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No. 43

Mathinna and Tower Hill Goldfields

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BY

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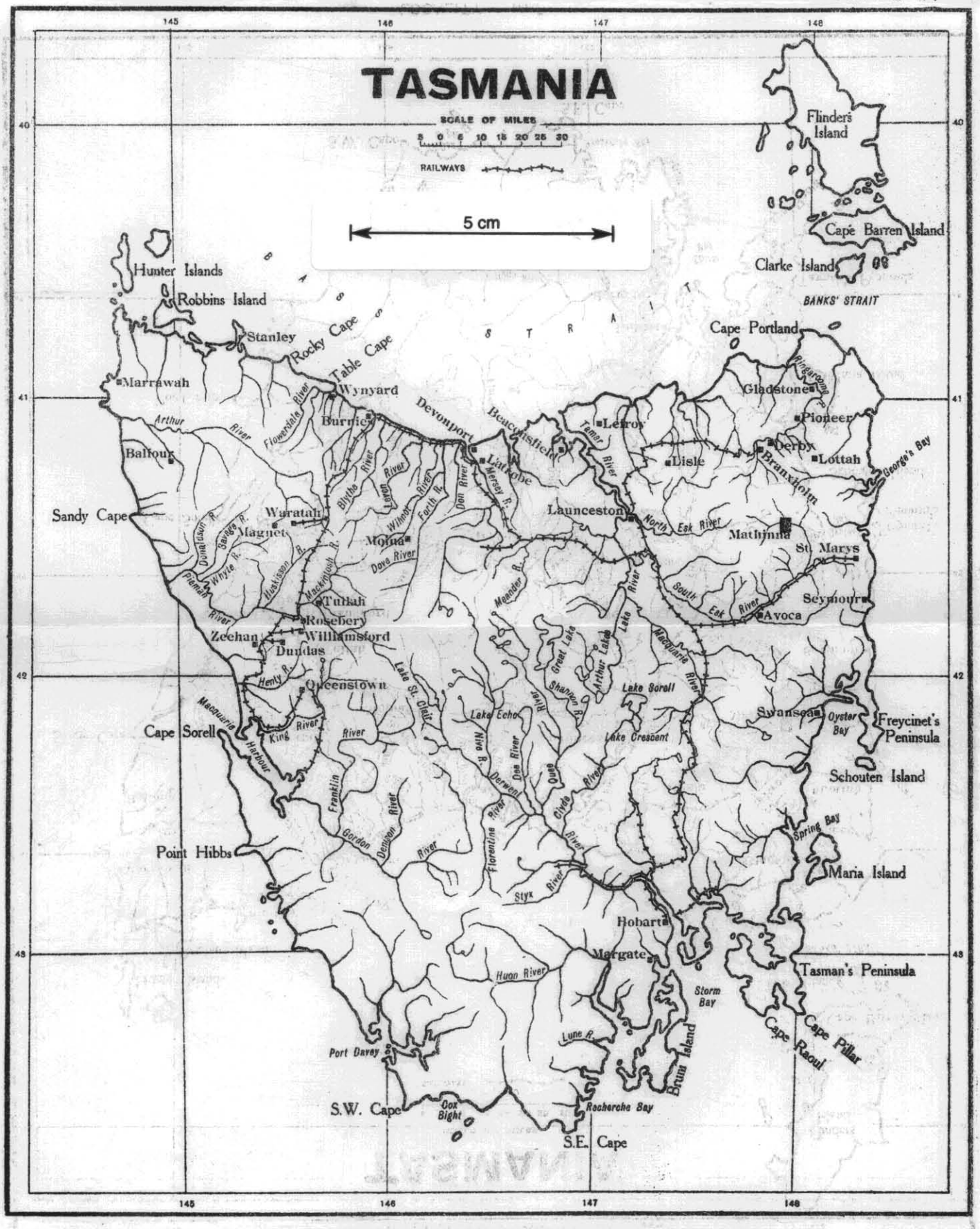

LOCALITY MAP

Mathinna and Tower Hill Goldfields.

I.—INTRODUCTION.

THE present geological survey of the Mathinna and Tower Hill Goldfields was undertaken as part of a scheme for the resurveying of the major goldfields of Tasmania. Though numerous official reports have been issued in the past, no geological map of this district had been compiled which showed the relationships between the rock structures and the occurrence of the various reefs. It was considered that detailed mapping of the rock structures around the mines would elucidate this point and that it might also throw some light on the distribution of payable shoots of gold within the various reefs. Close attention was also directed to any other geological features which might explain the occurrence and distribution of the gold-bearing quartz reefs.

Field operations were severely handicapped by the fact that most of the mines in the district had been shut down for some years, and, although all the accessible workings were examined, these constituted only a very small proportion of the whole. Moreover, the best rock exposures occur in old tunnels, and it therefore seems probable that the total information obtained is relatively small compared with that which would have been available had the survey been made when a greater number of mines were working.

The survey was commenced on the 14th July, and was completed on the 31st of August, 1932.

Mr. R. Stone acted as field assistant during the Mathinna survey, and Mr. J. Lee accompanied me over the Tower Hill District. I would like to express my appreciation of the able assistance rendered by these men.

Thanks are also due to Mr. J. Watson, Manager for Mr. Holdensen, and to numerous residents for their able and willing assistance during the course of the work.

II.—PREVIOUS LITERATURE.

List of Publications and Typewritten Reports.

The following list includes all departmental publications and typewritten reports relating to mining activities within the district:—

Publications.

(1) G. Thureau, F.G.S.: Report on Mt. Victoria, Dan Rivulet, Black Boy, &c. December, 1884.

(2) A. Montgomery, M.A.: Report on the Mathinna Goldfield. 12th September, 1892. (Secretary for Mines Report, 1891-2.)

(3) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part I. 29th March, 1906.

(4) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part II. 27th August, 1906.

(5) W. H. Twelvetrees: The Mathinna Goldfield, Part III. (Bulletin 2.) 13th December, 1907.

(6) W. H. Twelvetrees: On Some Gold Mining Properties at Mathinna. 30th September, 1914.

Typewritten Reports.

(1) P. B. Nye: Report on the Jubilee Mine, Mathinna. 29th January, 1924.

(2) A. M. Reid: Report on the Miner's Dream Mine, Mathinna. 25th November, 1925.

(3) P. B. Nye: Report on the Selection of Bore Sites for Messrs. H. E. and C. E. Brock. 20th December, 1927.

(4) P. B. Nye: Notes on the Tower Hill Mine. December, 1929.

(5) P. B. Nye: Report on the Tower Hill Mine, Tower Hill. 25th October, 1930.

III.—HISTORY.

It is uncertain as to when the first discovery of gold was made at Mathinna, but it seems probable that the discovery of gold near Fingal, made by James Grant in February, 1852, must have stimulated prospecting operations in the country to the north, and that the Mathinna field came into prominence within a few years after the abovementioned find.

Writing of the Mathinna Goldfield, in 1884, G. Thureau stated: " That goldfield, at one time so prosperous, is now almost abandoned; a few alluvial diggers still work and rework the alluvial deposits which were formerly found so prolific in gold; the numerous quartz reefs in the neighbourhood are quite abandoned, and the steam-winding, pumping, and crushing machinery have been removed elsewhere." At the time of Thureau's report the City of Hobart mine had been worked to a depth of 670 feet and had then been abandoned; many other mines had also been opened up and subsequently abandoned, so that considerable activity must have taken place some years prior to 1884.

Following the discovery made by A. Loane in the adit of the New Golden Gate Mine, considerable stimulus was given to mining activities within the district. Loane's discovery was made about the year 1887. While picking in the floor of the adit, where the lode-channel of the reef which now bears his name had been passed through, he found a little gold-bearing quartz. This led to his sinking a winze, in which more gold-bearing quartz was obtained, the quartz yielding 1 oz. 8 dwt. per ton. After some further work in the winze, a main shaft was sunk and the lode tested at a depth of 100 feet. Developments continued satisfactorily, and the New Golden Gate Mine was successfully opened up. The success attending these operations was instrumental in bringing a new influx of capital, and the field once more entered on an era of prosperity.

From 1888 to 1904 the New Golden Gate Company produced 232,225 oz. of gold and paid £355,200 in dividends. Below the 1300-ft. level, developments

proved unsatisfactory, for, although the reefs were still fairly strong, their gold content had diminished. The main shaft was sunk to a depth of 1800 feet, and a winze was put down on the East Reef to a further depth of 103 feet, so that prospecting operations extended to a total depth of 1903 feet below the surface. The work from 1300 feet downwards was carried out mainly during the period 1904-1908. From 1908 to 1912 mining operations were continued, but on a much restricted scale, and, in the early part of 1912, the company was wound up and the whole of its plant disposed of. The leases were purchased by a small syndicate of whom Edward Moses was the principal.

Although the New Golden Gate Company was the only one to pay dividends, many other companies carried out a considerable amount of prospecting and developmental work. Among the larger of these may be numbered the Tasmanian Consols and the Volunteer. The former worked a fairly large reef, which entered its property from the Golden Gate Mine at the 1400-ft. level; work was continued for some five years, and the shaft deepened to 1600 feet, but the Company was obliged to shut down in 1908; the amount of gold produced was 10,115 oz. The Volunteer group ceased active operations in 1906.

After the winding-up of the New Golden Gate Company in 1912, the mine was worked from the surface down to the 500-ft. level by a small syndicate, of which the principals were E. Moses, F. Moses, J. Fullerton, and C. Smith. These operations continued successfully until 1923, when the mine was taken over by the Golden Gate Consolidated N.L. This company unwatered the main shaft and did a considerable amount of prospecting and developmental work. Only a small measure of success attended these operations, and, as the immediate prospects did not warrant the necessary repairs being made to the main shaft, the mine was finally shut down in 1929.

Mining operations were also carried out on the Jubilee Mine from 1913 to 1916, and on the Miner's Dream Mine from 1923 to 1926, and on the old Boys'

Mine (Brock Bros.) from 1923 to 1931. None of these operations were attended with much success. Other prospecting and developmental work, including diamond-drilling, has been undertaken on various leases from time to time, but nothing of a payable nature has been discovered.

During 1932 the field was practically deserted, there being only two tribute parties engaged in working small veins to the east and south-east of the Golden Gate main shaft. A small amount of prospecting was also being carried out in various portions of the field.

IV.—GEOGRAPHY AND PHYSIOGRAPHY.

(1) Location and Access.

The Mathinna Goldfield is situated in the north-eastern portion of Tasmania, and lies about seventeen miles to the north of Fingal. The two townships are connected by a well-graded road. The railway from Conara Junction to St. Marys passes through Fingal.

Tower Hill is approximately four and a half miles to the south of Mathinna, and is connected with it by a rough cart-track. This may be traversed by cars at certain times of the year, but the journey is attended by considerable risks. The cart-track or the road from Mathinna to Tower Hill goes on to Mangana, the last-mentioned township being connected by road with Fingal.

A second-class road extends northwards from Mathinna to Ringarooma, but this can only be traversed during the summer months. A short road extends some six miles up the Dan Rivulet, and connects with the old track from Mathinna to Alberton.

A road also extends from Mathinna westwards to Blessington, but, although in good condition where it leaves Mathinna, this is said to be only a cart-track some few miles to the east.

(2) Topography.

The township of Mathinna lies approximately 1000 feet above sea-level. The principal mines are located on three spurs, which extend northwards from Tower Hill and terminate in the valley of the South Esk River. These spurs are separated by Long Gully Creek and Black Horse Gully. Sling Pot and Bowl Creeks, which are to the west of Mathinna, may be said to lie outside the main mining area. All of the abovementioned streams flow in a general northerly direction to joint the South Esk River, which is located about one mile to the north of the township.

In their upper reaches these streams run in steep V-shaped valleys, but in the vicinity of the township they spread out into extensive flats, which form part of the valley of the South Esk.

South of the New Jubilee and Commercial Sections, the country partakes generally of the character of a tableland, which extends southwards to Tower Hill. The height of the tableland may be regarded as being approximately 1700 to 1900 feet above sea-level.

The country to the south of the town is covered with a fairly heavy growth of timber, comprising peppermint, iron-bark, and stringy-bark, while the flat country bordering the South Esk is covered mainly by swamp gums and occasional clusters of wattle. General speaking, there is comparatively little undergrowth, and the country is therefore easy of access.

(3) Climate and Meteorolgy.

The climate of the district generally is mild, the average annual rainfall at Mathinna being 32 inches and at Tower Hill 35 inches.

The following table shows the average monthly distribution of the rainfall.

Monthly Distribution of Rainfall—Mathinna and Tower Hill.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Mathinna	191	169	275	259	283	406	343	319	272	317	167	222
Tower Hill	200	212	285	299	290	429	366	299	318	360	229	279

100 points = 1 inch.

As will be seen by the foregoing table, the wettest period of the year extends from June to October. During the summer months the country is particularly dry, and in the past some difficulty has been encountered in maintaining a sufficient supply of water for mining and treatment purposes. In the case of the Golden Gate Mine this was met by constructing a large dam in Long Gully Creek, but other companies were far less fortunate in this respect.

In the township tanks and shallow wells are relied upon for domestic supplies, but in dry periods of the year water for this purpose has to be carted from the South Esk River.

V.—GEOLOGY.

(1) Summary.

Practically the whole of the area examined is occupied by Lower Paleozoic rocks, consisting mainly of slates and quartzites. In the high country near Tower Hill these are overlain by horizontally bedded Permo-Carboniferous conglomerates, sandstones, and mudstones.

In the vicinity of Mathinna the beds of the present streams are filled with gravels of recent origin.

A small, altered, basic, igneous dyke occurs near the Sunbeam shaft at Tower Hill, and a few weathered lumps of basic igneous material occur on the Jubilee section.

Diabase outcrops on the summit of Tower Hill about one mile south of Holder's property, but does not occur *in situ* within the mapped area.

(2) The Sedimentary Rocks.

The sequence of the sedimentary rocks is shown by the following table:—

Age.	Lithological Character.
Cambro-Ordovician	Slates and quartzites
Permo-Carboniferous ..	Conglomerates, sandstones, and mudstones
Recent	River gravels, sands, &c.

(*a*) *Cambro-Ordovician.*

(i) *Lithological Character and Occurrence.*—The rocks of this age consist principally of slates and quartzites. The unweathered slates may be black, purple, green, bluish-grey, or light-grey in colour; at the surface they weather to various shades of brown. The quartzites may be light or dark

coloured, and generally contain mica along the bedding planes. Various rock types, intermediate in texture between the slates and the quartzites, also occur, and these may be described either as arenaceous slates or as argillaceous quartzites, according as to whether the texture approaches more nearly to that of a slate or a quartzite.

Generally, the quartzites predominate in the higher country and the slates in the lower. Thus the rocks along the Golden Gate ridge are mainly slates, while the country rock of the Pride of the Hills section, which is located from 500 to 600 feet higher, is principally a quartzite.

The Mathinna slates and quartzites form part of a great auriferous series, which extends from Mangana northwards to Lyndhurst. No graptolites or other fossil remains have ever been found in this series, but they have generally been regarded as being of Cambro-Ordovician age.

(ii) *Structural Features.*—The most obvious structural feature of the Mathinna slates and quartzites is a pronounced schistosity or slatey cleavage. The strike of the schist or cleavage-planes varies from N.10°W. to N.40°W., and the dip is generally to the west or south-west at angles ranging from 45° to 80°, though the steeper angles are the most common. In some cases the dip is vertical, and occasionally it is easterly.

Several sets of joint planes cross the cleavage-planes, either diagonally or at right angles, but no general rule could be deduced as to their behaviour. These joints will be mentioned at a later stage, when dealing with the quartz veins, as small gold-bearing quartz veins frequently occur along them.

In the majority of surface and underground exposures within the mining area, the cleavage almost completely masks the bedding, but away from the mining area (e.g., in the valleys of Bowl and Sling Pot Creeks, in the upper portion of Long Gully Creek, and in the western portion of Cox Creek) there is a less pronounced cleavage in the

rocks, and the bedding-planes are quite distinct. The impression is therefore gained that the zone in which the cleavage is prominent really represents a zone of dynamic metamorphism or shearing occurring, possibly, along some structural line of weakness within the slates and quartzites.

As stated above, the bedding-planes of the rocks along the main gold-bearing belt are far less evident than the cleavages, but, in some surface exposures and in some of the old tunnels into which access was gained, the bedding-planes can be followed fairly closely. They are distinguishable mainly by differences in lithological character among the various beds, such, for example, as beds of quartzites occurring in slates, or by differences in the colour of the slate beds. The strike of the bedding-planes varies from N.10°W. to N.50°W., but the most common observed strikes were N.30°W. and N.35°W., and these may be regarded as indicating the general direction.

The rocks are found to be folded into a number of anticlines and synclines, and the intensity of the folding varies in different portions of the field.

A zone of close folding may be traced in a general north-westerly direction from the Tower Hill road-cuttings near the Jubilee and Mountaineer sections, through the Horseshoe and the New North Eldorado workings, to Section 1154-93G. As far as could be determined this is the most closely folded belt in the district, and its occurrence appears to have some significance when the distribution of the ore-bodies is taken into account.

In the road cuttings referred to above, eight small anticlinal folds were observed over a distance of approximately 20 chains. The crest of an anticline also outcrops on the workings on the Flat Lode on the Jubilee Mine. This may be seen on the south side of a shaft located 50 feet north-east of the portal of No. 4 adit. Further to the north-west, on the Horseshoe Mine, a bed of quartzite, folded in the form of an anticline, may be seen in the southern portion of the old adit workings. A structure resembling the crest of an anticline occurs

in the open-cut workings on the New Eldorado section (1021-G). This was seen from the northern side of the cut, but I was unable to examine the beds closely on account of the unsafe condition of these workings. Fairly definite evidence of folding was obtained however in the adit workings on this section.(1) Beyond the elbow in the long west drive the bedding is practically horizontal, with a slight dip to the west at the extremity of the drive, while to the east of this elbow and also in a short section of the adit to the north of the drives the bedding-planes dip to the east. Some very close folding occurs in the rocks exposed in the North Eldorado adit, and the apices of two anticlinal folds may be seen quite clearly. One occurs at the bend in the drive, and the other at a point 100 feet from the portal. The slips of the bedding-planes between these points indicates the presence of at least two more anticlinal folds. In the adit on Section 1154-93G, an anticlinal fold occurs at a distance of approximately 190 feet from the portal. In the western portion of the adit the beds dip to the west, and towards the eastern end the dip is easterly.

On account of the relatively small number of exposures, it has been found impossible to map the axis of the various anticlines separately, and on the accompanying geological map the belt described above is shown merely as a zone of close folding.

On the north-eastern side of this zone the observed bedding-planes all dip to the east. The observations for strike and dip along this section were of necessity confined to old adit workings, as there are no reliable surface outcrops. However, some fairly good exposures of the bedding may be seen in the Caledonian workings, in the magazine tunnel of the New Golden Gate Mine (east of Long Gully Creek), in the Miner's Dream and South Miner's Dream adits, and in the adit workings on Sections 406-93G and 359-G. In the road cuttings to the east of the Jubilee sections the bedding-planes also dip east. In the Caledonian workings and in

(1) See plan of Eldorado Workings, Plate XI.

the magazine tunnel the dip varies from 65° to 85°E., but in the other sections it is rather flatter and generally ranges from 20° to 45°E.

On the south-western side the structure of the beds is less definite. In the Victorian Golden Gate adit, which lies near the zone of close folding, a bed of quartzite was observed to strike N.30°W. and dip to the north-east at 55°. Further south-east, however, on the east side of the Golden Gate dam (Section 2753-W), the bedding dips to the south-west at 70°. A consideration of the plan positions of these localities indicates that there is probably a synclinal axis extending in a north-west direction from the vicinity of Section 492-93G through Section 742-G.

