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On Some Gold-mining Properties at Mathinna

BY

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Frontispiece

1. New Golden Gate and Tasmanian Consols Mines.

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I.—INTRODUCTION.

For the last three years the output of gold from the Mathinna field has been very restricted. After the abandonment of operations by the large companies (New Golden Gate and Tasmanian Consols), the district fell into a languishing condition from which it has not yet properly emerged, though, owing principally to the efforts of the present New Golden Gate Mining Syndicate and the New Jubilee Gold Mining Company, and some others, the outlook is now assuming a somewhat brighter aspect.

The recent developments in these properties and their probable effect on the local industry have led to the present visit to, and examination of, the points in the field, to which attention is being paid.

Mathinna is 17 miles north of Fingal, and is situate about 1000 feet above sea level. It is situate in the great auriferous belt which extends without any interruption from Mangana to Mount Victoria, and thence through to Warrentinna and Lyndhurst. The numerous reefing properties which have been worked near the township, and which for many years in the aggregate yielded a substantial output of gold, indicate that the deposition of metal in the veins has been on an enormous scale. It cannot be supposed for one moment that the production hitherto represents more than a fraction of the quantity still remaining unextracted. The gold production of the Mathinna mines to date cannot be stated with exactitude, but from the official returns it may be given as between 300,000 and 320,000 ounces.

It is necessary to emphasise that the geological indications strongly suggest that at any time discoveries may be made equal to anything which has eventuated in the past. It is true that attempts on various reefs have in many instances proved abortive, but in most of these operations were suspended at comparatively shallow depths. It is well-known that in this field strong developments of quartz occur at some distance below surface, with which the outcrops have been wholly incommensurate.

The New Golden Gate Mining Syndicate is now working on stone which was not seen at surface, and the Lyons reef which is being worked by the New Jubilee Gold Mining Company is an entirely new one.

The great depth at which primary gold has been proved to exist in this field (1900 feet) encourages a wholesome belief in the persistence of the deposits. While the sometimes phenomenal gold content of the upper parts of the reefs must be regarded as the purely local result of the decomposition of the auriferous sulphides within the sphere of influence of atmospheric waters, followed by the reducing action of the undecomposed sulphides on the descending gold in solution, and therefore likely to give place to a diminished yield in depth, still if the primary ore proves payable, there would be no conceivable reason for its not continuing to an indefinite depth.

II.—GEOLOGY AND MINERALOGY.

GEOLOGY.

The dominant rocks throughout the whole district, extending from Fingal northwards to Mathinna, and on northwards to Mount Victoria, are those of the auriferous slate and sandstone series. These comprise clay-slate, graphitic-slate, arenaceous or sandy slate, quartzite and argillaceous sandstone. The slate is sometimes compressed and contorted, and varieties of this description have been locally called schist, but there is no true schist in the series.

The absence of organic remains from these slates is a feature which adds to the difficulty of defining their horizon in the geological column. No graptolites have been discovered in them. Silurian strata in Tasmania are invariably fossiliferous. It is a legitimate assumption that the Mathinna slates are pre-Silurian-Ordovician, or Cambro-Ordovician. A more definite reference is hardly possible at present.

These strata form the bed rock of the valleys and mountains alike, but on the mountains they are overlaid here and there by surviving grits, sandstones, and shales of Permo-Carboniferous and Mesozoic age. On the high mountain summits are crowns of diabase, fragments of an igneous intrusive sill.

Not much need be said on the subject of the genesis of the reefs, nor the ultimate source of their gold contents. Both are doubtless intimately associated with an underlying granite magma, the outward and visible form of which expresses itself in the outcropping granite rock a few miles north-east of Mathinna. This granite is the hornblendic and pyroxenic variety which characterises the peripheral portion of the granite mass prevailing in this part of Tasmania. This peripheral portion shows a variety of granite rock somewhat less acid than the granite of the Ben Lomond tin field; its ferro-magnesian components are more pronounced, and the proportion of plagioclase among the felspars is greater. It merges into the rock which in Eastern Australia is called grano-diorite. This may be seen at the New Carthage Mine, and in the Scamander River district. Further north it appears in the Lisle goldfield. It is *par excellence* the variety of igneous rock associated with gold-reefing fields in this part of the island.

In the New Carthage and Scamander districts distinct evidence presents itself of the existence of auriferous veins in this granite rock; in the Mathinna fields the connection of the reefs with the granite is a matter of inference. The

actual existence of the reefs at Mathinna, however, appears to depend upon the fracturing of the rocks along a zone of folded country. These axial folds can be traced from the Mountaineer section northwards through the Long Gully to the valley of the Dan, and at intervals as far as Mt. Victoria. The various reef occurrences at Mathinna, while not always following the axial line, are nevertheless within the folded zone. Thus while some of the reefs (*e.g.*, at the New Golden Gate) bear away some degrees to the east of north, they are still continued in the folded zone which continues to the west of north. Accordingly while the continuations of particular reefs are to be found in a north-easterly direction, new reefs take up the running, as it were, in a north-westerly line of country.

It is therefore hardly probable that any one reef will persist for miles. The reefs terminate at various distances, and parallel ones are developed, still in the same belt of country.

The structural features of the country consequently are of the first importance as factors governing the formation of the veins. The prospector recognises that the rock-fracturing process in this district is one which has operated more or less in one direction on a large scale, and that anywhere on this line discoveries may be made at any time, quite as important as those which have made the field famous in the past.

Unfortunately the prospector has to face the fact that the country to a depth of 50 or 100 feet is generally affected by weathering, being oxidised and showing superficial cracks and fractures filled with quartz, which have no connection with the true reefs. This means that in opening up a mine considerable outlay has to be incurred in sinking to the unaltered blue slate, or that to avoid this expense a good deal of tunnelling is carried out with uncertain results. Instead of being a poor man's field, it is one for mining companies, or at least for fairly strong syndicates. At present the New Golden Gate battery, with limited gold-saving appliances, is available for small customers' crushings.

Mineralogy of the Reefs.

The free gold in the reefs descends to the greatest depths attained on the field. In descending, the purity of the gold gradually diminishes, owing to an increasing alloy with silver, which is the same thing as saying that the gold found at shallow depths has lost its silver by a process of solution and re-precipitation.

The gold is everywhere associated in the stone with sulphide minerals (galena, zinc-blende, chalcopyrite, pyrite, arsenopyrite). This constant association gives rise to the presumption that the gold was probably thrown out of solution by these minerals. The sulphidic minerals carry up to 10 ozs. per ton and occasionally give on assay quite phenomenal results, such as 40 and 80 ozs. per ton recorded from pyrite in the deep levels of the New Golden Gate Mine. In a 4" or 5" vein along the eastern wall of east reef at No. 17 level, the stone contained galena, arsenopyrite, and much gold, worth 50 ozs. gold per ton. In 1904-5 at this mine the yield from pyrites in 1 oz. stone was from 5 to 6 ozs. per ton, and at the 600 and 700 feet levels it was 10 ozs. per ton. The percentage of pyrite in the reefs is between 1 and 2 per cent.

The value of the gold extracted from the sulphidic minerals in the New Golden Gate has ranged from £2 16s. to £3 6s. per oz., mostly a little under £3 per oz.; the battery gold from quartz being worth about £3 15s. per oz. The present value of the gold being won by the Syndicate is about £3 16s. per oz.

Observation of the veins at the deeper horizons in this field shows that the pyrites has a tendency to occur in distinct bands, rather than as disseminations, and that in contradistinction to what prevails at shallower horizons, the white quartz between these bands shows hardly any free gold.

III.—MINING PROPERTIES.

(1) New Jubilee Gold-Mining Syndicate, N.L.

This syndicate holds 43 acres on the course of Long Gully Creek, one mile and three-quarters south-east of the township of Mathinna. The sections are the following:—1101-G, 10 acres; 1100-G, 20 acres; 1102-G, 5 acres; 135-W, 5 acres; and 1109-G, 3 acres.

