine plans. The main shaft has been sunk 400 feet, and crosscuts driven at 200 feet and 400 feet. In the 200-foot crosscut and at 20 feet from the shaft a 6-foot reef formation was passed through, carrying some quartz, but no gold. This runs approximately with the country, and underlies east. It was driven on a short distance, with no results. It appears to be the Snake reef, which was sunk on by the Snake shaft 20 feet north of the boundary; and what is thought to be the same reef was exposed in a small shaft or pit opened by the roadside just south of the Gate residence. No certain information is available respecting the results of the old Snake shaft, but it is said that some half-ounce stone was got from it.

At the 400-feet in the South Gate shaft two long crosscuts were driven east and west. The west one was pushed 194 feet, or within 11 feet of the western boundary, without cutting anything beyond a wall at 107 feet from the shaft. In the east crosscut at 130 feet from shaft a reef formation, about a chain wide, was passed through, which must have been the Snake reef; and 84 feet further in a second formation, 75 feet wide, was intersected. Continued driving for further 150 feet failed to disclose any more reefs.

If the bearing of these formations is reported correctly as N. 25° W., we cannot connect them with any of the reefs worked in the New Golden Gate. The Snake reef is not far from the position which the main slide might be expected to occupy, but its underlay is easterly. The real relations of the South Gate reefs to the slide are

doubtful. We do not know their strike sufficiently well to be able to produce them northwards towards the Gate mine. As far as can be judged from appearances, they would intersect the Gate reefs on their underlay if they persist so far. It is regrettable that they were not explored more fully. As the Snake reef was gold-bearing where worked from the shaft, other parts of the reef will almost certainly be found gold-bearing also. The formations are mullocky or slaty where they have been cut, but as their strike is more or less with the country, it is probable that they will last for some distance, and may make more quartz at some point or other. I have charted them as south of the slide, assuming the bearing of the latter to be uniform throughout, but I am far from certain as to where the main slide would strike these reefs.

*Tasmanian Consols Mine.*

This company leases Sections 70-87G, 174-93G, 173-93G, 1008-87G, 57-87G, 204-83, 130-G, and 75-93G.

The work is being done on Section 70, at the shaft begun by the old North Golden Gate Company. The levels of the different crosscuts from the shaft are as follows:—150 feet from surface, 390 feet, 540 feet, 900 feet, 1000 feet, 1100 feet, 1200 feet, 1300 feet, 1400 feet. The New Golden Gate shaft is 190 feet south of the boundary, and the Tasmanian Consols shaft 62 feet north of it, so that the two shafts are not more than 252 feet apart, but the collar of the Tasmanian Consols shaft is 28 feet below that of the Gate. Accordingly, the levels in each mine do not correspond exactly with each other.

The west reef of the New Golden Gate has been developed in this mine at the 1200, 1300, and 1400-foot levels. It cannot be connected satisfactorily with formations seen in higher levels. As this is the only productive reef so far worked in this mine, I will take these lower levels first.

*1200-foot Level.*—At this level crosscuts have been driven west 130 feet and east 40 feet. The west crosscut, after passing through 50 feet of dark slate, dipping west, intersected a wall, and traversed an irregular reef formation for 15 feet. On the east side a vein of quartz about a foot wide, and carrying a little gold, has been cut. Then a further vein, 6 inches, was cut, and on the west side is mixed formation about 6 feet wide. The reported

values of the quartz are from 8 to 10 dwts. per ton. The crosscut was continued with the object of cutting another reef further west. The face is in dark, smooth slate, dipping west: 3 feet behind it is a 5-inch vein of quartz underlying with the country.

Levels were driven on the reef north and south. The south drive, 50 feet, to the boundary, has not opened up payable stone. About half-way in is from 6 inches to a foot of stone on the footwall, and a bunch of mottled quartz is in the face on footwall side, about 1 foot wide.

The north drive, at 30 feet from crosscut, carries 2 to 3 feet of mineralised stone on footwall, with a little gold; and at about 60 feet this improved to a body of payable quartz the full width of the drive. Stone was sent to the battery from the stopes above this level for a length of 80 feet by 20 feet high. The south end of the stopes comes to within 30 feet of the crosscut. At 90 feet from crosscut a rise has been put up 42 feet through the stopes. The reef was payable up to 20 or 25 feet, then fell off in grade and size. At 12 feet it was 5 feet wide; at 18 feet, 3 feet wide; at 25 feet, 2½ feet wide; at 40 feet, it is broken and valueless. Some rich stone was disclosed by this rise, some of the assays returning between 1 and 2 ozs. gold per ton; but values, on the whole, were irregular and poorer than below the level. The stope ends 30 feet north of the rise; and 20 feet further north a crosscut west was driven off the level for 21 feet in slate country with quartz veins, but with no result. About 15 feet behind the rise the reef appears to be divided, a splice going off east. A few feet north of the crosscut, on the east side of the level, a reef goes off to the east with 2 feet of clean low-grade stone. It may be wider, but has only been cut into for 2 feet. This appears to be a splice taking the place of the main reef, which crosses the level to the west. Ahead of this make, only bunches of quartz occur in the roof. Further north, at 220 feet from the main crosscut, a crosscut east has been driven for 75 feet. The main level continues north past this crosscut for 38 feet in clean slate country without any sign of a reef. It would seem here to be too far to the west.

The 75-foot crosscut was driven to intersect the east reef formation cut east of the main shaft. At one time it was suggested that this was the east reef in the New Golden Gate; but this cannot be the case, as that reef would be 90 or 100 feet east of the shaft, or only just inside the eastern boundary of the section. A reef has

been cut 3 feet behind the end, carrying 9 or 10 inches of quartz, with a north-west bearing. I doubt whether this is the same as the one in the crosscut east of the shaft; but it is probably identical with that cut at the end of a drive north of this crosscut, 50 feet back from the face. From that point the drive has been extended 107 feet north. This drive is supposed to be in the footwall part of the west reef, or on the east splice of the reef. About two-thirds of the way in, the reef rises in the floor and disappears again; and some quartz is seen in the level in two or three places. At the end a cuddy has intersected the east reef formation,  $2\frac{1}{2}$  feet wide, which is here stronger and carries more clean quartz than in the crosscut. The cuddy has been pushed through to the clean slate on the east side, which is smooth and identical in appearance with that at the end of the crosscut. The quartz carries a little gold.

The crosscut east from the main shaft cut a lode at 27 feet, which has been thought to be the one cut at the end of the level north. If the latter is the same as the one cut in the other crosscut, this reef could very well be a different one, for the bearings are not identical. The relations of the country-rock, however, are similar in all three exposures, and this suggests identity in some way, for here, too, the sandstone of the crosscut gives way to dark, smooth slate where the reef is cut. The reef has been driven on east of south for 15 feet, carrying about 6 inches of white unpayable quartz for half-way in, which then degenerates into stringers. The underlay is to the east. To cut the east reef of the New Golden Gate at this level, it would be necessary to drive the crosscut further east for about 70 feet, but the reef would then be found to underlay out of the section. The reef which has been cut in the Tasmanian Consols east of the shaft is most likely the formation met with in the Gate crosscut near the shaft.

The work done on the west reef in the Consols has followed it at about 100 feet nearer the surface than in the New Golden Gate, but this appears to be the cap of it. At the 1200-foot level the stone forms a low crown, or apex, which was disappointing above the level, but has been found to improve and lengthen going below it.

*1300-foot level.*—The crosscut west cut the west reef at this level at 58 feet west of shaft. At the intersection the channel is about 20 feet wide, carrying an irregular

formation of quartz veins, but payable. The length of payable stone has increased at this level to 220 feet. The reef was strong for 60 feet along the level as far as No. 1 winze, where it is 6 feet wide, and of good quality. Northwards from there it pinches, but after 40 feet it opens out again to  $7\frac{1}{2}$  feet, yielding very good stone; after another 40 feet, it contracted again. The northern end of the stope is in reef matter carrying a little gold, sufficient to go to the battery with other stone. North of the stoped ground the reef in the level varies from 3 to 5 feet in width, sometimes broken and irregular, and giving varying gold prospects. The face carries a well-defined footwall, and about 2 feet of stone altogether. Behind the end a flat floor comes in, cutting down through the lower part of the drive. The quartz is gold-bearing, but not payable. This is rather a long drive without any crosscuts.

At the bottom of the 40-foot winze (No. 1), from this level, there was, at the time of my visit, a fine reef of solid payable stone,  $9\frac{1}{2}$  feet wide, opening out going south to 16 feet.

The level south from the crosscut has been driven to the boundary, where the horse of lode slate intersected at the flat sheet terminates, and the two portions of the reef come together. In the face the division is just showing, the eastern side of the reef dipping east, the western side underlying to the west. The reef is 13 feet wide, but is not payable in the end; or, rather, the stoping-ground seems to have come to an end here, a stope running back from here north for 70 feet, and up to 80 feet above the level, communicating with the intermediate end from No. 1 winze.

The north end of the 1300-foot level on this reef in the New Golden Gate Mine is 28 feet higher than this face, and 70 feet on the south side of the boundary. It is still poorer, and probably there is not much of importance between them, as the gold is making north in a cone-shaped shoot, the base of which lengthens in descending.

*1400-foot Level.*—This is the bottom level. The crosscut west intersected the reef at 43 feet, or 15 feet to the east of where it was passed through at the level above. The survey shows that this apparent change of underlay is not real, but due to difference of angles at which the crosscuts have been driven, the reef being practically vertical, or dipping west very slightly. Where the cross-

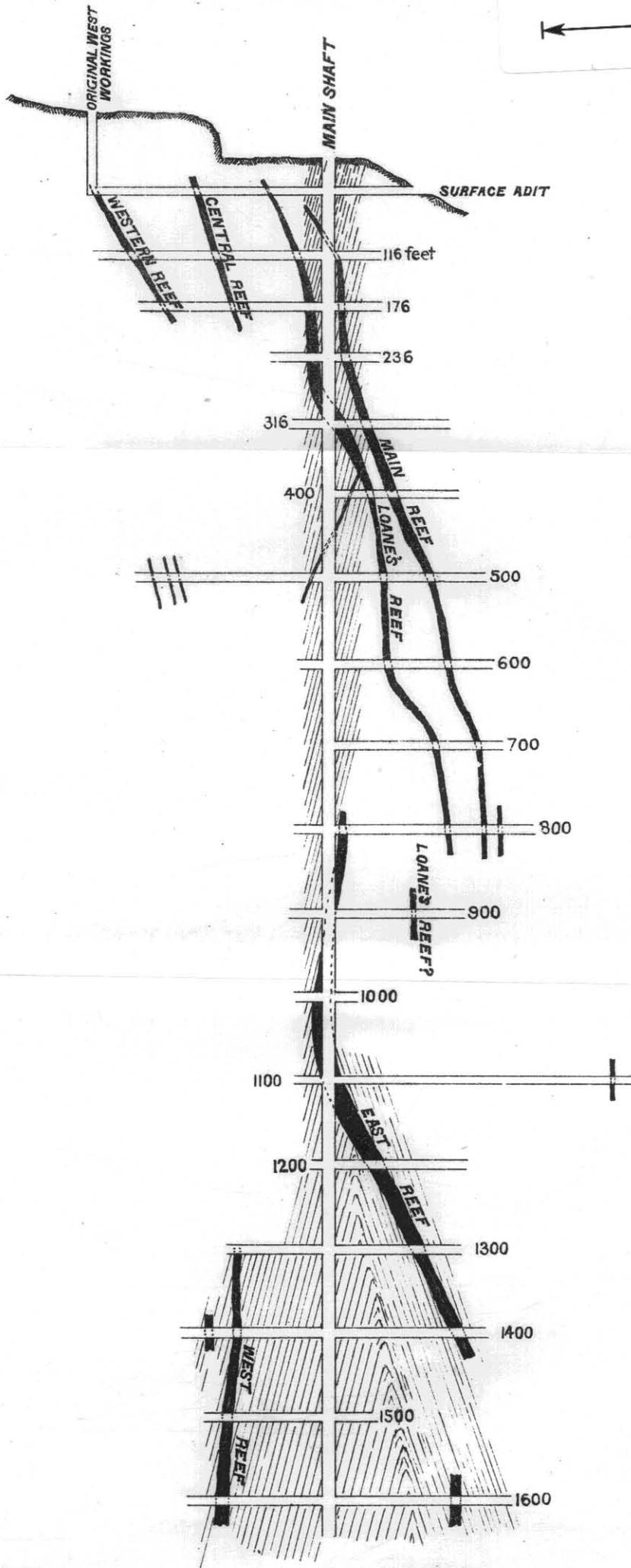
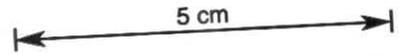
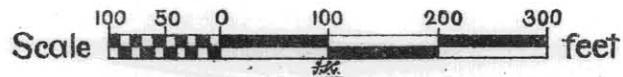
cut passed through the reef, the latter consisted of between 11 and 12 feet of gold-bearing stone. Levels north and south have been opened on it. When I saw the reef, soon after its intersection, it was a splendid body of quartz, 10 feet in width, well mineralised. The battery tests of it seem to show that it is worth about 10 dwts. per ton. Since my visit the south drive has been carried to the boundary. As the New Golden Gate has driven its 1400-foot level also to the boundary, on what is presumed to be the same reef, the two ends must be one above the other, separated by a vertical distance of about 28 feet. From the plans of the surveys of the underground workings of both mines, the reef at the 1400-foot level in the Consols is identical with that in the Gate at its boundary in its 1400-foot level, for the measurements give only 3 feet horizontal difference between each, the reef in the Gate being at that point 240 feet west of the north-east corner of Section 13-87c, while in the Consols it is 243 feet. This difference is not what I should have expected, for the Consols appears to be working on the eastern part of the reef (if there is any split), and on that supposition its reef should be to the east of the one in the Gate. But a few feet difference may exist in the survey, and absolute certainty cannot be attained unless a connection is made between the two mines. Whether, however, the workings are on one part or the other of the reef, and however the reef behaves, it is the west reef of the Gate that has passed through to the Consols.

An intermediate level is being driven at the Consols 50 feet above the bottom one, and is on a fine body of stone. The level north, at the 1400-feet, is also being pushed forward. This must be continued irrespective of any variations in the reef, as the length of the shoot has to be proved and developed in that direction. The form and direction of the gold shoot in this mine have not yet been precisely determined. From the analogy of the New Golden Gate we should judge that it will be found to pitch southwards. As far, however, as work has proceeded, it seems to show an approximately vertical shoot, widening north and south as it descends. More work is necessary before an opinion can be formed. The quality of the stone crushed varies within narrow limit, but is of payable grade, as may be seen from the following statement of crushings from the beginning of the company's operations to the end of last year, kindly supplied to me by the local agent, Mr. H. J. Wise.

# NEW GOLDEN GATE REEFS

PLATE I

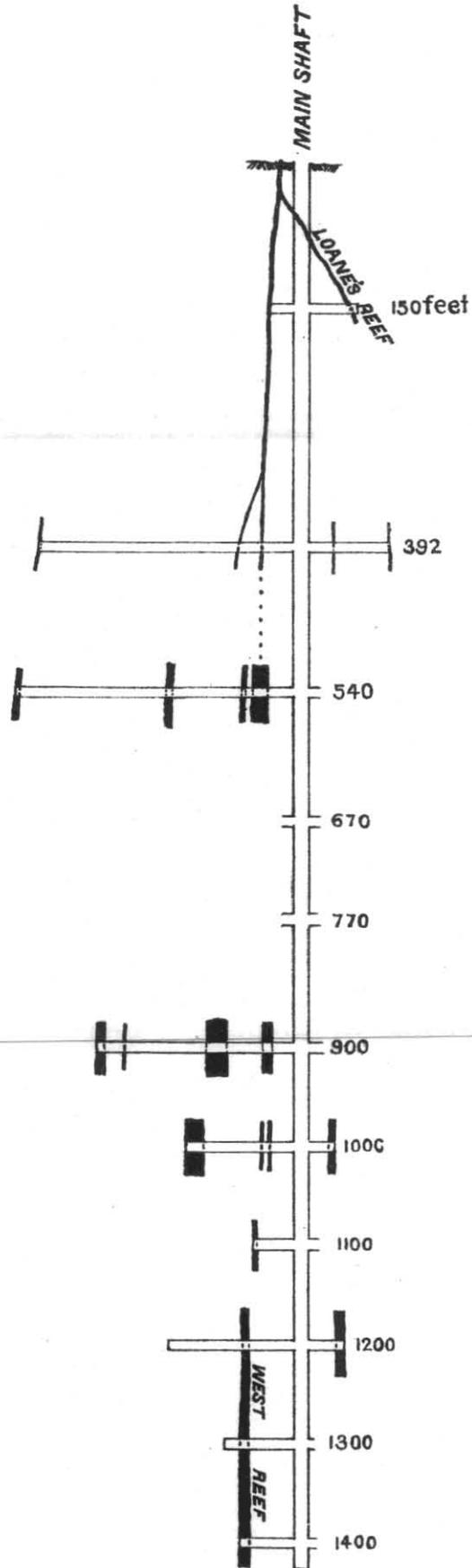
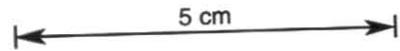
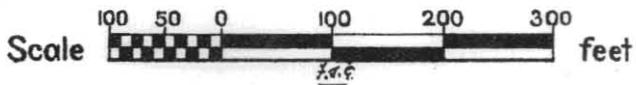
Cross section looking North