Immediately to the south-west of this probable axial line the observed dips of bedding-planes were easterly. Thus, in the adit on Section 1734-G, interbedded slates and sandstones strike N.50°W. and dip to the north-east at 60°, and on the Commercial workings greyish slates strike N.40°W. and dip to the north-east at 65°. Prolonging this line towards Long Gully Creek, it is found that the dip of the beds outcropping in the creek are generally to the north-east. Two south-westerly dips were observed while examining this creek, but one of these was due to a slight puckering in the beds, and it is possible that the other could be explained by a similar effect.

To the south-west of this line of north-easterly dipping rocks, only three strikes and dips of bedding-planes were obtained and these were all south-westerly. In Bowl Creek, above the Scott and Picket workings, the beds strike N.30°W. and dip to the south-west at 60° to 70°; in the creek below the Pride of the Hills workings they strike N.40°W. and dip south-west at 65°; and in the upper portion of Sling Pot Creek they strike N.30°W. and dip to the south-west at 60°.

The observed structural features in the south-western portion of the Mathinna field therefore indicate the presence of an anticlinal axis, which would probably extend through Sections 800-87G and 407-87G.

In the Tower Hill district no structural features of any importance were observed. The strike of the quartzites on the Tower Hill Mine and on Section 85P-G conforms with the observed strikes of the bedding in other portions of the mapped area.

The general structural features of the field are illustrated by the accompanying cross-section (Plate I.). They may be summarised briefly as follows:— A zone of close folding extends north-westwards from the Jubilee sections through and beyond the Eldorado workings. To the north-east of this zone the dip of the beds is generally north-easterly, while to the south-west the rocks appear to be folded into a broad anticline.

In order to check the above observations a traverse was made down Cox Creek from the Twilight Mine to where the creek enters the flat country adjoining the South Esk River. The rocks exposed in the creek bed are principally slates and quartzites, the latter generally predominating. About twenty-five to thirty chains above the Cambria Mine (Section 992-87G),(2) there is a large overturned anticline, which strikes N.30°W. and whose eastern and western limbs dip at 25° north-east and 75° north-east respectively. The position of this fold corresponds generally with the south-eastern projection of the zone of close folding described above. It would appear, therefore, that the close folding at Mathinna gives place to one larger fold as the beds extend to the south-east. Below this fold the beds strike N.30°W., and the dip is generally to the north-east at 50° to 60°. This north-easterly dip is fairly constant right down the creek, but there are occasional sharp anticlinal and synclinal folds. These appear to be small folds occurring on the eastern limb of the large anticline described above. In the upper portion of Cox Creek, to the south-west of the large anticline, the beds also dip to the north-east.

The description given of the structural features outside the main mining area is based on observations made during brief reconnaissance trips down

(2) See Mathinna Mineral Chart.

the various creeks. It will be realised that work of this nature has its limitations, and that more detailed mapping of the creeks may effect some alterations to the views stated above.

In his first report on the Mathinna field, Twelvetrees ([3]) has described the occurrence of an anticlinal axis extending from the township to the Jubilee Mine, but, judging by his remarks when referring to the difficulty in distinguishing between the bedding-planes and the cleavage-planes, it seems probable that most of his observations as to dip were taken from cleavage-planes rather than bedding-planes. On page 2 of his report he states: " It is only occasionaly that any difference can be detected between bedding-planes and cleavage-planes. It is seen, however, in the upper tunnel of the Eldorado, where the former dip easterly at 45° and the latter westerly at a very steep angle. The latter strike throughout the field between N.25° and N.30°W., underlying to the east of the Golden Gate shaft, to the east, and west of the shaft to the west."

My own observations throughout the field led me to the conclusion that there was a considerable difference between the bedding and the cleavages. Very often the bedding could be traced only by chipping practically the whole of a crosscut, and examining the walls for differences in the lithological character of the beds or for differences in colour when the beds were composed entirely of slates. This method of procedure, though slow and laborious, is, nevertheless, necessary. Apart from the various localities already described, no reliable exposures of bedding-planes were observed. On the other hand, the slatey cleavage is evident throughout the field, but it is quite unsafe to assume that it gives any indication of the true structure of the bedding. Furthermore, in many surface exposures which came under observation, the dip of the cleavage-planes was clearly influenced by hill-creep.

([3]) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part I., pp. 4-5.

The actual observed bedding-planes in the vicinity of the axial line indicated by Twelvetrees all dip to the north-east. Hence it was not found possible to confirm the existence of the anticlinal structure described by him. Then, too, his description of the arching of the anticlinal structure as seen in the Tasmanian Consols and Golden Gate workings (4) leaves a doubt as to whether it is due to the actual arching of bedding or to the abrupt junctioning of cleavages dipping in opposite directions; but, unless the actual occurrence could be examined, it would be impossible either to confirm or deny the existence of an anticline in these mines.

It seems probable that during his later examinations of the field Twelvetrees may have obtained some further evidence which inclined him to the belief that a number of folds occurred. Thus in his last report on Mathinna, (5) made in 1914, he states: "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 Long Gully to the valley of the Dan, and at intervals as far as Mount Victoria."

It will be noticed that Twelvetrees refers to "axial folds" and not to a single anticline as described in his first report. Unfortunately no direct evidence was given in support of the above statement, and no reference was made to possible distinctions between bedding and cleavage, but, taken as it stands, it is fairly descriptive of the general conditions observed on the field.

(*b*) *Permo-Carboniferous.*

Approaching the high country to the west and south-west of Tower Hill Mine, the Cambro-Ordovician slates and quartzites are seen to be unconformably overlain by conglomerates, grits, mud-

(4) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part I., 1906, p. 4.
(5) W. H. Twelvetrees: On Some Gold-mining Properties at Mathinna, Geol. Survey Report No. 5, p. 4.

stones, and sandstones of Permo-Carboniferous age. The conglomerates, &c., outcrop principally on the south side of the road which extends westwards from the Tower Hill Mine. A few typical Permo-Carboniferous fossils were observed here and there, the most common forms being *Fenestella* and *Spirifer*.

Scattered boulders of conglomerate, grits, and sandstones of this age also occur on the high, flat country to the south of the Jubilee and Pride of the Hills sections.

(*c*) *Recent.*

Gravels, sands, and clays of recent origin occur in the valleys of the present streams. The gravels are composed principally of pebbles of quartz, quartzite, and slate, with occasional boulders of diabase. In the past, the gravels of Black Horse Gully and Long Gully Creek were worked extensively for alluvial gold. The depth of the alluvial ground varies from four to tweny-five feet, the deeper ground being in the lower portions of the creeks.

It is stated that virgin alluvial ground exists in the Malahide Estate, immediately north of the Mathinna township, but no idea could be obtained as to its probable value.

Some shallow alluvial deposits occur quite close to Tower Hill in some small tributaries of Cox Creek, but practically all of these appear to be worked out.

(3) Igneous Rocks.

A small, completely decomposed, basic igneous dyke extends for a distance of seven or eight chains west from the Sunbeam main shaft. Some fresher material was obtained from the dump of this shaft by P. B. Nye, during his examination of the Tower Hill Mine in 1930.

Under the microscope the rock is seen to consist almost entirely of carbonates and plagioclase felspar, with possibly a little quartz. A colourless, opaque mineral resembling sphene also occurs throughout the section.

A specimen of the fresh material from the dump has been analysed with the following result:—

Analysis of Carbonated Dyke Rock, Sunbeam Shaft.

Constituents.	Per Cent.
SiO_2	42·00
Fe_2O_3	7·70
Al_2O_3	16·98
MnO	0·30
TiO_2	0·64
CaO	8·70
MgO	5·86
P_2O_5	0·18
Na_2O	0·15
K_2O	2·58
CO_2 and ignition loss	15·86
Total	100·95

Regd. No. 2270/1930. Analyst: R. H. Bath.

It is impossible to identify this rock, but it does not appear to be related to the Mesozoic diabase, and in all probability it is connected with the Devonian period of igneous activity.

Decomposed, basic igneous material also occurs scattered around the hillside immediately south of the old Derby adit (on the Jubilee section), but careful search failed to reveal any outcrops. When referring to this rock in his report on the Jubilee Mine, P. B. Nye states: "Similar material occurs in other portions of the North-Eastern District of Tasmania, and represents decomposed basic igneous dykes intrusive into the Cambro-Ordovician strata. They are probably of Devonian age, and generally occur in the vicinity of gold-quartz veins, but the relationship between the two has not yet been determined."

VI.—ECONOMIC GEOLOGY.

(1) The Auriferous Quartz Veins.

These are quartz veins containing free gold, arsenopyrite, pyrite, chalcopyrite, galena, and sphalerite. The colour and nature of the quartz varies considerably throughout the field, and also in individual veins. In some cases it is coarse, white, and vitreous, in others it is fine-grained and dense. The presence of sulphide minerals often gives it a bluish tinge, and, where banding is noticeable in the veins, it appears to be due to the relative distribution of the sulphides.

Arsenopyrite and pyrite are the most common of the sulphides, and are usually present in small quantity in most of the veins. Galena, chalcopyrite, and sphalerite are much more rare, but mining experience on the field shows that their presence may be regarded as a good indication for gold. Twelvetrees ([6]) gives the average sulphide content of the Golden Gate ore as being 1 to 1½ per cent., and these figures agree generally with the published returns of the company. Thus, to take a fairly typical example, the Annual Report of the Secretary for Mines, 1900-01, states that the New Golden Gate Mine crushed 19,675 tons of quartz for a return of 14,658 oz. of retorted gold from the battery, and that 194 tons of pyritic concentrates, containing 1041 oz. of gold, were also obtained. The figure of 194 tons represents approximately 1 per cent. of the crude ore treated. Judging by the above returns, the average amount of gold contained in pyrite (and other sulphides) per ton of crude ore would be approximately 1 dwt. Twelvetrees states, however, that for a number of years the pyritic concentrates from this mine yielded 10 oz. of gold per ton. Based on a 1 per cent. sulphide content, this represents approximately 2 dwt. of gold per ton of crude ore, and on a 1½ per cent. sulphide content 3 dwt. Thus the average amount

([6]) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part I., 1906, p. 8.

of gold associated with sulphides in the crude ore may be regarded as ranging from 1 dwt. to 3 dwt. per ton.

While the above figures indicate the average amount of gold associated with sulphides, it cannot be assumed that the gold is distributed evenly through them. Individual assays of lumps of pyrite and arsenopyrite from the 1600-ft. level of the Golden Gate Mine have yielded as much as 80 oz. per ton. On the other hand, it is probable that a good deal of the pyrite, &c., contains no gold.

The quartz veins throughout the field vary in width from a few inches up to thirty feet or more, and in length from fifteen or twenty feet up to one thousand feet. The longest recorded distances of reefs actually followed are the East Reef on the New Golden Gate (511 feet) and the Lower West Reef on the New Golden Gate and Tasmanian Consols (1020 feet). These are rather exceptional, however, and quite a considerable number of the veins are exceedingly short.

The strike and dip of the veins also shows considerable variation. The principal veins on the Golden Gate Mine, viz., the Main, Loane's, and East Reefs, strike in a general north-south direction, and dip to the east at a steep angle. These make an acute angle with the planes of foliation of the country rock. The West Reef of the New Golden Gate and Tasmanian Consols Mines strikes north-west, and thus conforms with the foliation: this also applies to most of the reefs occurring along the ridge extending northwards from the old cemetery, i.e., north-west of the New Golden Gate Mine.

The veins occurring along the ridge to the east of Long Gully Creek appear to have no general direction of strike. The principal veins on the Caledonian Mine have a general east-west trend; those to the north and north-east of the Gate Extended shaft strike north or north-west; while one of the veins worked near the East Golden Gate shaft strikes to the north-east. Most of these veins are short, one of the largest, viz., that worked in the old surface stopes of the Caledonian Mine,

being only sixty feet long. The majority of the veins along this ridge dip at angles ranging from 55° to 80°. The directions and angles of dip have been shown on the accompanying plan. A flat vein occurs in the adit workings of the Caledonian Mine.

In the vicinity of the City of Hobart and Old Boys Mines quite a large number of reefs have been worked, and these also show considerable variation in strike. The City of Hobart Reef trends N.20°E. for 150 feet, and then turns on a course N.60°E.; the large reef on the Old Boys Mine strikes N.30°E.; and the old Yellow Boy Reef has a strike approximating to N.70°E. A number of the smaller veins strike in a general east-west direction and dip to the south, while others conform both in strike and dip with the foliation planes of the slates.

The veins on the Eldorado and North Eldorado sections strike approximately east and west and dip to the south at 60° to 80°. Those on the Jubilee sections trend generally with the country. On the Scott and Pickett and Pride of the Hills sections the reefs strike N.20° to 30°E. and dip steeply to the north-west.

Further south, towards the Tower Hill Mine, the reefs also vary as to strike and dip. That on the Twilight Mine trends N.30°E. and dips to the north-west at 80°, and those near the Sunbeam shaft strike a little to the north of west and dip south. The formations worked on the Tower Hill Mine and also on Section 1352P-G consist of irregular quartz veins occurring in beds of quartzites.

(2) Relationships between the Veins and the Geological Features.

The auriferous quartz veins occur entirely within the Cambro-Ordovician slates and quartzites, and no reefs ever have been found in the Permo-Carboniferous rocks.

The majority of the reefs at and near Mathinna occur along and on either side of the zone of close folding shown on the accompanying plan. This zone corresponds generally with a maximum development of slate beds and also with a maximum develop-

ment of cleavage in the slates. As outlined previously the folding consists, not of a single anticlinal structure, but of several small folds occurring over a width of from twelve to twenty chains. This appears to have been the main structural line of weakness, and the majority of the reefs occur quite close to it.

When examined in detail, however, it is found that, with a few possible exceptions, there is no close relationship between the rock structures as indicated by the bedding and that of the reefs. That is to say, the reefs do not occur in the form of saddle, trough, or leg reefs as at Bendigo, in Victoria,(7) nor do the greater number of them occur where the folding is most intense. As has been indicated, the reefs may strike in almost any direction, and the gold-bearing solutions appear to have followed major joint-planes, shear-zones, or lines of pre-gold faulting which have been developed along or close to the zone of folding shown on the plan.

The exceptions mentioned above are: (1) The Horseshoe Reef, (2) Portion of the Eldorado Reef, and (3) The reefs on the Jubilee Mine. The Horseshoe formation consists of a number of quartz veins impregnating a bed of sandstone, three to four feet thick, folded in the form of an anticline. This bed is underlain by slates, and these also are penetrated by quartz veins, and the formation as a whole follows the arching of the beds. On the Eldorado Mine also the bedding has had some influence on the occurrence of the reefs. In general these strike a little to the north of west and dip to the south. At the elbow in the western portion of the adit workings on No. 1 reef, and also at the eastern end of the surface workings, the reef has turned along the bedding for a short distance. The principal reefs on the Jubilee Mine, viz., the Derby Reef and the Flat Reef, occur along the axis of an anticline, but the extent to which the bedding may have influenced the form of the reefs

(7) F. L. Stillwell, D.Sc.: The Factors Influencing Gold Deposition in the Bendigo Goldfield, 1917; Bulletin 4, p. 17, Advisory Council of Science and Industry.

could not be definitely ascertained. The general form of the Flat Reef, and also that of Lyons Reef, which is a branch of the Derby Reef, certainly suggests that they may have followed anticlinal and synclinal folds, but, in the case of the Flat Reef, I was unable to obtain any evidence in support of this view, as in such places as the bedding-planes could be seen the reef appears to cut across them.

One of the principal structural features at Mathinna which appears to have had some influence on the distribution of several important reefs is the main "slide" on the New Golden Gate Mine. This appears to have been a pre-gold fault or shear-zone, along which a certain amount of movement has taken place from time to time, thus enabling the passage of surface waters and the formation of a zone of pug or "dig" along the fault line. It strikes N.30° to 35°W. and dips to the south-west at 65° to 75°. It varies in thickness from a few inches up to four feet or more, and occasionally contains irregular lenses and veins of quartz. Several important reefs occur on the north-east side of this "slide," and some rich lenses of quartz have also been found along the south-western side. It is only occasionally, however, that the slide itself contains payable quartz, and, in many places at which it has been cut, it contains no quartz at all. Generally, it may be said to occur along the eastern margin of the zone of close folding, and on a parallel course. The north-western projection of this slide would pass close to Holdensen's workings on the hill near the Catholic church, and the south-eastern projection would pass through the Miner's Dream sections. At the same time it must be borne in mind that this slide has not been located outside the workings on the Golden Gate Mine, so that there is really no evidence to show that it does continue for any considerable distance. Several minor "slides" appear to be associated with the main slide; hence the general line of its course may represent a complex zone of pre-gold movement. In his report on the Miner's Dream Mine, A. M. Reid ([8])

([8]) A. M. Reid: Report on the Miner's Dream Mine, Mathinna, 1925.

states that the reef occurs along the walls of a fault, but, in such parts of the mine as were accessible, I was unable to recognise any major fault-planes comparable to that described in the various reports on the Golden Gate Mine.

As a general rule the distribution and gold content of the reefs appears to have been influenced to a large extent by the lithological character of the rocks. Thus very few reefs occur in country where quartzites predominate, and in such cases as reefs were found to occur in quartzites they appear to have been of little value. Thus the reef on Martyn's section and the Pride of the Hills Reefs contain only minor quantities of gold.

The formation on the Tower Hill Mine and also that on Section 135-PG consist of beds of quartzite containing veins and irregular masses of white quartz. The veins vary in width from a few inches up to a foot or more. Generally they cross the line of strike of the quartzite beds, but they cannot be said to have any constant direction of strike or dip. In these two instances the quartz veins have followed fractures in the quartzites to the exclusion of the adjoining slates, but none of the veins in either formation has been found to contain gold in payable quantities.

The Golden Stairs Mine provides an instance of the impoverishment of a reef due to its passage into a bed of quartzite. Furthermore, a similar change in the nature of the country rock may explain the impoverishment of the reefs in the lower levels of the New Golden Gate Mine. In conversation with Mr. G. Lindesay Clark, who for some time acted as consulting mining engineer for Mr. Holdensen, he stated that his recollection of some of the lower levels of the mine was that a considerable proportion of the rocks were quartzites.

(3) Enrichments.

Without being able to study mining conditions on the field at first hand, it is rather difficult to deal with this subject as fully as one would wish. Nevertheless, a good deal of information can be

obtained from the earlier reports, and a number of the operating causes appear to be similar to those observed on other gold-mining fields.

A general belief exists on the field that reefs which cut the foliation-planes of the slates are richer than those which are conformable with them. This is supported to some degree by Twelvetrees' description of the New Golden Gate Reefs. On page 3 (9) he states: "In the New Golden Gate Mine it seems to be the rule that, when the reef is gold-bearing, its course is east of north, and when west of north it is barren."

This statement was intended to apply mainly to Loane's and the Main Reefs. A number of reefs, trending west of north, have been found payable, but many of these also cut across the strike of the foliation, though in the opposite direction. The City of Hobart, Eldorado, and Yellow Boys Reef are more or less prominent examples of payable reefs occurring along fractures which cut the planes of foliation.

Many short, rich shoots which have been worked from the surface down to approximately 100 feet appear to be due, in part at least, to secondary enrichment. Among these may be numbered the Derby and Flat Reefs on the Jubilee Mine, the reef in the underlay shaft workings on the Miner's Dream, portion of the Scott and Pickett Reef, the shoot of gold in Turner's winze on the Old Boys Mine, the cross-reef worked at the surface on the Caledonian Mine, and a number of smaller veins in various portions of the field. The significant feature with regard to practically all of these is that their gold content proved to be very low when the reefs were tested in depth. Moreover the quality of the gold in many of these workings, particularly the Miner's Dream, is stated to have been very high.

Any enrichments below water-level appear to have been due to the intersection of two reefs or to the intersection of a reef with some prominent joint, fault, or fracture. The richest shoot on the

(9) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part I., 1906, p. 3.