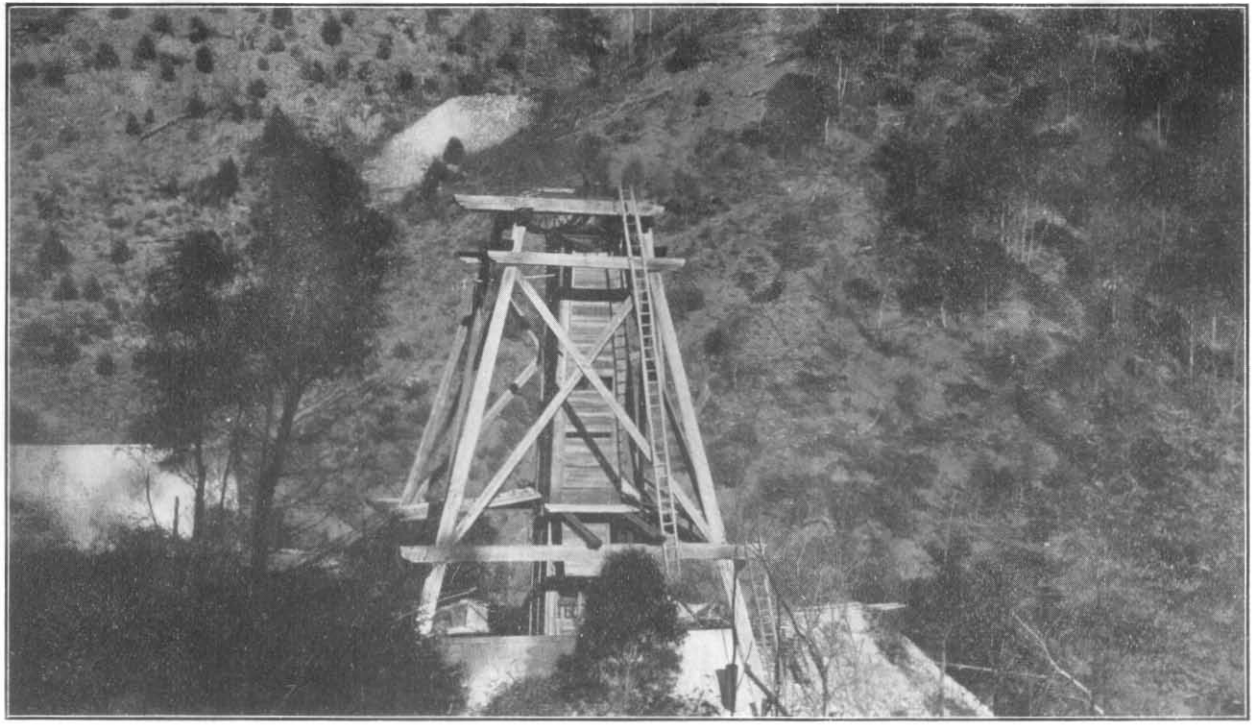
The main shaft and mine buildings are situate on the north side of a small creek, which heads from the Mountaineer Hill and flows into Long Gully. The shaft is a few yards south of the south-west corner of the three-acre section, and about 100 feet above Long Gully.

The property has an ancient and interesting history. It was originally worked by the Derby Company, which opened up the mine on two reefs for a length of several hundred feet. Both of these reefs yielded rich stone in parts, and the general average is reported to have been 1 oz. per ton. The main reef becoming small, the company eventually relinquished operations in 1881. The Jubilee Gold-Mining Company began work on the northern or Flat reef in 1887, and raised stone worth from 9 to 10 dwts. gold per ton. In 1896, the Tasmanian Exploration Company Limited took possession of the ground and deepened the main shaft to its present depth, 272 feet. For the work done by that company, readers are referred to the writer's report on the Mathinna Goldfield, Part II., 1906. The result of the company's work was indecisive, and the property still awaited an exhaustive trial.

The present company has done good work in discovering new stone underground, and in opening up the mine as far as time and means would allow. The following remarks will serve to indicate the present position with regard to the mining.

At 160 feet down a strong formation of quartz is passed through by the shaft. This is well shown in a little cuddy east of the shaft, where it is exposed for a width of 4 feet 6 inches. The quartz occurs in irregular bands and in areas of hard stone spread over the face of the cuddy. A sampling of the face was made on the occasion of this visit, and the stone has been assayed by Mr. W. D. Reid, Government Assayer, with the following result:—Only a trace of gold was present.

The crosscut west passes through slate country and intersects quartz at 88 feet from the shaft. The quartz occupies a reef channel, assumed to be that of the Derby



2. Shaft at New Jubilee Mine.

reef, in irregular veins and patches, and has been driven on north from the crosscut for 80 feet. The reef followed by the drive has been generally from 2 to 3 feet wide, but poor. A little distance behind the end the stone occurs as a strong body 3½ feet wide, separated from more stone by a horse of slate, but the end of the drive is in crushed slate showing patches and floors of quartz irregularly across the face.

The drive south from the main crosscut apparently leaves the reef channel about a couple of yards to the west, that is if the reef has not been displaced by faulting. The consequence is that only country rock is seen in this drive for 80 feet of its course until a disturbed zone is met with, caused by a slide or fault which, as far as can be judged at present, intersects the slates in a north-easterly direction with a dip to the south-east. It is somewhat strange that no vein matter is visible in the drive north of and near this slide, because on the south side of the latter the Derby reef is met with in full strength. It carries about 3 feet of stone at this junction with the slide, but it is understood not to be worth more than about 3 dwts. The drive has been continued 70 feet beyond this point, bearing in an easterly direction, but the quartz disappears.

The reef channel in these old stopes varies from 4 to 6 feet. At the end of the old adit a branch comes in known as Stevens' reef, and near the junction with this there is a bulge of stone which was driven upon for half a chain north-west. From these upper workings Mr. Brannan sent a parcel of stone to Ballarat which yielded 17 dwts. gold per ton, of which 15 dwts. was free gold. It is difficult now to learn what the reef in the old stopes was worth; it appears in places to have been rich, but it also varied in size considerably, and eventually became too small to be profitable. There are certain points in its course where it swells to a considerable width, viz., at junctions with other reefs and in the neighbourhood of the slide.

On crossing the slide in the drive south at the 160 feet level lenses of quartz are met with, from which a good deal of crushing stone has been obtained, showing free gold at times. The quartz is irregular and bunchy, as might be expected in slide country. In a short drive east at this point a new reef has been discovered, named Lyons' reef, which has been followed down in a southerly direction by a 72 feet winze. This reef abuts against the slide similarly to the Derby reef, with which it is roughly parallel and from which it is here distant about thirty feet. The winze follows the reef down on the hanging wall of the slide which at top underlies at angles between 40 and 50 degrees, but is

somewhat flatter at bottom, viz., just over 30 degrees. In the upper part of the winze the reef is rather narrow, but widens going down to a channel of a general width of 6 feet, and is reported to be strongest just above the bottom. Water prevented an examination of the bottom. A portion of the reef has passed out of the winze, so that its full width could not always be inspected. Its underlay is about 50 degrees to the west.

The Derby reef also comes from the south end on to the slide, but as said above, does not break through into the drive south of the main crosscut. The probability is that it continues in a weak channel west of and parallel with the drive; a short cuddy from the drive might intersect it, but would most likely be useless work, as there is reason to anticipate that the reef would be ill-developed and poor. The values in this reef have apparently been retained on the south side of this slide, which is evidently a very important feature of the mine. On the south side the country has been crushed up against the fault, and serpentine contortions of the strata have resulted, which the veinstone has followed, so that the reef presents the appearance of having been bent or curved.

Further south in this level, at the old Derby winze, the reef is upwards of two and a half feet across with a mullock band 4 inches to 8 inches wide. Information is to the effect that the stone here is worth about 4 dwt. Near here is a rise, past which the stone first pinches, then swells again to a foot, and in the face at end of drive is seen consisting of 6 or 7 inches of veins and slate on footwall side, and a narrow vein on the hanging wall side. The dip of the country and reef formation is to the east. Although the reef lies rather flat in the winze, it dips steeply in the end. The present end does not look very promising but its extension would bring it below the big stone in the top levels. The end is about 100 feet from the slide, and the Derby reef has been stoped above this level for a total length of about 200 feet, as estimated by Mr. Brannan, the mining manager: these stopes, however, are now accessible only for some 80 feet; they go up to surface. The writer, in ascending through the old stopes to surface, noticed good stone showing free gold here and there. Quartz taken from Turner's winze, below the adit level, was assayed by the Government Assayer with the following result:—Gold—24 oz 4 dwts. per ton.

This sample was chipped from the standing reef, and when broken subsequently showed free gold embedded in its substance. A second and larger sample yielded 2 oz. 6 dwts. gold per ton.

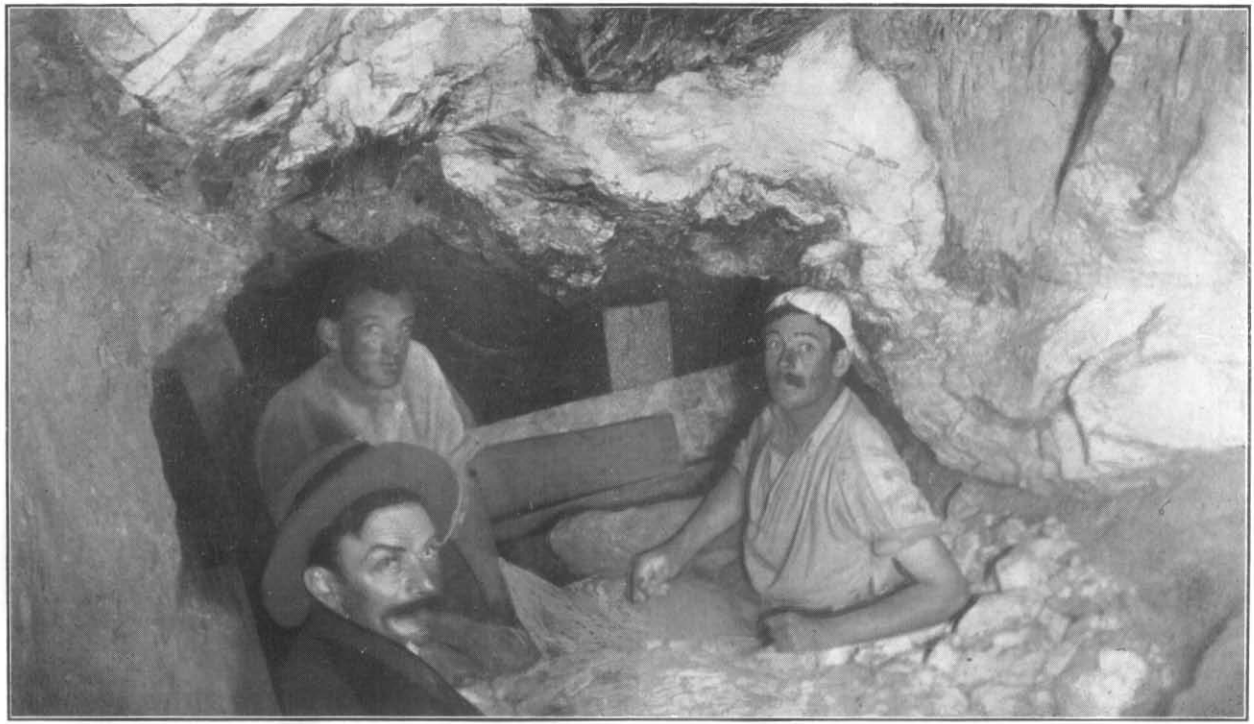


Photo.—J. W. House.