# TASMANIAN CONSOLS REEFS

PLATE 2

Cross section looking North

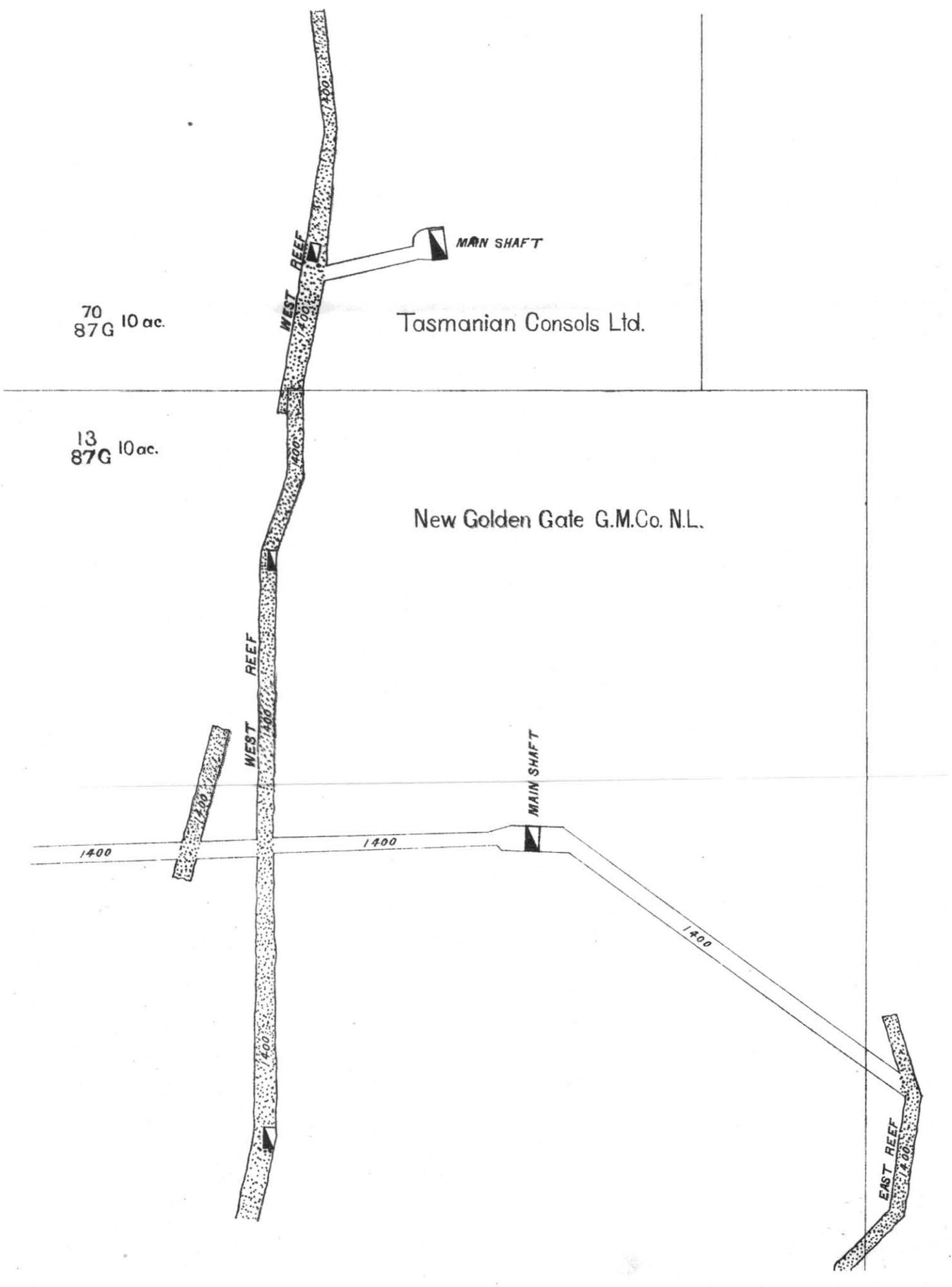


# LEVELS ON WEST REEF

PLATE 3

5 cm

Scale 10 5 0 10 20 30 40 50 60 70 80 90 Feet



# LEVELS ON WEST REEF

PLATE 4

Scale 10 5 0 10 20 30 40 50 60 70 80 90 Feet

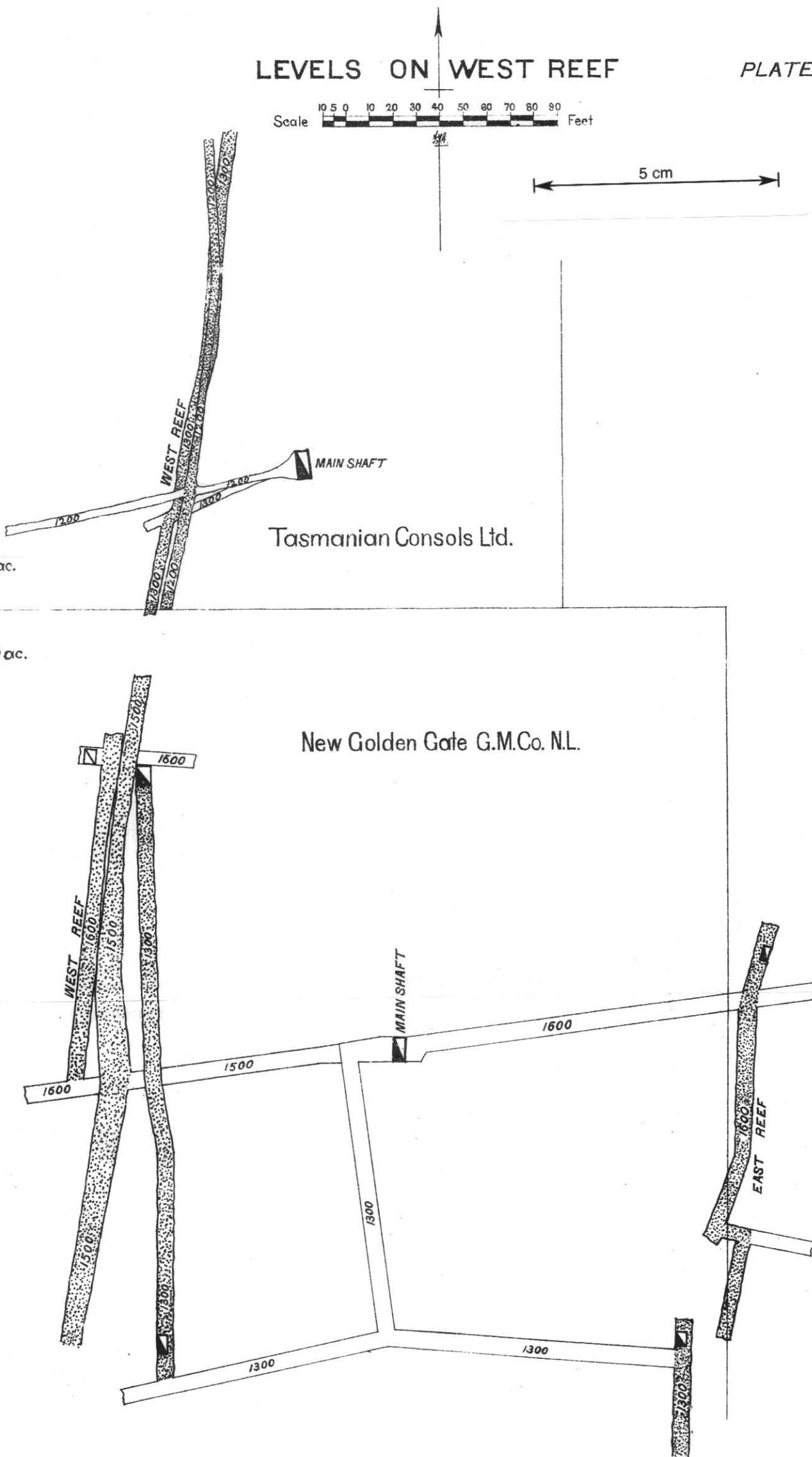
5 cm

70  
87G 10ac.

13  
87G 10ac.

Tasmanian Consols Ltd.

New Golden Gate G.M.Co. N.L.



STOPES ON WEST REEF

PLATE 5



S

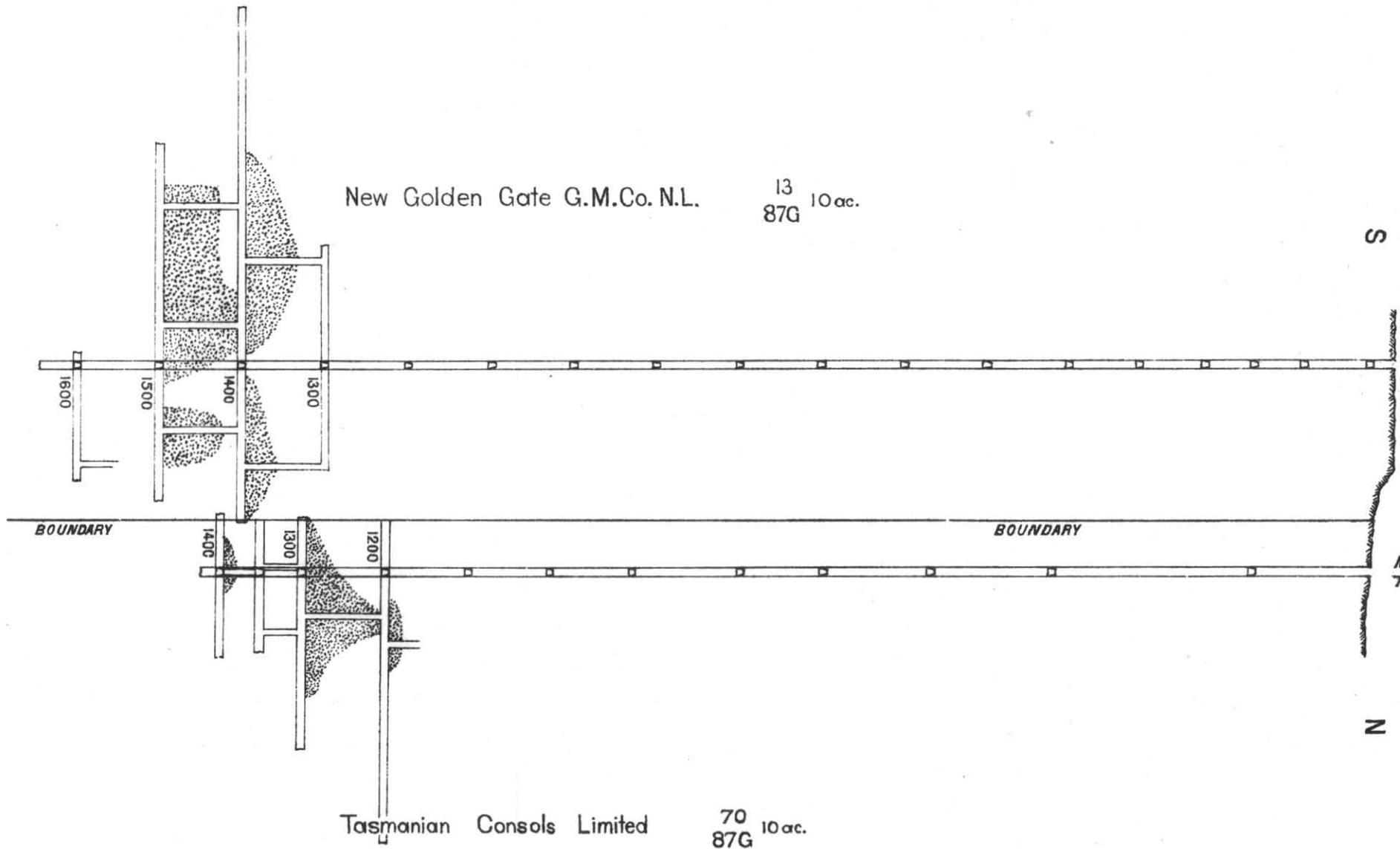
N

MAIN SHAFT  
NEW GOLDEN GATE

MAIN SHAFT  
TASMANIAN CONSOLS

New Golden Gate G.M.Co. N.L. 13  
87G 10 ac.

Tasmanian Consols Limited 70  
87G 10 ac.

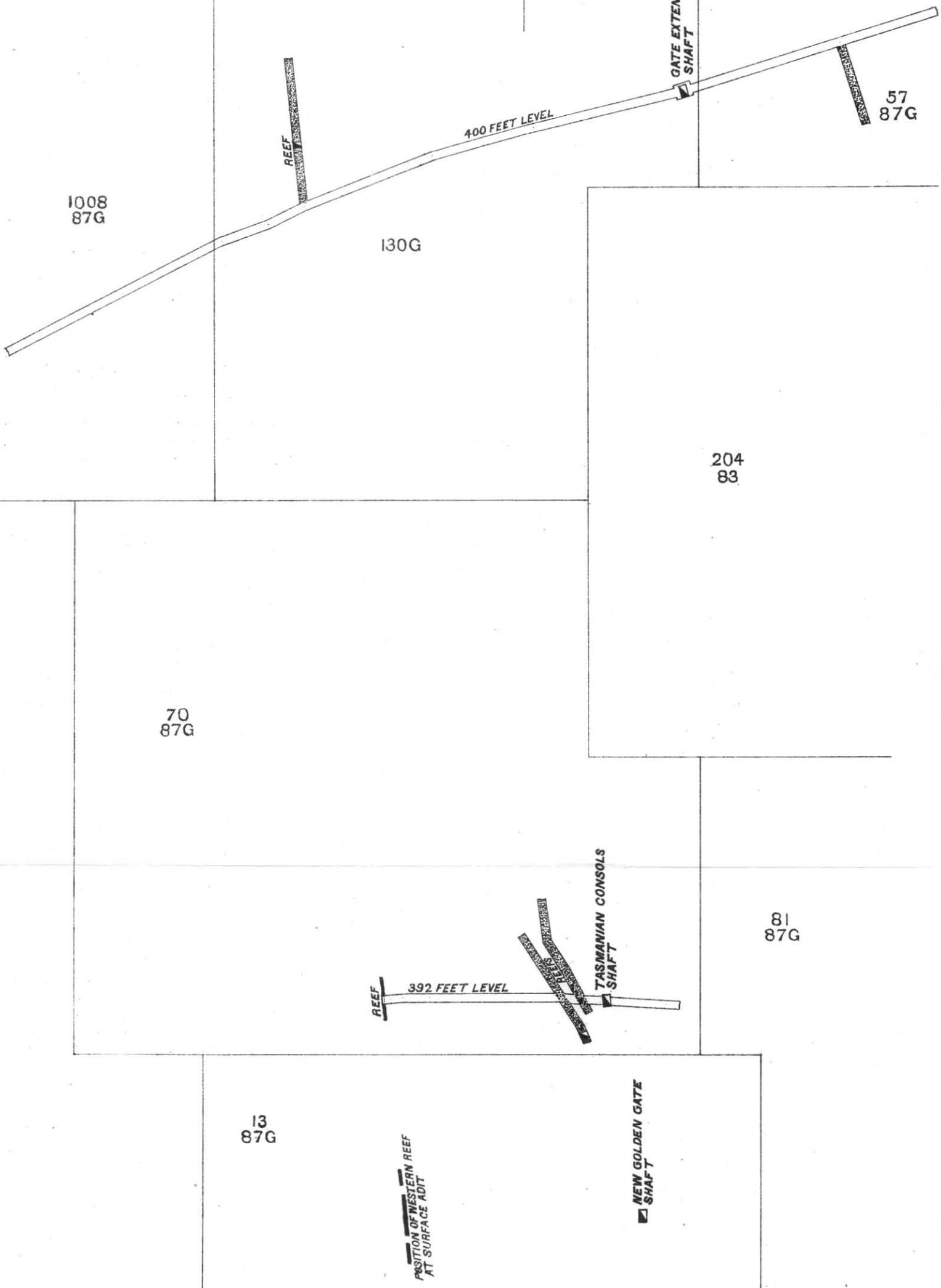


# GATE EXTENDED CROSS CUT

PLATE 6

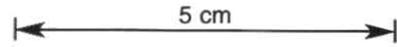
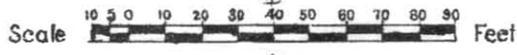
5 cm

Scale 100 50 0 100 200 Feet



# GOLDEN STAIRS MINE

PLATE 7



SHAFT WELCOME STRANGER

SHAFT

SHAFT

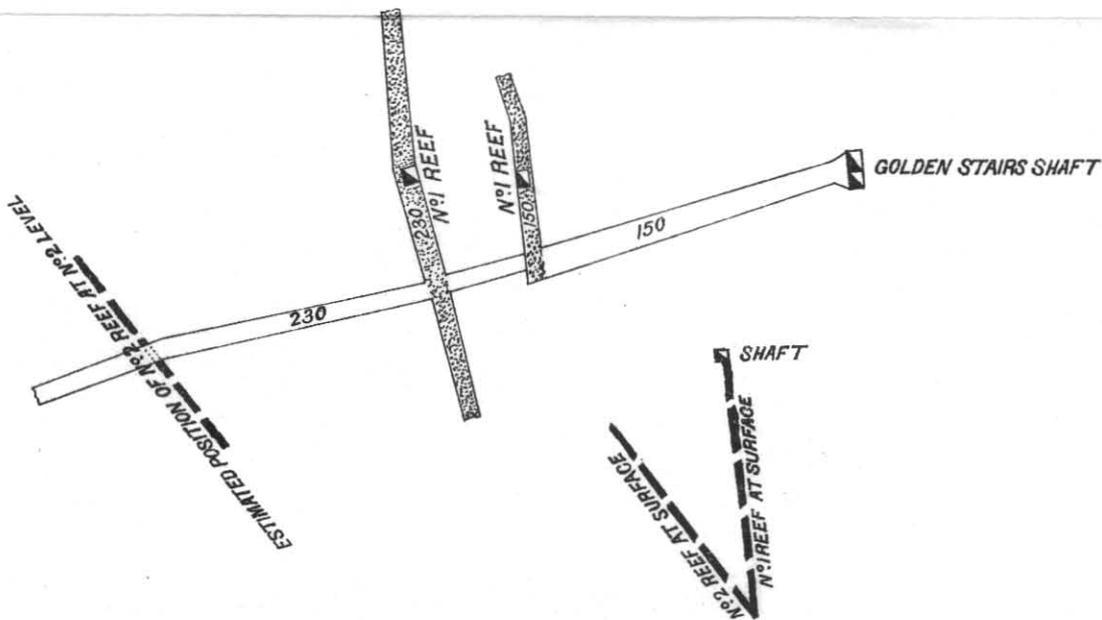
TRENCH

SHAFT

137 G

W.J. Todd

136 G



# LOCALITY PLAN

PLATE 8

5 cm

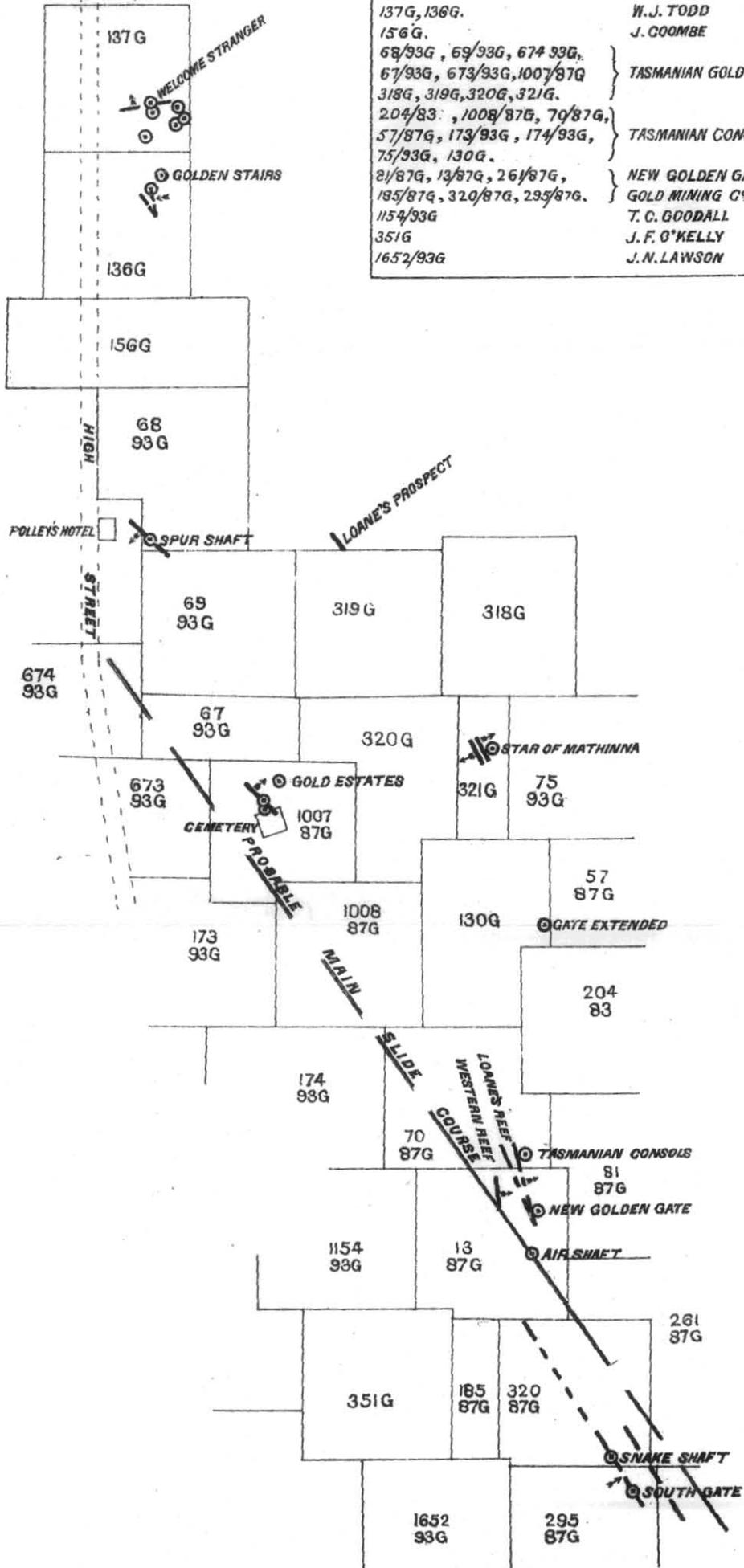
Scale 100 0 100 200 300 400 500 600 700 800 900 Feet

W.H. Twelvetrees  
Government Geologist  
29 Mar. 1906

ROAD TO FINGAL  
W<sup>m</sup> Talbot pur.

— REFERENCE TO SECTIONS —

137G, 136G.	W. J. TODD
156G.	J. COOMBE
68/93G, 69/93G, 674/93G,	TASMANIAN GOLD ESTATES C <sup>o</sup> L <sup>td</sup>
67/93G, 673/93G, 1007/87G	
318G, 319G, 320G, 321G.	
204/83, 1008/87G, 70/87G,	TASMANIAN CONSOLS L <sup>td</sup>
57/87G, 173/93G, 174/93G,	
75/93G, 130G.	NEW GOLDEN GATE GOLD MINING C <sup>o</sup> N.L.
21/87G, 13/87G, 261/87G,	
185/87G, 320/87G, 295/87G.	
1154/93G	T. C. GOODALL
351G	J. F. O'KELLY
1652/93G	J. N. LAWSON



## xxxiii

Date.	Tons crushed.	Ounces won.	Per ton. dwts. grs.	Value. £ s. d.
1904—Oct. 27	13	8	12 7	30 3 9
”	13	10	15 9	35 18 3
Nov. 14	200	109	10 21	387 7 2
Dec. 14	660	374	11 8	1352 11 4
1905—Jan. 25	345	172½	10 0	624 14 9
Feb. 22	510	181	7 2	665 3 10
Mar. 22	508	162	6 9	585 6 5
May 16	460	240¾	10 11	879 10 5
June 14	423	169	7 23	616 9 8
July 26	570	251¾	8 20	918 6 10
Aug. 23	380	209	11 0	764 14 0
Sept. 20	336	192	11 10	703 16 2
Oct. 18	400	219	10 22	804 5 5
Nov. 18	645	312	9 9	1150 14 7
Dec. 20	870	383	8 19	1404 16 6
(Plate gold)		137	...	483 6 8
	<u>6333</u>	<u>3130</u>	<u>9 21</u>	<u>£11,407 5 9</u>

Average yield, including pyrites, 10·23 dwts. per ton.

From the above quartz, 77½ tons pyrites were obtained, containing 383 ozs. gold; and the average value of the tailings is 2 dwts. per ton. The average value of the pyrites per ton is 4 ozs. 18 dwts. 20 grs.

The presence of the strong and payable reef in the bottom level sufficiently indicates what the company's policy should be. Further sinking of the main shaft is indispensable, combined with exploration to the north. For the latter purpose two levels had better be selected: the 1400-feet for proving the present reef; and perhaps the 1200-feet for driving north into the next section, in order to crosscut to the line of the New Golden Gate east reef, which cannot be reached from these workings in any other way. As it stands at present, the mine is a partly undeveloped property, work, owing doubtless to financial circumstances having been carried on on a limited scale; but the opening up of the ore-body in the lower levels is putting fresh heart into the company, and there is now every reason for undertaking the new work with vigour. I would urge that no time be lost in beginning another sink at the main shaft.

*Upper Levels.*—I now proceed to notice the upper levels, in which the deep west reef cannot be identified. In the 392-foot level crosscut, quartz veins were cut near the west end, which, in Mr. Montgomery's opinion, heralded

the Gate adit central and western reefs. Since then a level has been driven 200 feet deeper, the 540-foot level, which has been extended 24 feet further west, and has cut in its end what would seem to be the same formation.