Mathinna field, viz., that worked between the 236- and 800-ft. levels on the New Golden Gate Mine, was due to the intersection of Loane's Reef and the Main Reef. The rich shoot on the East Reef at the 1200-ft. level occurred immediately north of the intersection of this reef with the main slide. A number of other rich shoots were also found close to the main slide on this mine. On the Jubilee Mine the shoot at the eastern vertical part of the Flat Reef was formed above the intersection of the flat and vertical parts, and the shoot in Lyons Reef is associated with the intersection of a slide. The occurrence of shoots such as these is due to the increase in freedom and volume of circulation of the auriferous solutions which takes place in zones of greatest fracturing.

Montgomery's description of the moderately rich shoot of ore worked above and below the east drive in the adit level of the Eldorado Mine indicates that it occurred close to the intersection of a slide. An examination of this occurrence showed that the "slide" was really a quartzitic bed, along which a little movement may have taken place. There does not appear to have been any displacement of the reef, however, as the quartz reef in the drive occurs on both sides of the plane. The enriched portion of the reef extends eastwards from the plane, but the western portion is more or less barren.

(4) Faulting.

Both Twelvetrees ([10]) and Montgomery ([11]) mention the occurrence of "slides" on the New Golden Gate Mine and also on other mines within the Mathinna field. Of these the most important is the "main slide" on the New Golden Gate Mine, of which some mention has already been made. From the descriptions given, however, it is quite clear that the "slides" are not post-gold faults which have displaced the reefs, as in many instances the reefs pass through the "slides" without deflec-

([10]) W. H. Twelvetrees: Report on the Mathinna Goldfield, 1906, p. 15.

([11]) A. Montgomery: Report on the Mathinna Goldfield, 1892, p. 48.

tion. These planes represent faults or fractures formed prior to, or contemporaneously with, the main reef-channels, and, in a number of cases, they appear to have assisted in guiding and controlling the flow of the mineralising solutions. The fact that thin selvages of pug or clay are frequently developed along them is due to reopening and slight movements which permit the entry of surface waters. This movement appears to have taken place after the period of ore deposition, but in no instance of which I am aware has it been sufficient to effect any extensive displacement of the reefs.

A certain amount of later movement has also taken place along some of the reef-channels, and an instance of this was noted in the adit on Section 1154-93G. Here a smooth striated wall has been driven on for a short distance, both to the north and south, and on either side of this is a selvage of soft clayey material containing irregular lenses and fragments of reef quartz. The quartz appears to have been deposited originally along a fault-plane, along which slight movements have taken place after the period of ore deposition. In describing the Main and Loane's Reefs on the New Golden Gate Mine, Montgomery ([12]) states: "In both reefs the number of smooth planes or 'walls' coated with clay, often exhibiting striae on motion of the walls one upon the other, is very noteworthy. These may often be taken for the true walls of the reef, when in fact they are a very considerable distance from it. In some instances in breaking through these apparent walls other bodies of quartz, or "splices" as they are often called by the miners, are found behind them, and there may be several such splices separated by smooth plane surfaces between the walls of the lode-channel."

The formation of these walls is analogous to the reopening which has taken place along many of the reef-channels in the neighbouring goldfields of Mangana. In the latter field, greasy leads or walls, faced with clay, frequently extend along the whole

([12]) A. Montgomery: Report on the Mathinna Goldfield, 1892, p. 48.

of the lode-channel; in some cases these appear to have effected slight displacements in the reefs, but, in others, they have had no effect whatever.

In some instances quartz veins are seen to terminate along prominent cross fractures or leads, as in the underlay shaft workings of the Miner's Dream Mine. The quartz may or may not spread along the cross fracture for a short distance, and in the latter case the occurrence is often mistaken for a fault, even though direct evidence of faulting is absent, e.g., bending or fracturing of the reef, or the development of smooth, striated walls. Planes such as these have controlled the flow of the mineralising solutions, but they are not faults, inasmuch as no displacement of the reef has taken place.

In the North Eldorado adit and in one or two other instances, small faults were seen to displace bedding-planes. No evidence of major faulting was obtained during the mapping.

(5) Genesis of the Auriferous Quartz Veins.

With the exception of the carbonated basic dyke occurring near the Sunbeam shaft, no igneous rocks have been found outcropping on the field. Dykes of a similar nature occur in various parts of the north-eastern goldfields, and are generally found in proximity to gold-quartz veins, but the relationship between the two has not been determined. The diabase which outcrops on Tower Hill is of Mesozoic age, and hence cannot be associated in any way with the gold deposition. On the other hand, Devonian granites are extensively developed to the north, north-east, and north-west of the Mathinna field, as well as to the south-west and south-east, and it is probable that they underlie it at no great depth. In the Gladstone District, auriferous quartz veins are closely associated with the intrusive Devonian granites, and, although direct evidence is lacking, it seems probable that the solutions which gave rise to the Mathinna reefs have also been derived from this source.

VII.—THE MINES.

(1) Golden Stairs Mine.

Section 1748-G, 20 *Acres.*

This mine is situated towards the northern end of the township. The old main shaft, now fallen in, lies to the east of High-street and about five chains south of Wilson-street.

The mine workings have been inaccessible for many years, but details of the workings are contained in the reports of Montgomery [13] and Twelvetrees [14] [15]. The following account has been compiled from information contained in these reports.

The reef strikes a little to the west of north and dips to the west at approximately 70°. It was first worked by two shafts sunk on the outcrop, one being 53 feet deep and the other 30 feet, and, between these, portions of reef were stoped to the surface. It was opened up further to the north, but does not appear to have been payable. About one and a half chains south of the old stopes, the reef was found to junction with a smaller reef trending more to the north-west. It was not located further south than this point and appears to have died out.

Consequent on the revival of mining activities which followed the discovery of Loane's Reef, a company was formed to test this reef in depth. The sinking of a main shaft was commenced about 1890 or 1891, and, after carrying out a good deal of developmental work on the reef, operations were suspended in 1893, since when the principal workings have not been reopened.

The main shaft was sunk to a depth of rather more than 233 feet, the country rock being dark-blue slate. Crosscuts were driven on a bearing of

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[13] A. Montgomery: Report on the Mathinna Goldfield, 1892.

[14] W. H. Twelvetrees: Report on the Mathinna Goldfield, Part I., 1906.

[15] W. H. Twelvetrees: On Some Gold-mining Properties at Mathinna, 1914.

S.72°W. at depths of 150 feet and 233 feet. The upper crosscut intersected the lode at 94 feet from the shaft, and a drive was extended north for 54 feet. For the first 28 feet in the crosscut the country rock was similar to that in the shaft, but over the remaining distance it consisted of interbedded slates and sandstones, striking N.35°W. and dipping to the north-east at 75°. (This, by the way, confirms the general north-easterly dip observed to the east of the zone of close-folding shown on the general plan. Plate I.) Where intersected in the crosscut the formation was composed of 1 foot of quartz on the footwall, four feet of sandstone and quartz leaders in the centre, with two feet of quartz and a foot of flucan on the hanging-wall. In the north drive, the footwall quartz varied from one to four feet in thickness and was richer in the bottom of the drive than elsewhere. The remainder of the formation consisted of irregular veins of quartz penetrating the sandstones. At this level the reef formation trends generally north and south and dips west at 70°. At the 233-ft. level the reef was intersected at 120 feet from the shaft. Drives were extended 80 feet north and 29 feet south, but the reef was ill-defined and poor.

The main crosscut was then continued for a further distance of 115 feet, but the smaller north-west trending reef was not intersected, even though the crosscut had then been extended 30 feet beyond the expected position.

Some further prospecting work was carried out on the surface during the years 1901-2, but this does not appear to have met with any success.

In 1914, a prospecting shaft was sunk towards the northern end of the Golden Stairs Reef by Mr. T. Brannan. This reached a depth of 48 feet, and ten tons of quartz is stated to have been crushed for a return of 10 dwt. per ton. The reef-channel was described by Mr. Brannan as being 4 feet 6 inches wide and very mullocky.

On the northern side of Wilson-street is the old Welcome Stranger shaft. This was sunk as a

result of the discovery of some loose specimens. The reef-channel trends N.77°E. The shaft reached a depth of 40 feet, and the track of a reef was cut in a drive, but, as no gold was found, work was abandoned. On an assurance that gold had been left in the bottom workings, the shaft was cleaned out in 1891 or 1892, but only a reef-channel with two walls was disclosed.

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

It is stated that £1500 worth of gold has been obtained from the shallow alluvial workings to the north of the Golden Stairs shaft. It is probable that this has been shed from the known reefs in the vicinity.

A plan of the Golden Stairs workings is contained in each of Twelvetrees' reports.

(2) J. Brock's Enterpise Mine.

Sections 10,796-M, 1753-G, 10,797-M, 1737-G, *and* 10,798-M.

These are all 5-acre sections, and extend between Giblin and Smith streets. They are held by J. Brock.

The principal workings on these sections consist of three shafts. These are shown on the accompanying plan (Plate II.). A reef trending in a general north-easterly direction outcrops in Mangana-street, and in the north-western angle of Section 10,796-M an underlay shaft has been sunk on it to a depth of 76 feet, the angle of dip being 68½° north-west. At the time of my examination this was only accessible for 38 feet, the water having risen to within a few feet of that level. At 38 feet a drive, bearing 215½°, had been extended on the reef for 15 feet. In the face of this drive, the reef is 8 inches wide and dips to the north-west at 70°. Of this 8 inches, 3 inches on the hanging-wall is stated

to contain from 3 to 4 dwt. per ton, the other 5 inches carrying only a few grains. The quartz appears to cut out in the roof above the face. Ten feet from the shaft the reef widens to 18 inches, and in the north-eastern end of the shaft it increases to 2 feet 9 inches. A sample taken over the full width of the reef at this point was assayed in the Government Laboratory, Launceston, with the following result:—

Gold: 2 dwt. 8 gr. per ton.
Silver: 0 dwt. 13 gr. per ton.

Ten feet below this level there is stated to be a vein of quartz in the north-eastern end of the shaft, 7 to 8 inches wide, and containing about 15 dwt. of gold per ton. According to Nye's ([16]) report, drives were extended north-east and south-west at 70 feet. These are described as follows:—" In the north-east drive the quartz vein was up to 12 inches wide, and associated with oxides of iron; it is stated that the reef gave good prospects of gold. At 20 feet from the shaft the quartz peters out, as the reef-channel bends to the north, but oxides of iron persist. In the south-west drive the walls are at first 2 feet apart. Going south-west, the quartz vein becomes narrow and turns more to the west. At the face a good hanging-wall occurs, but there appears to be quartz to the west of it." The surface outcrop of this reef has been exposed in some trenches in a town allotment to the south-west of the shaft. These bear 237° for 15 feet and then at 207° for 60 feet. The first 30 feet of this shaft was sunk by Mr. T. Brannan, and about 10 tons of quartz is stated to have been crushed at the Jubilee battery for a return of 6 dwt. per ton.

One hundred and fifty-five feet to the south-west of the above shaft, and in the eastern portion of Section 1753-G, another shaft has been sunk on a reef striking N.35°W. and dipping to the south-west at 80°. About 20 feet north of this shaft is an old stope, which connects with the shaft at the 30-ft.

([16]) P. B. Nye, M.Sc., B.M.E.: Report on the Selection of Bore Sites for Brock Bros., 1927.

level. At this level there is a quartzose formation at the northern end of the shaft, varying in width from 2 to 3 feet. This has been stoped to the north, and connects with the old stope already mentioned, but at the southern end the quartz narrows to about 18 inches. At the 50-ft. level a drive has been extended 12 feet south. Over the length of this drive the reef varies in width from 0 to 15 inches; it strikes north and south and dips west at 80°. Near the south end of the drive a cuddy has been extended into the west wall, and this has disclosed about 8 inches of quartz striking north-west and dipping south-west at 55°. The average gold content of the reef at this level varies from 3 to 4 dwt. A winze has been sunk at the south end of the drive to a depth of 26 feet, and, from the bottom, drives were extended 10 feet south and 38 feet north. The vein in the north end is from 2 to 3 inches wide and in the south end 15 inches. About 5 feet south of the winze the vein carries 5 dwt. of gold per ton. The average dip of the shaft from the surface to 50 feet is 75°W.

Under the heading of "Hen and Chickens," Twelvetrees has described some workings on a reef which may be identical with the north-south reef described above. The description is as follows:—"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."

In 1927 it was decided to test the northern extension of these reefs by diamond-drilling. A bore site was selected by P. B. Nye, which was designed to cut the north-south reef at a depth of 101 feet below the surface, and the north-east trending reef at a depth of approximately 233 feet. This bore was located 180 feet north-west of the south-western shaft, and was laid out on a bearing of E.14°S., the angle of depression being 56° (34° from

the vertical). Drilling was commenced early in 1928, and the hole was extended 570 feet. The details of the country intersected are as follows:—

Feet.	
0-89	Slate.
89-130	Slate, sandstone, and quartzite with mineralised quartzite at 110 feet.
130-200	Slate.
200-214	Slate and sandstone.
214-226	Sandstone and quartzite.
226-237	Sandstone with bands of quartz.
237-300	Hard sandstone with bands of quartz.
300-305	Quartz formation.
305-351	Slates and quartzites.
351-355	Quartz formation.
355-368	Slate with bands of quartz.
368-434	Slate with banks of quartz at 382-384 and 421-423.
448-549	Slate with bands of quartz.
549-570	Slate with occasional bands of quartz.

It seems probable that the north-south reef is represented by the mineralised quartzite at 110 feet, and that the north-east trending lode is represented by the quartz formation at 300 to 305 feet. Samples of core from 300 to 305 feet and from 351 to 355 feet were forwarded to Mr. Brock, but they are understood to have been poor.

These reefs are converging to the south, and the channels should intersect at approximately 150 feet south of the south-western or No. 2 shaft. There is a possibility that payable quartz may be found at the intersection, and it would be advisable to continue development work with the object of testing it at a depth of 100 feet. The cheapest and most efficient way to do this would be to continue sinking No. 2 shaft to a depth of 100 feet from the surface and to drive south along the reef for 150 to 200 feet. As is shown by the plan, the distance from this shaft to the plotted position of the intersection is far less than that from No. 1 shaft.

Should this prospecting work be undertaken, it should be carried out as cheaply as possible. Both reefs are gold-bearing and, as stated above, there is a chance of something being found at their intersection. At the same time prospects are not sufficiently bright to warrant the expenditure of any large sum of money. There is absolutely no need to sink a new shaft as the No. 2 shaft could probably be placed in a sufficiently good state of repair to enable sinking to be continued to 100 feet.

The third shaft mentioned is located in the north-eastern portion of Section 10,797-M, and lies about seven chains south of those described above. This was sunk in the early days of the field by the old Golden Spur Company, and is now inaccessible. It is described by Montgomery as follows:—" The main shaft, over 100 feet deep and 10½ feet by 4 feet in the clear, is situated in Section 333-87G. It was sunk on a vein of gold-bearing stone from which fair prospects were obtained. The same vein has been traced to the south-east in Section 404-87G, where, however, it is very small, only ½ to 2 inches wide. The walls are pretty well defined nevertheless, and the dip is S.W. at 64°."

The vein described by Montgomery is probably identical with a formation exposed in some deep trenches about 2 chains south-east of the shaft. The formation consists of small quartz stringers, occurring in weathered quartzite. It strikes 140°, and dips steeply to the south-west.

(3) Section 10,998-M, 5 Acres.

This is located on the hill at the eastern end of Smith-street. The section is held by P. J. Holdensen. The position of the various shafts is shown on Plate III.

About one chain south of the Catholic church, a prospecting shaft has been sunk to a depth of 200 feet. Water had risen to within a few feet of the 100-ft. level, but it is stated that only a short prospecting drive had been extended 17 feet south-west at 200 feet. At the 100-ft. level plat the rocks con-

sist of black and greenish coloured slates, the cleavages striking N.30°W. and dipping south-west at 83°. No crosscutting has been done at this level.

A 5-inch drill-hole was extended some distance below the bottom of the shaft, and this intercepted a formation which is stated to carry gold.

Very little underground prospecting has been done on this portion of the field, but it may be pointed out that a shaft, no matter how deep it be sunk, tests very little of the country unless crosscuts are extended from it. This applies particularly to this portion of the field, as the known reefs trend north, north-west, or north-east, and all dip at steep angles. As shown on Plate III., the only exploratory crosscut north of the Tasmanian Consols, or North Golden Gate Mine, is that extending west from the Gate Extended shaft. It is suggested, therefore, that very useful work could be done in this portion of the field by extending exploratory crosscuts north-east and south-west from the 200-ft. level. In order to cross the strike of both bedding and cleavage planes as near as possible at right angles, and thus test a maximum amount of country on both sides of the shaft, the directions of these crosscuts should be W.30°S. and E.30°N. respectively. The western crosscut would probably intersect Moore's Reef at, approximately, 170 feet, assuming that the reef lines to the north and continues on its normal strike. It is considered that a maximum length of 300 feet for each crosscut should be sufficient to enable the country to be tested fairly thoroughly.

One hundred and seventy-six feet south of the above shaft is an old prospecting shaft, sunk by the Golden Spur Company with the object of testing Moore's Reef at depth. It is stated that this was sunk to 106 feet, but it is said that very little crosscutting was done from it.

An old shaft on Moore's Reef lies 150 further south, and from it a line of old stopes extends through the old cemetery on a bearing of 162°. The reef dips at a steep angle to the east and, judging by the stopes, is about 2 feet wide. The quartz in these workings is stated to have been payable.

(4) CONSOLIDATED LEASE 1201-G, 72 ACRES.

This is located immediately to the south-east of the Mathinna township, and is held by P. J. Holdensen. It includes the sections formerly held by the New Golden Gate and Tasmanian Consols Companies.

(*a*) *New Golden Gate Mine.*

A brief account of the history of this mine was given when dealing with the general history of the field. It was worked from 1888 to 1912 by the New Golden Gate Company, from 1912 to 1923 by Edward Moses and party, and from 1923 to 1929 by the Golden Gate Consolidated N.L. In 1929 the property was taken over from the last-named company by P. J. Holdensen, one of the principal shareholders.

Mining operations have been extended to a depth of 1903 feet, and levels opened out at the following depths below the collar of the main shaft, viz., 116 feet, 176 feet, 236 feet, 316 feet, 400 feet, and then at 100 feet intervals down to 1800 feet (except at 1700 feet). A winze was sunk from the 1800-ft. level to a depth of 103 feet, thus making a total depth of 1903 feet below the surface. In addition to the above an adit level had been put in before the New Golden Gate Company acquired the mine. This is 30 feet below the collar of the main shaft. The principal reefs occurring on the mine are the Upper West Reef, the Central Reef, Loane's Reef, the Main Reef, the East Reef, and the Lower West Reef.

With the exception of the western portion of the adit, which may be reached by way of the surface stopes on the West Reef, the whole of the mine workings are now inaccessible.

The following account of the mine has been compiled from existing reports and from information derived from the available mine plans. Various portions of the workings are shown on Plates III. to VIII.

The Upper West Reef.—This was originally worked from the surface, and, later, was cut in the adit level at 310 feet from the entrance. It was driven on for 132 feet north and 44 feet south.

The north drive is now accessible for only 30 feet; the reef is rather irregular and varies in width from 6 inches up to 3 feet. In the south drive there is very little quartz over the first 20 feet, but at that point the drive turns along a smooth wall striking 120° and dipping north-east at 75°. This is faced with quartz, 3 to 6 inches thick. At the bend in the drive, a branch drive extends for 22 feet on a vein of quartz striking north-east, and this has been stoped underfoot to a depth of 35 feet.

Montgomery states that J. McMurray (1881) was the last person to work this portion of the reef on any considerable scale. Three crushings were extracted, the details of these being as follows:—

First crushing: 23 tons for 9 dwt. 12 gr. per ton.

Second crushing: 124 tons for 13 dwt. 12 gr. per ton.