3. Reef in Lyons' Winze, New Jubilee Mine.

The short drive east of Lyons' winze is along the course of the slide, and is in greatly shattered country. A semi-circular drive south of the winze intersects spurs of quartz, but has not cut Lyons' reef.

The bulk of the 25 tons of stone, which has just been passed through the battery at the New Golden Gate Mine has come from the winze, and it is easy to see that for the present this reef is the one upon which the principal hopes of the owners must be fixed. It is satisfactory, therefore, that a rise is being put up from the bottom level to communicate with the workings above, which will admit of the stone being got in a miner-like way,

The slide must have existed prior to the deposition of the reef matter and has probably governed its disposition. If there had been no slide, the gold values would not have existed where they are now found. But once this pre-existence of the slide is admitted, an interesting though singular state of things may be recognised. The country south of the slide is to be looked upon as dominantly the reefing country of the shaft workings, and the concentrations of gold may be expected to occur mainly within a certain distance of the slide. Though this statement harmonises with theoretical considerations, it is not based upon them, but derives its justification from observed facts in other mines with somewhat similar features. The slide has faulted or broken the country, but has not faulted the reefs, and the slide channel has accordingly influenced the deposition of the silica of the reefs with its metallic contents.

The shaft unfortunately happens to be on the wrong side of the slide for the best working of the mine, but the peculiar reef conditions were unknown in those days.

The main crosscut at the 160 feet level has been extended 220 feet west of the level through slates dipping regularly to the east; in the end, however, there is a sharp change of dip to the west, Whether this change is purely local or denotes the passage through the axial fold which characterises the strata in the New Golden Gate mine cannot be determined without further driving, It is pretty certain that the property is on the line of the anticline which develops itself at the 1000 feet level in the Gate mine; and is therefore favourably situated for the occurrence of reefs.

At this level at 35 feet east of the shaft the main crosscut has cut what is known as the East reef. This has been driven on north for 30 feet. The face in the north end is at present obscured by mullock. In the south end the formation of slate and veins of quartz is from 4 to 5 feet wide; the quartz veins are from 1 to 3 inches. When this

reef was first struck it was reported as being 18 inches wide, and widening to 3½ feet going north, with 2 feet of stone, highly mineralised, but poor, and eventually becoming too small to induce further work on it.

As far as can be seen in the north end, where a fall of roof has occurred, there is some rather solid stone exposed, 6 inches to a foot in parts on the footwall, and 18 inches of quartz and mullock on the hanging wall. The reef dips east at angles varying from 50 to 70 degrees.

Samples were taken from each end, and have been assayed by Mr. W. D. Reid, Government Assayer, with the following result :—The stone from each end assayed only a trace of gold.

It has been thought by some that this East reef may possibly be the faulted continuation of the Lyons reef north of the slide, in which case the formation at the shaft would have to be the northern extension of the Derby reef. The idea, however, is inadmissible, once the true nature of the slide is realised; if the faulting affects only the strata and not the reefs, the East reef must of necessity be an entirely independent channel. Any full scheme of development must include driving both ends on this reef. By driving south the slide course will be intersected, and if the reef passes through it some concentrations of gold are likely to exist on the south side of the break.

In driving north stone may make at any point in its course, and the drive would pass into country east of the Flat reef workings in the northern part.

In the bottom level the East reef is represented by a mere dig with a little broken quartz in the broken material.

At 113 feet west from shaft the main crosscut intersects a formation of slate and poor quartz. A drive south for 100 feet has followed a track of pug and seamy quartz, which thins and swells a little at intervals, showing up here and there along the wall of the drive. At a bend in the level the formation passes out of the drive, and the level continues eastwards for another 100 feet in blank country. The end is in dry thinly bedded slate. The formation driven on in the first part of this level can hardly be the same as that followed in the level above, being a good deal too far west. A rise is going up from the end to connect with the reef sunk on in Lyons' winze, which will facilitate mining that stone. After this work is completed the bottom level will have to be continued so as to connect with the reef and ascertain how it behaves at that depth. If its appearance is favourable, and a little trial work proves satisfactory, the next step would be to start sinking for another level.

The above embraces the description of the principal structural features of the main shaft workings. It will be readily seen that if the writer's interpretation of the geology of the mine is correct, the success and future of the work depends very largely upon what influence the main slide has had on the formation of the reefs and the deposition of the gold. If owing to the arrest of the metalliferous solutions by this break in the country, the concentrations of gold in the reefs extend back south-east for some distance the future of the enterprise is bright; if on the other hand these concentrations cluster only round the disturbed country at the slide itself, and diminish or disappear at a trivial distance from the slide, their exploitation would naturally be handicapped by the amount of sinking which would be necessary. The Derby reef has evidently been worked for a few hundred feet back from the slide, and this fact indicates possibilities in respect of the Lyons reef.

The best stone of the New Jubilee is a solid, rather hard quartz, nicely banded and mottled. Frequently gold is visible in the substance of the stone, quite apart from any accessory mineral; at other times it is associated with galena, pyrite, arsenopyrite, sphalerite and chalcopyrite. The yield of a trial crushing at the New Golden Gate battery of 25 tons just mined shows an encouraging average, being 23 ozs. 18 dwt. of retorted gold, and 3 cwt. 3 qr. of concentrates. The concentrates and sand are to be sent to Victoria for treatment. This means that the parcel will yield altogether an ounce per ton of quartz.

Northern Workings.

The Derby reef has, apparently, been worked at surface as far north as the slide. An old tunnel has been driven across the reef north of the creek; at the entrance the reef has been stoped up to the surface. Several makes of quartz, some of them very flat lenses, have been passed through in the drive. In the end is a vein of quartz descending with the slate strata.

Craze's Tunnel.

This low adit was driven by previous owners. A lode track was cut in the approach, and about 50 feet in another insignificant track was passed through, which is supposed to be that of the Derby reef which has tailed out here.

After driving this adit in a north-easterly direction for 200 feet a reef was intersected, which was driven upon north. This was rather promising where it was struck, but when driven on it proved to be barren. Samples taken

from the point of intersection have been assayed by the Government Assayer in the Geological Survey laboratory, as follows :—

Result of Assay..... 5 dwts. 12 grs. per ton.

At 30 feet further in the adit another reef was cut, which was sunk on a little and driven north-west on for 20 feet. Only a little stone is showing on the wall. The end of the adit is in heady slate. A few feet behind the face are short drives north and south. The south drives shows a little brecciated vein quartz at entrance and some irregular quartz in the roof. The opposite drive shows only country rock in the end ; it gives no encouragement in this direction. The reef is admittedly poor.

Flat Reef.

The latter part of Craze's tunnel passes below old workings on a flat reef, from which a good deal of quartz was taken in the old days, though reports are to the effect that on the whole it was not very rich, probably between 7 and 10 dwt. stone. It has been worked for a length of perhaps 200 feet. Two tunnels have been driven on it and the stone stoped out between them and to surface. Although this reef crops out on the hill side on the same line as the Derby reef, it is a separate body of quartz and would be carried by its underlay to the east of the Derby line.

The old tunnel entrance which now gives access to the workings on this reef is situate 300 feet in a direction N. 65 degrees W. from the section corner peg near the main shaft. A flat arch of quartz shows at the entrance, apparently occupying a joint fissure across the bedded slate. The quartz in these workings seems to occur at different horizons, filling joint channels which traverse the steeply inclined slates, and having a general dip to the east. Following the workings into the hill, a vertical component of the reef system is met with, dipping steeply to the south-west. This is from 3 inches to 9 inches wide, feathering out in the roof, and thinning in the end. A descending stope has been worked in it, and the stone is said to have been worth 30 dwts. per ton. Samples taken from the toe of the vertical reef have been assayed by the Government Assayer with the following result:—

Result of assay.....5dwts. 15grs. per ton.

These workings are perfect burrows; the old workers followed the stone along all its numerous rolls, and evidently left off when it no longer paid to lift the stone to surface. At the same time the irregular course of the quartz and its variable width must have militated against profitable work. It might be worth while to explore these old works with a view of discovering any main vertical fissure, and working it as an ordinary reef. Although the flat makes of quartz swell at times into good-sized bulges, they do not lend themselves to profitable working. Craze's tunnel below these workings intersected a lower flat make, and it is impossible to say how many repetitions there may not be at still lower horizons; but sooner or later there must exist a vertical channel with which these flatly-inclined spurs will connect.

North of these workings Mr. Stevens has done a lot of surface work on the hillside, and obtained good prospects from some of the numerous veins which intersect the country. These occurrences of quartz appear to trend in a north to north-westerly direction, but no connected reef outcrop can be observed. The hill, however, shows abundant evidence of vein-forming action; and some of the quartz taken from the old surface works yielded over an ounce per ton.