*540 feet Level.*—This is a crosscut level west, driven 277 feet. From the chamber it passes through a formation of slate, with veins of quartz 16 feet wide underlying west. I interpret this as the same reef formation as was cut in the level above at about this distance west of the shaft. Mr. Montgomery thought it was a western branch of an extension of Loane's reef. Five feet further in is another formation 2 feet 6 inches wide, which may pertain to the same channel. In the course of the drive various channels and quartz veins occur, some of the latter being lenticular and discontinuous. At 57 feet behind the end is a track of some fault 2 feet wide, crossing the level; and in the end itself is a reef formation 3 feet 6 inches wide, consisting of slate and white lenticular quartz of irregular habit, dipping west. This has evidently come down from the west end of the 392 feet crosscut. From its position it would appear to be the northern extension of the western reef met with in the New Golden Gate surface adit. If the crosscut in the 500-foot had been extended a little further west, the reef channel would have been defined with certainty. Now, if this reef is prolonged northwards on its line, we shall find that it corresponds in position with the reef struck in the west crosscut in the Gate Extended at 470 feet from the shaft. That reef, therefore, is the upper western reef of the Gate mine. It has not been seen at a lower level in the Consoles, because none of the lower crosscuts have been driven far enough to intersect it. The 900-foot level crosscut is the nearest to it, having been driven to 196 feet west from the shaft. It is strange that the reef has not been driven upon from any of these crosscuts, as its behaviour and quality where it has been intersected form no proof of its value. It would be unusual if such a persistent reef did not carry economic values at some part or other.

*900-foot Level.*—At this level a crosscut west has been driven 196 feet from the main shaft, and a drive north for 54 feet on a reef channel.

In the crosscut, about 20 feet from the shaft, a formation is passed through, carrying 4 or 5 inches of stone on the east wall, and 6 to 15 inches on the west wall; the whole channel being about 8 feet wide, and underlying east. Thirty-six feet further west a formation about 20

feet wide, is intersected, composed of crumpled, twisted, and mullocky quartz, also dipping east. The stone is developed mostly in the roof and walls; nothing much is seen in the floor. The slate strata are much disturbed in this crosscut. The general underlay is east, though now and then the strata are vertical. Twenty-nine feet behind the end is a reef dipping east, with 6 to 9 inches of stone; and at the end is a  $7\frac{1}{2}$ -feet formation of quartz veins, 1 inch to 4 inches. This is a good looking reef channel.

The distances between the levels reduce the determination of the reefs in this level to a matter of surmise. The channel struck at the end can hardly be the same as that at the end of the 500-feet.

The drive north from west of shaft is on the line of a formation which is 19 feet wide at the end, and merits being driven upon. A winze has been sunk at the end to a depth of 60 feet, and it is said that the stone gave a fair prospect, though it was rather narrow. The shaft at this level seems to be in the centre of the fold of the country.

*1000-feet Level.*—Crosscuts have been driven east and west from shaft, and a short level driven north and south on a load-line east of the shaft.

The crosscut west has been driven 107 feet from the shaft in slate country, dipping west. At 20 feet from the shaft a small quartz reef is intersected, which has 7 to 9 inches of stone, dipping to the west. At about 10 feet further west a little more quartz is met with, and at 36 feet from shaft quartz is seen lying irregularly in flat curves. For 15 or 20 feet behind the end of the crosscut formation country is passed through with mineralised quartz veins, reported as carrying a little gold. When this was cut, it was thought to be the west reef of the Gate, but it is too far west for the lower west reef, and not far enough west for the upper or adit western reef. At the end of crosscut a lode formation about 2 feet wide, containing two veins, about 4 inches each, has been passed through, and a slate wall met with, vertical, or, if anything, dipping east.

The crosscut east has been driven 70 feet. At about 10 feet from the shaft it passed through quartz veins, and 10 feet further east intersected a lode 6 to 9 inches wide, dipping east. Towards the end the slate is very irregular, still dipping east. The end is in clean slate; a few small veins of quartz just behind it. A drive south goes from this crosscut at 17 feet from the shaft for 44 feet, on an irregular formation. A vein of quartz, 3 inches wide,

is seen in the middle of the roof, and parallel veins occur at intervals from this to the east wall of drive. Just behind the end a short crosscut or cuddy, 12 feet long, was driven to the west, in slate, with bunches of quartz.

A drive north from the main crosscut has also been put in for 43 feet, exposing irregular seams of quartz, and a cuddy west, behind the end, shows a formation  $4\frac{1}{2}$  feet wide, with quartz veins. This is the reef cut east of the shaft at the 1200-foot level.

*1100-foot Level.*—A crosscut has been driven 40 feet west from shaft, and on intersecting the reef a level extended in a north-westerly direction for 210 feet on the reef track. An east crosscut from shaft has only been opened out for 12 feet in hard slate, showing in the end a miniature inverted saddle of quartz on the south wall. At the shaft the strata are vertical, but on driving west a change to easterly underlay takes place immediately. At between 37 and 40 feet west, two veins of quartz, 6 to 8 inches wide, were cut, one of which was reported at the time as carrying good gold. The crosscut was continued a little to make sure that there was nothing beyond, and then the wall of the formation was followed in a drive to the north-west. The underlay of the reef is west. The level is in an arch of the strata, which underlie east on the east wall. The veins driven on come together, but the stone is small and irregular. After driving 80 feet in a north-westerly direction, another reef formation, 3 feet wide, consisting of mullock and mineralised quartz of poor quality, was passed through, and the drive turned north to follow it. This was, at the time, supposed to be the west reef, though which west reef does not appear from the reports. It is not far enough west to be the western reef in the Gate adit, but it may possibly be a western branch of the west dropper from Loane's reef. It was driven on for 120 feet without any improvement. A cuddy at the end was driven east for 12 feet without disclosing any quartz. In the end of the level is a lode track with a little mineralised stone on the west wall, tailing out, but it may re-appear further on; and behind the end there is a little stone on each wall. It is a disappointing level, and requires crosscuts to clear up some uncertainty as to position.

There are several features in this mine which command attention, and should encourage the owners.

Firstly—A massive payable reef has been opened upon in the deeper levels, now followed downwards, for a couple of hundred feet, with improving results. The fact that

the same reef has been developed in the Gate for long distances with, on the whole, disappointing results, need not influence work here. A shoot of gold has been fortunately located, and it remains to go down further on this.

Secondly—Any amount of virgin ground lies to the north, and development of the reef by extension of the drives on it northward must be undertaken.

Thirdly—If the northern crosscut at the 1200-foot level is extended in a north-easterly direction, the east reef of the Gate can be reached and proved in the Consols property (on Section 204). If that reef is payable there, a new mine will result.

Fourthly—The reef which I believe to be the Gate Extended reef can be driven upon in the 392 and 540 feet crosscut levels; preferably, the latter.

Fifthly—The ground generally east of the shaft is comparatively untried, and when everything is in full swing and funds are available, ought not to be neglected. It has the disadvantage of being a rather narrow strip from east to west on Section 70-87g.

Work during the past eighteen months has greatly strengthened the position and prospects of the mine. Vigorous exploratory and developmental work may be recommended confidently. This, together with sound management, may be expected to achieve good results.

The battery comprises 20 heads of stampers, with plates and blanket strakes. The blanketings are treated by sluicing. A modern gold-saving plant would be advantageous. The company is at present installing a new winding plant.

*Gate Extended Shaft.*—This is on the Tasmanian Consols, Section 130-g, 20 feet from the east boundary, and formerly belonged to the New Golden Gate Extended Gold Mining Company. At the time of Mr. Montgomery's report it was sunk to 159 feet. It has since been deepened to 410 feet. From the bottom, crosscuts have been driven east and west; the east one to 311 feet, the west one to 863 feet. These are now inaccessible, but Mr. Wise has kindly furnished me with the fortnightly mine reports, and Mr. Andrews has supplied the particulars of underground survey, so that authentic information of these important workings is available. These crosscuts cut right across the line of the Gate and North Gate reefs, and show us what exists on this parallel at that depth. At 182 feet west of the shaft, a drive was put out 106 feet

to the south-east on a mullocky reef formation, dipping east, about 2 feet in width, carrying bunches and bands of quartz, but of poor quality. It was thought that this would lead to the reef near the old Perseverance shaft further south; but work in the mine was suspended in August, 1897; and in February, 1898, the long crosscut was again taken in hand. At 250 feet from shaft a solid body of stone was passed through, showing 2 feet on the south side of the crosscut, but of poor quality. At 354 feet a vein of highly-mineralised stone was intersected. At 364 feet highly-mineralised quartz was observed; and at 380 feet a 6-inch north and south vein of stone was cut through, associated with lode-matter and small veins of quartz. At 471 feet a lode formation was passed through, with a well-defined wall and 1 foot of reef-matter on it, composed of soft pug and rubbly quartz. This channel corresponds in position with the western reef in the Gate adit, and has been cut in the 392 and 540-foot levels of the Consols Mine.

A drive was started north on the hanging-wall of this formation, a foot of solid stone carrying gold and pitching north. At 80 feet from crosscut the reef consisted of 3 feet of lode-matter and a foot of solid stone on the west wall, carrying gold. At 64 feet a rise was put up for 37 feet in a mullocky reef with broken quartz 3 feet between walls. A cuddy was put in east from the drive, but only disclosed small veins of quartz. The drive was continued north to 177 feet from the crosscut in a formation 3 feet between walls, and described as very mullocky. It was then stopped, and no drive put out to the south on this reef. The main crosscut, continued west, passed through mineralised veins of quartz at 491 feet from shaft. At 560 feet intersected bands of quartz in hard country. At 585 feet passed through several small north and south veins of mineralised quartz. At 696 feet intersected many mineralised quartz leaders; and at 716 feet several small veins of quartz. At 767 feet intersected some barren stone; and at 783 feet, numerous quartz veins. At 835 feet cut through a small vein of quartz; thence to the end, 863 feet from shaft, through clean, barren slate.

The intersection of the reef which was driven on took place at 99 feet east of the western side-line of Section 130-c; and the end of the crosscut is 264 feet due west of that side-line, in Section 1008-87c, a little above and to the west of the new road.

The east crosscut has been driven to 311 feet from shaft, through slate. At 193 feet, a reef-course, 2 feet wide, was passed through, consisting of lode-slate, with a good hanging-wall, carrying a seam of pug, dipping east about 1 in 3. At 206 feet several strongly-mineralised veins were intersected. At 217 feet blue slate, with strong bands of quartz, slightly dipping to the west, was passed through.

A drive south was started at 193 feet on the reef-course to prove the reef worked in the old Caledonia tunnel, which was thought to be identical with this. For 50 feet from crosscut the formation was 3 to 4 feet wide, carrying some mineralised stone on the footwall; but at 86 feet, and thence to the end at 98 feet, it was broken and discouraging.

The main crosscut was continued east in slate, with occasional leaders of quartz; and at 311 feet from the shaft work was suspended in fairly-clean, dry slate.

Two hundred feet south of the Gate Extended shaft is an old shaft, said to be 60 feet deep, evidently sunk for prospecting purposes, but no information is available.

#### *Tasmanian Gold Estates.*

The Tasmanian Gold Estates Company, Limited, has taken over some of the leases formerly held by the Tasmanian Consols, and now hold 1007-87g (not transferred), 673-93g, 674-93g, 67-g, 68-g, 69-93g, 318-g, 319-g, 320-g, 321-g.

This is all ground lying to the south of the Consols, and is in a good position for the upper western reefs of the Consols. The reef now being worked in the Consols at the 1300 and 1400-foot levels, if it maintains its north course, will at that depth pass through the Consols Section 75-93g, just east of the eastern boundary of the Gold Estates Section 321-g. As, however, this would be a  $\frac{1}{4}$ -mile to the north of the Consols shaft, a precise calculation cannot be made. If the reef in that distance bore a little west it would come into the Gold Estates section. In this section is the Star of Mathinna shaft, over 200 feet deep, from which a crosscut was driven west for a chain, cutting at 20 feet from the shaft a quartz reef 3 feet wide, dipping east. The reef has a smooth footwall, but carries no gold. Twenty feet further west a broken formation, 2 feet wide, dipping west, was intersected. These were at 150 feet from surface. At the surface, reef indications are seen at about 40 feet west of shaft,

and one outcrop is in the creek. These have been thought to be the South Gate formations, but Loane's reef, if its branches re-unite, and if it lives so far from the Gate Mine (30 chains), would pass through this section; and if it continues on a course only slightly to the west of north, might be expected to pass between the shaft and the western boundary of the section. It appears to me that the Gold Estates owners have a fair chance of meeting with something if they deepen this shaft and crosscut to the south-west under the Long Gully, and across the line of reefing country. I presume the same intention of proving this country by crosscutting under the Long Gully flat was present in the minds of the owners when they commenced sinking the new shaft north of the cemetery. This is on the top of the hill 15 chains south of west from the Star of Mathinna shaft. It has been sunk to 120 feet, but work is now suspended. One hundred and fourteen feet south-west is an old shaft, which was sunk 60 feet on a small vein running north-west and south-east, and underlying east. This is reported as having had a fair gold value. A prospecting shaft has been sunk 100 feet close to it. The new main shaft would enable this vein to be proved, if sunk deeper. There is an outcrop under the Catholic church, which is on the Gate line of country, and appears to run with the country. I am not at all certain what this reef is. It would be eventually intersected by a crosscut east from the shaft. The shaft is too far west to be used advantageously for testing the extensions of the Gate reefs, but it has a use of its own in testing the ground on the north-west line from the Gate. New makes of quartz are likely to be developed along this line, which is the belt within which the reef-channels occur. It would appear, therefore, that the Gold Estates Company has at least two points where new work may be recommended, viz, this shaft on the hill, and the Star of Mathinna shaft over the valley.

The company has another old shaft at the back of Polley's Hotel, now filled in. It was sunk to 100 feet on a small gold-bearing vein, running north-west and south-east, with a westerly underlay. The eastern and central sections of the Gold Estates Company are situate within the Gate reefing-belt, and this position warrants deeper work. It is possible that the Gate reefs may not extend continuously so far north; but even in that case their place may be expected to be taken by fresh fracture-lines and makes of quartz belonging to the same general system, offering every encouragement for exploratory work.

*Hen and Chickens.*—On the northern section of the Gold Estates, 68-93G, a tunnel was at one time driven from the main road beneath where the Chinese store is now; and winzes were sunk on an east and west lode, which intersects a main north and south reef. It is reported that 3-oz. dirt used to be won from the Hen and Chickens workings, but at excessive cost.

*Loane's Workings.*—On Section 1295-93G prospecting was carried on in the old days, and a little fine gold won. Recently Mr. A. Loane cleaned out the trenches and picked up a gold-bearing vein underlaying west and bearing south-east, a little east of the Star of Mathinna shaft, and a good deal east of the Gate Extended shaft. It is considered to be the reef driven on south from the east crosscut in the Gate Extended. It may possibly be the same, but the drive in that crosscut was only 193 feet east of shaft, and the reef underlay east, whereas this vein dips west, and if true to its source, would run 50 or 60 feet further east of the shaft. The distance between the two, however, is 30 chains, and it is impossible to be positive.

#### *Golden Stairs Mine.*

Sections 137-g, 136-g, 10 acres each, charted in the name of W. J. Todd; and 156-g, 10 acres, charted in the name of J. Coombe. This property is at the northern end of Mathinna township, occupying the flat land on a level with High-street, which traverses the sections. It is within the reefing-belt of the Gate line, about a mile north-west of the New Golden Gate Mine. Slate country prevails in the eastern part of the property, and sandstone in the western part. The underlay of the strata is to the west, and this indicates, together with other considerations, that the western part of the sections lies a little to the west of the Gate axial line. The eastern part lies fairly within the productive slate zone, in which the great reefs have been worked further south.

Operations were started here many years ago, and the old Golden Stairs Company put down a main shaft on Section 136-g, about 14 years ago, to prove the main north-west reef, and 3 cross-reefs (east-west), over which, in the alluvium, a large quantity of gold had been obtained. The cross-reefs have been worked down to a depth of 30 feet with good results.

The main shaft has been sunk through slate to a depth of 230 feet, and crosscuts driven west at 150 feet and 230

feet. According to the mine survey, the crosscut at 150 feet intersected the main reef at 94 feet from shaft. The reef was then driven upon north for 55 feet. Mr. Stephen Richards reported the reef formations, where intersected, as being 8 feet wide, with 12 inches of quartz on footwall and 2 feet on hanging-wall. The quality is not known, as no battery test was made. The reef being wider and better in the floor of the drive than in the reef, the shaft was deepened, and a crosscut from the bottom cut the reef at 111 feet from the shaft. It was here found to be irregular and poor. It was driven upon 80 feet north and 29 feet south. To intersect the cross-reefs, it would require to be driven 170 to 220 feet further north, and this ought to be done, but at a greater depth. The main crosscut was continued west for a further distance of 115 feet, passing 30 feet beyond where it was expected to cross through No. 2 reef, which junctions with the main, or No. 1, reef at 100 to 120 feet south of the shaft. This crosscut, it will be noticed, proves the ground west of the shaft, but the ground east of the shaft, which is the slate belt of the Gate, has not been tried. A long crosscut should be driven east from the shaft to test this ground. This is an important piece of work, and should not be omitted when operations are resumed at this mine. If this is done, and the main reef is also followed north and south in the bottom level, the mine will receive a good test. The position of the property, and the amount of gold won from the reef detritus at surface, warrant finding sufficient capital for exploratory and developmental purposes. If the exploratory work gives any encouragement, the main shaft could be deepened at once, as the indications are that it is not quite deep enough for the reefs to be settled and free from disorder.

Close to the back of the gardens, north-west of the main shaft, is an old prospecting shaft, sunk either on the main reef or on Markey's cross-reef, from which a crushing was taken, worth, I am informed, 3 or 4 dwts. per ton.

Sixty-two feet south-west of the main shaft is another old prospecting shaft, upon a reef about 4 feet wide, which has been stoped at surface under the mullock-tip. It is said that the stuff crushed went 3 to 6 dwts. per ton. This reef junctions with the main reef 89 feet south of this shaft, but has not been cut in the bottom crosscut, and the upper crosscut was not extended far enough to intersect it. The stone from this reef was crushed at the City of Melbourne battery.

Three hundred and forty feet north of the main shaft is the Welcome Stranger shaft, on the north side of Wilson-street, in Section 137-g. Some loose specimens at surface, aggregating 11 or 12 ounces, were found, and led to the discovery of a reef-channel, N. 77° E. I am informed that the outcrop dirt, after being washed, went 12 dwts. per ton. A shaft was then sunk to a depth of 40 feet, at about 20 feet north of the outcrop, and the track of a reef was cut in a drive, but no gold being found, work was abandoned. About 14 years ago, on an assurance that gold had been left in the bottom workings, these were cleaned out, but only a reef-channel with two walls was disclosed.

South of the Welcome Stranger shaft, by the roadside, some white quartz, carrying coarse gold, was sunk on to a depth of about 20 feet.

North of the Welcome Stranger is another formation. Good alluvial gold has been found in the flat to the east, but the alluvium to the north becomes too heavy for tracing reef outcrops.

At the corner of Wilson and Mangana streets an underlay shaft was sunk three years ago by Messrs. Markey and Todd, on an east and west reef, with northerly underlay, but no crushings were taken out. An outcrop is visible on the opposite side of the road. A little gold was found here by the former manager, Mr. S. Richards. South and east of this, the ground has been sluiced, and still gives good surface prospects.

On Section 156-g, Messrs. Markey and Todd sank a small shaft east of Mangana-street, on barren stone.

It is perhaps going too far to say that all the gold found in the alluvial covering on these sections has been shed from the known reefs; but unquestionably, the coarse gold which has been washed from the rubble over the reef outcrops has been derived from the reefs in question. The various discoveries of stone north and south of the main shaft speak in favour of a resumption of underground work. I look upon the property as an undeveloped one, which warrants going to the expense of a thorough trial.

#### CONCLUSION.

In concluding this first part of my report on Mathinna, I wish to emphasise my opinion that the goldfield has yet a long course of life before it. Its present unsatisfactory condition is mainly the result of two operating causes.

First, the large shoot of gold-bearing stone, which has been worked so uninterruptedly in the New Golden Gate, has become impoverished; and time has to be spent now in picking up the new shoot, which is almost certain to exist. Secondly, so many workings have been abandoned at comparatively shallow depths without thoroughly proving the ground, that, strange to say, they act as a deterrent, instead of inciting to fresh work; and, moreover, they tend to give the field a bad name. But confidence in the field ought to be sustained by a knowledge of the fact that the gold occurrences are not mere sporadic instances, but are integral parts of the great series of gold-bearing channels which extend in this belt for so many miles north and south. That these channels have been exhausted by the insignificant mine-openings made into them here and there along the line is an absurd idea. It may be regarded as a certainty that there still remains undiscovered an indefinite amount of gold in these reefs, and this should help to dispel pessimistic views. I look upon the Mangana, Mathinna, and Mount Victoria fields as forming a single geological unit. All three are indisputably charged with precipitated gold, derived, I believe, from one and the same deeply-seated source; and, as gold-fields, they possess, in my opinion, all the essential elements of permanence.

I beg to tender thanks to Messrs. H. J. Wise, T. Andrews, T. J. Andrews, Jno. Campbell, Geo. Webb, Ben. Searle, W. Stevens, Hitchcock, and others on the field, for information and assistance kindly given.

Part II. of this Report will be submitted at an early date.

I have the honour to be,

Sir,

Your obedient Servant,

W. H. TWELVETREES.

Government Geologist.