Third crushing: 200-300 tons for 3-4 dwt. per ton.

At the 176-ft., or No. 2, level this reef was intersected in the west crosscut at 200 feet from the shaft, and was driven on for 60 feet to the north-west. Where first cut it was composed of 3 to 4 feet of solid quartz, containing a little gold, but at 30 feet in the drive it diminished in size, and in the face there was very little quartz. Twenty-five feet further west, a branch drive has been extended in a south to south-easterly direction for 165 feet. This was driven by the Golden Gate Consolidated, in 1923, with the object of intersecting a reef worked above No. 4 level. This reef trends north-east, and was stoped up to within 25 feet of the No. 2 level drive, the stopes being connected to No. 2 level drive by a rise.

Below the No. 2 level, the West Reef does not appear to have been definitely located, but it seems possible that some fairly rich lenses of quartz, worked to the west of the main slide at the 316 feet and 500 feet levels, may represent branches of it. These are described in a later section.

The Central Reef.—This did not outcrop at the surface, but was intersected in the adit at 210 feet from the entrance. It consists of an irregular mass of quartz veins occurring over a width of approximately 10 feet. At 234 feet short drives have been extended to the north-west and south on a quartzose reef formation up to 3 feet wide; this appears to represent the main branch of the reef at this level. From 167 to 177 feet in the adit there is also an irregular reef formation, consisting of veins and bunches of quartz, which may form part of this reef or which may be a branch of Loane's Reef. The latter was intersected at 124 feet from the entrance.

At the 176-ft. level, the Central Reef was cut at 120 feet west from the shaft. It was still rather ill-defined, but the two main branches appeared to have joined. It was driven on for a short distance, both to the north and south, and a little gold was obtained from a winze sunk in the south drive. Montgomery considered that, below No. 2 level, the Central Reef channel joined the main channel formed by the junction of Loane's and the Main Reefs. At both the Nos. 3 and 4 levels the drives south from the junction of these reefs intersected a reef-channel coming in from the north-west. When this was cut at No. 3 level, the winze on the Central Reef at No. 2 level, which was standing full of water, was almost immediately drained, thus indicating that the two reef-channels are identical.

Loane's and the Main Reefs.—These were the most important reefs on the mine, and were worked by the New Golden Gate Company down to a depth of 900 feet and 800 feet respectively. Loane's Reef did not outcrop at the surface, but was intersected in the adit level at 124 feet from the entrance. When first cut the reef-channel showed only a little quartz, and no prospecting work was done on it by the company which drove the adit. In 1887 A. Loane sank a winze on this reef, and obtained a few tons of quartz, which yielded 1 oz. 8 dwt. of gold per ton. The New Golden Gate Company was then formed, and the sinking of a main shaft was commenced. At 100 feet in this shaft a new parallel reef was

intersected which was called the Main Reef. Above the 116-ft. level neither of these reefs proved valuable, as both contained only short shoots of payable quartz. At the 176-ft. level they were still poor, but at No. 3 level (236 feet) Loane's Reef increased to a width of 9 feet and yielded 2 oz. of gold per ton. The Main Reef also increased, both in size and gold content.

To the north of the shaft these reefs are parallel, the general direction of strike being approximately north and south. Both dip to the east at 80° to 85°. South of the shaft they converge and finally junction, forming one large body of quartz at the intersection. Above No. 3 level the length of the stoping ground on Loane's Reef ranged from 100 to 170 feet, and on the Main Reef from 100 to 200 feet, the average widths being about 6 or 8 feet. At No. 4 level, the length of payable quartz on Loane's Reef increased to 260 feet, the width being as much as 22 feet; on the Main Reef the length increased to 230 feet; and, in one of the stopes above the level, the quartz was 18 feet wide. At their intersection at this level, they formed a large body of payable quartz, 45 feet long and from 30 to 35 feet wide. From the 316-ft. to the 800-ft. level the length of the payable shoot on Loane's Reef ranged from 120 to 220 feet, the average being about 150 feet, but at 900 feet the length of the shoot had decreased to 80 feet and below that the reef dwindled to a track. The Main Reef was stoped over a length of 100 feet at the 400-ft. level, and at 500 feet there were two fairly big stopes, one being 100 feet long and the other 70 feet; between the 500-ft. and 600-ft. levels the length of payable quartz was approximately 150 feet, but from 600-ft. to 800-ft. it ranged from 30 to 70 feet. Below the 800-ft. level the Main Reef petered out.

The rich shoot of quartz formed by the intersection of these reefs was worked from level to level down to 800 feet. From the 116-ft. to the 700-ft. level it had a fairly regular pitch to the south-east, so that at each successive level it was found further to the south and east. Below 700 feet both reefs straightened up, and over the last 100 feet the

shoot was almost vertical. The southerly continuation of the reef-channel formed by the junctioning of these two reefs appears to have deviated along a prominent fracture in the country which was known as the main slide. This strikes N.30° to 35°W., and dips to the south-west at 65° to 75°. It consists of a fault zone, from a few inches to 4 feet wide, containing crushed and contorted slate, and, generally, a good deal of soft clayey material. Similar parallel fault zones occur to the west of it. These are not post-gold faults, inasmuch as they do not displace the reefs, but in many cases they appear to have exercised some control on the flow of the mineralising solutions. Other bodies of quartz, not directly connected with the principal reefs worked, were discovered by prospecting along the main slide. These are described in a later section. The average value of the quartz extracted from Loane's and the Main Reefs by the New Golden Gate Company was 18 dwt. per ton.

When the mine was taken over by Edward Moses and party, in 1912, the bulk of the work was confined to extracting blocks of ore left along Loane's and the Main Reefs. Many of these occurred in the walls of the old stopes. At the 236-ft. level a north-east branch of Loane's Reef was driven on for 40 feet. This contained from 3 to 4 feet of payable quartz. At the 316-ft. level payable quartz was also obtained from a more easterly branch of Loane's Reef. Some of the workings on Loane's Reef were also extended north into the Tasmanian Consols section. The syndicate worked to a depth of 500 feet, and at that level sank a winze on a block of quartz left by the company. This yielded a good many tons of quartz.

When the Golden Gate Consolidated purchased the mine in 1923, some additional work was carried out on Loane's Reef. At No. 2 level the north drive was picked up and driven a further distance of 84 feet, and an east crosscut was extended 15 feet at the end, but only a few small gold-bearing leaders were cut. At No. 4 level the south drive on Loane's Reef was picked up for 120 feet, and a winze was sunk 11 feet in order to pick up a wedge of payable

quartz occurring near the main slide. Some further work on Loane's and the Main Reefs was done at Nos. 7, 8, and 9 levels, and a small block of quartz stoped at No. 8 level. At No. 7 level (600 feet) the north drive on the Main Reef was extended to 166 feet from the main crosscut. Most of the drive showed about 3 feet of quartz, but, although this gave colours of gold when tried, it was unpayable. Ninety feet south of the main crosscut on this reef a winze was sunk 35 feet to connect with the old stopes at No. 8 level. The stoping at No. 8 level was apparently carried out on the Main Reef. According to the mine reports the quartz became small, and work was suspended. At No. 9 level some work was done south of the intersection of Loane's and the Main Reefs, and some stoping was done on Loane's Reef at 90 feet from the shaft.

The Annual Report of the Secretary for Mines for 1911 includes a report from the Manager of the New Golden Gate Company, who stated that large bodies of 7 dwt. ore had been left between the 600-ft. and 900-ft. levels. As far as could be ascertained this appears to have been on Loane's Reef, though it may also have included some ore on the Main Reef. According to Mr. C. S. Smith, a member of the syndicate who worked the mine after 1912, this ore was worked out towards the latter end of the New Golden Gate Company's operations.

The East Reef.—This was first discovered at the 900-ft. level, in 1896, by crosscutting south-east from Loane's Reef. It was followed up to the 800-ft. level, and subsequently was developed to a depth of 1900 feet. The general direction of strike is north and south, and from 800 to 1100 feet it is practically vertical, being about 50 feet west of the position of Loane's Reef at the 900-ft. level. Below 1100 feet it dips to the east at 60° to 65°, but becomes almost vertical at 1600 feet.

Between the 800-ft. and 900-ft. levels it was stoped over a length of 130 to 230 feet, the width ranging from 4 to 13 feet. From the 1000-ft. level up to the 900-ft. the average length of the stopes was 220 feet. At these levels the shoot of payable quartz was located from 100 to 360 feet south of

the shaft. At the 1100-ft. level the reef was stoped through to the 1000-ft. level from 50 to 210 feet south of the shaft, and a triangular-shaped block was stoped upwards between 260 and 390 feet south. These are shown on the accompanying longitudinal section (Plate VII.).

At the 1200-ft. level an arched reef formation occurs near the shaft, and this was presumed to be the axis of an anticline. The East Reef occurs along the eastern leg of this formation and the Lower West Reef along the western leg. It seems doubtful, however, as to whether this is a true anticline, formed by the arching of bedding-planes, and, from the descriptions, it seems probable that the anticlinal structure observed may be due to the junctioning of cleavages dipping in opposite directions. However, as stated earlier in this report, it would be impossible either to confirm or deny the actual existence of the anticline unless the occurrence could be examined. At this level the East Reef was first intersected at a point about 150 feet to the south-east of the shaft, and was driven on for 470 feet in a general southerly direction. Where first cut the reef was 12 feet wide, but very poor, and similar conditions persisted over the first 250 feet of the drive. Over the last 170 feet the reef was 12 feet wide, and contained 17 dwt. of gold per ton. It was stoped up to the 1100-ft. level over an average length of, approximately, 200 feet. At its southern end this shoot was intersected by the main slide, and at the intersection the reef turns in a north-westerly direction along it. A north-westerly drive was extended along the fault line for 200 feet and was found to contain broken and irregular veins of quartz similar to that seen in a displaced reef. According to Twelvetrees, the bend in the reef at this point represents a deviation along a pre-existing fault fissure, and there is but little doubt that this view is the correct one. The south drive on the reef was then continued a further distance of 270 feet. After passing through the slide the reef diminished in value to 8 or 9 dwt. From the end of this drive a crosscut was extended west for 260 feet, but failed to disclose anything

of importance. At a point 190 feet north of the slide an east crosscut was extended 233 feet, and at 180 feet from the drive this intersected a reef formation, 10 feet wide, containing bands of quartz from 6 to 12 inches in thickness.

At the 1300-ft. level the reef was intersected at a point 180 feet south-east of the shaft, and was driven on for a distance of 540 feet south. Where first cut it was 4 feet wide, but the width increased to 16 feet at a little over 100 feet from the crosscut. The value of the quartz varied from 3 to 9 dwt. per ton. The slide was cut towards the end of the drive, and north of it the reef was 15 feet wide, but of variable grade. Forty feet from the end of the drive a rise was put up, and this disclosed payable quartz. As shown on the longitudinal section, the stopes above this level are directly below those above the 1200-ft. level. A north-westerly drive was extended along the course of the slide for 70 feet, after which the drive turned due west for a further distance of 100 feet, but it is not known whether any quartz was obtained.

At 1400 feet the East Reef was intersected in a south-east crosscut from the shaft at 180 feet, and was driven on for 30 feet north and for 470 feet in a south to south-westerly direction. Where first cut it was 26 feet wide, but poor, and though well defined in the south-west drive it contained only from 1 to 3 dwt. of gold. The end of this drive is connected with the 1300-ft. level drive by a winze, but nothing of a payable nature appears to have been disclosed above the level.

No attempt was made to develop the East Reef at 1500 feet, but at the 1600-ft. level it was intersected in an east crosscut at 150 feet from the shaft, and was driven on for 30 feet north and 250 feet south. At the crosscut it was 5 feet wide and contained from 5 to 6 dwt. of gold per ton. At 150 feet south it was 6 feet wide and contained up to 5 feet of quartz in bands, but the gold content was low. No improvement appears to have taken place towards the end. At 10 feet in the north drive a winze was sunk 15 feet, and 43 tons of quartz

obtained, containing 1 oz. of gold per ton. The values in the winze were rather erratic, although the quartz itself was 4 feet wide and well defined.

At the deepest level (1800 feet) the East Reef was intersected at 187 feet east of the shaft, and was driven on for 104 feet north-east and 290 feet south-west. In the north drive it contained from 1 to 2 dwt. only, and in the south drive was generally poor, though occasional patches of quartz yielded up to 10 dwt. per ton. At 210 feet in this drive a winze was sunk to a depth of 103 feet, but the reef did not improve in value. In the face of the south drive the quartz died out.

The Golden Gate Consolidated extended the north drives at the 1100-ft. and 1600-ft. levels, but the actual extent of the driving and the results obtained therefrom could not be obtained.

The Lower West Reef.—This was first cut at the 1300-ft. level. A drive was extended south from the shaft for 124 feet, and from the end of this crosscuts were driven east and west to intersect the reefs. The West Reef was cut at 97 feet in the west crosscut and was 220 feet west of the East Reef. It was driven on to the north for 260 feet, or within 65 feet of the old Consols boundary. The reef-channel was 7 feet wide and contained only small barren veins of quartz. According to the mine plan of 1905, the New Golden Gate Company did not drive south of this level, but a more recent longitudinal section shows that the south drive was extended 150 feet from the crosscut. It is presumed that this work was carried out by the Golden Gate Consolidated. Two winzes were sunk from this level to the 1400-ft. level, one at 10 feet north of the crosscut and one at the end of the drive. These descend vertically, and prove that the reef-channel at this level is identical with that at 1400 feet.

A reef, called the No. 2 West Reef, was intersected 20 feet further west in the main crosscut, and this was considered to be a branch of the reef described above.

At the 1400-ft. level a crosscut was extended due west from the shaft for 505 feet. The West Reef was intersected at 112 feet and the No. 2 West Reef at 145 feet. Drives were extended on the West Reef for 197 feet north, to within a few feet of the Consols boundary, and for 440 feet south. The No. 2 reef was driven on for 54 feet on a bearing of 14½°. At the crosscut the West Reef was 12 to 15 feet wide, and over the first 100 feet of the south drive varied in width from 4 to 12 feet and contained from 8 to 24 dwt. of gold per ton. This shoot was proved to extend up for approximately 50 feet and down for 30 or 40 feet, after which both the width and value of the reef declined. In the south drive the reef was stoped over a length of 250 feet and about half-way up to the 1300-ft. level. Over the remainder of this drive only occasional bunches of quartz occurred, but the reef was 6 feet wide just near the slide, which was cut 10 feet from the face. Small veins and stringers of quartz passed through the slide and curved around to the south-west. In the north drive the reef varied in width from 5 to 12 feet and contained from 5 to 14 dwt. of gold per ton. It was stoped from 30 to 50 feet above the level, but over the last 60 feet the reef diminished in value and the stoping was discontinued.

The north drive on No. 2 reef contained leaders and bands of quartz up to 1 foot in thickness occurring over a width of 6 feet. This reef was also cut in two crosscuts of the south drive, one at 195 feet and the other at 310 feet from the main crosscut. The first crosscut disclosed 4 feet of quartz, but only a few inches was seen in the second.

At 375 feet in the long west crosscut a small slide was intersected which was considered to be the main slide.

At the 1500-ft. level the West Reef was intersected at 119 feet west of the shaft, and, according to the mine plan of 1907, was driven on for 180 feet north and 270 feet south. In the south drive the reef varied in width from 4 to 15 feet. The gold content varied a good deal and a lot of quartz was

low-grade. The reef was stoped up to the level above. In the north drive a shoot of quartz was stoped up for approximately 60 feet over a length of 80 feet. Over the last 70 feet the reef was about 20 feet wide, but contained only 3 to 4 dwt. of gold per ton. A winze 40 feet deep was sunk from this level by the Golden Gate Consolidated, and an intermediate level opened out on some quartz, containing from 3 to 20 dwt. of gold per ton.

At 1600 feet the west crosscut intersected the reef at 140 feet from the shaft, and a drive was extended north along it for 145 feet. At the crosscut the reef was 10 to 12 feet wide, but low-grade, and contained about 5 feet of lode-slate. At the end of the drive, on the west side, some quartz contained about 5 dwt. of gold per ton. A few feet from the end a crosscut has been extended east for 34 feet, and this contained small quartz veins occurring in the slates. A winze from the 1500-ft. level connects with the end of the drive.

At the 1800-ft. level the West Reef was intersected at 190 feet in the west crosscut from the shaft, and was driven on for 302 feet north, or 58 feet past the Consols boundary, and for 79 feet south. Over the first 120 feet the reef contained up to 26 dwt. of gold per ton, but, generally, the gold content was erratic. Over the remainder of this drive it was poor. At the boundary a crosscut was extended west for 21 feet. At 93 feet in the north drive a winze was sunk to a depth of 87 feet. The reef was about 4 feet 6 inches wide and contained 4 dwt. of gold per ton. In the bottom of the winze it was 8 feet wide and contained a little gold, but was not payable.

A reef worked by the Golden Gate Consolidated at the 900-ft. level was considered as being, possibly, the upward continuation of the West Reef.

Other Reefs.—These include a number of reefs worked to the south-west and west of the main shaft.

At the 1000-ft. level the New Golden Gate Company located a north-east trending reef called the New West Make. This occurred on the south-west

side of the main slide, and was followed up to the 600-ft. level. It proved to be a strong, high-grade reef. It widened to 100 feet at the 900-ft. level, but diminished to 30 feet at the 700-ft. This work was carried out during 1901 and 1902.

At the 500-ft. level a long crosscut was extended west from the shaft, and this intersected the main slide at 190 feet. A drive was then put in along the slide, and at 125 feet a reef trending south-west was cut. This was opened up over a length of 70 feet. It varied in width from 17 to 20 feet and contained 1 oz. 5 dwt. of gold per ton. At the northern end this was stoped up for 120 feet and at the southern end for 30 feet. At the south end of this stope, generally known as the Big stope, the reef turns sharply to the north-west, and was driven on a zig-zag course for 220 feet. This became known as the Zig-Zag Reef. The quartz was not altogether continuous, but was broken by several greasy leads or "slides." This reef was stoped above the level for heights ranging from 25 to 60 feet. At the end of this drive a large body of quartz was extracted from what was known as Bulger's stope. The Dug-out was a large stope which rose off the Zig-Zag. The shoot of ore was 18 feet long and pitched south at 55°. It was followed up on the underlay for 120 feet, when the shoot straightened up. A rise was then put up for 30 feet, and a small shoot of quartz extracted at the top of the rise. These working reached a vertical height of 130 feet above the 500-ft. level.

At the 316-ft. level the south-east drive along the slide intersected a reef which probably represents the upward continuation of the reef cut in the slide drive at the 500-ft. level. The stope on this reef at the 316-ft. level was known as Roder's stope. From the west side of Roder's stope a south-west trending reef was worked up to No. 2 level by the Golden Gate Consolidated.

The reef trending south from the slide at the 500-ft. level was also developed at the 600, 700, and 800-ft. levels. Some stoping was done at 700 feet, but the results of the work at 800 feet do not appear to have been very successful.

When the Golden Gate Consolidated Company took over the mine a drive was extended along the Zig-Zag Reef at the 600-ft. level. This work disclosed a new reef striking east and west. Drives were extended along this for 45 feet west and 55 feet east. The quartz was 2 feet wide, and extended for 40 feet in the west drive and for 34 feet in the east drive. The gold content of the reef was 1 oz. per ton. Drives were extended below this reef at the 700-ft. and 800-ft. levels, but the results of this work could not be ascertained.

When the New Golden Gate Company ceased operations in 1912, a total of 279,873 tons of quartz had been obtained from the mine for a return of 234,410·65 oz. of gold, and £355,200 had been paid in dividends. The company's last dividend was paid in 1905, and from that year up to 1910 an amount of £70,460 was expended on mine development. Of this the sum of £3200 was contributed by shareholders, and the balance was provided by gold won from the mine.