City Tunnel.

This is situated just inside the south-west corner of Section 1101-G. It has been driven easterly from the west boundary of the section; in the course of the drive a mullocky formation from 20 to 25 feet wide has been intersected. It is quartzose and pyritic, but no gold has been reported from it. It occupies the apex of a fold, the slates on the west side dipping west, and those at the end of the tunnel dipping east. This formation is situate in the lode belt in which on the south side of the southern boundary of the section so much quartz is developed in irregular lines; but there would appear to be no use driving on it from the tunnel, as there are very inadequate backs. It is quite possible that in depth the character of the formation may undergo a favourable change, but sinking would be entirely speculative. On the other hand, the work done by Mr. Stevens at the north end of the old Flat lode workings proved conclusively that there is gold in this part of the hill. It would be futile to attempt to identify the City reef formation with any particular reef worked by the Derby or Jubilee Companies, but undoubtedly all these features occupy one and the same reefing zone. It is moreover the principal reef line in the district, and is worthy of systematic attention throughout the whole of the Company's properties.

Assays.

In addition to those mentioned previously, assays have been made of samplings from different parts of the mine, as well as of grab samples from trucks coming up the shaft filled with stone going to the battery. The battery return of the 25 tons crushed shows pretty fairly that the reef quartz may be expected at all events for the present to yield about an ounce per ton. The stone, however, ought to be closely watched and sampled as the working faces recede from the vicinity of the slide, for as mentioned previously, it is most likely that the slide has controlled the concentrations of gold. Some of the stone which was sent to the battery had a white and barren look, but this poor looking quartz on being broken sometimes reveals free gold in its substance. When the returns from the treatment of the concentrates and sand are received, an opinion can be better formed as to the full value of the stone, but as the amalgamation return was not far short of an ounce per ton, the general result must be considered satisfactory.

The following is a list of the additional assays referred to:—

(1) Grab samples taken promiscuously from trucks loaded with stone going to the battery. First sample, 2 ozs. 13 dwts. gold per ton. Second, 14 ozs. 4 dwts. gold per ton. These samplings weighed several pounds, and were taken without selection.

(2) Slide stone at 160ft. level just beyond Lyons' winze yielded only a trace of gold.

(3) Derby reef at 160ft. level north, 30ft. from flat sheet, yielded no gold.

Concluding Remarks.

The property would appear to have the makings of a mine which may be of marked benefit to the district. The work done by the present owners is sound as far as it has gone, but a good deal of development work is still necessary before the mine can be considered to be on a satisfactory working basis. If it can be managed, the principal expenditure of capital in the near future should be on development lines. Quartz crushing should be proceeded with very cautiously until the mine is opened up.

The rise now going up to connect with Lyons' reef is good work, after which the proposed drive at the bottom level to test the downward continuation of the same reef should be proceeded with.

The East reef, though not very promising at the point where it has been cut, ought not to be neglected. It may make stone at any time, and in any case it would be well to drive south on it to the slide, as it may improve in value as it approaches that point. Afterwards it might be further tested by continuing the drive north on it.

After the connections are made with Lyons' reef as mentioned above, and the reef is opened up for working, crushing arrangements will have to be made, probably by erecting a small battery, but too much haste in putting up the latter is not advisable, neither would it be well to enlarge the scale of operations too suddenly. The mine is still in its preliminary stage and the speeding up process must be applied with care.

If capital is available, the northern part of the 20-acre section is well worth prospecting, and may perhaps eventually yield a new mine. The northern extension of the drive on the East reef would go forward into country near the Flat reef, and would give access to the reefing ground in that direction.

It will be gathered from this report that the hopes of the owners of this property must necessarily be centred for the moment on the development of Lyons' reef which, as far as work has proceeded, is opening up well. The work of testing this reef should be perserved in so as to establish the full length of the gold-bearing shoot. If this proves satisfactory, further sinking will have to be undertaken.

(2) Mountaineer Mine.

This mine is situate on ground to the south-east of the New Jubilee. It is an old mine, but has been held recently by Mr. W. Smith, under leases 1103 and 1105, 10 acres each, but these have now been united in one 20-acre section (1209-G).

The mining works are on a very steep hillside on the south side of the gully below the Jubilee shaft. At the entrance to the upper tunnel a shaft was sunk a good many years ago to a depth of about a 100 feet on a reef, the outcrop of which Mr. J. Turner first prospected. He states that the reef in the shaft was 20 inches wide, and that the stone was worth 35 dwts. per ton, but got thinner going down. A short adit was driven south-east into the hill on the reef at the shaft collar, where it is said to have been worth 9 dwts. per ton. The reef has thinned out in soft slate at 40 feet in the face at the end of the drive.

The lower adit is a crosscut tunnel for 175 feet, when it bends to the east, and crosses 9 or 10 feet of poor quartz formation, and connects with the bottom of the shaft. The adit is then continued for some distance in a southerly direction. At the bottom of the shaft the reef appears to be broken, and about 4 yards south of it a winze has been sunk 14 feet in the sole of the drive, but what has happened to the reef is not quite apparent. This part of the drive appears to be in slide country, and the reef has not been picked up further south. The assumption of the existence of a slide would explain the crushed country near the shaft, and the termination of the reef at the winze. Information is to the effect that the stone went down strong in the winze, but passed out of it, pitching underfoot.

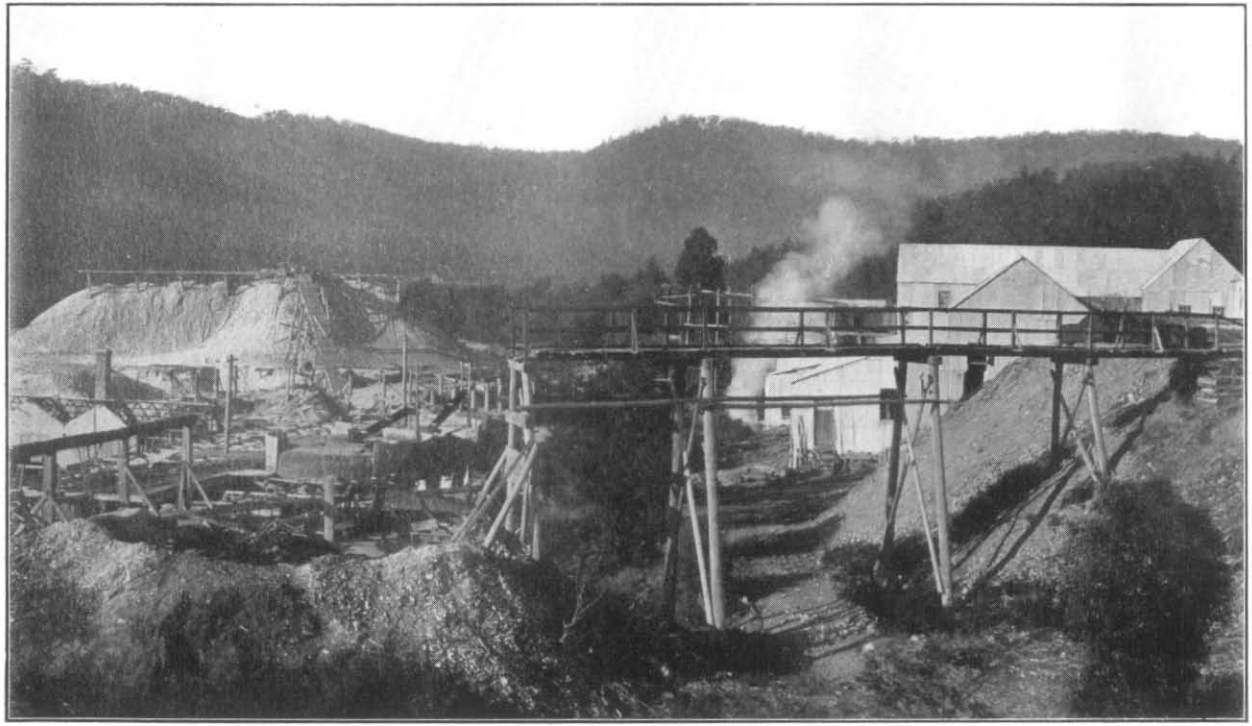
The tunnel past the winze is in country, and a short, sinuous drive west was put in at 20 feet on a leader of quartz, but this drive is practically in country also.

Future work here would consist of deepening the shaft or winze on the reef, and exploring the latter in the vicinity of the slide. Judging from what inspection is possible in the present condition of the workings, the slide features in this mine possess a similarity to the phenomena in the New Jubilee, but owing to the slope of the hill the length of the shoot cannot be great until greater depth is attained.