W. H. WALLACE, Esq.,  
Secretary for Mines, Hobart.

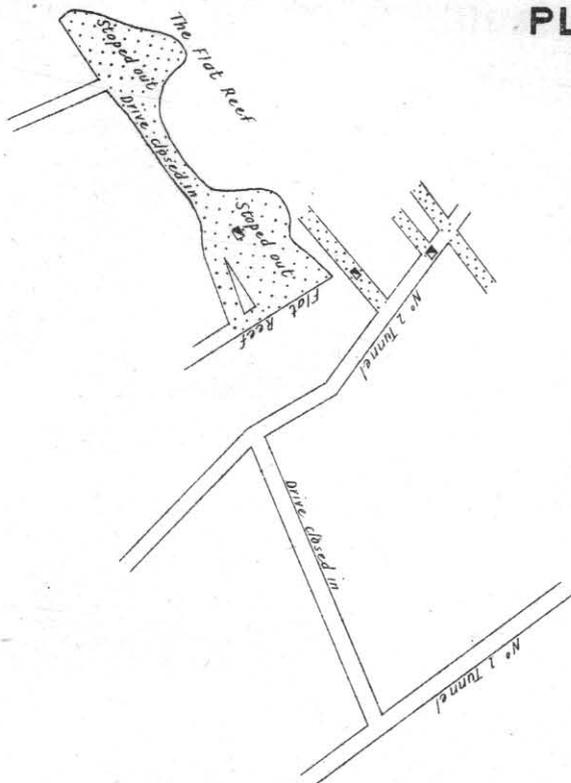
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# PLAN OF JUBILEE MINE

## MATHINNA

SCALE OF FEET  
0 50 75 100

5 cm



211  
93G

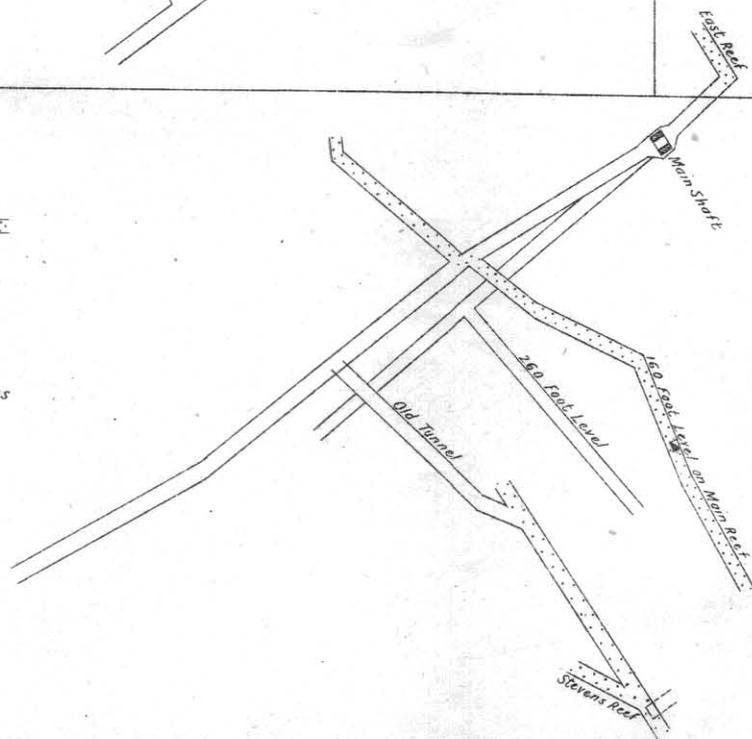
324  
G

### REFERENCE

Drives on course of Reef

M. H. Twelvetrees  
Chief Inspector of Mines  
August 1906.

209  
93G



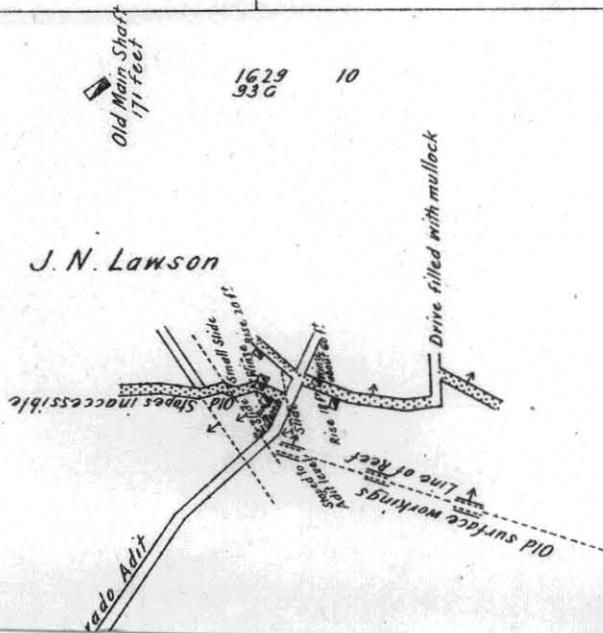
1633 10  
93G  
J. N. Lawson

1630 10  
93G  
J. N. Lawson

5 cm

# PLAN OF OPHIR MINE

Scale of Chains  
0 1 2 3 4 5 6

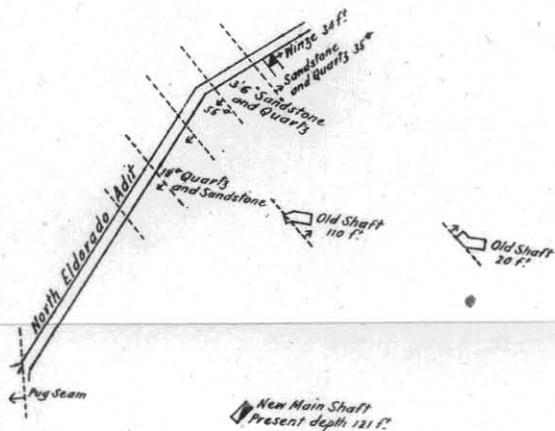


1632 7 ac:  
93G  
J. N. Lawson



349 10 ac:

Gibson and O'Kelly



1652 10 ac:  
93G  
J. N. Lawson

185 3 ac:  
879  
NEW GOLDEN GATE  
G. M. CO. N. L.

536 10 ac:  
H. E. Hitchcock

W. H. Twelvetrees  
Chief Inspector of Mines  
August 1906.

# REPORT ON MATHINNA GOLD FIELD.

## PART II

[With Two Plans.]

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Government Geologist's Office,  
Launceston, 27th August, 1906.

SIR,

I HAVE the honour to submit Part II. of my Report on the Mathinna Gold-field. Part I. dealt with the properties on the Gate line of reef, from the New Golden Gate northwards. I now proceed to notice those in the southern part of the field.

The same belt of reefing-country continues southwards through the sections 425-g, W. D. Stephens; 423-g, Stevens and Dick (Miner's Dream); 422-g, W. D. Stevens (South Miner's Dream—now A. J. Gabell); 426-g, G. Webb; 471-g, Volunteer Consolidated Extended; 419-93g, Telegraph; 409-93g, City; 322-g and 209-93g, Jubilee and Mountaineer. This is as far south as I have gone yet; but before I have finished with the field I expect to trace the line still further in that direction, as I find the strong axial fold of the country persistent through to the Jubilee; the strata north of the Jubilee Creek underlying east, and south of it underlying west. There is, therefore, a very good reason why reefs should be met with all along this line. The more I examine this zone the more astounded I am at the pessimism of those who look upon it as exhausted. This line, running north and south for 20 miles, denotes a persistence of gold quartz to great depths, and stamps the districts through which it passes as permanent gold-fields for generations to come.

The Hill ridge, south of the South Gate shaft, follows a direction east of south, falling into a saddle south of the mine, and then rising past the Pride of Mathinna shaft and, further on, the old Telegraph shaft. In the saddle at the race the slates are vertical, and fall away east and west from this line towards the Long Gully on the one side, and Black Horse Gully on the other. The first mine met with on this line is—

### *The Miner's Dream.*

This is on Section 423-g, 12 acres, in the name of W. G. Stevens and D. Dick. Three chains south of the

north boundary, and  $2\frac{1}{2}$  chains east of the west boundary, is the old Pride of Mathinna shaft, which was sunk 70 feet to intersect a small north-west reef trenced upon at surface. This was cut in a crosscut at 50 feet east from the shaft, dipping east, but no definite information about it is obtainable. It is said to have been only a foot wide where it was cut. It is a little too far west to be a continuation of either of the South Gate east reefs; on the other hand, it ought to have been intersected in the west crosscut from the South Gate shaft. A formation, or wall, is shown on the mine-plan in the west crosscut, at 107 feet west of shaft, about where the Pride of Mathinna vein would come in; but to connect the two is quite speculative.

The work preliminary to the discovery of the Miner's Dream reef consisted of loaming up the east side of the hill from the race. A little gold was always followed, and 9 feet west from the shaft on the west side of the hill the discovery was made which led to the present sink and drive being undertaken. This was towards the end of 1903, and in a few months' time the fortunate finders obtained 140 ozs. of gold, valued at £4 0s. 5d. per oz. The mine has been worked only on the scale of a working miner's claim, but the quality of the stone has been excellent. The quartz has been crushed at the Volunteer Consolidated Company's battery, and the output has been as follows:—

	Quartz crushed.	Gold obtained.
	tons.	ozs. dwts.
For quarter ending—		
31st March, 1904.....	10	50 0
30th June, 1904.....	11	90 10
30th September, 1904.....	11	57 4
30th June, 1905.....	12	40 0
30th September, 1905.....	13	37 11
31st December, 1905.....	10	26 0

The discovery of this reef after the spot had been tramped over for years is another instance of how gold-bearing stone may exist anywhere just below the surface in this belt unsuspected and unworked.

A small vertical shaft has been sunk on the western slope of the hill for 20 feet; and then a rather flat reef has been followed down for 150 feet on the underlay, bringing the present end to 100 feet below the surface, which is as far as it can be extended with the present system of working. The average underlay of the reef is about  $27^{\circ}$  from the horizontal, though at the end it has

become a little steeper. The width or thickness of the stone has varied from 1 foot to 2 feet. The mean direction of the drive is S. 50° E. No crosscuts have been put in from the drive, and, accordingly, very little knowledge of the reef is ascertainable. We do not even know at what angle to the strike the drive has gone in on. If at right angles, the reef ought to outcrop just east of the Pride of Mathinna shaft, and would be too far east to be cut in the crosscut from that shaft. From the indications, however, it seems more probable that the real strike of the reef is a few degrees west of north, and that the drive has been taken obliquely across it. But in this case it ought to have been seen in the old shaft. We shall not learn anything definite until more work has been done. The reef-quartz is white with rusty stains, and carries a little mineral, and the veinstone has been followed all along the floor of the drive. In the face it is growing steeper, as if it might change into a vertical vein, and the slate strata are dipping north-east. To continue work in this mine a new shaft further east and higher up the hill will have to be sunk, which is warranted by the good returns obtained from the stone. The work has now grown beyond the resources of working miners. The mine is situate in the Gate reefing-belt, and deserves to be proved in a serious way. It is quite possible that the flat lode may prove to be a feeder of, or dropper from, a more important reef. On the other hand, it may be that it is quite independent of any vertical reef, and in that case it will be rather difficult to work. This, however, can only be settled by further work, and as the vein has been such a good gold-producer, it ought to have a thorough trial.

About 40 feet south of the shaft a small shaft has been sunk to 35 feet, and intersected a flat gold-bearing vein, which was not payable at that point. This is probably the same as the main lode. In a pit a little further south a reef was cut about 18 inches wide, striking east into the hill, with a southerly outlay. A ton of the stone was crushed with the richer stuff from the other workings, and it was estimated to be worth 15 dwts. per ton. This will be found to intersect the flat reef in the hill, and there is a chance of something being found at the junction.

#### *South Miner's Dream.*

South and adjoining the Miner's Dream is the South Miner's Dream, a 10-acre section hitherto held by W. D. Stevens (422-c), but now held by Mr. A. J. Gabell.

An attempt has been made to intersect the Miner's Dream reef, about 500 feet further south, by driving a tunnel from the Long Gully side of the hill. The tunnel has been started 40 feet above the New Golden Gate Company's race in the abandoned section (439-g), and driven 380 feet in the direction S. 55° W. into the hill, through slate underlying east.

At 158 feet in, a reef formation about 2 feet wide was passed through, consisting of broken slate and three or four bands of quartz, from 2 inches to 7 inches in width, the whole underlying east, at an angle of 70°. It is said to be just gold-bearing.

One hundred and fifty-four feet further in is another reef formation, 2½ feet wide, carrying 7 inches of white quartz, also carrying gold, but even less than the first reef.

Seventy feet further is the end. The adit has just been driven far enough to reach the line of the Miner's Dream workings, but it must not be forgotten that those workings will plunge below the level of this adit. The only chance which it seems to me that the adit has, and it is a fair one, is of cutting some reef in the heart of the hill. Judging from the quantity of loose quartz lying on the surface of the ground ahead of the adit face, there ought to be some undiscovered reef between here and the crest of the hill. In addition to this, the position is excellent, being in the centre of the reefing-belt.

*Volunteer Consolidated Extended.*

This company owns two sections south of the South Miner's Dream, viz., 426-g (8 acres), in the name of G. Webb; and 471-g (10 acres), charted in the name of the company. The work is being carried on upon the latter section. This mine is situate up the Black Horse Gully, about 180 feet above Mathinna. Mr. J. Turner found gold here, and was joined by Mr. Webb and another, but they did not succeed in picking up the reef; and when the company suspended operations on its leases west of the township, it took this claim in hand.

The upper workings comprise an adit driven into the hill north-east for 60 feet, 45 feet of which have been across what appears to be a fault-fissure formation, consisting of rubbly clay, slate and lumps and arched bands of quartzite, mixed with a little vein-quartz. The adit has been driven right across this into slate. At 16 feet in the drive, a crosscut has been put in N. 38° W. for

17 feet in the course of the formation, which dips north-easterly into the hill; an opposite direction to that of the enclosing slates, which dip south-westerly. From a winze inside the entrance, and 12 feet below the adit, a crosscut was driven for 17 feet south-east, but this is inaccessible. In driving the above adit 23 tons of dirt were crushed at the Volunteer battery, and returned 6 dwts. 18 grs. gold per ton. The width of this formation in the adit is 45 feet. The prevalence of quartzite, and the small quantity of purely vein-quartz, are remarkable. The reason is most likely to be that a bed of sandstone alternated here with the slate. It has been shattered, in all probability, by faulting, and permeated by silica from veins carrying gold.

At the entrance of the adit an underlay shaft has been sunk for 50 feet. At 6 feet from surface the rubble formation was lost, and slate entered. Twelve feet from the bottom of the shaft a small vein, 3 inches wide, of quartz and quartzite was struck, which has expanded from 10 inches to a foot in width, and has been followed south-east for 60 feet on the northern wall of the drive. A little behind the end the stone is a foot wide, but does not carry gold there. At intervals in the drive, it is being bored through with a view of ascertaining its value. The reef does not come away easily from the country; and at my last visit I found it had pinched in the end of the drive, though it still appears to continue. A short crosscut has been put in behind the end, but will have to go a little further to intersect the formation.

At 20 feet from the shaft crosscuts have been driven—one, 29 feet north-east; the other, 28 feet south-west. At a few feet in the south-west crosscut the same rubbly formation is met with as was cut in the upper level, but here it is not more than 12 feet wide. It rises in a peculiar manner to 10 feet above the roof, and is then covered by solid slate rock. The veins in it are flat. A little slate underlies it at the entrance to the crosscut, and slate overlies it in the end. The covering of slate may be explained by irregularity of wall of the formation-channel causing overhanging projections of the enclosing slate. Near the entrance to this crosscut is a 5-in. band of quartz, said to be gold-bearing, underlying the formation and separated from it by a little slate. In the end of the crosscut is slate, with normal dip to the south-west. Although the soft formation closes in over the roof of the drive, I believe it is continuous with the channel intersected in the upper adit.

In the north-east crosscut, which is through slate, dipping south-west, at about 10 feet a little gold-bearing stone was met with in the sole of the drive. In the end a small quartz formation is showing.

The small vein followed in the main drive has been very persistent, but it is of subordinate importance to the fault-formation, though proportionately richer in gold. The veinstone is for the most part quartzite or sericitised sandstone (wall-rock), veined with a little pure vitreous quartz. The most feasible method of development will be to follow it into the hill, and crosscut west at intervals through the parallel formation until the latter begins to carry solid stone. If this is unsuccessful, sinking will have to be resorted to, for all the gold in the crush-dirt of the formation has certainly come from lode action somewhere in this channel.

A shaft a little higher up the hill is necessary to test this reef-channel at a proper depth.

The formation and vein strike in the direction of the old Telegraph shaft higher up the hill. They are probably parallel to that reef, and this indicates the existence on the property of a zone of reefs running N.W.—S.E., which should be traversed in depth by crosscuts from a main shaft.

This zone is west of the Gate zone.

#### *Telegraph Mine.*

About 500 feet south of the Volunteer Consolidated Extended boundary is the old Telegraph shaft, which was sunk 55 feet on a quartz vein 12 to 18 inches wide, running N.W.—S.E. An adit was started to come under the shaft from the east side of the hill, and is said to have passed through unimportant veinlets of quartz, but nothing solid and defined. Work was suspended fifteen years ago, but the continuation of the adit would be good work, as it would prove the hill at a rather favourable point; for the quantity of quartz lying about at surface is considerable, and points to the existence of a yet undiscovered reef. Less than 300 feet more driving is required to bring the adit end under the old shaft.

#### *City Mine.*

In the south-west corner of Section 400-93G are the workings of the old City P.A. A tunnel was driven east from the west boundary of the section for about 120 feet, and at 50 feet a wide mullocky formation was struck,

carrying quartz and pyrites. This was driven through for 25 feet, and appeared to strike a few degrees west of north, with an easterly dip. The width of this channel, and its position, have suggested the idea that it may be identical with one of those met with in the east crosscut in the South Gate Mine. The distance between the two is nearly half a mile, and the bearings are not quite the same, but we undoubtedly have here a prolongation of the same reefing-line. The more important matter, however, is to settle the relations of this reef with that of the Jubilee Mine, which is not far to the south.

A small shaft has been sunk at 60 or 70 feet above the adit, but I have no information about it.

#### *Jubilee Mine.*

This property comprises four sections—322, 323, 324-G, and 209-93G; in all, 40 acres. It was originally known as the Derby. The Derby Company opened up the mine on the Sections 209 and 322, which are on the Gate axial line, and three-quarters of a mile south of that mine. A good length of reef was worked—about 300 feet on the Derby reef, and nearly 200 feet on the Flat reef. A main shaft (the Derby shaft) was sunk 150 feet, and a crosscut driven to the reef, and some distance south on it, which carried gold at that point, but not enough to be payable. The reef had been stoped up to the surface from creek-level and 40 feet below, with good results. The average yield from the two reefs is reported as having been 1 oz. per ton. Operations were suspended in 1881. The Jubilee Gold Mining Company took over the mine in 1887, and did a little work on the Flat reef, which gave them stone averaging 9 to 10 dwts. per ton. This Flat reef is one which is situated a little farther to the north, but slightly to the east of the main reef, and has at one time connected with the latter at a higher level. This connection has been denuded, and the two are now quite separate. Two tunnels were driven on the Flat reef, and the stone stoped out between them and to surface.

In 1896 the Tasmanian Exploration Company Limited, took over the leases; and in 1897 cleaned out the main shaft to 168 feet, and cut it down and timbered it to the 160-foot level. Sinking was resumed, and the shaft deepened to 272 feet by May in the same year. The mine survey shows that the crosscut south-west from the main shaft intersected the reef at the 160-foot level, at 98 feet

from shaft. From reports which have been kindly placed at my disposal by Mr. H. J. Wise, I gather that the reef at that point was strong, and 3 feet in width. In the drive south the width of the reef decreased to 2 feet, carrying 18 inches of solid mineralised stone, and at 150 feet from crosscut was only 6 inches wide. Driving was discontinued at 177 feet. A winze was sunk for 42 feet from this level below the old stopes overhead; but it only showed clean slate, with a small seam of pug on footwall.

The north drive at this level was on a reef 2 to 3 feet wide, but poor; and at 68 feet it showed only 6 inches of stone on footwall side. A large quantity of stone had been taken out previously over the drive and near the surface, and it was thought that the drive would enter payable ground. A slide, however, displaced the stone; and the same displacement was met with in a winze from the floor of this level.

The main crosscut was driven to 318 feet from the shaft through slate, which, at 160 feet, changed from green to dark blue, of a very favourable character. At 188 feet, bunches of quartz were passed through, letting out a good deal of water; and at 200 feet numerous mineralised quartz leaders were intersected. This quartz zone continued for a width of 70 feet, when clean slate country was again driven in to a distance of 318 feet from the main shaft.

The main crosscut was also driven north-east from the shaft for 38 feet through hard slate with bands of quartz, when, from the plan, a reef-formation would appear to have been struck and driven on north. Where intersected it was 18 inches wide, and well defined. In driving north it widened to 3½ feet, between two good hard walls, carrying highly-mineralised stone 2 feet wide, but of poor quality. It was eventually reported as small, and tight for driving.

*260-foot Level.*—At this level crosscuts have been driven from the main shaft 183 feet south-west, and 38 feet north-east.

On starting the south-west crosscut 4 feet of quartz spurs were driven through, and at 85 feet quartz veins were again passed through for 2 feet. At 112 feet a channel was struck carrying 3 feet of stone, and a drive south was put in on its course for 140 feet. The reef soon fell off in width, and degenerated into bunches of quartz, and eventually to a small leader. All through this drive the stone was of poor quality. The western exten-

sion of the main crosscut passed through slate country, dipping south-west.

*No. 1 Tunnel.*—An adit was driven in the early days north of the present workings in a north-easterly direction for 70 feet; and as the recent Company, in stripping the main shaft, passed through a quartz formation at 20 feet from the surface (striking north and dipping east), it was decided to extend the adit with a view of proving whether this formation was connected with the gold-bearing stone previously worked. The extension was driven to 100 feet, through slate with mineralised quartz leaders.

*No. 2 Tunnel.*—120 feet further north is a parallel tunnel, which has been driven 217 feet into the hill. At 90 feet in is an old drive south, connecting the two adits, and at 120 feet beyond this a drive north-west was put in on the course of the reef for 50 feet. This reef was, where struck, a strong body of quartz full width of the drive, carrying a good deal of iron pyrites, galena, and a little gold. At 30 feet in the drive the quartz was still wide, but poor, and the lode walls were irregular and broken. At 47 feet a big body of stone was reported as still in the face, but its full size is not known, as the hanging-wall was not carried. A small winze was started in this drive, but passed through the reef not far below the floor or level.