The total production of gold from the New Golden Gate Company's mine is shown in the following table:—

Production of Gold from New Golden Gate Mine.

Company or Syndicate.	Period.	Quartz.	Gold.
		Tons.	Ounces.
J. McMurray.....	—— to 1881	400 approx.	138·4
New Golden Gate	1888–1912	279,873	234,410·65
Edward Moses and party	Year 1912	..	192·25
	„ 1913	..	1115·05
	„ 1914	1,540	1,031
	„ 1915	2,137	2,774
	„ 1916	..	1,523
	„ 1917	542 quartz 1,000 tailings	323 118
	„ 1918	1,278	1,006
	„ 1919	1,383 quartz 7 pyrites	1,442 81
	„ 1920	970	627·6
	„ 1921	..	558·35
	„ 1922	1,416	802·40
	„ 1923	100 Other sources	48·80 183·00
Golden Gate Consolidated	„ 1923	2,005 14 pyrites	888·20 114
	„ 1924	..	1571·46
	„ 1925	..	533·50
	„ 1926	1,584	1481·00
	„ 1927	..	1759·50
	„ 1928	261 quartz 2,910 tailings	214·10 292·73
	„ 1929	210 quartz 1,154 tailings, &c.	384·20
P. J. Holdensen...	„ 1930	328 sands	56·57
„ „	„ 1931	256	158·30
„ (tributors)	„ 1932	..	37·04
		Total	253,865·10

In addition to other exploratory work on the mine, the New Golden Gate Company extended a long crosscut to the east at the 500-ft. level. This was put in from a south-east to southerly drive extending from Bulger's stope workings. The crosscut was commenced from a point approximately 650 feet south of the shaft, and followed a south-easterly course for 113 feet, after which it turned due east for 710 feet. Nothing of a payable nature appears to have been disclosed by this work.

It is fairly certain that practically all of the payable ore which was left by the New Golden Gate Company was extracted by E. Moses and party and the Golden Gate Consolidated. Nevertheless, a close examination of the mine plans shows that there is a large block of untested ground to the south-west of the slide, between the 1000-ft. and 1400-ft. levels. Furthermore, very little driving has been carried out on the East Reef north of the main shaft. Beyond the ends of the drives the reef has been cut in only six places, viz., in the boreholes from the 1200-ft., 1300-ft., 1500-ft., and 1600-ft. levels at the North Gate Shaft, and in the two crosscuts from the North Gate workings at 1400 feet.

(*b*) *Tasmanian Consols, or North Golden Gate Mine.*

The Tasmanian Consols main shaft is located 264 feet north of the New Golden Gate shaft, and is 28 feet below it. The workings have been inaccessible for many years, but accounts of the principal mining operations are contained in the reports of Montgomery and Twelvetrees, and some further details are contained in the annual reports of the Secretary for Mines.

The sinking of the main shaft was commenced by the North Golden Gate Company N.L. some time prior to 1890, and at the time of Montgomery's visit to the field, in 1892, it had reached a depth of 405 feet, and levels had been opened out at 150 feet and 392 feet. After 1892 this company sank the shaft still further and opened out a new level at 540 feet. The mine was taken over by the Golden Spur Prospecting Association in 1895, but work was sus-

pended in 1897, and the mine was transferred to the Tasmanian New Golden Gate Extended Company in 1898. The latter company did some prospecting work in the north drive at the 900-ft. level, and sank the shaft to 1000 feet, opening out a new level at that depth. Operations were suspended in 1899, and the mine was sold to the Tasmanian Consols Company in 1902. This company sank the main shaft to a depth of 1600 feet and opened out at 100-feet intervals from 1000 feet to 1600 feet. Work was suspended in 1908. In 1914 the mine was taken up by Moses, Moses, Fullerton, and Smith, and some of the workings on the New Golden Gate Mine were extended northwards into this mine.

The following abbreviated account of the principal features of the mine has been compiled mainly from information contained in Montgomery's and Twelvetrees' reports. Montgomery has described the 150-ft. and 392-ft. levels, and Twelvetrees the 540-ft., 900-ft., 1000-ft., 1100-ft., 1200-ft., 1300-ft., and 1400-ft. levels. Information regarding the 1500-ft. and 1600-ft. workings was obtained from the mine plans.

One Hundred and Fifty Feet Level.—Crosscuts were extended from the shaft for 47 feet east and 31 feet west. In the end of the east crosscut an irregular formation, striking N.21°W. and dipping east, was driven on for 10 feet north and 10 feet south. It contained about 2 feet of broken slate and quartz, but was not gold-bearing. At 20 feet from the shaft, in the west crosscut, a body of quartz, 3 feet 6 inches wide, was intersected, but this contained only traces of gold. The reef formation cut at the end of the east crosscut was considered by Twelvetrees to be the northern extension of Loane's Reef.

Three Hundred and Ninety-two Feet Level.—At this level the east crosscut was extended 82 feet and the west crosscut 253 feet. Nothing of any importance was exposed by the eastern crosscut, but in the west crosscut lode-channels were intersected at 30 and 53 feet from the shaft, and, near the end, a number of quartz veins and some puggy lode material were intersected, which Montgomery

considered to be the extension of the Central and West Reefs of the New Golden Gate Mine. The reef formation at 30 feet was driven on for 40 feet north-west and 8 feet south, but was found to contain only small stringers of quartz. That at 53 feet was driven on for 86 feet north-west and 62 feet south-east. In the drives the reef formation consisted of two distinct walls, 5 feet apart, containing crushed slate and a little quartz. At the end of the south-east drive a winze was sunk 64 feet, and this contained some irregular veins and patches of gold-bearing quartz.

Five Hundred and Forty Feet Level.—At this level a crosscut was driven west for 277 feet. At 30 feet from the shaft an irregular lode formation, containing veins of quartz, was intersected, and this continued to 46 feet. Five feet further along the crosscut is another formation 2 feet 6 inches wide. These were considered to be the downward extension of the reef formations intersected at 30 and 53 feet from the shaft at the 392-ft. level. At 220 feet a fault, 2 feet wide, was intersected, and in the end of the crosscut there was a reef formation, 3 feet 6 inches wide, consisting of irregular lenses of white quartz. This was considered to be the West Reef cut in the adit of the New Golden Gate Mine, and it also corresponds in position with the reef cut at 470 feet west of the shaft in the Gate Extended Mine.

Nine Hundred Feet Level.—A crosscut was extended 196 feet west from the shaft. At 12 feet from the shaft a reef formation was intersected, carrying 4 to 5 inches of quartz on the east wall, and 6 to 15 inches on the west wall; the whole channel being 8 feet wide and dipping east. At 50 feet from the shaft a reef formation, 20 feet wide, was cut. This was composed of crumpled and twisted quartz, most of which was developed in the roof and sides. At 167 feet an easterly dipping reef, 6 to 9 inches wide, was intersected, and at the end of the crosscut there is a formation, 7 feet 6 inches wide, composed of quartz veins varying from 1 to 4 inches in thickness.

A drive was extended north for 54 feet on the formation nearest the shaft, i.e., at 12 to 20 feet, and at the end a winze was sunk to a depth of 60 feet. The quartz was stated to be gold-bearing, but narrow.

One Thousand Feet Level.—Crosscuts were driven east and west for 70 feet and 107 feet respectively, and drives were extended north and south from the east crosscut at 17 feet from the shaft.

In the west crosscut a west-dipping reef, 7 to 9 inches wide, was intersected at 20 feet from the shaft, and at 36 feet some quartz was seen lying irregularly in flat curves. From 87 to 92 feet, mineralised quartz veins, carrying a little gold, were cut, and, at the end, a lode formation, 2 feet wide, containing two 4-inch quartz veins.

In the east crosscut some small quartz veins were intersected at 10 feet from the shaft, and, 10 feet further east, an east-dipping vein 6 to 9 inches wide. The remainder of the crosscut is entirely in slate, with a few small quartz veins near the face.

The south drive has been extended 44 feet on an irregular formation consisting of a fairly persistent vein, 3 inches wide, with short parallel veins occurring at intervals. Near the end of the drive a crosscut was extended 12 feet into the west wall. This disclosed some irregular bunches of quartz. The north drive was extended to 43 feet and exposed irregular seams of quartz. Twelve feet from the end a short west crosscut exposed a reef formation, 4 feet 6 inches wide, containing quartz veins.

One Thousand One Hundred Feet Level.—A crosscut was driven west from the shaft, and at 37 feet and 40 feet two west-dipping veins of quartz, each 6 to 8 inches wide, were cut. One of these contained a little gold. A drive was then extended in a north-westerly direction along the reef-channel for 83 feet, but the quartz proved to be small and irregular. At that point a formation, 3 feet wide, containing mineralised quartz, was intersected, and the drive was turned north along it and continued for 127 feet, making a total of 210 feet from the

crosscut. In the end, this drive contains the track of a reef with a little mineralised quartz on the west wall. A crosscut was extended 12 feet into the east wall, but failed to disclose any quartz.

The east crosscut from the main shaft was continued for 12 feet only.

One Thousand Two Hundred Feet Level.—Crosscuts were driven 130 feet west and 40 feet east. After passing through 50 feet of dark-coloured slate the west crosscut intersected an irregular reef formation 15 feet wide. This consisted of 1 foot of gold-bearing quartz on the east side, with a 6-inch vein a little further west, and a 6-ft. formation of mixed slate and quartz on the west side. The quartz is stated to have contained 8 to 10 dwt. of gold per ton. Drives were extended north and south along this reef. The south drive was extended 50 feet to the boundary, but failed to disclose payable quartz. The north drive was stoped above the level to a height of 20 feet, the stopes extending from 30 feet to 110 feet north of the main crosscut. At 90 to 100 feet in the north drive a rise was put up 42 feet through the stopes. The reef was payable up to 20 or 25 feet, and then fell off in size and gold content. At 12 feet it was 5 feet wide; at 18 feet, 3 feet wide; at 25 feet, 2 feet 6 inches wide; and at 40 feet it was broken and valueless. At 155 feet from the main crosscut a crosscut has been extended 21 feet into the west wall, but nothing of a payable nature was cut. A few feet north of the crosscut a reef, showing 2 feet of low-grade quartz, went off into the east wall of the drive. North of this only bunches of quartz were seen in the reef. At 220 feet a crosscut was driven 77 feet in a north-easterly direction in order to intersect a reef formation cut on the east side of the shaft. The main drive continues past this crosscut for 38 feet, but it contains no quartz. From the north-east crosscut, at 22½ feet from the main drive, a drive was extended north for 107 feet on what was presumed to be the east splice of the West Reef. At approximately 70 feet in this drive the reef rises in the floor and

disappears again. Some quartz was seen along the drive at one or two places, and at the end a cuddy, extended into the east wall, intersected a reef formation, 2½ feet wide, containing gold-bearing quartz. A reef, 9 inches wide, was also intersected at 3 feet from the end of the north-east crosscut.

The east crosscut from the main shaft cut a reef at 27 feet, and a drive was extended south on it for 15 feet. This drive contained 6 inches of low-grade quartz over the first 7 feet, but the vein then split into small stringers. This formation dips to the east.

The reef worked in the main drive at this level corresponds with the West Reef worked in the lower levels of the New Golden Gate Mine. Here it has been worked 100 feet nearer the surface, so that this may represent the cap of it. At the same time, a consideration of the cross-section (Plate IX.) indicates that the reef formations intersected immediately west of the shaft from the 150-ft. level down to the 1100-ft. level may well represent the upward extension of this reef.

One Thousand Three Hundred Feet Level.—The west crosscut from the shaft intersected the West Reef at 58 feet. It consisted of an irregular quartzose formation about 20 feet wide. The south drive was extended 50 feet to the boundary. In the face the reef was 13 feet wide, but unpayable. It was separated into two portions by a horse of mullock, the eastern portion dipping east and the western portion dipping west. The horse of mullock was much wider at the intersection of the main crosscut, but narrowed considerably to the south. The north drive was extended 240 feet. Over the first 60 feet the reef was 6 feet wide and of good grade. Northwards from this point it pinched, but opened out to a width of 7½ feet at 100 feet from the crosscut. At 140 feet the reef contracted again, and over the remainder of the drive varied in width from 3 to 5 feet; it was sometimes broken and irregular and the gold content was variable.

The stopes at this level extend from the south boundary northwards for 230 feet, and connect with the floor of the stopes at the 1200-ft. level.

One Thousand Four Hundred Feet Level.—The west crosscut intersected the West Reef at 43 feet from the shaft. The reef consisted of 11 to 12 feet of quartz, containing 10 dwt. of gold per ton. The south drive was extended 50 feet to the boundary and the north drive was extended 340 feet from the crosscut. At 288 feet in the north drive a crosscut was extended east for 300 feet, and at 237 feet this intersected a reef which probably represents the East Reef of the New Golden Gate Mine. Drives were extended along this for 70 feet north and 20 feet south, and an underlay winze was sunk on it to a depth of 25 feet. The reef dipped east at 80°, and at a point 34 feet east of the underlay winze a vertical winze was sunk to a depth of 110 feet. At a depth of 100 feet in the latter a short crosscut was extended into the west wall. Where first intersected in the east crosscut this reef was 11 feet wide. It consisted of mixed quartz and slate and yielded results of 2 oz. per ton or more on assay. The south drive rapidly passed into a poor zone, and in the north drive quartz of much lower grade persisted for 25 feet only. In the bottom of the underlay winze the hanging-wall portion of the reef was 16 inches wide and contained 16 dwt. of gold per ton.

The West Reef was stoped from the south boundary northwards for 175 feet, the stopes being taken through to the 1300-ft. level. In the early stages of development work at the 1400-ft. level an intermediate level was driven 60 feet above the floor of the drive, and this disclosed a large body of high-grade quartz.

In 1928 the Golden Gate Consolidated Company extended an eastern prospecting crosscut from the North Gate shaft at the 1400-ft. level. This was driven to intersect a rich vein of quartz alleged to have been cut in a bore-hole. The crosscut was advanced to 283 feet, but no rich quartz was encountered. At 223 feet a reef, 3 feet 6 inches

wide, was cut, and this was driven on for 15 feet north and 17 feet south. The gold content ranged from 1 dwt. 4 gr. to 4 dwt. 11 gr. This is probably the East Reef of the New Golden Gate Mine.

One Thousand Five Hundred Feet Level.—At this level the west crosscut intersected the reef at 60 feet from the shaft. Drives were extended 38 feet south and 225 feet north. The main stope at this level extended from the end of the south drive northwards for 140 feet, and was 60 feet above the floor of the drive at its highest point. Generally the ore was much lower in grade than at the levels above. At 95 feet north from the main crosscut a winze was sunk in the drive to a depth of 20 feet, and at 125 feet a rise was put up 40 feet. The ground was stoped out for 15 feet north and 25 feet south of the latter, the maximum height of the stope being 15 feet above the roof. Judging by the drives the reef appears to have been about 6 feet wide.

One Thousand Six Hundred Feet Level.—The west crosscut intersected the reef at 50 feet from the shaft, and drives were extended 50 feet south and 130 feet north. Twenty feet north of the main crosscut a winze was sunk to 30 feet, and at 90 feet a rise was put up for 4 or 5 feet. Near the end of the north drive a short crosscut was extended into the west wall.

The work at the 1600-ft. level does not appear to have disclosed any payable ore, as no stoping was carried out.

The occurrence of the various reefs on this mine is illustrated by the accompanying plans and cross-section (Plates III., V., and IX.).

From the 1200-ft. level down to 1600 feet diamond-drill bores were extended east from the shaft, but the records of these could not be obtained, though they are said to have intersected the East Reef.

The production of gold from this mine is shown in the following table:—([17])

Production of Gold from the Tasmanian Consols Mine.

Period.	Quartz.	Sands.	Gold.
	Tons.	Tons.	Ozs.
October to December, 1904..	886	..	501
January to December, 1905..	5447	..	2029
January to June, 1906.....	3985	..	1747
July to December, 1907.....	7117	3189	2779
January to September, 1908 .	6175	3700	2459
Total	23,610	6889	10,115

In addition to the above, 77½ tons of pyritic concentrates, containing 383 oz. of fine gold, were obtained up to December, 1905, and 29 tons, containing 338 oz. of fine gold, up to December, 1907; and during the last quarter of 1907, 3091 tons of old tailings were treated at the New Golden Gate plant for a return of approximately 161 oz. of fine gold, valued at £683. Thus the total production was 23,610 tons of quartz for a return of 10,997 oz. of gold, an average of 9·3 dwt. per ton.

(*c*) *South Golden Gate Shaft.*

This is located towards the southern end of the Consolidated Lease, and lies about 19 chains south-east of the New Golden Gate shaft. Work at this shaft had been suspended some time prior to Twelvetrees' visit in 1906, but he obtained a general account of the principal workings from Mr. Andrews, then Manager of the New Golden Gate Mine. A summary of this account, supplemented by information derived from the mine plans, is given below, and the mine workings are shown on Plate X.

The main shaft was sunk 400 feet, an east cross-cut was driven at 200 feet, and at 400 feet two long

([17]) The figures up to December, 1905, were obtained from Twelvetrees' report, and the remainder from the quarterly statistics given in the "Mineral Industry."

crosscuts were extended east and west. At 20 feet from the shaft in the east crosscut a 6-ft. reef formation was intersected, carrying quartz, but no gold. This runs approximately with the country and dips to the east. It was driven on for 32 feet with negative results. This was thought to be the Snake Reef, which was prospected in the early days of the field by a shallow shaft a few chains to the north. The crosscut was then extended to 174 feet from the shaft, but nothing of any value was intersected.

At the 400-ft. level the west crosscut was extended 413 feet and the east crosscut 492 feet. A wall was intersected at 227 feet in the west crosscut, but very little quartz was seen. In the east crosscut a formation, 60 feet wide, was intersected between 130 feet and 190 feet from the shaft. This was considered to be on the downward extension of the reef cut at the 200-ft. level. Eighty-four feet further in, a second formation, 75 feet wide, was cut. The remainder of the crosscut proved to be barren. According to the mine plan of 1897, no driving was done on either of the formations in the west crosscut. Hence it seems probable that neither could have been gold-bearing.

(5) The Caledonian Mine.

Section 10,714-M, 19 *Acres.*

(*a*) *Caledonian and Adjoining Workings.*—This is located to the east of Long Gully Creek, and lies about 40 chains east of Mathinna.

The reefs on this section were originally worked by the Caledonian Company, and subsequently by the Gate Extended and Golden Ladder Companies. Descriptions of the principal workings are contained in the reports of Montgomery ([18]) and Twelvetrees. ([19]) ([20]) The reefs and underground workings are shown on Plate III.

([18]) A. Montgomery: Report on the Mathinna Goldfield, 1892, pp. 52 and 53.

([19]) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part I., 1906.

([20]) W. H. Twelvetrees: On Some Gold-mining Properties at Mathinna, 1914.

The old Caledonian adit has been extended in a north-easterly direction into the hill for a total distance of 317 feet (measured from the toe), and was evidently driven with the object of intersecting the reefs worked in the old surface stopes above it. Over the first 100 feet it passes through fissile slates striking N.10°W. and dipping to the east at 65°, and from 100 to 172 feet there are a few small veins and bunches of quartz varying in width from a few inches up to one foot. At 172 feet there is a large body of quartz, containing a good deal of broken country rock, which strikes in a northerly to north-westerly direction and dips to the east at 65°. The drive has been filled with mullock over the next 20 feet, but, by crawling over a portion of this, the inner workings may be reached by way of a short east crosscut. At 200 feet from the toe, just beyond the mullocked portion, a reef has been intersected, and has been driven on both to the north-west and south-east. The north-west drive trends at 293½° and has been extended 28 feet, but the reef pinches to a mere thread a few feet from the main crosscut. Between 11 and 17 feet in this drive the quartz body, cut at 172 feet in the main crosscut, has been intersected and has been driven on to the north for 42 feet. At 17 feet the main body of quartz enters the west wall, but an irregular bulge, about 2 feet wide, may be seen in the face. The south-east drive trends 136° and has followed the reef for 23 feet, at which point a winze has been sunk on it to a depth of 40 feet, the quartz varying in thickness from 20 to 24 inches. The reef has been stoped above this drive to a height of 35 feet, the stopes extending back over the north-east drive. For the first 19 feet the reef dips at 70° to the south-west, but over the upper 16 feet it dips at 50°. Twenty-three feet above the floor of the level the stope is 28 feet long and bears 113°; the quartz appears to have been 12 inches wide. In the roof of the stope there is an irregular bunch of quartz, 1 foot wide, at the north-western end, but going south-east the vein dwindles to a mere thread. An intermediate level has been driven above these stopes,

and from it a rise has been put up for 25 feet. In the western end of these workings the same large body of quartz is seen as occurs in the main adit.