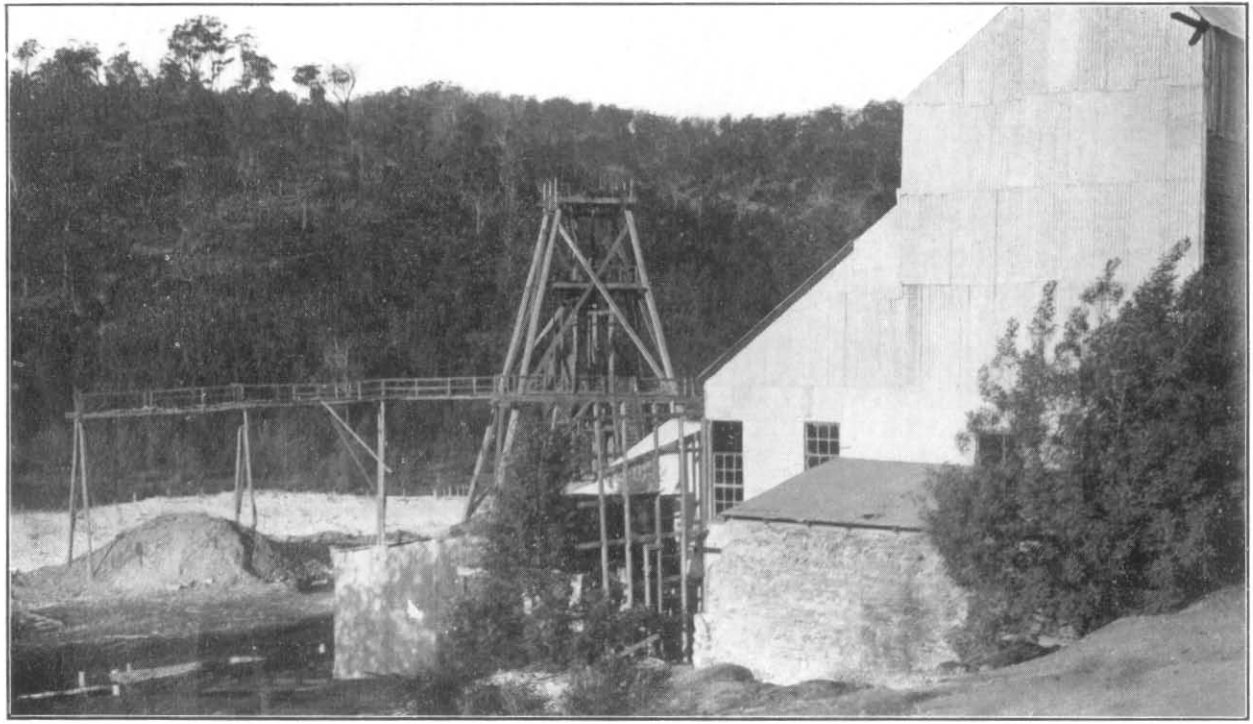
(3) New Golden Gate Gold-mining Syndicate.

This syndicate holds the properties formerly owned by the New Golden Gate Mining Company and the Tasmanian Consols Co. at Mathinna under a consolidated lease, 1201-G, 72 acres and the accompanying water rights, in the names of E. Moses, F. Moses, J. Fullerton, and C. Smith. It has been operating now for about eighteen months.

As is well known, the New Golden Gate Mine started work in 1888, and paid dividends up to 1904, distributing in that time the sum of £355,200 among its shareholders. During this period 277,393 tons of quartz were raised, yielding 232,225 ounces of gold, being an average of 16 dwts. 17 grs. per ton of stone, and realising £883,071 3s. 2d. The reef falling off in value, exploratory work was carried out in the deeper levels of the mines, but with indifferent success. A description of the mining work down to the 1600-feet level will be found in the writer's report of 1906. Since then the main shaft has been sunk to 1800 feet, and a winze put down on the East reef to a further depth of 103 feet, so that the lowest works were 1900 feet from the surface—the deepest mine in the State. This winze at its



4. New Golden Gate Battery.



5. Tasmanian Consols Mine.

greatest depth, according to the report of the then mine manager, showed the reef 3 feet wide, with fair prospects of gold in small bands of quartz, the remainder of the reef at this point consisting of formation.

From level to level down to the 1300-feet, the East reef in being followed southwards has been found to be deviated by a slide or crosscourse, in the channel of which it has lost itself and has not been picked up beyond. Below the 1300 feet, the shoot of gold which hugs the slide has not been reached in the drives and indications exist of it shortening as it descends. From the position of the gold-bearing shoot in the bottom level it would appear to be a different one from that worked in the 1100-1400-feet levels. It seems to be a new and parallel one, but what its value will be can only be proved by further sinking. This East reef, which was first seen at the 900-feet level, was highly profitable for a vertical depth of about 300 feet, but down at 1400 feet its gold contents, though here and there payable, had generally diminished to between nothing and 3 dwts. per ton. At this level the reef, when the writer saw it last, was about 12 feet wide, and it is said to have subsequently shown a width up to 20 or 25 feet. It continued a strong reef for a length of 500 feet, but its value decreased to below the limits of profitable mining. At the 1600 feet it was still 4 or 5 feet wide, and carried a few pennyweights of gold per ton and a small quantity of stone which was worth one ounce per ton.

The bottom level showed the reef from 5 to 15 feet wide including the formation, but only small gold occurrences were present, worth from a few pennyweights up to half an ounce.

At the 1300-feet level in this mine a parallel reef, the West reef, was struck at about 200 feet west of the East reef, and has been worked in the 1400, 1500, and 1600 feet levels. It had varying widths of from 5 to 15 feet with short blocks of gold-bearing stone, generally from 5 to 7 dwts. per ton, and occasionally from 10 dwts. upwards. At 1800 feet it has been driven on with a bulk return, according to the manager's report, of $5\frac{1}{2}$ dwts. per ton; and on the same authority, a winze sunk on it from the same level to 80 feet showed the reef channel at the bottom 10 feet wide, and worth 3 dwts. gold per ton.

If ever deep mining is resumed in this mine, the exploratory work would include the further sinking of the main shaft to a depth of say 2000 feet, with the driving of crosscuts to open out both the East and West reefs in both directions.

The reefs worked in the upper levels of the mine were two parallel ones called the Main reef and Loane's reef. These are powerful reefs descending from the surface adit to the 800 and 900 feet levels. Down to the 176-feet, or No. 2 level, both these reefs were poor, with short shoots of gold-bearing stone, but below that gold began to make. The writer was informed by Mr. Andrews, the then general manager, that at the No. 3 level Loane's reef strengthened to a width of 9 feet, and yielded quartz worth two ounces of gold per ton. North of the shaft these two reefs are parallel, but south they approach each other and eventually junction with a width of as much as half a chain of gold-bearing stone. As deep as 800 feet, Loane's reef, where intersected by the crosscut, showed a width of over 28 feet of clean payable quartz, but averaged at the different levels about six or seven feet.

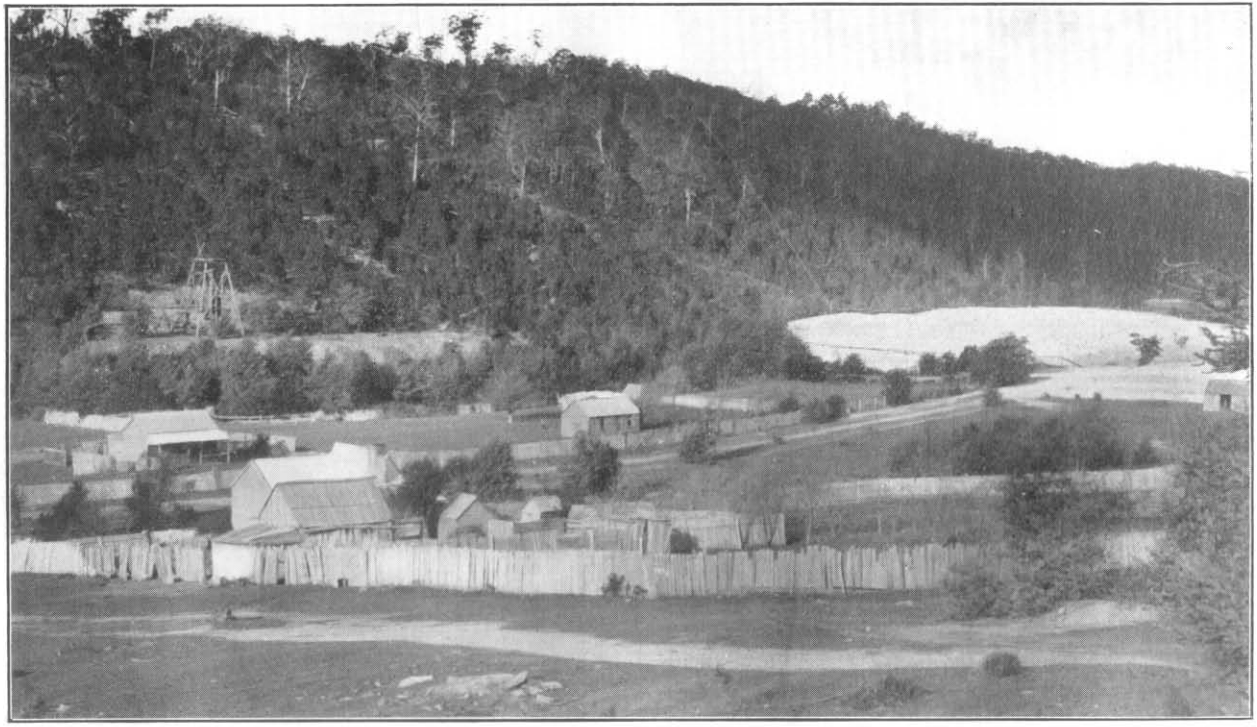
The present syndicate is working on Loane's reef at the 236 and 316 feet levels; 400 feet is as deep as can be got at the present time without alterations to the winding drum. Three stopes were being operated at the time of this visit, one of which is between the 116-feet level and the floor of the adit level.