The adit was continued north-east in slate, with numerous mineralised quartz leaders; and at 200 feet a hard wall was struck, dipping east about 2 in 6, and carrying 3 inches of soft flucan and 6 inches of highly-mineralised stone. This was driven on 16 feet north, the formation being gold-bearing 2 feet wide, and showing 8 inches of stone. It becoming small and somewhat broken, a drive was started on it south-east, and continued for 30 feet. The reef carried a little loose gold, and varied from 6 inches to 2 feet in width. As it showed signs of strengthening underfoot, a winze was begun on the gold-bearing stone passed through in driving the adit. Here it was solid, fully 4 feet wide, but of rather poor quality. At 20 feet down, the main hanging-wall was struck, underlying east 1 in 6. The formation at that point was 2 feet of dark slate and quartz, and the hanging-wall portion carried a little gold. At 45 feet down the reef was small, but more defined.

The work done from the old tunnel on the south side of the creek is inaccessible, and I can only refer to Mr. Montgomery's report. The ground has been stoped from the back of the tunnel near creek-level to surface for a

length of 140 feet, and north of the tunnel for about 40 feet down from surface for a length of 190 feet. At the end of the tunnel, which has been driven 216 feet in a south-easterly direction, a branch reef comes in, known as Stevens' reef, which was reported as carrying 18 inches of stone. It appears to have been driven upon 32 feet north-west.

Inspection of the plan shows where work in this mine might be usefully resumed. The 260-foot level is so far to the south-west that it involves a change in the underlay of the reef, which, however, seems well established as being to the north-east. The inference to be drawn is that the reef-channel has been passed through in the crosscut unnoticed, and that the reef at that level has not been proved at all. The bunchy quartz followed was probably mere country quartz. It would seem to be good policy to examine the crosscut carefully, and pick up the true reef-channel for driving.

The parallel reef east of the shaft has been driven on very little. It appears to have been well defined, and carrying promising quantities of pyrites. The mere fact of it diminishing in size when work was suspended should not prevent further work on it. I am credibly informed that, in general, it was an encouraging lode, and considered likely to make stone at any time. There is now a level at 260 feet, and this reef might well be proved at that depth.

It will be gathered that I do not consider that the property has yet had an exhaustive trial, and it would be a pity not to test it thoroughly, after obtaining such good yields from the upper part of the reef.

As for the Flat reef, such reefs are always difficult to work, and are often more important for what they lead to than for what they are in themselves. A good deal of quartz has been crushed from it, and it is probably connected with a reef of the normal character; perhaps with the eastern reef.

Between the City tunnel and the North Jubilee workings encouraging loams have been got on the side of the hill. I understand that at the north end of the old surface-workings 35 ozs. of gold were obtained from 30 tons of stuff. There is no doubt that the property is a seat of lode action. It is to be noted that in the western part of the workings the country underlies south-west, as is also seen at surface, while near the main shaft the underlay is towards the north-east. This, and the general

position, show that the mine is on the Gate axial fold. This circumstance has weight with me in considering the likelihood of gold existing in depth. The probabilities are neither more nor less than those for the Mathinna field proper, and if there are reasons for believing that field worth working seriously, the same reasons hold good here also.

*Mountaineer.*

South-east from the Jubilee, and between 200 and 300 feet up the steep hill which rises from the south side of the creek, are old workings, respecting which I was unable to obtain information. Some shafts have been sunk and adits driven, in one of which I noticed the stone was 12 to 16 inches wide. The reefs worked have a north-west strike, and a north-east underlay. It is the continuation of the Mathinna belt; and though there may not be much to induce expenditure on the hill flank, reef-channels will undoubtedly persist in depth, and it will probably be found here, as elsewhere in this district, that deep mining is the only class that will pay.

This is the farthest south to which I have as yet traced the Gate axial line. To the west of this line there is another reefing-belt, in which the reef-fractures take a more westerly direction, while the strikes of the strata and the cleavage planes remain generally the same.

This is an intermediate zone, between that of the Gate and the City of Hobart, and comprises, at the southern end of the field (which is the portion examined so far), the reefs of the Gladstone hill, the Eldorado, and the Victorian Golden Gate. The most southerly property is the--

*Gladstone.*

*Section 1033-87G (10 acres).*—This section is on the steep slope of the high hill south of the Eldorado, and the old workings were on a reef parallel to that one. The strike is N. 70° W., and the underlay to west of south. The reef is about 2 feet wide, and crosses the country slate, which bears N. 20° W., and dips south-west. The old timbered shaft, 6 feet 6 inches by 4 feet, is filled with water. To the west, the reef has been worked down from surface to 15 or 20 feet for a distance of a chain, and nearer the shaft to 30 or 40 feet. Mr. Guy took a crushing from this of about 10 tons, which, he says, averaged 12 dwts. The old crushings are said to have been 60 tons, worth 9 to 11 dwts. gold per ton. I am informed

that this was amongst the earliest reefs opened upon at Mathinna. The distribution of gold in it, however, was found to be irregular. It is situate a good way up on the north fall of the spur, which is separated by a deep ravine from the Eldorado property.

For 300 feet east of this is a series of trenches and shallow shafts on other reefs. The most easterly shaft was put down a couple of years ago on a reef coursing N. 55° E., and is stated to have given a small crushing of rich stone. The average width of quartz is 4 to 6 inches. A couple of chains further west a shaft has been sunk on a 6-foot formation of country slate, with bands of vitreous quartz, not well exposed. Between this and the old main shaft the ground has been trenched at one or two points, but as it is near the crest of the spur, not much backs are available.

About 300 feet up the hill to the south-west is a reef-line running N. 50° W., underlying south-west, and carrying a foot of strong white quartz, said to be of low grade. Mr. Stevens opened a cut upon it between two and three years ago, and other openings have been made further west, but nothing very rich has been found so far. The reef continues right through the section. Oxidised veinlets traverse the stone, and the gold probably has its source in these, for no mineral is visible in the quartz.

About 2½ chains west from the preceding, and higher up the hill, T. Parker has opened upon a parallel reef striking N. 25° W., and dipping south-west. The stone has much the same character as that of the other reef, but fair prospects of gold are obtainable. The quartz is about a foot wide.

Near the above is Guy's reef, with a foot of quartz exposed in the cut. The reef is said to be 2½ feet wide, and some good gold was found at one spot, but not picked up again. The strike is N. 55° W., and dip south-west. It is here 400 feet above the road, and just south-west is the hill summit. The reef crosses the spur, and would have to be worked from lower down. Unfortunately, it dips into the hill, and the spur is not very wide.

Further along towards the north-west corner Mr. Clarke has trenched up the hill from the gully on the boundary. Loose stone was found, and good gold prospects obtained. Further south some solid quartz was met with, but poor.

The whole of the hillside is strewn with quartz, and a lot of superficial prospecting has been carried on. Gold

has been found in several places, but it has given out, and men have continued work only as far as they could get down with the pick.

Most of the reefs course north of west and south of east, and this strike would take them into the Volunteer Consolidated Extended and Telegraph sections, on the eastern side of Black Horse Gully. They are not wide at surface, but they are numerous, and superficially have shown short shoots of gold frequent enough to suggest that deeper exploratory work might result in something a good deal better than has been found hitherto.

*Ophir (formerly North and New Eldorado Mines).*

Sections 1629-93G (New Eldorado), 1630-93G, 1631-93G, 1632-93G, 1633-93G, 1652-93G (North Eldorado)—in all, 52 acres; chartered in the name of J. N. Lawson.

The principal works are situated on 1629 and 1652, nearly three-quarters of a mile south of the Mathinna township. The old work done from the former main shaft and from the upper tunnel was examined by Mr. Montgomery, and described by him in 1892.

The present company has done a little work from the old upper drive, prospected at surface in different parts of the property, and sunk a new main shaft to a depth of 121 feet in the north-west corner of Section 1652. The idea seems to have been to sink here to some depth and crosscut east and west, perhaps more particularly east, to intersect the supposed faulted part of the New Golden Gate reef south of the crosscourse in that mine. The policy is sound; provided the reef in question has really been faulted, for its heave, according to all the rules of faulting, should be to the west of the Gate drives. But I have shown in my previous report that there is reason to doubt whether faulting has actually taken place, and the exploratory crosscut west from the 1200-foot level has not come across the missing part of the reef, though it has been advanced to within 90 feet of the western boundary of the 3-acres section. That is to say, the crosscut has reached a line which, if produced southwards into the Ophir section, would be about the same distance, viz., 90 feet east of the Ophir new main shaft. This zone of 90 feet accordingly represents a distance which has not been proved, and in which the lost reef could occur if, as said above, it has been displaced by a fault. To set this question at rest, the shaft might be deepened another 100 or 150 feet, and the crosscut east driven at that

depth. I do not think that it is necessary to sink deeper than that for this purpose before opening out, for at this depth the country rock will be found perfectly solid and favourable for reefs.

The shaft, however, is in a position for proving, by means of a crosscut at any depth that may be determined upon, the formations which were intersected by the old North Eldorado adit, 3 chains to the east. The old underlay shaft, 170 feet north of the new shaft, is said to have been sunk 110 feet on a reef running N.W.—S.E., about 18 inches wide, and a few tons of quartz crushed. The adit was driven to prove this reef, and has been put in 400 feet in a south-westerly direction. The first formation of any note that was passed through is a quartz vein 18 inches wide, dipping north-east at  $70^{\circ}$ . This was also cut towards the bottom of the new shaft, where it yielded a few colours of gold. Past the intersection in the adit quartz is occasionally seen in lumps and patches associated with flat arches of quartzite. Bunchy quartz in a belt of sandstone  $3\frac{1}{2}$  feet wide would appear to represent the reef sunk on by the old 110-foot shaft; at least, according to its position, but the two are dipping in opposite directions. At 30 feet behind the end of the adit a winze has been sunk 34 feet, where there is a quartz formation about 1 foot wide; and in the end, another quartz and quartzite formation, dipping flat to the west, is visible. The quartz all through this adit is barren, so the gold-bearing stone taken out of the 110-foot shaft must have been a short shoot. The line of the winze reef is about 200 feet south-west of the new shaft, and as it is underlying into the hill, the deeper the shaft is sunk the further the crosscut will have to be driven. The same applies to the reef at the 110-foot shaft. A crosscut of about 500 feet from the new shaft, in a south-west direction, would prove all ground between the shaft and the new Eldorado adit, but it should be looked upon as purely speculative and prospecting work.

*New Eldorado (Section 1629).*—The old work done on this has been described in detail by Mr. Montgomery, and there is no necessity for me to go over the ground covered by his report. The surface workings in the centre of the section show that a reef half a foot to 2 feet in width runs in a direction  $20^{\circ}$  south of east, and has been stoped down to varying depths, the maximum being over 50 feet. The stone is said to have yielded

from 18 dwts. to 1 oz. of gold per ton, and some of it nearly 4 ozs. per ton. The old drive east is now unsafe, and the stopes above are inaccessible. An underlay winze has been recently sunk from this drive to a depth of 42 feet on quartz which yields prospects of gold, but not payable. A little free gold is noticeable. In the drive above this winze, onwards for 50' feet, the quartz has been found gold-bearing, and the work has connected with the old workings on the surface. The main adit, continued further south for 20 feet, passes through what has been regarded as the other part of the reef, which has been followed for a couple of hundred feet west. The channel is 4 to 5 feet wide, filled with clay and soft rock. A winze sunk near the beginning of the drive went down 60 feet, carrying a couple of inches of stone on the south wall. A little west of this a rise has been put up 18 feet, but no stone stoped from it. A small vein of milky quartz has been followed in the drive, but it was not worth anything, though a nice bit of stone was met with now and then. A flat lode crosses the drive from north to south, dipping east at right angles to the southerly dip of the main reef. It has been driven upon south, but the drive is filled with mullock. At the west end of the main level the vein is small and tight, carrying a little gold, but practically of no value. A crosscut north from this level might have disclosed better stone, but nothing permanent can be expected without proving at greater depth. The disturbances in consequence of slides will make work rather difficult and uncertain. A little work has been done by a short drive east, but very little stone was met with. A main shaft was sunk in the south-east part of this section to a depth of 171 feet, and a crosscut begun at the 163-foot level to intersect the reef at somewhat more than 100 feet below the levels just described. I could not learn in which direction this crosscut had been driven, but the best direction for avoiding the disturbed ground and reaching the reef quickly would be due north.

*New Eldorado (Section 1630).*—On this section, 120 feet north of the south boundary, is an old underlay shaft (Whip shaft), sunk to 113 feet, from which, I undertsand, three short drives were put in on a reef about a foot wide. Mr. Montgomery reports 77 tons as being taken from this shaft, and yielding 105 ozs. of gold. The reef runs about east and west, and dips to the south.

The works are inaccessible now, but the good stone found in the old days makes it likely that there is something here which is worth exploring. No solid stone is seen, and probably the reef consisted of bands or leaders in comparatively soft slate. Some recent trenching to the east disclosed a little gold in the softened slate. The ground in this part of the section is traversed by several outcropping veins, which have been tested by Mr. Hitchcock, the mine manager; but as the result in each case is about the same, I need not particularise. Some long outcrops have been sunk or trenched upon, and have occasionally given gold prospects, but when followed down a little the quartz is replaced by clean country.

*Section 1632.*—This section is traversed by more than one line of reefs, running north-west. One such line passes out of the section, at its north-west corner; another passes south-east down below the Whip shaft. These lode-lines are characterised by short shoots of quartz with variable gold contents. The country is slate, with thin beds of sandstone, often sericitised, striking N. 30° W., and dipping south-west. A good deal of trenching and superficial work has been done on these lines, and the quartz, rather white and free from sulphides, should be favourable for specimen gold. Its occurrence is so irregular at and near the surface that up to the present shallow work has been unsuccessful. Either something more definite will have to be located or hopes must be fixed on deep exploration.

During the past year the Ophir sections have been diligently prospected by Mr. Hitchcock without coming upon anything which promises to be permanent. The work offering most result appears to be the deepening of the new main shaft, and exploring from it into the hill. We are here in a different zone of reefing-country from that of the Gate line. The reefs run much more west of north, and seem to be subsidiary to the main north and south reef-lines of the district, filling fractures which, as it were, connect the parallel north and south main zones. This makes any prediction hazardous, but it is probable that the good stone formerly met with at comparatively shallow levels will be replaced in depth by a more permanent make, provided that the troublesome faults can be avoided. The chance of meeting with a faulted part of the Gate reef is slender; but, apart from that, the property offers facilities and fair prospects for deeper exploratory work.

*Victorian Golden Gate.*

This property comprises Section 527-g (10 acres), in the name of S. J. Plain, and Section 349g (10 acres), in the names of G. T. Gibson and J. F. O'Kelly, and is situate about 50 chains south of the Mathinna township.

The recent work is in the southern part of Section 527-g, where, at the bottom of the hill, west of the Eldorado, a crosscut has been driven north-east across grey slates, which dip south-west. At 222 feet in, a reef has been intersected, which appears to run, roughly, in a south-easterly direction. It was followed for 30 feet, and then sunk on by an underlay-winze for 30 feet; but in the drive east of the winze it has been lost, and not recovered, though the level was continued for 200 feet further. The continuation, however, has pursued a north-east direction, which is hopelessly wrong, being nearly at right angles to the observed course of the reef. The position of the workings is not favourable for shallow drives, as the reef will pass under the gully just ahead, but backs can be obtained once the gully is passed. I could learn nothing about results from the quartz taken from the reef. The first thing necessary to be done at this mine is to find the continuation of the reef. It must also be made clear whether it has been displaced by a fault or left by the altered course of the drive. The reef would appear to bear into the Ophir Section 1632. Judging from general experience on this field, exploration by adit is not favourable for permanent work, the large reefs being developed at considerable depths. The poor and disordered character of the reefs disclosed by adits not far from surface inevitably brings driving to a standstill; and if no capital is provided for the difficulties of deeper work, mines are abandoned, and it is not easy to get them re-started, even when there is fair warrant for doing so. This hillside gives evidence of reefs existing, from which a certain amount of stone has been taken, and below the zone of superficial disturbance more solid quartz may be expected to prevail.

In the eastern part of 527-g is a belt of reefing-country 5 or 6 chains wide, which has been prospected by means of numerous trenches and shafts. The stone outcropping is a white, glassy, yellow-stained quartz, generally in light-coloured sericitised sandstone, in bands alternating with slate. O'Kelly's reef, in this belt, has a direction of N. 40° W., and consists of a quartz vein in a small band of sandstone, in slate, in a vertical position. A

little gold has been got in it. This mixture of quartz and sandstone is known locally by the name of "native cat." There are parallel runs of such reefs east of the track up the hill, from which gold has been got in the course of prospecting. These reefs are generally a foot or 15 inches wide.

Some very old workings exist on the western side of the hill down the fall to the tunnel, and a rich patch of gold is said to have been struck at one time.

*Section 1154-93G (10 acres).*

This is a vacant section, formerly in the name of T. C. Goodall, when the name of the mine works was the Golden Gate Hinges, otherwise West Gate. The adit is situate 30 chains south of Mathinna, east of the track up Black Horse Gully, and has been driven N. 49° E. into the Golden Gate ridge for 168 feet. At 20 feet in, a rubbly formation of twisted pyritous graphitic slate, with flat veins and blows of quartz, begins, and continues to the end. At 108 feet in, are a shallow winze and short drive to the north-west. Near the winze, the slate, which elsewhere in the drive has an underlay to the north-east, dips west. The easterly dip of the strata on this side of the hill is only seen elsewhere where the track enters Mathinna, nearly opposite the old post office.

*Martyn's Section, 451-g (18 acres).*

This is in the name of Alex. Forbes Martyn, on the east fall of the City of Hobart hill range, half a mile south-west of Mathinna. At about 60 feet above the valley two shafts have been sunk, 150 feet apart. The north shaft has been sunk 72 feet; and at 60 feet a crosscut was driven east through reef-formation, with and carrying a little gold. The bearing is stated to be bands of quartz, said to be 9 inches wide, well mineralised, north-west, and uncertainty exists as to whether this is the same reef as is seen at the outcrop, or whether there is here a junction of two reefs. The shaft was begun about ten years ago, and good prospects were obtained. It went down for 50 feet on the wall of the reef, nearly vertically, and the latter then went right out of the shaft to the east. The strata also dip east in the crosscut. At 100 feet north of the shaft the reef has been exposed in a trench, 15 feet lower down the hill. Mr. Martyn tells me that the gold is finely disseminated

through the stone, no coarse gold being seen. It is his intention to deepen the shaft another 100 feet; a wise policy as far as it goes, but it should be sunk still deeper. Southwards the reef outcrop has been trenched across at intervals, and the south shaft sunk 8 feet east of it to a depth of 50 feet, and then intersected the reef, which consists there of blue quartz, said to be 8 feet wide. The stone is hard, vughy, mottled, blue quartz. Mr. Martyn sampled it in 2-foot sections, and says that on the footwall the assay yield reached 5 dwts. per ton. An old upper crosscut at 25 feet also intersected the reef for 6 feet. Both reef and country at surface dip west, but in descending, become vertical, and then change their underlay to an easterly direction. The reef has been prospected for 130 feet south of this shaft by trenches. The stone, where exposed, is rather flinty-looking, and has given some fair prospects. Endeavours have been made to discover stone higher up the hill to the west, but without success.

The reef is about 3 chains west of the road. It must obviously be a parallel one to that of the City of Hobart. The latter ought to pass through the section from north to south higher up the hill. Notwithstanding the local variableness of the dip of the strata, the general underlay in this belt of country is still in a westerly direction. But we enter here another reefing zone, that of the City of Hobart line, roughly parallel to the Gate line, with which it is connected by the north-west reefs system, already described in this report.

#### *City of Hobart Mine.*

Three sections are charted in the name of the City of Hobart Gold Mine, Limited, viz.:—472-G (10 acres), 520-G (10 acres), 521-G (10 acres). The main workings, however, are on the 20-acre Section 618, in the name of the Commercial Bank; and two sections (223-83, 5 acres; and 94-93G, 10 acres) are still held by the Tasmanian Exploration Company, Limited.

The properties are idle, and the workings inaccessible. I can, therefore, only form an opinion from information received, and by examining the indications supplied by the work done from the surface.

The old main shaft (now fallen in) is on Section 618, a quarter of a mile south-west of Mathinna. The first work was carried on some thirty years ago by adit, a crosscut tunnel striking the reef, 4 feet wide, at

50 feet from surface. This was then driven upon for 500 feet, much of it proving mullocky; but Mr. A. A. Butler reported that the quartz obtained from 120 feet of reef was crushed, and averaged 1 oz. of gold per ton. The main shaft was sunk 660 feet, and according to Mr. Peter Irvine, who was the mine manager from 1877 to 1881, the reef carried about 3 feet of loose quartz, worth over 1 oz. of gold per ton, down to a depth of 300 feet. At 580 feet a slide displaced the reef west and north. The reef where the shaft was sunk has a north and south bearing, and is nearly vertical, or with a slight dip to the east. At a depth it is stated to have changed its underlay to the west. Though the stone was good the shoot of gold was short. An expensive system of 60-foot levels was followed, and shaft-sinking continued without accompanying driving on the course of the lode. The slide was met with, and the company became discouraged, though if, as I am credibly informed, £80,000 worth of gold was obtained, there was certainly ample warrant for continuing work. In a southerly direction, about 150 feet from the main shaft, a small prospecting shaft (City Extended) has picked up a vein 6 inches wide, carrying gold; and 200 feet further south, just inside the north boundary of 521-c, is another shaft, supposed to have struck gold-bearing stone. There are several runs of veins in this zone, and it is difficult to connect the different workings satisfactorily; but the surface-trenching would indicate that the northern shaft is on a continuing vein of the main reef.