Beyond the winze the south-east drive has followed a flat reef for 53 feet. This is exposed in the roof and varies from a few inches up to 2 feet in width. The same flat reef has been followed south-westerly in a crosscut, but dips into the floor at 15° at a point 19 feet from the drive. This reef also appears to have been cut in the east crosscut at 172 feet from the toe of the adit; there it dips south-west at 10°. At 53 feet from the winze the drive turns to the east along a vertical reef formation, 18 inches wide, containing two 6-inch quartz veins, and at 14 feet a winze has been sunk on this to a depth of approximately 20 feet. The drive continues to 44 feet from the turn, but there is very little quartz in the face.

At 220 feet along the main crosscut a drive has been extended 54 feet along a puggy reef formation, 2 to 4 feet wide, and containing numerous small quartz veins. This trends 126½° and dips north-east at 70°. Thirty-six feet beyond this drive, i.e., at 256 feet, there is an irregular bunch of quartz veins occurring on either side of a smooth, puggy plane, striking 130° and dipping north-east at 45°. The crosscut then turns more to the north, and continues for a further distance of 62 feet. Over this portion it passes principally through black slates, but near the end these contain beds of quartzite. The bedding-planes strike N.30°W. and dip to the north-east at 85°.

The largest of the old surface stopes lies almost directly above the intersection of the main crosscut and the south-east drive. It trends at 73½° and dips north at 70°, but turns slightly to the north-west at the western end, and to the south-east at the eastern end. The width of the stope varies from 2 to 12 feet, and the total length is about 50 feet. Quartz veins, 3 to 4 inches wide, are exposed at either end. About 40 feet north of this there is another old stope, 37 feet long, on a reef trending 112° and dipping north at 60°; the quartz varies

in width from 2 to 12 inches. The old stopes of this mine are reported to have yielded quartz containing about 18 dwt. of gold per ton.

About 3 chains east of the old surface stopes there is a line of shallow workings on a reef trending east. This has been traced over a length of approximately 200 feet, and, where now exposed, the quartz varies in width from 6 to 12 inches. Battery tests on this reef are stated to have yielded up to 23 dwt. per ton when it was first cut. A shaft has been sunk at the western end of the trenches, and this may be identical with a winze, 23 feet deep, described by Twelvetrees ([21]). It is difficult to see any sign of a reef formation, but it appears to run N.30°W. with the shaft, and to dip south-west at 75°. According to Twelvetrees, the reef followed in the winze had a north-easterly trend, so that it is possible that the two are not identical, i.e., unless a mistake has been made as to the direction of the reef. Above the trenches, and near the eastern boundary of the section, another shaft has been sunk on a formation striking N.70°E. This was probably sunk by Messrs. Reece and Lawson in 1912 or 1913.

On line with the east-trending reef mentioned above, and 2 chains east of the eastern boundary of the section, there is a deep trench, 35 feet long, on a reef striking 93° and dipping north at 80°. This varies in width from 3 to 6 inches, and is stated to contain a few pennyweights of gold per ton.

As shown by the plan (Plate III.), the northern end of the main adit has passed beyond the line of these east-west workings, but the reef has not been intersected.

In the south-east corner of the section is an old tunnel which was formerly used as an explosives magazines by the New Golden Gate Company. This was commenced by the old Golden Ladder Company with the object of intersecting a reef outcropping higher up the hill, but work was abandoned some time prior to 1892. The adit has since been extended

([21]) W. H. Twelvetrees: On Some Gold-mining Properties at Mathinna, 1914, p. 20.

to 317 feet. At 137 feet an irregular reef formation, striking 130° and dipping 80° south-west, has been driven on for 14 feet. Nothing of any consequence is exposed over the remainder of the adit.

Eighteen chains south-east, along the ridge from the north-east corner peg of this section, there are two shafts, each about 15 feet deep, which have been sunk on two separate east-west reefs. In the southern shaft the reef formation is 18 inches to 20 inches wide, and contains numerous small quartz veins. In the northern shaft there is from 12 to 18 inches of quartz trending at 95° and dipping south at 70°. On the north-eastern fall of the hill, and 2 chains north of the above shaft, an adit has been driven 150 feet in a southerly direction to intersect this reef. At 100 feet in the adit a winze has been sunk on a 3-inch vein striking north and south and dipping east at 55°. The winze is 10 feet deep, and from the bottom a drive has been extended 6 feet north. This vein crosses the drive and enters the west wall at 118 feet. The drive then turns south-east along a few small veins, but at 134 feet it has intersected a vein, 6 inches wide, striking 175° and dipping 55°E. This tails out at 9 feet from the face. The reef worked in the shaft does not appear to have been intersected in the adit.

(*b*) *Gate Extended Shaft.*—This is located in the north-west corner of the section. Details of the workings are contained in Twelvetrees' report,[22] and the following summary has been derived from that source. The shaft and the crosscuts from it are shown on Plate III.

The shaft was sunk to 410 feet, and, at 400 feet, crosscuts were extended 311 feet east and 863 feet west. At 182 feet west of the shaft a drive was extended 106 feet to the south-east on a mullocky reef formation, dipping east, about 2 feet wide, carrying bunches and bands of low-grade quartz. At 250 feet a solid body of low-grade quartz was intersected which was 2 feet wide on the south

[22] W. H. Twelvetrees: Report on the Mathinna Goldfield, Part I.

side of the crosscut. At 354 feet a vein of highly mineralised quartz was intersected, and similar material occurs at 364 feet. At 380 feet there is a 6-inch north and south vein of quartz associated with lode-matter and other small quartz veins. At 470 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 Golden Gate adit, and has been cut in the 392-ft. and 540-ft. levels of the North Gate, or Consols, Mine. A drive was extended along this formation, commencing on 1 foot of gold-bearing quartz. At 80 feet from the crosscut the reef-channel was 3 feet wide, with a foot of solid quartz 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 mullocky formation 3 feet wide. No drive was extended south on this reef. Continuing west along the crosscut, mineralised veins of quartz were cut at 491 feet from the shaft, and at 560 feet there were a few bands of quartz occurring in hard country. Several small mineralised veins of quartz were cut at 585 feet, 696 feet, and 716 feet, and some barren quartz at 767 feet. Numerous quartz veins were intersected at 783 feet and a small vein at 835 feet. The end of the crosscut is in clean slate.

With regard to the east crosscut, a reef-channel, 2 feet wide, was intersected at 193 feet from the shaft, and several highly mineralised veins were cut at 206 feet. At 217 feet the country rock consisted of blue slate, containing bands of quartz dipping to the west. A south drive was commenced on the reef at 193 feet, as it was considered that the reef worked in the old Caledonian tunnel was identical with this. At 50 feet from the crosscut the formation was 3 to 4 feet wide, carrying mineralised quartz on the footwall, but at 86 feet, and thence to the end at 98 feet, it was broken and discouraging.

(6) Star of Mathinna Mine.

This old mine has been abandoned for many years, and was inaccessible when Montgomery made his examination of the field. The main shaft is located 12 chains north of the Gate Extended workings. Another small shaft has been sunk about 1 chain to the south, and this discloses a vein striking a little west of south and dipping to the south-east at 60°. In describing these workings, Montgomery states: "The Star of Mathinna shaft is on Section 469-87G; its depth was 157 feet. At 50 and 60 feet two gold-bearing leaders were passed through, dipping westerly. A crosscut has been opened out at 150 feet and driven S.78°W. 63 feet. At 21 feet from the shaft a reef was cut, 3 feet wide, and driven on 21 feet S.30°E., underlaying to the eastward about 4 in 6. This consisted of fairly solid quartz with well-marked clayey walls. It contained no gold, and became small in the end of the drive and split up into leaders. At 44 feet from the shaft a lode, 2 feet wide, underlying west, was cut, from which there was a considerable flow of water. No driving was done on this, as it contained no gold, and the formation was much broken." These particulars were obtained from Mr. S. Richards.

The small prospecting shaft was sunk to 30 feet, and in the bottom the reef split into two branches, one underlaying east and the other west. North of this shaft the reef appears to turn due north.

(7) East Golden Gate Workings.

The old workings on this mine are located a few chains north of the north-east corner peg of Section 10,714-M, and lie approximately half a mile east of Mathinna.

Two small shafts have been sunk near the top of the ridge on small gold-bearing veins, but no particulars regarding them are available. A main shaft was sunk to a depth of 200 to 300 feet, and an adit was extended into the hill from the eastern fall. The former has been inaccessible for many years, and the latter has collapsed at the entrance. The shaft has been sunk in dark-blue and black slates and dark-coloured quartzites.

About 2½ chains north of the main shaft there are some old workings on a vertical reef striking N.45°E. This varies in width from 9 to 12 inches. Another reef occurs about 5 chains north-west of the shaft. This varies in width from a few inches up to 1 foot and strikes N.40°W. It has been traced by surface trenching over a length of 90 feet.

The New Golden Gate Company did a considerable amount of prospecting and development work from the main shaft, but the results obtained were discouraging.

(8) Golden Hinges Mine.

Section 1154-93G, 10 *Acres.*

This is located on the eastern side of Black Horse Gully, about 30 chains south of the township.

The workings are shown on Plate XI. They consist of an adit driven into the hillside for 274 feet. Over the first 208 feet the drive bears N.47°E., after which it turns on a bearing of N.13°E. At 77 feet from the portal there is an irregular bunch of quartz, 4 feet wide on the north side and 2 feet on the south. At 109 feet there is another small vein, but this appears only on the south wall. At 135 feet drives have been extended, north-west for 16 feet and south-east for 22 feet, on a puggy fault-fissure formation, about 2 feet wide, striking N.52°W. and dipping south-west at 70°. This contains small irregular lenses of quartz, and appears to represent a reef-channel, along which some movement has taken place. Towards the bend in the drive the slates are puckered and contorted and are full of small quartz veins. A distinct anticline occurs at 190 feet from the portal. From the bend to the face of the drive the rocks consist of sheared black slates containing numerous quartz veinlets. A winze has been sunk at the end of the drive, but it is stated that this was sunk purely as a prospecting venture; no defined reef or reef-channel occurs in the drive above it.

(9) The Eldorado Mine.

Descriptions of the workings on this mine are contained in the reports of Montgomery ([23]) and Twelvetrees. ([24]) The workings are shown on Plate XI. herewith.

(*a*) *North Eldorado: Section* 744-G, 10 *Acres.*

This is located about 50 chains south of the township, and lies to the east of Black Horse Gully.

The principal workings on this section consist of three shafts, some surface stopes and trenches, and an adit. The shaft, 110 feet deep, located near the centre of the section, was sunk on a vein 18 inches wide. The vein strikes W.10°N. and dips south at 80°. A little over 2 chains to the west is another shaft, 20 feet deep, and from this a line of old surface workings extends W.10°N. for approximately 100 feet. The vein then turns south-west, and has been underhand stoped over a length of 20 feet. The adit shown on the plan was driven to intersect the vein worked in the 110-ft. shaft, but apparently it failed to achieve its objective. The structural features of the rocks exposed in this adit have been described in an earlier section, and need not be repeated here. It is sufficient to state that they consist of interbedded slates and quartzites folded into a series of anticlines and synclines. At 146 feet from the portal there is a bed of quartzite impregnated with quartz veins. An anticlinal fold occurs at the bend in the drive (224 feet), and a foot of quartz extends down the eastern limb. At 272 feet another bed of quartzite, impregnated with quartz veins, also occurs. At 290 feet there is a small, irregular quartz formation striking across the drive. A short drive has been extended along this, and a winze sunk 34 feet. The total length of the adit is 316 feet. None of the veins occurring in it have been found to be gold-bearing.

([23]) A. Montgomery: Report on the Mathinna Goldfield, p. 42 *et seq.*

([24]) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part II., p. 13 *et seq.*

According to Montgomery,[25] a number of tons of quartz were crushed from the old workings, but it was not very rich.

The shaft, 121 feet deep, in the north-eastern portion of the section, was sunk with the idea of crosscutting east and west at some depth, in order to intersect the supposedly faulted portion of the New Golden Gate Reef south of the "slide" in that mine. No record exists as to whether any crosscuts were ever extended from the shaft. It seems fairly certain also that the "slide" in the New Golden Gate Mine has not displaced the reef.

(*b*) *New Eldorado: Section* 1021-G, 10 *Acres.*

This adjoins the North Eldorado section to the south.

Two distinct reefs appear to have been worked on this section, both trending in a general east-west direction. It was thought that these were parts of a single reef which had been faulted, but an examination of the adit workings showed that no displacement has actually taken place.

The more westerly of these reefs has been worked at the surface by an open-cut about 40 feet long and from 20 to 60 feet deep. From the western end of the cut a line of shafts and shallow trenches extends along the outcrop for 150 feet, the direction being N.65°W. The reef is reported as having varied from 6 inches to 2 feet wide in the open-cut. Where it is now exposed in the more western workings the width ranges from 6 to 12 inches. Looking from the south side of the cut there is what appears to be the crest of an anticlinal fold, and to the west of this the reef appears to have been practically vertical, while to the east it appears to have turned south along the bedding, the dip of this portion being north-east at 65°.

The surface workings on the second reef are located 50 feet north of the eastern end of the open-cut described above. They consist of a shaft

[25] A. Montgomery: Report on the Mathinna Goldfield, page 43.

from which an open stope extends E.4°S. for 30 to 40 feet and then turns south. Looking at this stope from the surface, it would appear that two veins had junctioned. The stope dips 65°S. near the shaft, and the southerly portion dips 65°E. Montgomery's descriptions and the plan attached to his report show that these workings connect with the stopes above the east drive at the adit level. Further east, at the surface, a few small trenches have exposed irregular quartz veins up to 3 feet in thickness.

The adit shown on the plan has been driven in a general south-westerly direction to intersect the reefs at approximately 100 feet below the outcrop. The No. 2 reef was cut at 292 feet from the portal, and consisted of a well-defined wall, faced with an inch or two of quartz, striking at 306° and dipping south-west at 65°. This was driven on in a south-westerly direction for 34 feet, after which the drive takes a sharp bend to the north-east. The drive is accessible only for 17 feet beyond the bend, but the mine plan shows that it continues in a general easterly direction for a further 84 feet, making a total of 135 feet from the crosscut. From 14 to 25 feet from the crosscut the vein appears to have widened a little, and some stoping has been done above the drive. At 34 feet, i.e., at the sharp bend, it increases in width to 2 feet, and continues without interruption as far as the collapsed stopes, i.e., 51 feet from the crosscut. As the "slide" mentioned by Montgomery cuts this drive at 49 feet from the crosscut, it is apparent that it does not displace the reef, though it has had some influence on the distribution of the gold in it. As stated in an earlier section of this report, the so-called slide appears to be a quartzitic band occurring along a bedding-plane, and some slight movement has taken place along this. A shoot of payable quartz extended 50 feet eastwards from 49 feet, and, when stoped upwards, this was found to connect with the northern surface stope described above. Montgomery states that the slide may be clearly traced in the stopes above the drive, and that it forms the western end of the stopes and

cuts off the quartz. He describes the now inaccessible portion of this drive as follows:—"At 95 feet from the adit a winze has been sunk on the lode to a depth of about 60 feet, but at 38 feet the slide was met with, and, of course, cut off the stone. This was of very good quality right down to the slide. Another winze has been sunk 31 feet nearer the adit. Ten feet below the level the slide was struck, and the winze then continued down in good stone on the intersection of the lode and slide until the first winze was broken into. There is now about 18 inches of quartz showing in the side of this later winze in the first 10 feet below the level, but lower down it is very thin, though a good body of stone was found along the intersection. East of the main winze some 12 inches or so of quartz is seen going off into the hanging-wall. The drive, however, was turned more to the north-east, and soon passed through the lode altogether, the stone leaving it on the southern side, 30 feet past the winze. It seems to me, therefore, that the stone going into the hanging-wall just past the winze should have been followed. A block of good quartz has been left unstoped above the winze to protect it, but this appears to be the eastern end of the shoot of gold, for no stoping has been done further in."

A drive has also been extended 30 feet from the crosscut along the western portion of this reef, and a rise put up to 20 feet at the end. This work discloses the same well-defined wall as is seen at the beginning of the east drive; it carries from 1 to 2 inches of quartz.

The No. 1 reef has been cut in the adit at 312 feet and drives extended east and west. At the intersection the quartz is about 1 foot wide and dips south at 67°. The east drive has been extended to 36 feet, the vein diminishing in width to 2 inches at 12 feet. It has been underhand stoped near the end of the drive to a depth of 10 feet and a rise put up for 20 feet. The western drive has followed a well-defined wall dipping south at angles ranging from 53° to 67°. A few feet from the crosscut an underlay winze has been

sunk on about 3 to 12 inches of quartz to a depth of at least 60 feet. It is uncertain as to whether this winze connects with the workings from the main shaft. At approximately 30 feet a rise has been extended 18 feet, commencing on 16 inches of quartz, but no stoping has been done from it. The reef formation widens to 3 feet at 60 feet from the crosscut. At 100 feet from the crosscut the reef turns suddenly to the south along a bedding-plane dipping east at 25° to 35°. The drive continues for another 10 feet, and then turns south along the reef for 21 feet. The reef then turns westwards along another cross-fracture, and from 2 to 4 inches of quartz has been driven on for 59 feet, the dip of the reef changing from 30° south to 68° south as it gets further away from the influence of the bedding. The rocks in this western section of the workings are arched in the form of an anticline. The dip is practically horizontal in the west drive, with a slight dip to the west towards the end, while in the short south drive the dip is east. The reef has risen along the bedding-planes for a short distance above the south drive, and a flat stope has been taken up 25 feet over a length of approximately 16 feet.

The structure of the rocks along the main west drive could not be followed very clearly, but in the adit, north of the drives on No. 2 reef, they dip east at 55°. The anticlinal structure observed in the stope occurs almost directly above the intersection of the adit and the drives on No. 1 reef.

Near the south boundary of the section a main shaft was sunk 171 feet, and from it a drive was extended north-west at a depth of 163 feet. This was intended to intersect the reefs worked in the adit, but the results obtained are unknown. At 58 feet from the shaft a vein was cut striking N.80°E. and dipping south at 47½°. This was driven on both east and west.

From December, 1886, to August, 1892, the New Eldorado Company crushed 535 tons of quartz for a return of 810 oz. of gold. It was estimated by Mr. Clerke, mining manager in 1892, that 500 tons of quartz was crushed prior to 1886. He also

informed Montgomery that an early crushing of 29¼ tons yielded 100 oz. of gold. Details as to any further crushings are not available, but the company appears to have ceased operations shortly after 1892, and the lease was allowed to lapse in 1896. This property, along with the North Eldorado and other sections, was taken over by J. N. Lawson in 1904, and was held until 1908. It was during this period that the shaft was sunk in the north-east corner of the North Eldorado lease. Some work was also carried out in the Eldorado adit, but there is no record of any gold having been produced.

In 1909 the Eldorado adit was cleaned out and the east drive on No. 2 lode repaired for 95 feet. A drive was also extended 50 feet on a formation trending south-east. Six tons of quartz were crushed for a return of 13½ oz. of gold, but no record exists as from which drive this was obtained.