At the 236-feet level, where Loane's reef was 6 to 7 feet wide, a branch running off in a north-easterly direction has been followed for some 40 feet. This has had a width of 3 feet and is expanding as driven on. The end of the drive shows a full face of stone 3 to 4 feet wide with leaders through formation on east side. A rise is going up on this branch and shows the reef 3 to 4 feet wide at 25 feet above the level, consisting of nice-looking laminated stone.

At the 316-feet level a rise is being put up on a more easterly leg of Loane's reef. In the East crosscut, Loane's reef shows solid stone 18 to 19 feet wide; it branches off at this level in the same fashion as in the level above. A 3 feet mineralised band has been driven on north for some 40 feet, carrying fair gold. A grey stone, which is confined to the western wall of the reef, appears to have carried the best values. The bulk of the face in the north end is lode slate, veined with quartz and a few inches of stone on the hanging wall; to this may be added 8 or 9 inches of gold-bearing slate, in all about one foot of gold-bearing material.

(4) Reece and Lawson's Mine.

This comprises Section 980-G, 10 acres, in the name of G. Reece and L. Lawson, and an adjoining 1-acre section, north and adjoining, in the name of G. Park, both situate east of the consolidated lease 1201-G held by E. Moses and others.



6. Gate Extended Shaft.

The property is situate on the east side of Long Gully, about half a mile south-east of the Mathinna Post Office. The reefs on this ground were formerly worked by the old Caledonian Company and subsequently by the Gate Extended and Golden Ladder companies. The one-acre section includes the Gate Extended Shaft, which is a useful addition to the property. It is 410 feet deep, and crosscuts east and west have been driven from the bottom of the shaft for a total distance of 1174 feet, the longest crosscut being the one west which was put out under the Long Gully Flat to 863 feet. The east crosscut intersected a reef channel 2 feet wide at 193 feet from the shaft. The formation was driven upon south for about 100 feet, showing a width of 3 or 4 feet with some mineralised stone, but eventually became broken and work was suspended. At the time, this formation was considered to be the continuation of the Caledonian tunnel reef.

The different reef formations cut in the old Caledonian tunnel have been fully described by Mr. A. Montgomery in his 1892 Report on the Mathinna Goldfield. According to his description, flat or saddle-shaped makes of quartz are characteristic of the reefing ground passed through in this tunnel, and the stone has been difficult to follow in the drive east from the tunnel.

The tunnel has been driven in a north-easterly direction for 220 feet into the hill. Thirty-six feet behind the end there is a south-easterly drive on a reef channel on which a winze has been sunk to a depth of 40 feet by Messrs. Reece and Lawson. The bottom is now under water, but information is to the effect that the reef in the floor of the winze is from 20 inches to 2 feet wide. Down 20 to 26 feet the winze is said to be in very good stone. The reef crosses the tunnel and has also been driven on in a north-westerly direction. The drive bears round northerly and a reef formation, wide but poor, crosses the end A little further in the tunnel is a drive south-east on reef matter for about 70 feet. The face in the end is lode slate and pug, with a little gritty and lumpy quartz. This is about 100 feet below the surface, but requires greater depth.

The owners wish to extend the main tunnel another 100 feet so as to intersect the reef ahead, which has been worked higher up the hill. The intention is also to deepen the winze referred to above. The winze in question represents the deepest work yet done from this level, and in carrying it down the reef prospects at a greater depth would be easily tested.

The old Caledonian stopes stretch along the hill slopes at about 100 feet up from the tunnel for a considerable length and depth. They are reported to have yielded stone worth from 18 dwts. to an ounce. The present owners have sunk a winze 23 feet on a north-easterly reef formation with about 18 inches of stone at the commencement, widening going down, but the handling and transport costs to the battery were excessive and did not admit of profitable working. The reef extending up the hill, in an easterly direction, has been trenched and tested at surface for a long distance. Battery tests are said to have shown a gold content up to 23 dwts. where it was first cut into. Then a few feet higher up Messrs Reece and Lawson sank a small shaft on it, and the stone raised was mixed with the crushing from the winze. The Caledonian tunnel, if extended, would probably intersect this reef in from 80 to 100 feet, with 140 feet of backs. A sample from the 23 feet winze assayed 15 dwts. gold per ton.

One hundred and twenty-five feet west of the entrance to the Caledonian tunnel, and at about the same level, is a formation consisting of a large body of stone running north and south and dipping east, with jointed quartz from wall to wall. A good footwall is exposed, but the hanging wall is not shown.

The formation channel is 15 feet wide, but the direction is, perhaps, a little indeterminate at present, as the only excavation is one about 6 feet deep by 6 feet long by 6 feet wide. The reef capping is slate veined with quartz. This formation is well worthy of trial; an adit could be driven about 25 feet below the outcrop, and the reef followed into the hill.

It is strange to notice with the numerous occurrences of auriferous stone in the hill on this side of the Long Gully, that no really deep exploration work has been carried out during all the time that mining has been going on at Mathinna. The Caledonian tunnel work is all shallow mining. The east crosscut from the Gate Extended shaft is the only serious attempt on this side of the gully; and from that only one drive on a reef channel was put in for a distance of not more than a hundred feet, Notwithstanding this, there are strong makes of quartz in the Caledonian reef workings and elsewhere on the hill, some of which have shown gold contents varying from 10 dwts. to over an ounce per ton, proving clearly that the properties are the seat of gold deposition. If operations in the New Golden Gate had ceased at the shallow levels which have been abandoned in despair on this

7. Golden Stairs Mine.

side of the valley, there would never have been a New Golden Gate Mine. This should encourage and stimulate exploration on these properties.

The East reef of the New Golden Gate Mine, which was intersected at 250 feet in the east crosscut from the 1400-feet level in the Tasmanian Consols Mine, must, at that depth, lie in the Caledonian property; in fact its bearing at this point would bring its northern continuation below the bottom of the Gate Extended shaft. Mr. Canning's bore, about 8 yards north of the entrance to the Caledonian tunnel was put in to a depth of 272 feet, but although it pierced auriferous quartz, the latter could not have been connected in any way with the Gate East reef, for this would only pass into the property at a much greater depth.

In exploring this property, the facilities afforded by the 410-feet shaft of the Gate Extended Mine must not be neglected. The east crosscut driven from that shaft ought to be thoroughly examined. The drive on the reef at 193 feet should be continued if the channel is at all persistent, for stone may make at any time, and that is an excellent way of following it into the Caledonian reefing ground.

(5) Golden Stairs Mine.

This property now comprises one section, 1208-M, 20 acres, at the north end of Mathinna township, held by W. Smith. High-street and Mangana-street traverse the sections from north to south.

The shallow alluvial has in its time yielded a fair quantity of gold, some of which must have been derived from the reefs on the property. The alluvial appears to deepen going north.

A main shaft was sunk by the Golden Stairs Company about 23 years ago to prove a reef on which the previous company had started to work. This shaft is on the 20-acres section, and has been sunk to 230 feet. Two crosscuts have been driven west at 150 feet and 230 feet. The mine plan of 1893, when operations were suspended, shows that the upper level was driven north on the reef for 55 feet. Where it was first cut by the main crosscut the reef channel carried altogether 3 feet of stone according to the report of the then mine manager. The reef at the 230-feet level was driven on 80 feet north, and 29 feet south, but was found to be ill-developed, and poor in quality.

About 100 feet south of the shaft the reef either forks or junctions with another one, and the bottom crosscut was extended 115 feet west in the hope of intersecting the second reef, but it passed 37 feet beyond the estimated line of inter-

section without striking it. Most of the ground through which the crosscuts passed is sandstone; the shaft itself is in slate, and seems to be just near the western edge of the slate reefing belt of the Gate line. This slate belt has not been tested here; and manifestly almost the first thing to do when work is started again is to prove it by pushing out a crosscut east.