In the north-western part of Section 618 are several old shafts and trenches on a lode apparently running north and south along the western boundary, and known as the North City of Hobart reef. The deepest shaft was 180 feet deep. The reef-channel seems to be a couple of feet wide, and has been worked at surface for some distance along its course. Reports state that it is a low-grade reef, averaging only 2 or 3 dwts. per ton. Its bearing is east and north, and it dips east, a parallel reef evidently to the main reef; there being a distance of about 3 chains between the two, if each maintains its course. A little to the east of this line a new main shaft has been sunk recently, but work was suspended when it reached a depth of 100 feet, and I do not know whether the reef was struck. In cutting the engine-plate a reef was exposed, prospects from which, I am told, went 3 dwts. of gold. Not long ago Mr. T. Andrews cut the excavation

for a new shaft, 130 feet west of the old main shaft, with a view of working the main reef from it. The idea was to drive south beyond the old workings, prove the reef upon which the property was floated, and test the junction of three distinct reef-channels in that direction. The position of the proposed shaft seems favourable for these objects, and it enjoys the advantage of being in solid ground.

In the south corner of this section are the old Champion shafts on more than one reef. The principal reef, which is reported to have yielded 7 dwts. per ton, strikes a little south of north-west, and dips south-west; if continuous, it must intersect the City main reef.

The North City and the Main reef are both reefs that require prospecting, especially the latter, which has yielded so much gold-bearing stone of good quality. Mr. Irvine has stated that below 300 feet the white friable quartz is replaced by blue laminated quartz, heavily charged with auriferous arsenical pyrites. It would seem, therefore, that a good plan for the owners is not to attempt restoring the old main shaft, but to pick up the main reef from a new shaft well out of the influence of the old workings, and open out on it at a moderate depth. Each of the sites which have been contemplated, viz., that of the new shaft already begun, and that prepared by Mr. T. Andrews, has advantages of its own, according to the aim in view.

It is singular that what may be called an ounce proposition has remained idle for so long. The neglect to keep exploratory work well ahead while production and sinking were going on was undoubtedly responsible for the despair which settled down on the proprietors after they had picked the eyes out of the mine, and which eventuated in the abandonment of a property which had promised so well. The consequence is, the exploratory work remains to be carried out. Though nothing certain can be predicted there is good reason for expecting that judicious development expenditure would be well repaid. The lode junctions, which must take place at some points, the converging directions of several of the veins, even the narrowness of many of them, indicate a system of fractures which will possibly, in more than one place, unite to form larger bodies of stone, accompanied by concentrations of gold, which past work has shown the reef to hold. This is really all that can be said at pre-

sent. The zone is indisputably gold-bearing, but search for the shoots cannot be properly undertaken without the outlay of considerable capital.

*Alluvial Flats.*

In both the Black Horse and Long Gullies there is a good deal of alluvial, which has been washed down by the main creeks and their tributaries. As these creek-courses intersect reef-lines, besides receiving the sheddings from auriferous reef outcrops on the hill flanks, a good deal of gold must have found its way into the valleys. Thirty-five years ago a considerable number of men were engaged in working the ground, which, I am informed, has never been what may be called rich. Considering the number of gold-bearing reefs in the surrounding hills this might be thought inexplicable, if we did not take note of the fact that the gullies are comparatively recent in origin. They have been formed while the country has been assuming its present configuration, and consequently there has not been time for any large concentrations of gold to accumulate. The best part of the alluvial field has been that at the mouth of the Black Horse Gully, east of the township, where the deposit averages from 6 to 7 feet in depth. Higher up the gully the depth increases to between 10 and 30 feet, finally shallowing to a few feet. It would seem, therefore, that some bar of bedrock crosses the valley lower down, damming the alluvial to some extent. The lead on this line has been turned over at intervals for  $1\frac{3}{4}$  miles for a width of about 400 feet. In the early days small nuggets up to 4 or 5 dwts. were common, and I am informed that once a piece was found weighing 1 oz. 19 dwts. The gold is always well waterworn. Mr. W. Stevens tells me that he found the alluvial east of the Golden Stairs yielding 3 grs. to the dish.

For a long time it has been thought that the cradling operations of former days did not exclude the possibility of the deposit being payable if treated by the modern method of hydraulic sluicing. Mr. Leslie Jolly has recently endeavoured to ascertain the value of the ground, and some extensive boring was carried out by Mr. Geo. Webb, of Mathinna. Eighty-seven holes were put down, a chain apart, in 10 lines; the lines being 8 to 10 chains apart.

Mr. Jolly has kindly furnished me with the results of these:—

		Average depth.	Gold per cubic yard
		ft. in.	grains.
1st line	7 holes	7 4	0·43
2nd "	10 "	7 6	2·58
3rd "	13 "	5 0	5·904
4th "	8 "	5 5	6·43
5th "	10 "	7 6	22·80
6th "	11 "	7 0	11·88
7th "	10 "	6 2	13·881
8th "	8 "	7 4	10·101
9th "	5 "	6 1	24·384
10th "	5 "	6 11	26·782

Average yield,  $\frac{1}{2}$  dwt. gold per cubic yard.

The deposit consists of about 3 feet of clay and small drift, covering quartz-wash mixed with clay, and the whole lying on a layer of pipe-clay, which covers the bedrock. I was informed that the gold is found on and in the pipe-clay.

General information is to the effect that sufficient water for hydraulic sluicing can be brought in from the Tyne with 100 feet of pressure; and the report furnished to Mr. Jolly is to the effect that the total cost or recovering the gold would not exceed 3d. per cubic yard, or say, equal to  $1\frac{1}{2}$  grains of gold. The ground is certainly shallow, but there is a total absence of boulders and tree stumps.

The valley of the South Esk must certainly hold a good deal of gold in the aggregate, brought down by that river and Dan's Rivulet, and all the lateral tributaries. It is, however, a broad valley, and the gold will no doubt be found considerably scattered. The best alluvial is nearest to the present river. I understand that boring was carried on at Marshall's some years ago, and that as much as half a dwt. per dish has been obtained there. Some desultory hole-sinking has been done here and there in the alluvial of this plain, but without result. If the South Esk alluvial could be systematically prospected, there is a fair chance of some discovery of payable ground, for there must be places where concentration has taken place. For ages quartz gravel and any accompanying gold have been carried down from the Mathinna and South Mount Victoria fields, and deposited in the Esk Valley. I suppose that everywhere over this rather broad plain a little gold can be found; but it is

also extremely likely that definite channels of concentration exist somewhere as yet undiscovered.

CONCLUSION.

In concluding this part of my report, I realise more than ever that the intermittent and half-hearted way in which so many of these properties have been worked has been very disadvantageous to the interests of the field. A little money has been raised, and when it has been spent, and the gold-shoot worked out or faulted, operations have been suspended, and the reputation of the field suffers in consequence. The sooner it is recognised that it is neither a poor man's nor a poor company's field, the better. The rewards will only fall to the lot of those who persevere in serious work. The New Golden Gate has been one prize; the other deep mine (The Tasmanian Consols) may be another. The undeveloped properties of the Jubilee and City of Hobart invite an outlay sufficient to really prove their value; and the owners should meet with no insuperable difficulty in procuring the necessary capital.

The Gladstone and Eldorado hills have really only been scratched. The Miner's Dream and Telegraph hill is almost virgin ground, and no one can say what it might develop into in depth. In fact, the part of the field covered by this report could be described in a sentence—"prospected but not developed." But there is no valid reason why work should not be resumed. Ordinary mining risks must, of course, be faced. Gold may not be met with at any given point, but that it exists, and in quantity too, in the reef-channels below this field, does not admit of any doubt whatever.

Part III. of my report on Mathinna will be prepared after a future visit.

I have the honour to be,

Sir,

Your obedient Servant,

W. H. TWELVETREES,  
Government Geologist.

W. H. WALLACE, Esq.,  
Secretary for Mines, Hobart.



## REPORT ON COX'S BIGHT TINFIELD.

[With One Map.]

Government Geologist's Office,  
Launceston, 5th December, 1906.

SIR,

I HAVE the honour to report that, as instructed by you, I proceeded to Cox's Bight on the 31st August, and returned to Hobart on the 18th of the next month. I was accompanied by Mr. M. J. Griffin, Inspector of Mines for the Northern and Southern Division.

The country bordering on the Bight is little known, and the land outside the mountain ranges, which hem in the little strip of flat country on the sea-shore, is practically *terra incognita*.

The Bight is a broad bay on the south coast of Tasmania, 6 miles across, divided into two smaller bays by a small promontory (Point Eric), which rises to a conical summit, 160 feet above the surface of the water. The horn of the west bay is formed by the precipitous bluff range, known locally as Cox's Bluff (charted as New Harbour Bluff); that of the eastern bay is the hill range which terminates in what the fishermen call Red Point. The distance from South-West Cape is about 12 miles; and from Recherche, by water, 36 miles.

Between Catamaran, at Recherche, and the Bight the country is wholly uninhabited by man. In 1901 and 1902 Mr. T. B. Moore, under instructions from the Surveyor-General, cut and marked a track from Hastings to Cox's Bight, passing the western head of Port Davey, and his reports on same are published in the Surveyor-General's Annual Reports for 1900-1901 and 1901-1902. With reference to the Cox's Bight section of his track (between the mouth of the Old River and Point Eric), he says:—"Primary and eruptive rocks occupy the whole of this line of country. Silurian slates and schists, highly mineralised, occur in places along Bathurst Harbour, which are well worthy the attention of prospectors. At Cox's Bight a granite boss, about  $1\frac{1}{4}$  mile in diameter, rises through the Silurian strata at the southern end of the

Bathurst Range. The creeks on the east and west side of this intrusive mass have been worked in a very primitive way for alluvial tin. If a good supply of water were stored, and the old workings sluiced in a systematic way, I estimate that a far greater quantity of ore would be won than that previously obtained."

Mr. Moore's observations on the mineral characteristics of the country between Hastings and Port Davey are the only ones that have been published. It is known that as far as the New River, or the south end of the Arthur Range, the prevalent geological formations are Permo-Carboniferous sandstones and shales, and the eruptive trap-rock (diabase) of Mesozoic age. The western mineral country appears to come in at the New River, for Mr. Moore mentions limestone in that basin containing traces of copper pyrites, tetrahedrite, carbonate of copper, and galena. Thence westwards the country consists of slates, schists, and quartzites, which have been unprospected for mineral, but in which discoveries will very likely be made when the area is made accessible by the construction and maintenance of tracks. The mountain ranges preserve the usual north and south or north-west and south-east trend, terminating seawards, as a rule, in bold, lofty bluffs; and a track overland from Recherche, if anywhere near the sea, would have to reckon with these promontories. In March this year Messrs. Tyler and Harper were commissioned to go overland from Recherche to the Bight to find a route for a track. The way they went was as follows:—Cockle Creek, 2 miles past Recherche; across to South Cape, on to the beach; across Coal Mine Hill, past the old Government Huts; across South Cape Creek (by wading), up Fluted Cape (1600 feet); thence to Granite Bay and Shoemaker Point; thence to Surpise River (crossed at mouth by wading), and along beach to Tom Pretty's Point; from thence to the New River (crossed by raft); and thence to Deadman's Bay, and up the great High Bluff (3500 feet); west of this to the Louisa Plains and bay, separated from Cox's Bight by the dividing range of quartzite and schist. What time was occupied in cutting their way through to the Bight does not appear from the published account, but the return journey was made in five days, with one day's interruption by accidents and weather. They think that, with a boat at New River, a track could be made taking only three days to walk. It would seem certain, however, that a four-day track is possible.

Mr. T. B. Moore's track to Hastings is much longer, and crosses the high land at the heads of the rivers. This avoids the steep ascents of the bluffs near the sea, and secures a tolerably even grade; in fact, Mr. Moore says a railway grade can be obtained.

During my stay at the Bight we discussed the question of the route with Mr. Gaffney, and possibly might have returned overland if the weather had been better, and the old boat on the right side of the New River. For the purposes of the Bight, a track to Recherche is the one that is most needed, and although the country is rough, it has been shown that no insuperable difficulties exist. The men who are developing the resources of the State in such an isolated spot are entitled to a more certain and more easily available means of communication than is afforded by the little steamer which pays periodical visits. If the stores run out, or a conflagration takes place, or any serious accident happens during the absence of the steamer, the result may be disastrous. For such eventualities a track through to the nearest settlement is most desirable.

Between the Bight and the New River such a track would pass through schist-country, in which most probably mineral discoveries will be made. This south-west corner of the island has, owing to its inaccessibility, received no attention from prospectors. Much of it consists of barren-looking quartzite, very unpromising from a mineral point of view; but, on the other hand, granite and favourable-looking schist and slate belts exist, which it is difficult to believe are destitute of ore deposits.

Overland by Moore's track from the Bight it is not more than 7 or 8 miles to water, at the head of New Harbour Creek, which is an inlet of Big Bay, Bathurst Harbour; and if tin-mining here progresses, it may be the means of opening up the Port Davey district.

The high ranges round the Bight are partly bare, with their crests of white quartzite shining like snow, or lightly timbered on the spurs and heights, with heavy growths of myrtle, sassafras, gum, and fern in the ravines, which deeply score their sides.

The Bathurst Range rises to 2800 feet at the trigonometrical station, but a view of the latter is obscured by the nearer eminence of Foley's Pimple, the conical-looking end of a spur from the range, from which, in a series of saddles and prominences, a ridge descends to sea-level at Point Eric.

*Geology.*

The succession in the geological record at the Bight may be succinctly presented in tabular form, as under:—

RECENT.	Swamp and lagoon land at foot of terrace ground. This deposit descends to a few feet below sea-level. Terraces of tin-bearing detritus and wash at foot of mountains, from 50 feet to 150 feet above sea-level.
TERTIARY.	Terrace of clayey sand with carbonaceous material fringing foot of mountains 150 to 200 feet above sea-level.
JURA-TRIAS.	Not represented.
PERMO-CARBONIFEROUS.	Not represented.
DEVONIAN. (?)	Biotite granite below recent terraces and exposed in mountain form from sea-level up to 600 feet. Intrusive in quartzite and schist and intersected by veins carrying tin ore with accessory molybdenite. Dyke of hornblende-lamprophyre intrusive into quartzite found as loose stones on beach at east end of Western Bay. Veins of greisenised quartz intrusive into quartzite near junction of latter with granite. Actinolite contact-rock as loose stones on beach near Sand Bluff.
SILURIAN AND ORDOVICIAN.	Not identified.
PRE-CAMBRIAN.	Quartzite of Cox's Bluff Range, Foley's Pimple, Bathurst Range, Red Point Range.
ALGONKIAN.* (?)	Mica schist and quartzite at Point Eric. Mica schist at Black Bluff.
	Slate and sandstone on Slate Range. Silvery mica schist on fall of range to Louisa Bay.

\* Proterozoic—of Chamberlin and Salisbury—*Geology*, Vol. II., pp.163-217.

The schist and quartzite belong, apparently, to the geological series between the Cambrian and the eruptive Archæan, to which American geologists have applied the term Algonkian, dividing the Pre-Cambrians into an upper series (Algonkian), dominantly sedimentary, and a lower one (Archæan), dominantly eruptive. At the Bight the quartzites and mica schists alternate so rapidly, and are so intimately connected, that it is reasonable to attribute a sedimentary origin to both. The white saccharoidal quartzite is undeniably an altered sandstone, and the schists (muscovite, sericite, and biotite) were most probably alternating stratified argillaceous beds, now reconstructed and distorted beyond recognition.

The Bight is one of the localities in which have been found the objects known as obsidianites (= Australites of Suess), or obsidian buttons, now very generally regarded as of cosmic origin. Mr. Christopher Iles informed me that he discovered some at about 100 feet above sea-level, under 2 feet of button-grass peat and on the top of 3 feet of tin-wash, the latter resting on granite rock. A feature of interest connected with this find is that the wash is unmistakably of recent (Quarternary) age. It adds another to the list of evidences pointing to the shower of meteorites being subsequent to the deposition of the Tertiary sediments in Tasmania.

Mr. Lark Macquarie, of Hobart, is said to have been the first discoverer of tin at the Bight, which he obtained from a hollow or basin in the south-east part of Section 1620, near the neck of Point Eric. After him came Robert Glover and W. H. Foley, from Port Davey. Reward sections on the western bay were granted to these in September, 1892, which were transferred to the Glover and Foley Proprietary in 1893. Messrs. Glover and Foley also worked on the eastern bay; and after them, one Meldon was at work, till Mr. J. J. Gaffney and the present company (Cox's Bight Tin Mines, N.L.) started work.

The information which I have been able to gather establishes the fact that from first to last about 120 tons of tin ore have been won from the ground at the Bight. In 1905 3 tons were shipped, and in 1906, up to the time of my visit,  $4\frac{1}{4}$  tons had been consigned.

Several parties hold sections here. The Cox's Bight Tin Mines are working terrace-ground overlooking the eastern bay, at the foot of the granite and quartzite range. The same company holds three terrace sections on the

western bay, and two sections of alluvial flats bordering one of the lagoons on that bay.

Messrs. Weber, Gourlay, and Hawson are taking leases of lagoons and surrounding flat land on the same bay. Messrs. Pender and Atkins hold mountain sections, comprising the granite spur which has shed the ore into the lower ground on each side of it. They also have a section on Bourke's Creek, near the shore of East Bay. F. Pender has applied for a section west of the Black Point Range, and north and adjoining this is a section for which Mr. J. J. Gaffney is applicant. West of the latter H. Gaffney has applied for 80 acres.

From this it may be seen that the tin ore is spread over a fair extent of country, say about 3 miles from east to west, and from half a mile to a mile from north to south.

The observed granite contact with the quartzite spur of Foley's Peak runs east and west inside the north boundary of Pender and Atkins' section 1524-m, 80 acres, and continues east along the north boundary of A. D. Sligo, 1619-m, 20 acres, where it is exposed by the high-level race. To the north of this contact is the mountainous country of the back range, in which, so far, no granite has been seen. Inspector Griffin and Mr. J. J. Gaffney ascended the Bathurst Range to the trigonometrical station. From the summit an extensive view was obtained of Port Davey, the Arthur and Franklin ranges, and all the tumultuous sea of mountain country lying north and east, and concealing, doubtless, in its unexplored fastnesses, mineral deposits, which at some future date will be dragged to light and pressed into the service of man. For the present, the camp at Cox's Bight is the advanced outpost of explorers.

Between 50 and 60 miles further north-west, near Moore's Look-out, north of the Junction Range, Mr. T. B. Moore noticed the occurrence of stones of tourmaline-bearing quartz, and bearing in mind the generally linear character of our granite exposures, it would not be surprising to find granite outcropping somewhere between these two points. Wherever it may be found on this line, I think it is highly probable that it will be found to be tin-bearing. This likelihood should be borne in mind by prospectors. Even where the granite does not crop out visibly it may possibly have risen to no great distance below the present surface, and sent out tin-bearing veins into the overlying or surrounding schists. Taking this into account, and also the copper and antimony ores which

have been found in the Port Davey District, it is possible that the south-western portion of the island may eventually rank as a substantial contributor to the mineral output of the State.

*Cox's Bight Tin Mines, No Liability.*

This company's operations are on the following sections (charted in the name of A. D. Sligo):—1290-m, 40 acres; 1291-m, 40 acres; 1292-m, 40 acres; 1619-m, 20 acres; 1620-m, 40 acres; 1613-m, 60 acres (now forfeited); 1614-m, 80 acres; 1612-m, 40 acres; 1796-m, 76 acres; 1797-m, 80 acres; and more land has been applied for north-east of the eastern sections.

At the time of my visit work was being carried on at two faces, Meldon's and Gaffney's, on sections 1292-m and 1620-m.

These faces are in a flat terrace of wash, from 40 to 150 feet above sea-level, composed largely of stones of quartz, quartzite, and granite, and up to 15 feet deep, the waste of the adjoining hills. Meldon's face is the upper one, and is about 3 chains in length, with 7 to 10 feet of wash, the lower 3 or 4 feet being the best. This face was worked in the old time by Glover and Foley; then by Meldon; then by Gaffney.

I was informed by Messrs. Gaffney and Heise that a measured 1200 cubic yards turned out 24 bags of ore in May last, which is equivalent to  $2\frac{1}{2}$  lbs. tin ore per cubic yard. Prospects washed by Inspector Griffin were equivalent to 5 lbs. per cubic yard. Four men are employed in this face, which is yielding about  $1\frac{1}{4}$  tons per month. The bulk of the tin has always been got from this section, and it is still the best ground. It is at the foot of the granite spur, and was favourably situated for receiving the tin-drift from the mountain. The stone in this terrace-wash is heavy, interspersed with sand at intervals, in small quantity.

Owing to the quantity of stones the wash looks at the first glance unpromising, but its tin contents are undeniable, and it has always yielded more tin than it prospects.

The terrace being near the foot of the hills the stones are not so much waterworn as those which compose terraces nearer the coast. The tin ore is in fair-sized grains, generally black in colour, sometimes grey, and also resin-coloured. A nugget weighing 2 ozs. was shown to me. The largest which Mr. Gaffney has seen has weighed a quarter of a lb., but they have been reported as heavy as 7 or 8 lbs. Smoky quartz crystals have been observed, but no

gems; and tourmaline seems to be absent. A few specks of molybdenite were noticed by Inspector Griffin in a small quartz vein traversing the granite on the high spur.

The water for hydraulicing Meldon's face is brought from Bell's and Cox's Creek, in a race about a mile long. The length of column is 300 feet, and about 3 sluiceheads of water were being used, with a 2-inch nozzle. I understand that last year there was plenty of water, except for five weeks in the middle of summer, and that after rain 5 sluiceheads can be got. To pick up additional water it would be necessary to extend this high-level race (which is 230 feet above the brow of the face) nearly another mile, to Bourke's Creek, which would give twice the present quantity of water, and probably make up the total to sufficient for an uninterrupted supply all the year round.