(10) Victorian Golden Gate Mine.

Section 856-G, 10 *Acres.*

This mine is located on the western fall of the Eldorado spur and on the eastern side of a small creek which passes Martyn's section.

The adit shown on the plan (Plate XI.) has been driven into the hillside for 241 feet. At 224 feet a quartz reef was intersected, and this probably corresponds with a reef seen in an old shaft located 4½ chains north-west of the portal. In the adit the reef consists of a lenticular formation striking E.24°S. and dipping south-west at 63°. It has been followed in the drive for approximately 30 feet, and is 4 feet wide in the centre, tapering away to a few inches at either end. It has been stoped for some distance above the drive, and has been followed down for 30 feet by an underlay winze, from which a little stoping also appears to have been done. The reef continues as a mere thread to 66 feet from the crosscut and then dies out. The drive continues in a direction slightly south of east to 140 feet from the crosscut and then bears 60° for 66 feet. At 98 feet from the crosscut there is a bed

of quartzite, striking N.27°W. and dipping north-east at 55°, which is impregnated with quartz veins. At 206 feet the drive turns in a direction 26° west of north and follows a well-defined wall forming the footwall of a reef-channel. The width of quartz varies from 6 inches up to 3 feet, and the dip is to the west at 63°. This drive has been extended 69 feet, but over the last 30 feet it turns due north, and the reef formation enters the west wall at 12 feet from the face.

The reef in the end of the adit workings is almost directly below an old vertical shaft sunk from the surface, but the two do not connect. To the east of the vertical shaft another shaft has been sunk 20 feet vertically, after which it underlays south at 60°. About half a chain north of these shafts are some old trenches on a quartzose formation up to 5 feet wide in places, trending N.68°E. The nature of the formations followed by the shafts cannot be seen, and it is difficult to correlate these surface workings with the reef formation observed underground.

No records are available as to the gold content of the reefs worked on this section.

(11) The Horseshoe Mine.

Section 1603-G, 10 *Acres.*

The principal workings are located on the eastern side of Black Horse Gully, about 30 chains south of the Miner's Dream.

The original discovery of gold on this section was made by J. Turner, who was joined by G. Webb and R. Stone. A small company, known as the Horseshoe Gold Mining Company, was formed, but after some preliminary development work, which included the sinking of an underlay shaft, the section was abandoned. When the Volunteer Consolidated Extended suspended operations on its leases west of the township, they took this mine in hand and carried out a good deal of work on it. This was commenced prior to September, 1905.

The formation appears to consist of a number of quartz-veins occurring along a bed of quartzite,

underlain by slates, folded in the form of an anticline. In short, it may be described as a saddle reef. The quartz veins occur along the bedding-plane between the quartzite and slate beds, and penetrate small cracks and joints in the quartzite. Some small veins also occur in the slate beds. The formation strikes approximately N.35°W.; the eastern limb dips at 30° and the western limb at 25°. In addition to the main formation, there appear to be a number of small veins or "droppers" penetrating the country below the anticline.

Mr. R. Stone informed me that the underlay shaft was sunk by the Horseshoe Company for 70 feet, on a bearing of approximately 80°, the angle of dip being 30°. The formation was lost at 6 feet from the surface and slate country entered. From the bottom, a drive was extended south-east for 30 feet on a formation consisting mainly of quartz and quartzite, and at the end of this drive a winze was sunk to 15 feet. The winze was sampled by Mr. Stone, but it was found to contain no gold. Although he could not remember the tonnage, Mr. Stone informed me that the average of everything crushed by the Horseshoe Company was about 3 to 4 dwt. per ton.

An account of the operations of the Volunteer Consolidated Extended Company up to 1906 is contained in Twelvetrees' report, ([26]) but the outline of the workings has altered considerably since that was made. A plan of the present workings is shown on Plate X.

The Volunteer Company drove an adit from the shaft across the formation. At 30 feet from the shaft the arch of the anticline rises above this drive, but the formation is again encountered at 44 feet, and apparently it continued to 52 feet. The end of the adit is entirely in slates. After some preliminary work, the whole of the western leg appears to have been taken out by open cut. From 48 feet in the adit a drive, 7 feet wide, has been extended along the western leg for 63 feet, the direction being S.40°E. Along the foot of the western wall of this drive there is an

([26]) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part II., pp. 4-5.

irregular quartzose formation, varying in width from 1 to 3 feet. A drive has also been extended north-west, but this now connects with the open-cut workings, and the formation appears to have been taken out along it.

The character of this formation can be seen in two pillars left on the northern and southern sides of the adit. Furthermore, the nature of the stoping indicates saddle reef structure. The structure is rather indefinite in the south-west drive, and, owing to the condition of the workings, it could not be determined whether the formation persisted for any distance down either leg of the anticline.

Twelvetrees' report states that the 23 tons of ore obtained while driving the adit was crushed at the Volunteer battery for a return of 6 dwt. 18 gr. of gold per ton. Details of two other crushings, which probably came from this mine, are recorded in the "Mineral Industry." These are as follows:—

Quarter ended December, 1905: 50 tons for 34½ oz.

Quarter ended March, 1906: 15 tons for 8 oz.

(12) Telegraph Mine.

Section 957-G, 10 *Acres.*

Near the south boundary of this section is an old shaft, which is reported by Montgomery as having been sunk on a rubbly quartz vein, 12 to 18 inches wide, trending north-west. An adit was commenced from the eastern fall of the hill, with the object of intersecting the reef at depth. It has been extended 161 feet through slate, and has intersected a few unimportant veins and bunches of quartz. According to Montgomery, it would have to be continued for another 260 to 270 feet before reaching the shaft.

The suspension of work in the adit is stated to have been due to the failure of the Van Diemen's Land Bank.

The above workings were not examined during the present survey.

In the northern portion of the section there are some old trenches on a rubbly quartz formation up to 5 feet wide. The trenches appear to have been put in in an endeavour to locate the southern continuation of the Horseshoe reef.

(13) Gladstone Mine.

Section 1033-87G, 10 *Acres.*

This is located about 20 chains south of the Eldorado Mine.

The principal workings are on a reef, 2 feet wide, striking 290° and dipping south. The old shaft has been inaccessible for many years. To the west of it the reef is stated to have been worked to a depth of 15 or 20 feet over a length of a chain, and, nearer the shaft, to a depth of 30 or 40 feet. Montgomery states that a crushing of 60 tons yielded from 9 to 11 dwt. per ton. A further crushing of 10 tons is reported by Twelvetrees as having been extracted by a Mr. Guy. This was stated to have yielded 12 dwt. per ton.

A considerable amount of surface trenching has been carried out in the vicinity of this and the Eldorado sections, but nothing of a payable nature appears to have been opened up.

(14) Miner's Dream Mine.

This is located on the Golden Gate ridge, and lies about 1 mile to the south-east of Mathinna. The principal workings are on Section 10,726-M, 12 acres, held by D. R. Dick, M. Barnes, and A. D. Dick. This previously formed part of Consolidated Lease 1689-G, 62 acres, held by the Miner's Dream Gold Mining Company N.L. The mine workings are shown on Plate X.

The discovery of the Miner's Dream reef was made by W. G. Stevens and D. R. Dick towards the latter end of 1903. According to Twelvetrees' report, a small vertical shaft was sunk to a depth of 20 feet, and then a rather flat reef was fol-

lowed down for 150 feet on the underlay, the width of quartz ranging from 1 to 2 feet. The average dip of the reef was stated to be 27°.

The old workings now present some rather different features from those described in Twelvetrees' report, though it is probable that many alterations may have been effected since the report was made. The underlay shaft has been sunk from the surface on a bearing of 140¾°, the angle of dip being 24½°. At the time of my examination it was accessible for 120 feet, and below that it was filled with water. At 120 feet drives had been extended from both ends of the shaft. From the surface down to this level the sides were carefully examined in such places as the timber had fallen away, but the flat reef appears to have been taken out in its entirety over the length of the shaft. According to Mr. T. Brannan, it was about 9 inches wide, and varied in length from a few feet up to 16 feet, and in some places in the shaft it dwindled to a mere thread.

The drives off the underlay shaft correspond to a depth of 50 feet below the collar. That from the north-eastern end bears 53¼° for 24½ feet and turns N.8¼°W. along an ill-defined formation containing quartz-veins from 4 to 6 inches wide. At 48 feet from the shaft the drive turns N.31°W. and the formation enters the east wall. The drive continues on this bearing for 17 feet and then bears 358° over the remaining distance, viz., 26 feet. Towards the end a 1-inch quartz vein occurs, striking N.10°W. and dipping east at 60°. Nothing of any consequence appears to have been exposed by this work, and no stoping has been done.

In the drive south-west from the shaft a formation striking 200° and dipping 40°E. has been stoped up for 20 feet. This consists of a well-defined plane, on the under side of which there are bunches and veins of quartz varying in width from 6 to 12 inches. This extends from 4 to 13 feet from the shaft. From 23 feet an irregular, corrugated, east-dipping vein has been followed for 25 to 30 feet, and this ends abruptly on a small vein striking across the drive. At 60 feet from the shaft an irregular quartzose formation was inter-

sected, which has been driven on in a south-easterly direction. At the intersection the formation varies in width from 15 inches to 5 feet and dips north-east at 55°. It dies out at 13 feet in the south-east drive. The latter continues to 54 feet from the main drive, but only a few small quartz stringers have been exposed. On the northern wall of the main drive the formation terminates in an irregular bunch of quartz occurring along a cross-fracture. The main drive continues in a westerly direction for 23 feet, and then turns north along the west wall of an irregular quartzose formation, about 4 feet wide, which is exposed in the west drive. At 24 feet from the bend the north drive intersects a strong reef striking a little to the north of west and dipping south at 65°. About 10 feet east of the intersection of the drives a strong body of quartz is formed by the junctioning of the north-south formation and the reef. A winze has been sunk at this point, but it was full of water, and could not be examined. In the stope above the winze the body of quartz referred to terminates along a plane striking 202° and dipping 35°E. It apparently formed a triangular-shaped mass, the base of which extended 22 feet along the plane, while the apex joins the reef intersected in the north drive. The north-westerly drive on the reef is accessible for 47 feet. It has been stoped above the drive, and towards the end these stopes appear to connect with some old workings at the surface. Over the last 20 feet the reef has also been stoped below the drive. At one time this drive probably connected with an adit put in from the eastern side of the hill, but the latter has now collapsed at 60 feet from the portal. The average dip of the stopes is 63°S. A few feet past the winze in the east drive, a drive trends north-west for 25 feet along some small vertical stringers. Near the end a small north-west cuddy intersects a vein, 6 inches wide, dipping south-east at 40°. This may be on the continuation of the plane seen in the stope.

Further details as to development work in this section of the mine are contained in A. M. Reid's

report. ([27]) The underlay shaft is described as continuing to 255 feet, and the deeper workings are described as follows:—"From the 250-ft. the eastern drive passed beyond the vein at 10 feet, but on the western side the ore-shoot continued to 107 feet. The stone, dipping at a low angle, is thin and rich to 45 feet; whence in the end it is wider and poorer and is inclined at a high angle. A little stone has been stoped above this level. A drive is now being cut on a thin section of rich stone a few feet above this level. Here the vein is sharply corrugated, and its position is suggestive of an off-shoot from the main body. In this irregularly-fractured country many branch veins are found."

The old adit workings are 38 feet lower than the collar of the underlay shaft. The adit was accessible for only 60 feet from the portal, and at that point it appeared to run into an old stope. Referring to these workings, A. M. Reid states: "They expose at 58 feet the end of a rich 15-ft. shoot of ore about 8 inches wide. At this point a winze, 22 feet deep, exposes 12 inches of stone, containing gold in the proportion of 12 dwt. per ton. From the bottom of the winze a south-east drive exposes a 12-inch shoot to 20 feet and a 4-inch shoot to 40 feet. The stone here is rather poor." This winze must lie between the end of the north-west drive at the end of the workings from 150 feet in the underlay shaft and the collapsed stopes at 60 feet in the adit.

In 1923 the Miner's Dream Gold Mining Company N.L. was formed, with the object of developing the reef at a greater depth. Six chains south of the underlay shaft a vertical shaft was sunk to 280 feet, and a crosscut was extended 300 feet north to intersect the reef. This work was not attended with any success, and the mine shut down in 1926.

No plan of the workings from the vertical shaft is available, but it seems probable that the northern crosscut was driven to intersect the reef worked in the west portion of the underlay shaft workings.

([27]) A. M. Reid: Report on the Miner's Dream Mine, November, 1925.

The production of gold from this mine is as follows:—

Production of Gold from Miner's Dream Mine.

Period.	Quartz.	Gold.	
	Tons.	Oz.	Dwt.
Quarter ending March, 1904	10	50	0
„ June, 1904.....	11	90	10
„ September, 1904	11	57	4
„ June, 1905.....	12	40	0
„ September, 1905	13	37	11
„ December, 1905	10	26	0
„ December, 1906	24	27	0
„ June, 1907.....	11	13	0
„ June, 1908.....	27	26	0
„ September, 1908	39	16	0
„ September, 1912	20	16	5
Year 1925	14	20	0
„ 1927	—	13	17
Total	202	433	7

The whole of the above was obtained from various portions of the underlay shaft workings.

(15) South Miner's Dream Adit.

This is located on the eastern face of the hill from the Miner's Dream Mine, and lies about 10 chains to the east of the new main shaft.

The adit was extended 403 feet into the hillside, on a bearing of 235½°, with the object of intersecting the Miner's Dream Reef. The rocks consist mainly of greenish-coloured slates, striking N.25°W. to N.40°W. and dipping north-east at 45°. Quartz veins, varying in thickness from 3 to 6 inches, were intersected at 46 feet, 145 feet, 158 feet, and 313 feet, and an irregular quartzose formation, about 4 feet wide, was intersected at 204 feet. The veins at 158 and 313 feet are said to have carried a little gold, but the others are barren.

(16) Section 359-G, 20 Acres.

This is located on the northern side of a small eastern tributary of Long Gully Creek, and lies about one and a half miles south-east of Mathinna.

The mine workings are shown on the general plan (Plate I.). They consist of an adit driven into the hillside on a bearing of 16¼°, the distance being 135 feet. At approximately 125 feet a rather flat reef formation was intersected, striking N.40°W. and dipping to the north-east at 40° to 45°. The formation consists of broken slate, containing quartz veins varying in width from 1 to 6 inches.

Drives have been extended along it for 34 feet north-west and 28 feet south-east, and a winze about 8 feet deep has been sunk from the end of the crosscut in order to intersect it. No information is available as to whether the formation proved gold-bearing, but no stoping appears to have been carried out. The country rock consists mainly of black slates, the bedding-planes striking N.45°W. and dipping north-east at 40°.

(17) Jubilee, City P.A., and Mountaineer Mines.

Consolidated Lease, 11,090-M, 55 *Acres, and Section* 1728-G, 10 *Acres.*

A complete report on the Jubilee and City P.A. Mines was made by P. B. Nye in 1923, and is attached to the present bulletin as an appendix. The mine workings are shown on Plate XII. It was found possible to gain access to two old adits on the Mountaineer Mine, which were completely blocked at the time of Nye's visit, and the additional information obtained is given below. Some workings on a reef occurring about 6 chains east of the Mountaineer adits were also examined.

Mountaineer Mine.—The principal workings on this mine consist of three adits, located near the eastern boundary of Section 1726-G. For descriptive purposes these have been numbered from 1 to 3. No. 1 adit is located just inside the boundary of Section 1729-G, and the toe is 30 feet south-east of one of the northern corner pegs. It has

been driven on the reef for 68 feet, but a heavy fall has occurred between 10 and 43 feet from the toe, and only the last 25 feet can now be examined. The reef strikes 128° and the dip is almost vertical at the entrance, where there is a fairly large make of quartz. Above the fallen ground the reef narrows to a mere track, but about 10 feet past the fall there is from 6 to 12 inches of quartz on the footwall, and in the face there is a quartzose formation about 2 feet wide. The dip in the face is 75° south-west. Ten feet from the toe of this adit a shaft has been sunk on about 2 feet of quartz, now stoped out, and this shaft connects with the No. 2 adit workings.

The entrance to No. 2 adit is approximately 70 feet below No. 1, and is approximately 130 feet north of the shaft. The adit has been driven on a bearing of 170¼° for 161 feet, but in the end it turns east for 15 feet, and apparently runs into some old workings connected with the shaft above. Light could be seen coming down from the shaft, but it was unsafe to go beyond this point. The adit has been driven in intensely cleaved, greenish slates, and contains numerous large, irregular patches and veins of quartz. These extend mainly between 50 and 100 feet from the entrance and from 130 to 160 feet. At 132 feet a large vein crosses the cleavages at right angles, and then turns north along them. Most of the veins are irregular, and have no general direction of strike or dip. The quartz is generally white and vitreous, and appears to be barren.

No. 3 adit is 20 feet west from No. 2, and is at approximately the same level. It has been extended in a south-westerly direction for 206 feet. Over the first 60 feet the adit is entirely in sheared greenish slates. At 75 feet from the entrance there is an irregular bunch of quartz on the south wall, which merges into a thin vein on the north wall, striking 280° and dipping north at 70°. At 100 feet there is a flat plane striking 310°, and associated with this there are flat veins and irregular bunches of quartz extending over a width of 4 feet. From 120 feet to 191 feet the rocks consist of sheared greenish slates, striking north-west and

dipping either vertically or at steep angles to the east or west. Over the whole of this portion of the drive the slates are impregnated with innumerable irregular veins and bunches of quartz. The veins vary in thickness from a fraction of an inch up to 3 or 4 inches, and most of them are puckered and contorted in an extraordinary manner. Some of the larger bunches of quartz are 4 or more feet wide. The quartz is similar to that observed in No. 2 adit and appears to be barren. At 13 feet from the face a winze has been sunk for approximately 20 feet on a quartz vein striking north-west and dipping north-east at 65°. There appeared to be about 1 foot or more of quartz at the top of the winze, but, as it had been sunk right across the drive, it was impossible to make a careful examination. A cuddy, 8 feet long, has been extended south-west from the winze.

About 3 chains south-east of the north-west corner peg of Section 1729-G another reef has been worked. This trends 105½° and dips to the south at 75°. It has been opened up by trenches over a length of 57 feet, and at the western end of these a shaft has been sunk. The quartz, where visible, is approximately 2 feet wide. Seventeen feet east of these workings a shallow trench has exposed a reef formation, about 5 feet wide, containing small veins of quartz; this trends 150°. Approximately 3 chains north of these workings an adit has been commenced, with the object of intersecting this reef at a depth of 100 feet below the outcrop. It has been driven only 45 feet, and would need to be continued for another 150 feet before it would cut the reef, assuming that the dip of the latter remained constant. No information could be obtained as to the gold content of this reef, or as to whether any of the quartz obtained from it had been crushed.

Four chains to the west of the north-west corner peg of Section 1729-G there is another adit. This is located on the western fall of the hill, and is 250 feet south and 100 feet above the north-east corner peg of Water-right 2753. It has been extended into the hillside on a bearing of 80½° for 66 feet, and then bears 63½° for 44 feet. Thirteen feet

from the face there is an irregular bulge of quartz, 6 to 8 inches wide, striking N.40°W. Between this adit and the shaft mentioned above there are a number of shallow shafts and trenches on small veins and reef formations, none of which appear to persist for any length.

(18) Volunteer Mine.

The Volunteer Mine is located on the Malahide Estate, and lies about 1 mile to the north-west of Mathinna.

Very little information can be obtained regarding the mine, and no previous reports have been made. All that can be seen at the surface is the old main shaft, three small prospecting shafts, and some old surface stopes above a shallow adit, now collapsed, on a reef trending north-east and dipping to the north-west at 70°. The reef formation worked in the surface stopes is visible in one or two places, and is about 2 feet wide.