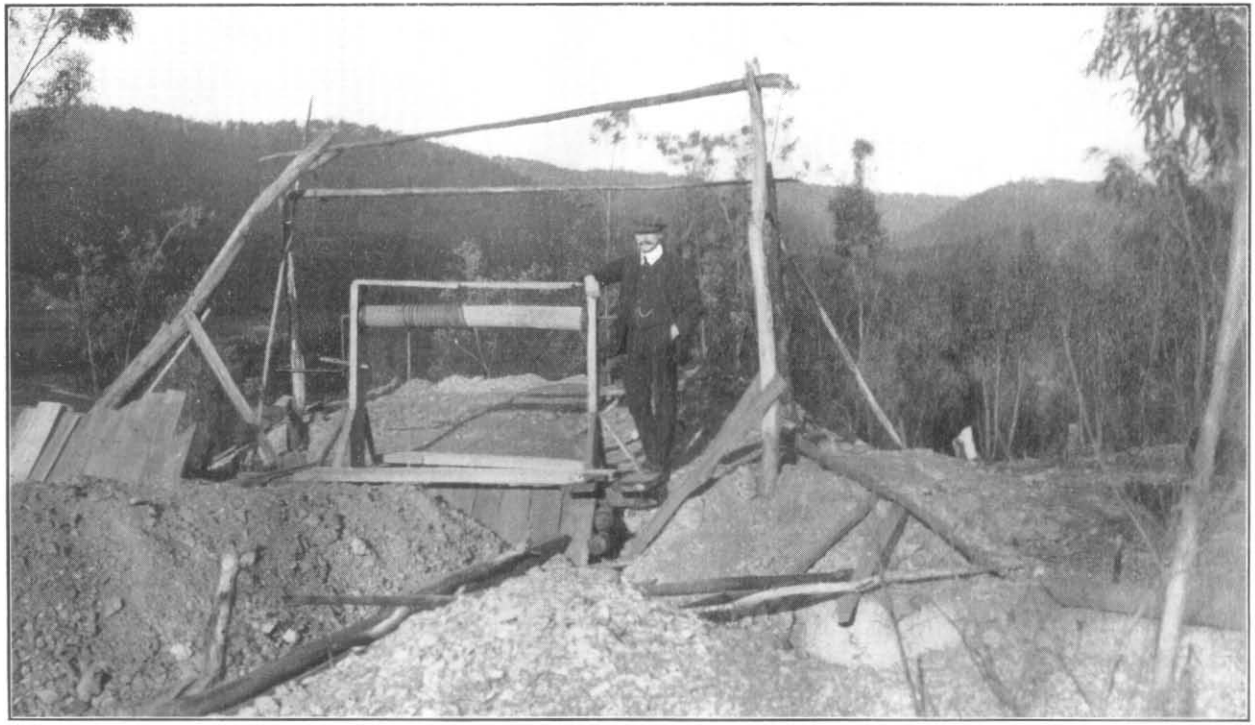
An old prospecting shaft was sunk 220 feet north-west from the main shaft, from which some stone was crushed, and is said to have yielded 3 or 4 dwts. per ton. There is a small shaft close to this which has been sunk by Mr. Brannan to a depth of 48 feet. He sent away 10 tons of stone, which returned 10 dwts. per ton, according to his statement. He describes the reef channel as being 4 feet 6 inches wide and very mullocky. The quartz was a hard mottled variety, and the gold very finely disseminated. This from its position would be the main reef. Somewhere about here is a junction with a reef sunk on twelve years ago by Messrs. Markey and Todd, at the corner of Wilson and and Mangana streets. In the neighbourhood of all these shafts good surface prospects are obtainable, and while some of the surface gold has no doubt been brought from a distance, the coarse gold found in the superficial reef rubble must have come from the reefs on the property.

About a chain south-west of the main shaft an old prospecting shaft has been sunk on the second reef, and the stone from it is said to have returned between 3 and 6 dwts. per ton at the City of Melbourne battery.

The Welcome Stranger shaft is situate 340 feet north of the main shaft on the north side of Wilson-street. In the old days a surface formation was located by the discovery of specimen quartz and auriferous dirt, and a shaft sunk about 40 feet, disclosing a reef track, but no gold. The formation has a bearing of N. 77 degrees E. About 23 years ago the shaft was cleared out with a view of examining what had been left, but nothing was found.

Some quartz with coarse gold, a little south of the Welcome Stranger shaft, was sunk on to a depth of 20 feet.

It cannot be said that the property has been properly tried. There has been so much superficial gold showing in the rubble and shallow stone that it is difficult not to believe that there are no deep-seated deposits. The ground is flat and low lying, and it is quite possible that the main shaft is not quite deep enough to be in properly settled country. At any rate, the deep country to the east has not been tested, and as that country lies within the Gate belt, it might very well be tried.



8. Dawn of Hope Mine.

(6) Dawn of Hope Mine (Kitto and Thurley).

Messrs. Kitto and Thurley are prospecting on land which was formerly held by the Old Boys Gold Mining Company, and before then by the old Black Boy Company. They have sunk a small shaft to a depth of 20 feet on what appears to be the eastern branch of the Black Boy reef. This is about 400 feet north of the old company's 120-feet shaft, which was sunk just south of the junction of the eastern branch with the main reef. All along the line of the east reef the ground has been trenched and surface-stoped at intervals.

The present prospectors have driven 35 feet on their reef from the bottom of the small shaft. In the north end, the formation is the width of the drive; in the south end they are saving a foot of stone. They have taken out a crushing of 22 tons which yielded 10½ ozs. retorted gold, or with the concentrates 10 ozs. 16 dwts. altogether. The development of the mine will be in a southerly direction, as the north drive would soon run out to surface, owing to the configuration of the hill.

One hundred and fifty feet further north is a lower shaft on this reef, which would give a reef line of 550 feet to the main junction. Stone as high as 13 dwts. has been got from this point. The bearing of the reef is N. 25 degrees E., but just to the north a north and south reef will intersect.

Experience gained by the Boys operations shows that the reefs in this hill are persistent to at least 300 feet, and at intervals along their course are gold-bearing. This fact alone is sufficient to justify intelligent prospecting. At Kitto and Thurley's, future work should consist principally in sinking shaft near the lower junction, and then opening out to prove the junction and adjacent reefs.

(7) Alluvial Flats.

Both the Black Horse and Long Gullies are filled with alluvial derived from the creeks and the streams which empty into them. The various creeks have cut through numerous veins and reefs, which must have contributed a fair amount of gold in the aggregate, though it has never been a rich field. The gullies themselves have been excavated in comparatively recent times, and consequently could not be expected to collect any large accumulations of the precious metal. The flat ground west of the township has been that which has been worked the most. It has been turned over time and again along a course of nearly a couple of miles. The late Mr. Geo. Webb carried out some rather

extensive boring work on the flat with a view of ascertaining whether the deposit was such as would warrant a trial by hydraulic sluicing. The result of his tests was to show that the drift had an average depth of 6 to 7 feet, and where bored was worth half a pennyweight of gold per cubic yard. It was considered that sufficient water could be got from the Tyne, and that the cost of recovering the gold would not absorb more than $1\frac{1}{2}$ grains of the total content. On J. Kennedy's lease the average depth is stated to be 6 feet 9 inches, and the greatest depth 16 feet at 7 or 8 chains west of High-street.

There appear to be two classes of wash, viz., a narrow belt of wash from the gully, and a broader belt of finer wash which is probably the older sediment deposited by the ancient Esk River. The best ground is that comprised in the gully belt, and is perhaps a couple of chains wide, though the whole zone is about 400 feet in width. Clay and shingle overlie quartz wash and clay, and the whole lies on a layer of clay some 8 inches thick in which the gold is generally found.

Crossing the flat eastwards one meets with the deeper ground where there is not so much shingle, though it appears here and there in bands or runs. The shingle consists of slate and sandstone in flat rounded stones and a good deal of angular material associated with it. The stones of quartz are mostly angular. Much of it has the aspect of stuff re-assorted by the Esk. A little ruby tin ore is said to have been found on Kennedy's Flats; this has probably been left by the waters of the Esk, and, no doubt, came originally from Ben Lomond.

At first glance the broad plain would suggest that there ought to be a fair quantity of payable wash brought down by the creeks which have undoubtedly intersected several reefs and received the sheddings of quartz from other auriferous outcrops. The upper part of Long Gully has not been tried, though it is said that there is as much as 20 feet gravel in it. The stream, however, is practically an underground one in this part of its course, filtering through the deep bed of shingle which fills the channel, and for this reason miners have fought shy of it. A further deterrent consideration is that the the quartz of these reefs is exceptionally hard and does not triturate and release its gold readily.

The plain east of the township is an ideal alluvial flat, but the gullies are narrow with steep sides and are evidently young. This immaturity is, in the writer's opinion, the key to the comparative poverty of the ground.

The valley of the South Esk, however, is a mature one, and the river plain must hold a great deal of gold in the aggregate. Nevertheless as it is so broad, the metal is no doubt rather sparsely scattered through the alluvial, and it will probably be difficult to locate concentrations. Dan's Rivulet and the Mathinna streams have been feeders to this ground, but the area is so wide that the sporadic trials, which have been made from time to time, have not furnished any decisive criteria for judging the value of the deposits; besides, operations have been considerably impeded by the land in this valley being privately owned.

IV.—CONCLUSION.

The result of the preceding examination may be described as being on the whole encouraging. The deplorable state into which this mining field has been allowed to lapse is being steadily improved by a few determined workers, who have found money and labour for operating on hitherto unworked reefs.

The New Jubilee owners are proving new ground and preparing for permanent work at their mine. As explained in this report, their success will greatly depend upon the behaviour of the shoot in the vicinity of the slide. If the gold-bearing shoot runs back from the slide for any fair distance, the outlook will be good. This can only be proved by driving south from the slide. The New Golden Gate workers are developing a branch of Loane's reef, which is very promising. More work is necessary to establish whether this branch is a permanent offshoot or only a component of the principal reef itself. Meanwhile its extension is being proved to the greatest depth at present possible. Messrs. Reece and Lawson at the Caledonian mine have been proving the reefs on that property with some degree of success, but their operations are sadly limited by difficult working conditions and want of means for deep work, which is absolutely necessary for working that ground. The same remark applies to the prospecting on the Boys ground, which has recently been carried on by Messrs. Kitto and Thurley. The Golden Stairs property is being held with a view of proving the ground east of the main shaft, which is in the Gate slate belt and was not traversed by any of the underground workings. This task is a perfectly legitimate enterprise. Since the writer's inspection of the field, prospecting operations have started on the ridge behind the township, where gold prospects have been obtained. At the extreme south end of the field, the Mountaineer property, though held, is idle. Although some good gold was got here in the past (Mr. Clark states that he crushed 100 tons of one-ounce stone, and Mr. Turner says he got a return of 35 dwt. per ton) the conditions are peculiar, the mine being practically worked to a dead end against a slide, and no further good work can be done without sinking. The slide here, as in so many mines in this field, seems to be the factor controlling the deposition of metal.