Gaffney's face is in the terrace inside the north-east angle of section 1620-m. It is about 45 feet in length, with a bed of wash averaging 6 feet in depth. The face itself is 10 or 11 feet deep to the granite bedrock. At present the wash consists of large stones of quartzite, but sand occurs at times. This face is yielding fairly well, though the contents are not so rich as the upper one. It is served with water brought from the lower race, which has its intake on Luttrell's Creek.

East of this are faces near the brow of the terrace, facing the sea, between 40 and 50 feet above the swamp, now idle.

A. is a small face on the edge of the terrace; 2 chains north-east from it is B. face. C. face is 2 chains north of B. face. D. face is  $1\frac{1}{2}$  chains north-west of A. face. The terrace edge is 650 feet from the beach, and its level surface extends back for  $\frac{1}{2}$ -mile to 1 mile to the foot of the mountains, covered with button-grass, which conceals from 5 to 18 feet of quartzite wash, resting, at any rate in its western part, on granite bedrock.

The section downwards in B. face is 10 feet of large wash, resting on a layer of carbonaceous matter, with decayed timber, below which are 5 feet of wash, lying on the granite. The upper 10 feet carry coarse tin (Messrs. Castle and Heise obtained over 7 lbs. to the cubic yard); the lower wash is poor and patchy. C. face has wash varying from 2 to 8 feet, with fair tin. In D. face the wash is tight—5 or 6 feet of large stones and feathers out to the south. Variable tin prospects have been got from this. Three holes have been put down further west in 6 or 7 feet of wash, with moderate to poor results. Inspector Griffin got good results from Meldon's

shaft. This flat button-grass terrace of wash extends all over Section 1290, and over half of 1291 and 1292. The eastern part of this area has not been prospected. The wash, which is exposed wherever the peaty covering has been removed, is nearly entirely quartzite towards the extreme east, and quartzite mixed with granite in the central and western part. The bedrock over the whole area is probably granite. It is undoubtedly granite on Section 1619, on 1292, and on 1291, where the bottom is exposed in the faces on the brow of the terrace. This fact largely increases the possible area of granite whence tin ore may be derived, adding considerably to the granite area exposed above surface. This flat terrace-land extends over, approximately, 80 acres, of which perhaps 50 acres has been ascertained by prospect-holes, &c., to be tin-bearing. Nothing definite appears to be known as to the character of the balance of the ground, but there is every reason to believe that it will be stanniferous, though being further from the mountain it may not carry such heavy tin as the wash near the foot of the hills.

The timbered gully coming down from the granite ridge west of the present main workings has yielded the best prospects on the whole field, and is in an ideal position for collecting the sheddings of tin ore from the ridge. The terraces west of the Main Creek are shallow, up to 3 feet of wash, but give good prospects, and offer every inducement for extending the high-level race, and dealing with them.

Information has been submitted to me showing that Mr. H. Castle and the company's manager, Mr. F. Heise, took 39 measured samples, within an area of 50 acres, from wash averaging  $6\frac{1}{2}$  feet deep, which gave an average return of 2 lbs. 3 ozs. tin ore per cubic yard. In addition to this, 1215 cubic yards on Meldon's face, 12 feet deep and 5 chains wide, gave 2 lbs. 3 ozs. per cubic yard.

Before beginning to sluice, the face was sampled for 1 lb. 5 ozs. per cubic yard, so the actual yield proved much better than anticipated. The samples above referred to went as high as 7 lbs. 5 ozs. per cubic yard, and as low as  $4\frac{1}{2}$  ozs. to the yard. Inspector Griffin got 2 ozs. to the dish, or 5 lbs. to the yard, from the upper face, so undoubtedly high values occur. The work of sampling the area so as to form an accurate calculation of the tin contents is not within the sphere of my duties, but putting together the results of my examination and the information supplied, I should be disposed to agree that the whole

50 acres might be estimated at between 1 and 2 lbs. per yard; perhaps fully the latter quantity for the part now being worked, and somewhat less for the eastern margin of the sections.

With the present price of tin, this ground should be highly payable, even taking into account somewhat higher working costs than ordinary, entailed by the remote position of the field and imperfect shipping facilities.

In addition to the upper terrace there is a lower flat of swamp land 2 or 3 yards above sea-level, on the southern half of the Section 1291-m, about 9 chains wide from north to south. Very little is known of its value for tin. Three holes have been sunk in it at the foot of the terrace; one was sunk to the granite bottom through 6 feet of peat and  $7\frac{1}{2}$  feet of wash-dirt, poor in tin. Mr. Gaffney sank another shaft through 7 feet of peat and 7 feet of wash, which carried a little tin all the way down. No. 3 hole was sunk to 16 feet in the line of the creek. I was told that wash was met with at 14 feet, but not payable.

One must be prepared for some difference in the contents of this swamp, as compared with the deposit in the higher terrace. The brow of the terrace evidently marks an old shore-line, and the swamp-ground has only been above sea-water during a comparatively recent period. It is now only 6 to 8 feet above high-water mark, which does not allow any great lapse of time for the accumulation of ore since it was raised above the waves. Before the elevation of the land the tin would tend to be scattered by the action of the waves, and the wash distributed over a somewhat wide area, and consequently not likely to be so rich in tin as the heavier wash, which has been accumulating on the terraces for a much longer time. It is possible, however, that in places a fair quantity of mineral may have collected. The flat cannot be prospected by hole-sinking, owing to water. Systematic trials by boring should be instituted, and the value of the ground ascertained; but it would also be well to consider whether this area is not too limited to warrant the expenditure required for equipping dredging-plant.

The company has not done anything to its sections on the western bay. Meldon's old workings are in the south-west corner of Section 1797-m, in a small narrow gully in the granite foot-hills. His tailrace runs down to the swamp on Section 1612-m. The wash is 6 feet deep, and consists of large stones of white mica, granite, and quartz, the latter predominating. I was told that 18 cwt.

of tin ore has been won from here. Glover's old workings are on the adjoining section to the west, 1614-m. A strip up the gully for 3 or 4 chains has been worked, and I understand 10 tons of tin-ore were obtained. The body of wash in the gully is 20 to 25 feet wide, and has been worked down to a depth of 8 to 10 feet, but not bottomed. It is composed of large stones and boulders of quartz, quartzite, and granite, and is altogether the largest deposit of heavy wash on the western sections. Nice prospects of coarse tin can be got here, some of the tin adhering to quartz. Below the false bottom Mr. H. Castle ascertained there are 5 feet of wash, prospecting 2 ozs. to the dish.

The granite is exposed in the banks of this creek; to the west of it the quartzites come in. The granite hills come down to Meldon's and Glover's workings, and then, with the exception of a low knob of granite protruding through the swamp 5 or 6 chains north of the small lagoon, the bedrock to the south all over Sections 1612-m and 1796-m is concealed below an alluvial plain or swamp.

About 100 yards below Glover's workings a hole has been put down in the plain, 10 feet deep, without bottoming. The drift showed a little tin.

Irregular prospects, some good, some poor, were obtained from 2 shafts, 16 feet and 17 feet, on this plain. No bottom was reached, owing to water.

In Section 1613-m, further west, a hole was sunk 12 feet, but no tin obtained; and I believe no granite has been found on that section. The section appears to be well within the quartzite area.

A granite bottom most probably underlies in Section 1796-m, and a part of the adjoining one to the west. A portion of a small lagoon lies within the boundaries of these two sections. This flat, swampy land can only be dealt with satisfactorily by dredging, prior to which it must be well prospected with boring rods. The whole of the granite waste from the western side of the dividing spur has been shed into this low ground, which is only a very few feet above sea-level, and it would be very surprising if tin were not found. While the distribution of the ore may be rather widely spread, there are probably special channels in the drift which could be located by boring. The good results obtained on the higher ground by Glover and Meldon indicate that much tin must have found its way into the flat.

Work on the two upper sections will have to be by sluicing. Whether the creeks can give a continuous

adequate supply of water is doubtful. The supply, however, could be supplemented by pumping from the lagoon.

Looking at this company's property, as a whole, there is no doubt that the decision to start on the eastern sections has been a wise one, for a fair area of payable ground is being worked, and a considerable extent of promising ground is ready for testing. As regards landing plant, this is not impossible in favourable weather if a landing-terrace is cut in the sea-wall at Point Eric, and hoisting machinery used; but the sea is very uncertain, and the weather would have to be watched. Tin ore in bags is at present carried to the steamer by boat through the surf. If operations are carried on here on a large scale, doubtless in course of time Bathurst Harbour will be utilised.

#### *Kent Tin Prospecting Association.*

This association has been formed to develop 370 acres on the west bay, viz., four 80 and two 25-acre sections, applied for in the names of Messrs. Weber, Gourlay, and Hawson. Two lagoons are situate on the property within a very few feet of sea-level. The western, or large lagoon, extends for the length of two 80-acre sections as far west as the range of Cox's Bluff, which closes in the bay in that direction. The land all round these lagoons is a swampy button-grass flat, separated from the sea-beach by a few chains of dune-sand, covered with thick ti-tree scrub, which forms a kind of bar, damming back the fresh water of the swamps. A creek, however, issues from the lagoon, and flows into the sea.

This large flat receives the drainage of the high ground on the north and north-east. Every creek which comes down from the hills carries tin, and must have been shedding ore slowly into this shallow basin for ages. The terrace-ground on this side of the dividing range runs a little farther back from the sea than on the eastern bay, and the swampy area is therefore larger. The flats in the neighbourhood of the lagoons have not been bottomed on account of water, which consequently prevents sampling before boring rods are on the spot. Prospects taken haphazard from the unbottomed drift are valueless. Below the surface peat a white sand-drift appears to prevail, and a little fine tin has been obtained from prospects. It was in another part of this large stretch of flat, swampy ground that two holes were sunk by Mr. Gaffney and the company to 16 and 17 feet without bottoming, but yielding tin from

$\frac{1}{4}$  oz. to  $2\frac{1}{2}$  ozs. per dish, so that the swamp has been definitely shown to have formed a reservoir or collecting-place for ore, which was only to be expected in view of its position.

This flat ground occupies all the area which the Kent Syndicate intends to hold, and on it is a part of the small lagoon, and the whole of the large lagoon, mentioned above. The depth of the latter has not been ascertained, but Mr. Weber judges that there are from 6 to 8 feet of water in it. Some fine tin has been found in creek sand further west, at the base of the Cox's Bluff Range. This has either been derived from veins in the quartzite, of which that range is composed, or is the remnant from a larger deposit of drift covering the plain in old times.

The plain, certainly, has been below the sea in recent time, geologically, and the tin is probably distributed through the area pretty widely, though the extreme western portion is likely to be the poorer part, being most distant from the granite hills.

In the hilly quartzite country, north of the Kent ground, are the abandoned Conliffe's Creek sections, extending a couple of miles inland to the headwaters of that creek. That area is all quartzite, and it is not probable that much tin will be found in it.

The first thing for the Kent P.A. to do is to prove its ground by boring, as there is too much water for shaft-sinking. Wherever shaft-sinking is possible, shafts should be sunk. Although more costly than boring, yet with them there is much less chance of being misled; but owing to the water the boring rods will be necessary in most cases in this flat. The whole of the contents of the bores must be carefully gauged in a measured box, and the tin weighed, and great care expended on the entire operation, as it will form the basis of all calculations. Tubed bore-holes, 1 chain apart (or a less distance whenever a channel is found to exist), in every direction would test the ground very thoroughly. Towards the western end bore-holes at each 100 feet would suffice. The depth is unknown, but I should think that it would be somewhere between 20 and 40 feet at most. With the results from these bores the owners would be in a position to calculate the value per yard to a nicety. This preliminary work is absolutely necessary prior to placing machinery on the property.

The bottom of the deposit is probably at sea-level, or below it, and the conditions require elevation of material and water. This, and the frequent removal of plant,

indicate the adoption of hydraulic dredging, if the water difficulty can be overcome.

Landing and shipping in the western bay can only be effected from the beach, but the property is only distant 7 or 8 miles from Port Davey waters.

*Pender and Atkins' Sections.*

These are 1534M, 80 acres; 1525M, 40 acres; 1526M, 40 acres; 1527M, 40 acres (on the west bay); and 1735M, 80 acres on the east bay

Of the above, the 80-acre section is, perhaps, the most important, as it is nearly entirely composed of granite, and contains the spur traversed by the quartz veins which have shed most of the tin ore into the adjoining properties.

The spur or ridge rises from the sea in a succession of rocky knobs to a height of 600 feet, when the granite junctions with the quartzite inside the northern boundary of the section. At the junction, white mica appears in the veins of quartz, which are partly greisenised.

At about 800 feet above sea-level, west of the north-west corner of the section greisenised quartz veins occur in quartzite, and in this neighbourhood a white quartz reef in quartzite country 2 feet in width, barren and massive, courses N. 45° W. to the west boundary of the section. Still higher up, on Section 1525, is a large reef of quartz, with a north-east strike, and further west another broad outcrop of white quartz, with a north-west strike, traverses the same country rock.

These reefs in quartzite and the greisenised veins in the same country rock are important, as showing that lodes have passed from granite into the surrounding country. Such may explain some of the occurrences that have been noted in this field, of alluvial tin in creeks flowing over quartzite and schist country. Heavy tin has undoubtedly been shed from Pender and Atkins' sections into the properties on either side of the ridge, and it seems that this tin has been derived mainly, if not entirely, from veins, and not from the granite matrix itself.

The characteristic mica is magnesian, and there are no stock-works or extensive alterations of the granite in the form of stanniferous formations; but the quantity of tin found in the wash at the foot of the hills points to the existence of rich veins as yet undiscovered. The southern part of Section 1524-M descends to the alluvial ground near the sea on the western bay, which may have received a fair quantity of tin ore from the range.

Unfortunately, there is the difficulty of absence of water, which probably could be remedied by pumping supplies from the lagoons if all the sections were in the same hands.

The Sections 1527-m and 1526-m would appear to have been taken up mainly for position, as the granite is exposed only along their south boundaries. It is possible, however, that greisen veins in the quartzite may be tin-bearing. The sections have not been explored. They occupy the high hilly ground at the back of the Cox's Bight Tin Mines sections, and search might be made along the southern boundaries for tin veins at or near the granite junction, especially as the gullies coming down from them carry tin.

There is a mineral lease, 1735-m, 80 acres, on the east bay, in the name of F. Pender and C. Atkins, on which a little work has been done. The southern part of this is flat, swampy ground, a part of the low alluvial plain mentioned on the Cox's Bight Tin Mines section. This ground has not been bottomed, and will probably be found to carry fine tin. It is from 8 to 10 chains in width, and is only 2 or 3 yards above sea-level. The extent of this ground on the section is, however, limited. To the north of the creek is a hill range composed of quartzite and slate, with a strike a little west of north, dipping south-west. On the crest, brown slate is observed, crossed by east and west veins of barren quartz. Large quantities of white quartz stones are scattered over the surface of this hill. At the summit is also a vein of white vitreous-looking quartz, 1 foot wide, crossing the country east and west in soft brown laminated and jointed sandstone. This rock may possibly be a softened quartzite. At any rate, it belongs to the same series as the quartzites and schists. Further east is a parallel lode of white jointed quartz, striking N. 80° W., without any trace of mineral. This hilly ground deserves prospecting for copper lodes. The quartz, which is strewn about everywhere, has not a very favourable aspect, but mineral may eventually be found in some of the veins.

*Section 2559-m, 80 acres—F. Pender, Applicant.*

This is north-east of the preceding, and is situate in the foot-hills between the quartzite and slate range on the west, and the Black Point schist range on the east.

On this section, too, there is a lot of loose quartz scattered about. Beyond a little prospecting, no work seems to have been done, but I was told that some tin

prospects had been got out. In the south-east angle, east of the creek, a strong east and west quartz reef is marked out by a line of loose quartz. The stone is white, and mineral is not visible in it.

*Section 2455-M, 80 acres—J. J. Gaffney, Applicant.*

This is on the same hill ranges as the section to the south, 2559-M, and shows similar quartz detritus. It is a section which invites prospecting for lodes in the same way as F. Pender's.

*Gourlay and Tolman's Creeks Claims.*

This ground, situate north of the preceding, is watered by Gourlay's, Tolman's, and Bourke's creeks. These join and form a large creek, eventually flowing through Pender and Atkins' section, further south. Some prospecting has been done on it by Mr. Weber.

The works on Tolman's Creek show excavations down to about 6 feet, exposing 3 feet of turf, 9 inches of small tin-bearing wash, and 2 feet of heavy wash, resting on soft, brown, and bleached slate. The strike of the country here is N. 50° W., with dip to the west. A little tin has been won. This is on Mr. Weber's prospecting area. Better ore is obtained higher up the creek, where the wash, consisting of angular quartz and slate debris gives good prospects. The observed strike of the slate was N. 20° W., and dip, as usual, to west.

Bourke's Creek, a little further east, is too full of boulders and large stones to be worked, consequently Tolman's may be said to be the most easterly creek that has been worked, though, as mentioned above, tin has been found on Section 2559, and even as far east as the base of the Red Point Range.

There are two ways in which the presence of tin on the slate and quartzite bedrock in this part of the field may be accounted for. Some of it may be directly derived from veins which have penetrated the country rock, and some have survived from a former (Tertiary) covering of drift, vestiges of which still remain to the west of these creeks in the form of a high terrace clinging to the base of the mountain.

*Section 2456-M, 80 acres—H. Gaffney and Jones, Applicants.*

The ground on this section west of the Big Creek was worked by Tolman. Heavy quartzite wash exists

for 8 feet below the peaty grass surface, but it has not been bottomed. The wash consists of flat, rolled stones, mixed with sand, and has been worked for a width of some 15 feet, and 60 feet in length. Near the edge of the workings is a 10-foot hole, also not bottomed, showing stones of quartzite all through.

In the northern and north-western portion of this section is a terrace of sandy clay raised to about 200 feet above sea-level, and some 40 feet above the other terrace-ground.

A creek east of Luttrell's Creek has cut down into this drift, which gives prospects of fine and coarse tin. The drift is a soft brown deposit, with a little carbonaceous matter in it, and is apparently a terrace of Tertiary age. From this we learn that the uplift of the shore-line shown by the lower terrace has not been the only one which has taken place here. Mr. Gaffney sank a shaft 15 feet in this deposit while I was at the Bight, and obtained a few prospects of tin, but when the boring rods are on the property a few holes should be put down on this terrace, for there may be runs of tin in it which would pay to work. Sinking holes at haphazard would be of no use, as valuable gutters might easily be missed. There are some possibilities here, as this fringing terrace is distinct in age from that of the granite terrace lower down. Luttrell's creek, to the west of this, is a narrow creek, with steep banks, and must have cut its channel in soft material, possibly the same Tertiary deposit. The ground between here and the Cox's Bight T.M. properties further west, is the lower-terrace ground, covered with quartzite detritus. It has not been prospected, and little is known of its capabilities. It should receive whatever tin is shed from veins in the quartzite range.

#### *Black Point.*

The mica schist range terminates on the sea-coast as a precipitous bluff, running north and south. Tin is said to have been found on this range on the vacant 56-acre section, 1371-91m, and again, further north, to the east of Section 2455-m. At the bluff itself, on the sea-front, there is a pyritic quartz vein in the schist a few inches in width. Some of the pyrites is arsenical. An assay of the stone by Mr. W. F. Ward, the Government Analyst, yielded the following result:—Gold, trace; silver, 8 dwts. per ton.

This, and the slate range to the west, would appear to be more favourable for the discovery of silver or copper veins than the harder quartzites, but prospecting has been

so limited that the potentialities of these mountains can hardly be gauged at present.

Further south-east are the two old gold Reward sections, granted to Messrs. Brakespeare and Brice, but indications of mineral upon them are not known.

#### CONCLUSION.

Reviewing the district as a whole, there is no doubt that its present value is due to the output of tin ore, which is proceeding steadily on a limited scale. With respect to this mineral, the field is not likely ever to be one of more than moderate dimensions, as the exposure of granite is not large. The extent of terrace-ground fringing the base of the mountains is known and easily measured, and the area of lagoon and swamp ground is clearly defined. The nature of these areas has been outlined in this report. The sections taken up by the various associations cover, approximately, the tin-bearing ground at the Bight, so that we have there a compact proposition parcelled out among a few owners, some of whom, with proper management and adequate capital, will probably find their venture payable. The Cox's Bight Tin Mines Company ought certainly to do so, for the extensive tests made in different parts of the area by Messrs. Castle and Heise indicate a valuable property. The Kent Tin P.A. has not yet proved its property sufficiently to enable a forecast to be made.

Meanwhile much interest attaches to the work going on there, for success means the extension of exploration northwards and eastwards into practically virgin mineral country. If granite is found further north, tin will most probably accompany it; but irrespective of granite exposures, the ancient schists of this part of the island are likely depositories of copper and antimony ores, and from the scattered indications which have been found hitherto it is possible that when the country is better known discoveries of value will be made.

I have the honour to be.

Sir,

Your obedient Servant,

W. H. TWELVETREES,  
Government Geologist.

W. H. WALLACE, Esq.,  
Secretary for Mines, Hobart.

## REPORT ON THE RENISON BELL TINFIELD.

Government Geologist's Office,  
Launceston, 18th December, 1906.

SIR,

I HAVE the honour to submit the report of a brief visit to the Renison Bell Tin Mine, in accordance with your instructions, on the 23rd to 27th of last month. The present report will not extend beyond a preliminary statement of the geological and mining problems met with at the northern or Renison Bell end of the Dundas tin-bearing belt, leaving a more extended report on the whole belt till a further visit to the district is made.

Deposits of tin ore occur in the North-East Dundas district, within a zone of country roughly estimated at about a mile in width, and coursing in a persistent line from N.W. to S.E. for about 3 miles in length.

Though some of the lodes strike north and south, or to the east of north, their bearing for the most part is north-westerly, which is the direction of the cleavage planes of the country rock.

This linear direction of the metalliferous belt must not be ignored. The lode occurrences have not been haphazard, but have been in obedience to some orderly physical process, which not only serves to indicate the directions in which prospecting may be carried on usefully, but also very strongly suggests that a good deal about the ore occurrences remains to be learned.

Acid eruptives being the true source of tin, the origin of the Dundas tin deposits may quite naturally be ascribed to neighbouring granite. Examination of the various lodes of this part of the West Coast leads irresistibly to the belief that underlying granite is responsible for much of the ore-deposition which has taken place. Most of the country rock at the northern end of the belt under review is slate or crystalline sandstone, or quartzite, the geological age of which has not been defined precisely, but it is nearly certain that it is Lower Silurian or Ordovician. Prof. T. S. Hall, of Melbourne, has identified some graptolites in slates from the North-East Dundas Railway, near the Ring River, and also at  $12\frac{1}{2}$  miles from Zeehan on the

same railway line, but he pronounced the discovery of no great value for determining the age of the containing rocks. We have, however, good reason to believe that the Dundas series of stratified rocks are older than those at Zeehan, which are known to belong to the Upper and Middle Silurian.

In various parts of the North-East Dundas district the sedimentaries are penetrated by basic eruptives, such as gabbro and serpentinised olivine and pyroxene rock, *e.g.*, on the Penzance and Goldstraw's sections. With these basics may be connected concentrations of copper, lead, nickel, and iridosmine, as regards the former epigenetically, and the latter by a magmatic process, but tin-deposition evidently took place subsequently to their consolidation, and accompanied the intrusion of tourmaline quartz-porphry dykes. These dykes have pierced both the serpentinous rocks and the sedimentary strata, but tin has not been found, and is not likely to be found, in the former, for this metal appears all over the world to be associated genetically with only acid eruptives (granitic plutonics or their geological equivalents).

My attention during this visit was confined to the country immediately contiguous to the Renison Bell Mine, and I first endeavoured to learn all that could be ascertained about the occurrence of igneous rocks in the neighbourhood.

Isaacson's Creek is a small creek which rises in a vacant section north of 1215-m, C. Brumby, and flows for a mile north-easterly by the side of the Emu Bay railway line, eventually emptying into the Ring River. Mr. Gilham took me to this creek, the sand of which gave prospects of gold, tin, and iridosmine (osmiridium). I was informed that about  $\frac{1}{2}$ -dwt. or 1 dwt. of the latter mineral is present in each cwt. of tin ore from the creek. The chocolate-coloured slate on the banks of the creek shows a development of serpentine (sometimes slightly asbestiform) in the joint or cleavage planes, and it is highly probable that serpentine rock exists somewhere in the hill situate to the south-east. In the creek bed I also saw a greenish granitoid rock, the precise nature of which needs microscopical identification; but it was not fully exposed, and I could not say positively whether it is *in situ* or not. Search for granite should be made in the hill above this creek.

Lower down the Argent River, north-west of the Renison Bell, and also on the line of McKimmie's tramway

towards the Tasmanian Smelting Company's lease, serpentine is also reported to be present. From the latter direction Mr. Gilham brought to me some stones of granitoid rock found by him in prospecting. All this shows that the northern end of the metalliferous line connected with the eruptive rocks has not yet been seen.

At 140 feet from the south-west angle of the Renison Bell Section 2536, Porphyry Creek crosses the boundary line. Its bed is quartz-porphry, containing scattered needles of tourmaline, a little iron pyrites, and fluor stains. The apparent direction of this quartz-porphry dyke is north-westerly, consequently parallel to the general trend of the lode-belt. Going south-easterly a similar rock outcrops on the boundary line between Section 165-93M and Section 1963-M, 1000 feet above the railway line, intrusive into slate. The distances between the exposures are so great that I could not satisfy myself whether this is the same dyke or not. Tourmaline quartz-porphry and tourmalinized slates are intimately associated with tin ore deposits in other parts of the district, and consequently it is not surprising that the tin lodes on the Renison Bell ground should be accompanied by this intrusion. It would appear that the dyke forms an intrusion extending along the western side of the tin-bearing belt all through that ground. At the same time, it is not the only occurrence of quartz-porphry in the district. I noticed a small quartz-porphry dyke 3 feet wide in the centre of a 50-foot pyritic formation in the south-east angle of Section 1342-M, 75 acres, in the name of J. Craze, which was discovered a few weeks ago. The formation with the dyke has a bearing N. 35° W. Further south on the Penzance and Goldstraw's sections there is a good deal of quartz tourmaline porphyry, and there can be little doubt that its intrusion all through was an integral part of the process which introduced the tin into this area.

A further indication of the granitic source of the tin present in this district is in the well-known vein of axinite in the Cornwall (New Dalcouth) and Commonwealth sections. The question whether this vein has faulted the lode there or has been the channel of mineralisation is of interest, and even of some importance, to the owners. Different views exist, but in the short time at my disposal I was unable to arrive at any definite opinion in the matter. It seemed to me, however, that the direction in which the ore-body should be developed is along the line of lode, notwithstanding that the bearing of the axinite

vein corresponds more with the general trend of the other lode outcrops in this belt. I could not, however, investigate the whole of the data bearing on this point.

I have been informed that as far as can be ascertained fully 200 tons of tin ore have been sent out from the North-East Dundas district during the last fifteen years from alluvial and detrital deposits. In some parts of the field much of the ore has been found as large nuggets, 7 lbs. to 14 lbs. in weight; sometimes boulders of pure tin ore a hundredweight each have been met with in sluicing, and one large boulder weighing nearly a ton of ore is in the Tasmanian Museum, Hobart. These boulders indicate the existence of rich tin veins up to a couple of feet or more in width.

The tin is invariably in the form of oxide (cassiterite), but apart from that found in connection with quartz-porphry, it is in the majority of instances associated with sulphidic gangues (pyrite, arsenopyrite, or pyrrhotite). It is this that has probably mainly contributed to the stagnation of lode-mining in this field. The treatment of ore stuff from which pure oxide of tin, as on the East Coast, can be easily removed is so simple and inexpensive that the separation of tin stone from these contaminating sulphides has been a bogey which has frightened adventurers.

The exact metallurgical treatment cannot be settled off-hand, but there is no inherent difficulty about it (comparable, say, with the zinciferous sulphides of Mt. Read, &c.). Mr. J. D. Millen of the Mt. Bischoff Smelting Works states that he has made several experiments on the sulphide ore at the Renison Bell, and is satisfied with the result.

Mr. Donald Clark, in his "Australian Mining and Metallurgy" (p. 224), seems to think that the ore at the Cornwall Mine, which is mainly pyrrhotite with a little pyrite and arsenopyrite, could be roasted and concentrated for 15s. per ton. Mining costs would probably be between 8s. and 10s. per ton; development 4s. to 5s. Altogether, with tin at its present price, sulphidic ore of 1 per cent. quality might be expected to pay working expenses. If these properties are ever to be exploited seriously, it is manifest that the present is a highly favourable time.

I paid a visit to the Commonwealth section, now E. Flight, 271-m, 77 acres, where the tunnel has been driven into the Cornwall (New Dalcouth) property to the south. The tin-bearing pyrites in this tunnel appears to have a

trend east of north, while the axinite vein bears west of north.

The tin ore is scattered visibly in places through the pyrites. Outside the tunnel entrance (on the Commonwealth ground) is a rich face of lode-matter composed of oxidised iron, quartz, tourmaline, arsenical pyrites, pyrite with visible crystalline tin ore. Lower down an open drive was begun by optionees, apparently with a view of opening up the lode at a lower level; but work here was abandoned by them for some reason or other.

I visited the exposure of the large lode on the creek on the Commonwealth, consisting of pyrrhotite, arsenopyrite, pyrite, with some copper pyrites. Mr. Montgomery's samples from this outcrop assayed 2.1 per cent. of tin and 3 dwts. 6 grs. gold per ton. The ore is evidently mixed with arsenopyrite in considerable quantity. Very careful selection is necessary here to determine any payable zones of metal. On this section (Flight's) an alluvial or surface formation is being sluiced very successfully in the central and north-western part of the property.

On the same line further north-west is a section, 1215-m, 36 acres, in the name of C. Brumby (formerly North Renison Bell), near the southern boundary of which Evenden's tribute party is sluicing a rich tin-bearing formation, apparently consisting of disintegrated quartz and sandstone. The limits of this have not yet been exposed, and it is consequently too early to say what the deposit really is. Since my visit I have heard that a still richer discovery has been made.

#### *Renison Bell Tin Mine.*

The Renison Bell Tin Mine is the chief mine at the northern end of the belt, and is at present being worked by optionees, who are producing ore by sluicing operations, and are driving underground to intersect the large pyrrhotite lode a hundred feet below its exposure in the railway cutting. For this work they have made use of the adit which was driven from the Argent River, 200 feet along what is known as the No. 1 lode. This lode is cut through by the Argent River, which exposed on its south bank a face of gossanous and soft pyritic lode-matter, from which bulk samples were taken from time to time, returning from  $7\frac{1}{2}$  to 10 per cent. tin. Since my visit in 1900 this face, which was then about 20 feet wide, has been cut down and the material removed, reducing the width of lode to 6 or 8 feet, and showing that the outcrop at this point pro-

bably partook of the nature of a bonanza. The bearing of the lode is S. 60° E., and its dip at a high angle to the north-east. A drive has been put in in footwall country south-east for 200 feet, and crosscuts driven through the lode at 100 and 200 feet. The first crosscut intersected the lode about 9 feet wide of siliceous and pyritic nature, but poor for tin. The second crosscut at 60 feet in cut a pyritic band, succeeded by about 30 feet of carbonate of iron and dolomite, and finally passed through another band of pyrites 9 feet wide at the end of the crosscut. The level has been resumed on the east side of the lode for 120 feet, short crosscuts west being extended into the lode at 60 and 120 feet. The first crosscut or cuddy passes through the pyritic band into flat layers of dolomite. The tin contents of the lode here are stated to be 1.01 per cent. In the next crosscut about 8 feet of pyrites are exposed. A crosscut is now being driven north-easterly to intersect the parallel pyritic (pyrrhotite) lode shown in the railway cutting. This crosscut is now 100 feet vertically below that lode, but will have to be extended to cut it on its underlay.

The No. 1 lode is shown at surface at the west end of the railway cutting, with a width of 10 feet about 150 feet further west than its occurrence underground. This would indicate that its mean underlay above the level of the drive is about 35°. In the drive, however, it is much steeper. Taking into consideration the low grade of this lode, where it has been tested underground and at surface, combined with its good return at the Argent River face, it seems likely that its richest horizon is below the river level. It will have to be proved in depth by means of a shaft sunk on the hillside above the river.

The lode, however, which invites the first attention is the Big Blow Lode, which is probably the same as the pyritic (pyrrhotite) lode shown in the Emu Bay railway cutting. This identification is not absolutely certain, as from the distance between the two outcrops (1000 feet) some doubt may very well exist. As the Big Blow outcrop is fully 250 feet above the pyritic lode exposure, its underlay would seem to carry it at railway level to the east of the railway cutting altogether. But the Blow outcrop is so huge and irregular that it is uncertain what is the true lode strike, and this uncertainty will not be removed until more work is done.

The outcrop is a quartzo-ferro-manganese mass projecting 28 to 30 feet vertical from the hill-slope, and bearing

at its northern end nearly due north, but bending round south-westerly at its southern end. The slates forming the footwall of the gossan dip to the east. The outcrop forms a mass of oxidised lodestuff which extends along the hillside, not without some interruption, for upwards of 5 chains. At the southern end it forms a continuous wall for 167 feet in length, from 21 to 30 feet in width at the top, and decreasing to from 6 to 9 feet in width at tunnel level, and this is the block of ore-bearing material which the company relies upon as an available asset.

A tunnel has been driven below the outcrop at the south end for about 200 feet into the hill, showing the underlay of the ore-body to be flat, and indicating a change of the gossan to pyrite and pyrrhotite. I have no doubt that the oxidised matter will be replaced by these sulphides in depth. The crosscuts and rises from this tunnel have fairly well established that the ore-body descends to this level, and facilitate the formation of an idea as to what approximately may be expected to be won from this large block of material. I measured the Big Blow outcrop, and confirmed in a general way the measurements upon which the company's published estimates are based. The published samplings of this block show an average content of a little over 4 per cent. metallic tin, but this is a subject which is outside the province of my report. I was shown the bore-holes in the lode from which the various samplings had been taken, and I formed the opinion that the sampling had been carried out in a systematic and efficient manner. The crosscut from the main drive where a connection has been made with surface at the southern end of the outcrop in question (viz., at 150 feet in), shows pyritic lodestuff descending in unimpaired strength, and the assay value of the lode at this depth is stated as 2.75 per cent.

The flat layers of lode-matter connected with the Blow cause some doubt as to whether the main deposit may not prove to be in the shape of a floor following the stratification of the country. The horizontal banding of the lode material might be taken to imply this, and if this theory were correct the working of the deposit might prove awkward. It would mean that the extensions and undulations of the bedding planes would have to be followed indefinitely. I am rather disposed to look upon the horizontal layers as lines of bedding which are made visible by a replacement process taking place within a more steeply inclined channel of ore deposition afforded by the planes of cleavage. On this theory future work under-

ground would consist in following the ore channel down to any depth to which it might lead.

A short tunnel a few yards to the east of the main tunnel shows disturbed country and pyritic lodestuff (a good deal of pyrrhotite). The position of this is not easy to connect directly with the Blow, and the lode being unoxidised it has been thought to be an independent occurrence. This, however, is not likely. The difference in character is probably due to the predominance of pyrrhotite, which oxidises very slowly.

As a general rule in this district, it is probable that where the lodes consist mainly of pyrrhotite the outcrop will be sulphidic, while the large outcrops of ferro-manganese indicate that the preponderating pyrites in the vein below is the bi-sulphide.

The distribution of the tin, both in the gossan and sulphide, appears to be sporadic, and variable within short distances. No general law of distribution has been discovered so far, consequently any forecast of the behaviour of the lode in depth would be founded on precarious data. Tin, however, being a metal of deep-seated origin, will certainly be found in the lode channel in sinking to a considerable depth from the present surface, which has a purely fortuitous connection with the tin ore in the upper part of the lode. There is therefore every inducement after turning the metal of the large outcrop into cash to prove the lode in depth.

The hill spur descends from the Big Blow to the railway cutting, and the form and direction of this spur lend great probability to the view that the same lode is exposed in the cutting as the pyritic lode. This is there cut through obliquely for 46 feet, which would be equivalent to a true width of about 40 feet.

The ore channel is steep and well defined, evidently parallel with the planes of cleavage and at nearly right angles with the flat bedding planes.

About  $6\frac{1}{2}$  chains south-east of the lode in the railway cutting is No. 6 lode, which has been trenched across its outcrop for about  $1\frac{1}{2}$  chain, and driven across underground for an oblique width of 26 feet. Its true width seems to be about 14 feet, and bearing, as far as can be judged, S.  $70^{\circ}$  W. It cannot be very far east of the Big Blow lode, and on my former visit I surmised that it might be identical with it; but I am now inclined to think that the two are distinct, and that this crosses the line of railway below the embankment. A useful piece of work would be

to put in a deep exploratory crosscut into the spur from this side, which would intersect all lodes coursing down the hill. It is a rather solid pyritic lode, with a considerable admixture of quartz, but not rich in tin at this level. Its dip is south-easterly, and it is conformable with the foliation planes of the country. It forms the slope as it were of the camp gully, and hence is easy of attack. Near the end of the drive some further pyritic veins have been passed through, and in the face flat replacement veins of pyrites occur which evidently mark bedding planes.

What is called the "White Lode," or a zone of white sandstone and conglomerate, has been intersected by the railway cutting for a width of some 48 feet. The same zone is prolonged 6 chains further south, where an underlay shaft and some trenches have been excavated in it. In sinking the shaft 25 feet, quartzite was followed by white conglomerate, and the latter by pug. Mr. Briggs informed me that he obtained prospects as much as 2 lbs. to the dish. A couple of chains from this a hole was put down from a trench passing through 15 feet of grit and quartzite, 3 feet of loose rubbly quartzite into soft yellow clay in which a 6-inch vein gave a rich assay. In the railway cutting the lode called the "Cross Lode" is believed to have junctioned with this one. This is a little problematical, but at any rate there is a wide belt of fissured country there which has been a channel for the ascent of stanniferous vapours or solutions, and which has contributed a good deal to the detrital formations which are being sluiced below the line.

The mineral solutions in this zone have doubtless ascended vertically, but the horizontal bedding planes give the replacement deposits their structural features. On the whole, this "White Lode" deposit is low grade, but it should be explored for locally enriched portions.

#### *Western Lode.*

A large ferro-manganese gossan outcrop crosses the boundary line between Sections 2606 and 166 in a north-westerly direction on the fall to Porphyry Creek. Its observed length is between 500 and 600 feet, and its surface width from 20 to 30 feet. On Section 2606 a short drive has been put into it for 25 feet, and 20 feet below the hard craggy outcrop. As is often the case below these outcrops, the ferruginous matter is much softer underground. Quartz veins or patches occur in it. The

enclosing strata, clay slate, lie rather flat. To test the lode at some distance down, a winze might be sunk following one wall, and adit crosscuts may be driven from the east fall of the hill to a considerable depth. There is nothing in this occurrence inviting urgent attention, but the probability is that the iron gossan outcrops so common in this district cover pyritic lodes, and the sulphides, as we know in numerous cases, are often accompanied by tin ore.

In the southern part of Section 2534 above the Big Blow trenching has disclosed several iron gossan formations, about which little or nothing is known, but any one of which may cap payable lodes.

These numerous formations on the Bell property give large scope for prospecting work.

The alluvial or detritus deposit now being worked with profitable results forms a belt of detrital tin-bearing material covering the hill-slope for a width of about 200 feet, and extending down the hill to the Argent River on the one hand, and up the hill for about 400 feet from the railway cutting on the other. The deposit seems to be about 3 feet deep. I am informed that the average depth of the test bore-holes was 39 inches, and that the assay yield was equivalent to 13 lbs. per cubic yard. I was shown the test-holes which had been put down, and noted that they corresponded with those shown upon the mine plan. The productive work in progress is, I am given to understand, generally confirming the published estimates. The deposit in question is not a bed of waterworn stones, but consists almost entirely of angular detritus, and in a large measure seems to be the waste of lodes disintegrated *in situ*, the soft country rock being amenable to the pick. The process of deposit is simply the wasting away of the lode formations, and consequent liberation of the ore which remains *in situ* for sluicing.

Taking the alluvial and the Blow outcrop into consideration, it is obvious that the owners of this property have a quantity of ore in sight, or easily accessible, waiting to be handled. Any quantity beyond this can only be disclosed by developing the lodes. The outcrop and the work on the Big Lode at tunnel level lead one to expect that the ore body will continue remunerative to a greater depth, and certainly warrant expenditure in opening up and exploring the lode. At present nothing is known throughout the entire Dundas district as to how these lodes, which within that area have a pronounced family likeness

in common, will behave in depth, and the pioneer work of testing the question seems likely to devolve on the Renison Bell owners, who may be considered as possessing a valuable property, and of considerable potentialities in its undeveloped lodes.

*Lewers' Section.*

The North-East Dundas tin-bearing belt continues north-westerly from the Renison Bell into the adjoining section, R. D. Lewers, 37 acres, 4550-93m. The lodes continue as three large ferro-manganese outcrops within a few chains of each other, traversing the entire section and emerging from it at its northern boundary.

On the northern fall of the hill a wide outcrop of one of these lodes has recently been discovered by Mr. Gilham. It has a favourable appearance, as these outcrops go, consisting of the usual iron gossan with a little pyrites and a considerable quantity of quartz, some of it chalcedonic. I believe it is not tin-bearing so far, but a little tin has been found by assay in other outcrops of these lodes, and possibly tin in payable quantity will be eventually found somewhere on this property. The easiest way of testing some of these lodes would be by the diamond-drill, but unless the bores were very close together the results would be inconclusive, for we may anticipate that the ore concentrations will prove extremely irregular. As said above, there is reason to suppose that the gossan will be replaced by pyritic veins in depth, and having regard to the nature of this metalliferous belt I see no reason for doubting that some of them will be tin-bearing.

In concluding this report of my brief visit to the northern end of the Dundas tin district, signs and evidence support the view that the whole district is one of undeveloped wealth. The quantity of alluvial and detrital tin which has been produced, and which is increasing every week, shows that the tin-bearing formations are more numerous and better than hitherto supposed. The present price of the metal is acting as a stimulus to the efforts of working parties to sluice wherever possible. This must inevitably lead to attention being paid to the lodes. It is true that the lode cappings are in many cases, but not always, poor or barren, but it is not likely that that will be the last word on the subject. The scratchings and chippings upon which discouraging estimates have been based will have to be followed by more venturesome work in the shape of testing the lodes at a reasonable depth on

the quite reasonable ground that tin is an ascending metal. The pyritic lode-stuff will, of course, necessitate treatment to which our tin-mine owners have been unaccustomed, and in some cases the accessory minerals (arsenides, &c.) may prevent the ore from being easily amenable to profitable metallurgical treatment; but these instances are exceptional, and do not affect the prospects of the field as a whole. A very promising feature in much of the so-called alluvial of the district is that it is really the waste of lode capping *in situ*, and consequently that the fresh discoveries of alluvial which are now being made every month mean so many additional lode formations brought to light. With the present favourable market conditions, it would be a pity to let the time go by without making a serious attempt to test some of the lodes at deep levels.

I have the honour to be,

Sir,

Your obedient Servant,

W. H. TWELVETREES,

Government Geologist.

W. H. WALLACE, Esq.,  
Secretary for Mines, Hobart.