For some time to come, gold mining will probably possess greater attractions than mining for base metals with their fluctuating markets; and there seems no good reason why

the Mathinna field should not experience a revival to some extent. In view of the properties on which deeper work is warranted, it is perhaps not too much to expect that some attention will be paid to its possibilities in the near future. In time, no doubt, a strong combination will be found prepared to give the Gate reef a thorough trial at and below the present deep workings. Meantime substantial benefit is being derived by the district from the operations of the mining syndicates who are keeping the field alive.

W. H. TWELVETREES,
Government Geologist.

Launceston, 30th September, 1914.

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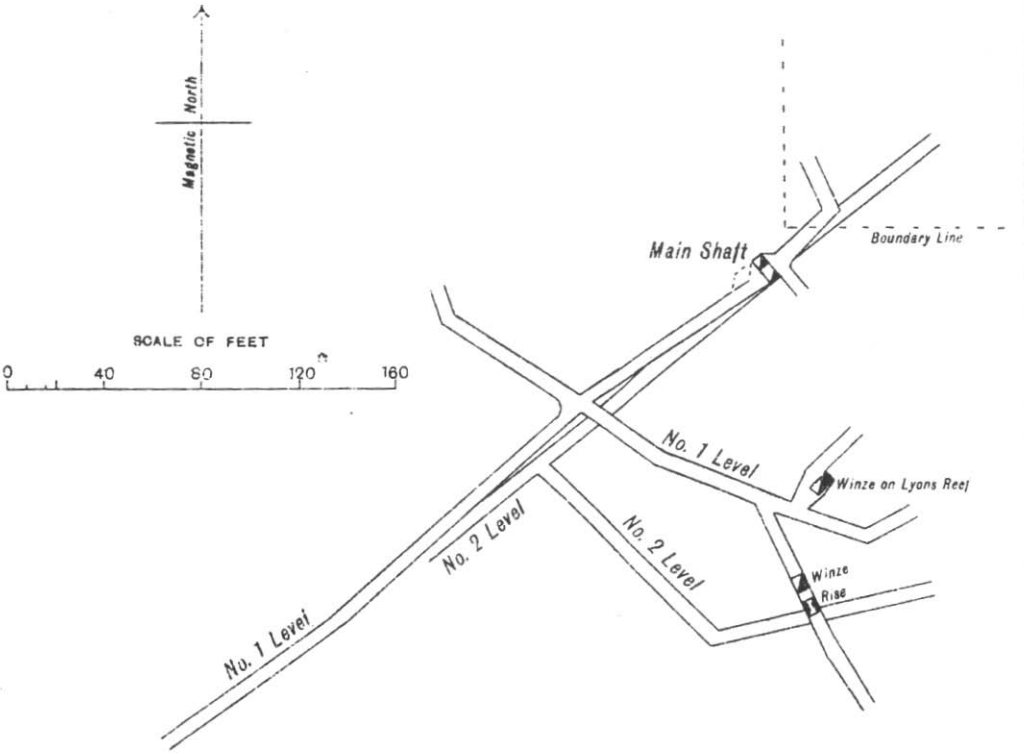
PLATE I



PLAN OF THE

NEW JUBILEE GOLD MINE

From T. M. Brannan's Survey, 1914

No. 1 Level — 160 Feet
No. 2 Level — 260 Feet

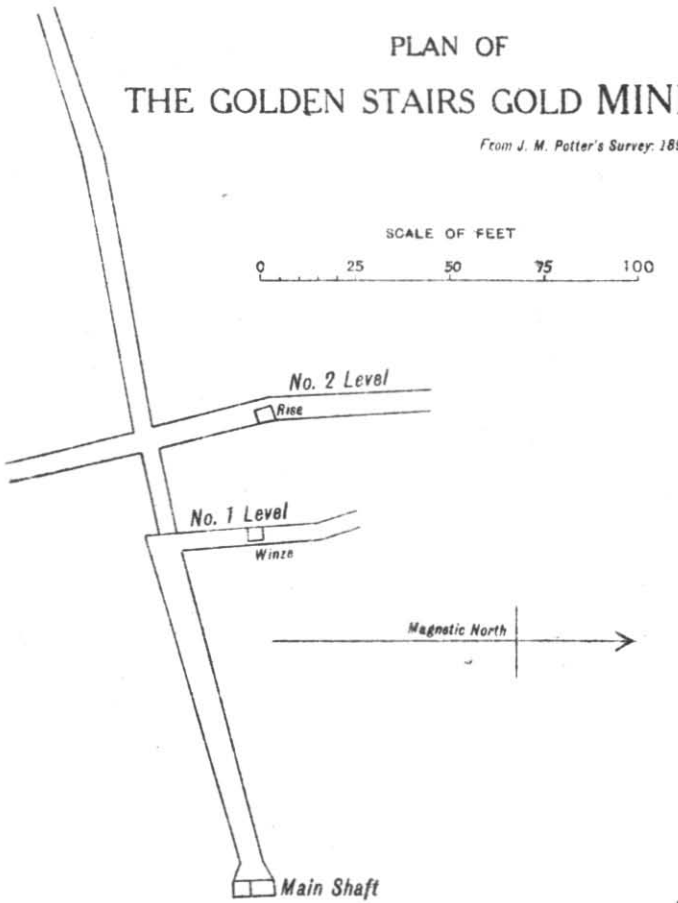
W. H. Twelvetrees
Government Geologist

Photo Algraphed by John Vail, Government Printer, Hobart, Tasmania.

PLATE II

PLAN OF
THE GOLDEN STAIRS GOLD MINE

From J. M. Potter's Survey: 1893



W. H. Twelvetrees
Government Geologist

Photo Algraphed by John Vail Government Printer Hobart Tasmania.

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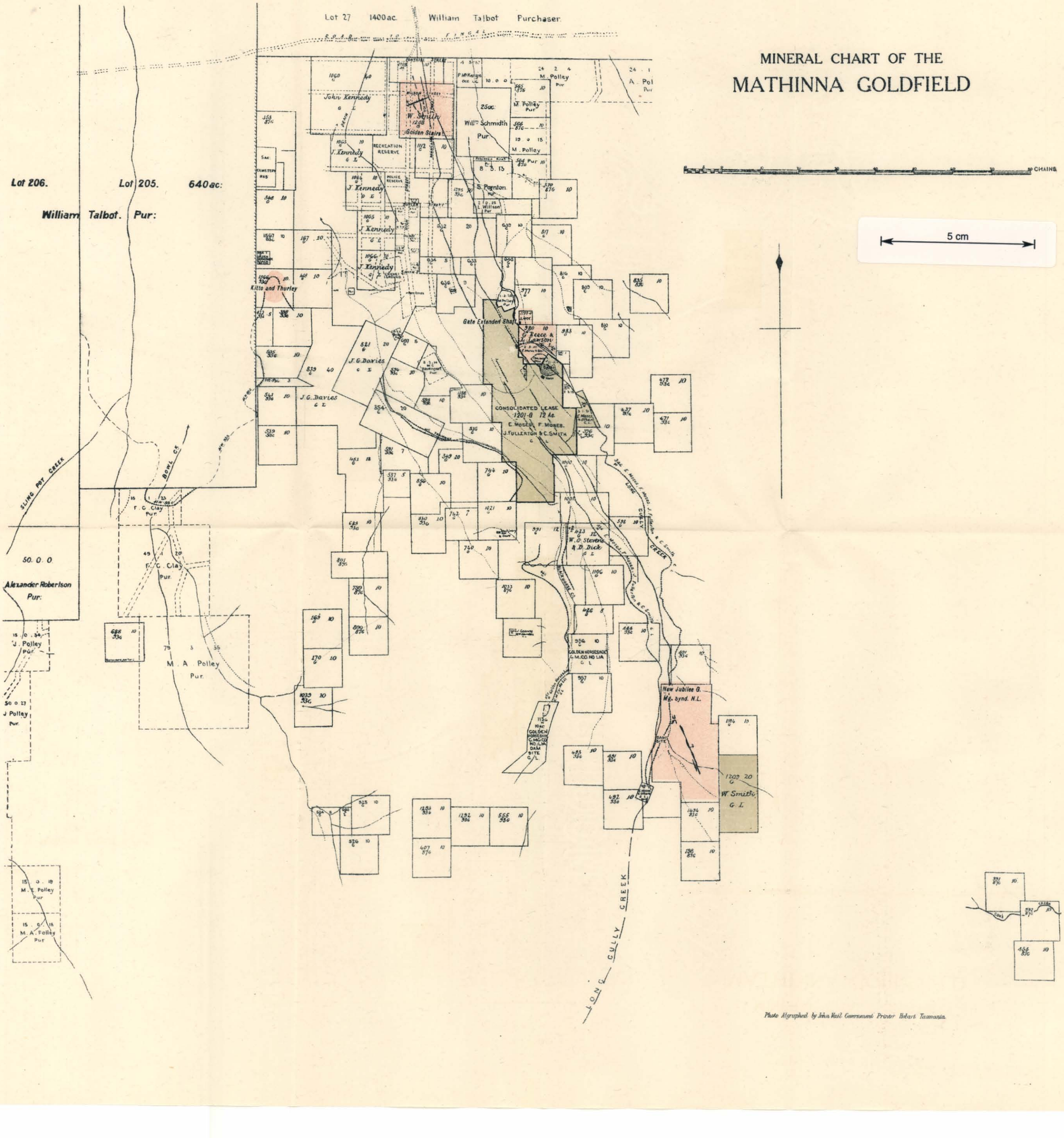
MINERAL CHART OF THE
MATHINNA GOLDFIELD



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