According to information contained in the "Mineral Industry" and in the reports of the Secretary for Mines,([28]) the Volunteer Company commenced work on this property during the latter portion of 1901. A shaft was sunk 110 feet, and a reef 10 feet wide was exposed at the 100-ft. level. This level was then connected by rises, with an intermediate level at 50 feet. A new main shaft was commenced early in 1902. Until December, 1902, most of the quartz was obtained from the old adit workings and from the 110-ft. shaft. The crosscut from the new main shaft at the 200-ft. level cut the reef, which was then driven on to the north and south for 107 feet. Below the 100-ft. level a winze, sunk to 30 feet, disclosed about 3 feet of quartz. Sinking below the 250-ft. level in the main shaft a reef 4 to 5 feet wide was intersected. During 1904 the main shaft was sunk to 418 feet. At the 330-ft. level a drive north was extended 180 feet on a reef averaging 3 feet in width. At the 400-ft. level a drive was extended north for 45 feet along the reef-channel, but very little quartz

([28]) See Secretary for Mines' reports, also quarterly reports on the "Progress of the Mineral Industry, 1901."

was encountered. Owing to the poor battery returns, operations on the mine were suspended early in 1905.

According to the quarterly returns as published in the "Mineral Industry," the production of gold was as follows:—

Quarter ended—	Quartz Crushed. Tons.	Gold. Oz.
June, 1902	500	144
September, 1902	1410	491
December, 1902	1120	346½
March, 1903	....	527
June, 1903	1050	250
September, 1903	740	211
December, 1903	920	305
March, 1904	....	11
December, 1904	960	223
March, 1905	600	42
Total	....	2550

During 1906 the battery tailings were cyanided, but the amount of gold produced has not been recorded.

The operations of the company appear to have been profitable, or at least payable, until the end of 1902, but subsequent to that operations were carried out at a loss. It would appear that the best ore was won above the 100-ft. level, and that the reef diminished in size, and also in value, below that level. The average gold content of the ore mined ranged between 5 and 6 dwt. per ton.

The "Mineral Industry" for the quarter ended 31st December, 1904, states that the total quantity of quartz raised to that date was 7590 tons, yielding 2282 oz., an average of 6 dwt. ⅛ gr. per ton, and which realised £8128. There is a discrepancy between the published quarterly returns and the total gold yield up to December, 1904.

(19) Section 1704-G.

This embraces the Old Boys (Brock Bros.), Volunteer Consolidated, Yellow Boy, and Chester and Murray Mines.

(a) The Old Boys (Brock Bros.).

This is located about 20 chains east of the Mathinna township.

The Old Boys Mine had been shut down a few months before the present examination of the field commenced. As the ladders had been withdrawn from the main shaft it was impossible to examine any of the workings, but the following account of the principal mining activities, kindly supplied by Mr. R. Stone, manager for Brock Bros., is accurate in all the essential details. The mine workings are shown on Plate XIII.

In 1923 prospecting work carried out by J. Turner towards the north-eastern end of the large quartz reef shown on the general plan (Plate I.) disclosed a small quartz vein carrying a little gold. A prospecting shaft, known as Turner's winze, was sunk to a depth of 120 feet, the width of the vein varying from 3 to 12 inches and averaging about 8 inches. The quartz from this winze was not tested in bulk, but on the results of the work it was decided to sink a main shaft and test the vein at a depth of 200 feet. This was commenced in 1926. At 150 feet in the shaft a 3-inch vein carrying a little gold was encountered. This dipped west and was cut on the plat at the 200-ft. level; it had narrowed to a width of from 1 to 2 inches, but still carried a little gold. A drive was extended a short distance south, but the vein petered out.

At the 200-ft. level a west crosscut was then extended to 55 feet, at which point a small vein was cut. This was driven on for a distance of 130 feet in a direction approximating to N.25°E, the width of the vein ranging from 4 to 12 inches. At 60 feet in this drive a branch drive was extended for 30 feet on a 2- to 3-inch vein striking S.45°W.; a crosscut was also put in for 10 feet off the main drive, but it failed to reveal anything of importance. At 70 feet a rise was commenced on about 12 inches of quartz; this was extended to 18 feet, but, although a little quartz persisted throughout, it contained no gold. A winze was then sunk directly below the rise to a depth of 18 feet, the quartz varying in width from 6 to 18 inches and

containing about 3 dwt. of gold per ton. Driving was then commenced from the south side of the crosscut, and the vein followed for a distance of 50 feet, but very little quartz was obtained. Towards the end of this drive crosscuts were extended east and west, but these revealed nothing of any consequence. The west crosscut was then extended to 90 feet, and short drives were put in to the north and south at 80 feet from the shaft. No success attended this work.

At the 300-ft. level driving was commenced north from the plat, and continued for 65 feet. A west crosscut, extended a distance of 25 feet from this point, cut a formation about 1 foot wide containing two 4-inch to 5-inch veins of quartz. A winze was then sunk to a depth of 20 feet, but the results obtained were disappointing. Driving was then commenced along the formation in a direction approximating to S.40°W. At 30 feet from the first winze another winze was sunk on what was called the "white stone." This went down 18 feet, but the quartz cut out at a depth of 4 to 5 feet. The "white stone" consisted of an irregular bunch of white quartz. It is reported as having been 4 feet wide when first struck, but it did not persist far, and practically the whole of the quartz was taken out in the drive and in the first 4 feet of the winze. Driving was then continued, the formation containing occasional quartz veins varying from a few inches to 1 foot in thickness and containing a little gold. At approximately 130 feet another winze was sunk, the depth being 28 feet. On the floor of the drive a vein of quartz 2 to 3 inches wide had been found to contain gold. This winze was sunk to test this, but the results obtained were negative. On the plan this winze has been marked No. 3; those mentioned previously are not shown. A few feet south of No. 3 winze a rise was extended 20 feet on a small gold-bearing vein, which petered out a short distance above the drive. In the drive between No. 3 winze and the winze to the 375-ft. level the formation contained occasional veins of quartz, but these carried only minor quantities of gold. Near the winze to the 375-ft. level there was a

4-inch quartz vein carrying about 15 dwt. of gold per ton. This persisted down to 30 feet below the 300-ft. level, but below that values were poor. At this point, i.e., 30 feet in the winze, intermediate drives were opened out to the north and south. In the north drive there was a small quartz vein carrying a little gold, but, although there were a few veins in the south drive, they contained no gold. Sinking was continued in the winze for a short distance, when it was decided to open out at a deeper level. On the 300-ft. level, just north of this winze, a short rise was put up, but the vein petered out. The westerly branch drive at the 300-ft. level was driven to cut the western leg of the large quartz reef outcropping on the surface. This drive was extended 260 feet without striking anything of an encouraging nature. The large quartz reef referred to was passed through, but it proved barren.

The crosscut from the shaft to the vicinity of No. 3 winze at the 300-ft. level was put in after the main south-west drive had been extended for some distance.

After sinking the winze at No. 3 level, the main shaft was deepened to 390 feet and a level opened out at 375 feet. A crosscut was then extended 119 feet in a general westerly direction. The formation followed at No. 3 level was cut at 104 feet, and drives were opened out to the north-east and south-west. In the north-west drive the formation carried only small patches of quartz. In the south-west drive a small patch of gold-bearing quartz occurred at 54 feet from the crosscut, but this rapidly petered out. At 96 feet a short crosscut was put into the west wall, and this disclosed a vein 8 inches wide containing 6 oz. of gold per ton. However, this did not persist for any length. A branch drive was extended to the north-east, and the vein widened to 1 foot, but it contained no gold. A winze was then sunk just clear of the main drive, but the vein petered out. A rise was then put up for 10 feet; a little quartz persisted, but was found to contain nothing of any consequence. From 96 feet to 240 feet the formation varied in width from 2 to 3 feet. A small patch of gold was

obtained at 240 feet, but it persisted only for a few feet. Nothing of any importance was found in the remainder of the drive, and the northern crosscut towards the end is all in slate. A rise was put up to connect with the winze from the 300-ft. level. It commenced on a small quartz vein, which widened to 3 feet at 20 feet above the level, at which point it carried a little gold. Where the rise broke through to the winze the quartz vein was still about 3 feet wide, but only a few inches was gold-bearing.

About 30 feet from the end of the drive at the 375-ft. level a winze was sunk to a depth of 49 feet. This commenced on 2 feet of gold-bearing quartz, which became poor at a depth of 6 feet. Thirty feet below the level an intermediate drive was extended 18 feet on a small leader, and from the end of the drive a short crosscut was extended into the west wall. This disclosed a small gold-bearing vein. A short drive was also extended south from the winze on a vein 3 feet to 3 feet 6 inches wide, which carried a little gold.

Other work at the 375-ft. level includes a short south drive at 30 feet west of the shaft. This was driven on a small vein cut higher up in the shaft, but results were not encouraging.

During the course of underground operations on the mine some small discoveries were made at various places around the surface. About 6 tons of quartz, averaging about 1 oz. per ton, was obtained from Watt's winze, a shallow prospecting shaft located 1½ chains south of Turner's winze, and about 2 tons, averaging 7 to 8 dwt. per ton, was obtained from a small cross-leader some 2 chains east of the old Volunteer Consolidated shaft. Other work included testing various points along the large quartz reef to the west of the main shaft.

The mine was equipped with a small steam winding-engine and a ten-head battery. No crushings were put through the battery until the 375-ft. level had been partly developed. Details of the crushings are as follows:—

First crushing: 110 tons for an average of 3 dwt. per ton.

Second crushing: 100 tons for an average of 4 dwt. per ton.

Third crushing: 20 tons for an average of 22 dwt. per ton.

The first crushing comprised quartz won from development at the 200-ft., 300-ft., and 375-ft. levels. The second crushing also comprised quartz from each of these levels, and included 10 tons from Turner's winze; while the third crushing was composed of quartz obtained from the vicinity of the Volunteer Consolidated and Chester and Murray shafts, some from the 70-ft. level, which is connected with the main shaft, and various small parcels obtained from small veins occurring on the lease.

The large quartz reef outcropping to the west of the main shaft was worked by the old Black Boy Company some time prior to 1892. Near the intersection of the two branches a shaft was sunk to a depth of 120 feet, the first 40 feet being vertical, and the remainder underlaying west at 60°. Drives were extended from the bottom for 80 feet south and 30 feet north. According to Mr. S. Richards the reef had pinched in the end of the southern drive, but was 12 feet wide in the northern drive. The Black Boy Company is reported to have won a good deal of quartz, varying from 4 to 10 dwt. per ton, but on the whole the reef was found to be unpayable. The prospecting operations carried out by Brock Bros. failed to disclose anything of a payable nature, and the reef is quite barren over the greater portion of its length.

(b) Volunteer Consolidated.

The old main shaft of this mine is located 10 chains north of the Old Boys shaft. The mine workings at the 157-ft., 200-ft., 300-ft., and 450-ft. levels are shown on Plate XIII.

The Volunteer Consolidated workings were originally known as the White Boy, and later as the Old Boys. Under the latter title the workings down to 300 feet have been described by Montgomery,[29] and a plan of these is included in his

[29] A. Montgomery: Report on the Mathinna Goldfield, 1892, p. 45.

report. According to Montgomery the shaft was sunk in order to cut two reefs which had been worked by small shafts down to a depth of 90 feet, and which had yielded quartz to the value of 1 oz. per ton. These trend west or west-north-west and dip to the south. They were known as Nos. 2 and 3 reefs. Levels were opened out from the shaft at 157 feet, 200 feet, and 300 feet. A drive was extended west at the 157-ft. level, but very little is known concerning it. At the 200-ft. level a drive was extended west along No. 2 reef for 140 feet. The reef-channel varied in width from 8 inches to 6 feet, and consisted of small veins and bunches of quartz occurring in broken slate. Fifty-five feet west of the shaft a crosscut was extended south for 35 feet, and this intersected No. 3 reef, which was driven on for 109 feet east and 53 feet west. In the east drive the reef-channel varied in width from 6 to 8 inches, and contained only occasional small veins of quartz. A fairly large body of quartz was encountered in the west drive, and this was stoped almost to the surface, the shoot pitching south-west. To the east of the shaft, at the 200-ft. level, a new reef was cut, which had not been seen at the surface. This was called No. 1 reef, but it junctioned with No. 2 reef just north of the shaft, and appears to have been a branch of the latter. It had a general north-easterly trend and dipped north-west at 87°. It was followed north-east for 58 feet, but contained only a little quartz, occurring as short veins 3 to 12 inches wide. Seven feet from the end of this drive a reef trending almost at right angles was intersected, and this was driven on to the south-east for 50 feet. Over the first 19 feet the drive contained from 6 to 18 inches of quartz, but at that point 6 inches of quartz turned east along a smooth wall, and over the remainder of the drive hardly any quartz was seen.

At No. 3 level a crosscut was driven south-westerly for a distance of 134 feet. From 13 to 30 feet a reef, consisting of broken country rock, with a number of gold-bearing veins through it, was intersected. Its general course was north-west. The same reef was cut in the shaft just above the plat, and from its general course and

dip was thought to be identical with the reef in the south-east drive of No. 1 lode at the 200-ft. level. The No. 1 reef was intersected in the crosscut between 44 and 54 feet from the shaft, and also in the shaft from 15 to 24 feet below the 200-ft. level. It was rather irregular where cut in the shaft, but contained up to 3 feet of gold-bearing quartz. In the crosscut a little gold was obtained right across the reef formation, but there was very little solid quartz. At 89 feet the crosscut intersected several small gold-bearing veins, which were considered by Montgomery to be droppers from No. 3 reef. The footwall of No. 3 reef was intersected at 122 feet, and was found to be much flatter than above the 200-ft. level. From the crosscut a drive was extended west for 80 feet, the footwall being followed for 33 feet. At 33 feet the hanging-wall came in on the south side, and at 80 feet the hanging-wall and footwall were close together, with 12 inches of lode material between them. The reef formation in this drive consisted mainly of fractured slate, with only occasional small patches of quartz. The crosscut terminated against the smooth hanging-wall of No. 3 reef, the dip being 50° south-west. In the floor of the footwall a body of gold-bearing quartz was cut, pitching west. A winze was sunk on the underlay for 24 feet, and a drive extended 26 feet east. At the winze there was 18 inches of gold-bearing quartz, and in the face of the drive from 12 to 15 inches. The quartz contained a good deal of arsenopyrite and galena. A crushing of 67½ tons of quartz from the winze workings, including, however, a few tons from No. 1 reef, yielded 43½ oz. of gold.

The Old Boys Company ceased operations in 1895, but it seems probable that some further driving and crosscutting was carried out at the 300-ft. level shortly after Montgomery visited the mine. The mine plan of 1904 shows that the west drive on No. 3 reef was extended 176 feet from the crosscut. This reef was also driven on to the east for 200 feet, and at 164 feet a crosscut was extended south for 170 feet. Nothing of a payable nature appears to have been disclosed by this crosscut.

The intermediate level (350 feet) also appears to have been put in by the Old Boys Company.

In 1901 the mine was acquired by the East Volunteer Company, but, after unwatering the shaft and sinking it to 450 feet, work was suspended for lack of funds in 1902. During the first quarter of that year tributors obtained 12 tons of quartz, which yielded 34 oz. of gold.

In 1903 the East Volunteer Company was reconstructed, and the mine became known as the Volunteer Consolidated. At the 450-ft. level a crosscut was extended south for 310 feet. This intersected four reefs, which were called Nos. 1, 2, 3, and 4. No. 1 reef was intersected at 40 feet from the shaft, and probably corresponds with the irregular reef formation cut at 13 to 30 feet at the 300-ft. level. A drive was extended south-east on it for 20 feet, but it does not appear to have been payable. No. 2 reef was cut at 226 feet, and was driven on for 118 feet west. This corresponds with the No. 3 reef of the Old Boys Company. It was stoped up to the intermediate level (350 feet) over a length of 40 feet, and the old winze from the 300-ft. level appears to have been continued past the intermediate level to connect with the end of the drive at the 450-ft. level. No. 3 reef was intersected at 270 feet, and this may correspond with the No. 4 reef of the Old Boys Company; this outcropped on the surface to the south of the main shaft. No. 4 reef was cut at 311 feet from the shaft. It was driven on to the south-west for 78 feet, and over the last 53 feet a stope was taken off for an average height of 8 feet above the drive. A drive was also extended north-east for 63 feet. The main crosscut was then continued in a general south-easterly direction for 117 feet, and this intersected the eastern leg of the large quartz reef which outcrops on the surface to the west of the Old Boys (Brock Bros.) main shaft. This was called the No. 5, or Black Boy, reef. Drives were extended along it for 192 feet south-west and 48 feet north. This reef was approximately 4 feet wide, but was payable only over the first 30 feet of the south-west drive. The north-east drive on No. 4 reef was then continued in a general easterly

direction for a further distance of 80 feet, making a total of 143 feet from the main crosscut. At 63 feet from the main crosscut a crosscut was extended 28 feet north, and this appears to have intersected No. 3 reef (Volunteer Company). At 107 feet from the main crosscut a branch reef trending south-west was cut, and this was called No. 6 reef. A drive was extended along it for approximately 60 feet, and one stope was taken off the back. Some stoping also appears to have been done above the drive at the junction of Nos. 4 and 6 reefs.

The production of gold from the mine during the Volunteer Consolidated Company's operations was as follows:—

Quarter ended—	Quartz. Tons.	Gold. Oz.
September, 1903	60	66
December, 1903	365	420
March, 1904	160	90
June, 1904	160	125
September, 1904	380	198
December, 1904	130	100
June, 1905	425	186

The prospecting and development work at the 450-ft. level failed to disclose a sufficient quantity of payable quartz, and active operations on the mine ceased towards the end of 1905.

(*c*) *Yellow Boy Reef.*

The old stopes on the Yellow Boy Reef are located 12 chains north-east of the Old Boys (Brock Bros.) main shaft. The reef trends N.60°E. to N.70°E. and dips to the south at 80°. A line of old stopes and trenches extends along it for a distance of approximately 6 chains. Judging by the old stopes, the reef formation appears to have varied in width from 18 inches to 4 feet. In some places where small blocks of ground have been left, the formation is seen to consist of a number of small stringers and veins of quartz, 3 to 4 inches wide, extending over widths ranging from 2 to 4 feet. According to the available reports the shallow surface and stopes were worked prior to 1892.

Prospecting work was again commenced on the reef in 1901 by the East Volunteer Gold Mining Company, but was discontinued for lack of capital. A trial crushing of 90 tons was extracted during 1902 or early in 1903. The results are stated to have been satisfactory, but the amount of gold obtained is not recorded. During the latter portion of 1903 a shaft was sunk to a depth of 115 feet by the Volunteer Consolidated Extended Company. This is located approximately 100 feet south of the old stopes. Three lodes were cut in workings from this shaft, and two were reported as payable, the third being rather irregular. During the first quarter of 1904 a trial crushing of 170 tons yielded 60 oz. of gold. Work was then continued until 1905, but only one other crushing has been recorded. This was put through towards the end of 1904, and consisted of 40 tons of quartz, which yielded 25 oz. of gold. The company then took up the old Horseshoe Mine, south of the Miner's Dream.

(*d*) *Chester and Murray.*

No previous report has been made on this old mine, and very little information can be obtained with regard to it.

The main shaft, now fallen in, is located 10 chains south of the Old Boys Mine (Brock Bros.). It was sunk by an English company, probably the Tasmanian New Golden Gate, which took over the mine from the original owners, G. C. Chester and T. Murray, in 1896. The mine then became known as the Hatherton. The shaft was sunk to 350 feet, and levels were opened up at 150 feet and 350 feet. At 150 feet a crosscut was driven to intersect a reef striking east and west, which was then driven on for 196 feet. The average value of the quartz is stated to have been well over 1 oz. per ton, but the width of the reef is not given. This reef is probably identical with a reef which outcrops a few chains west of the shaft, and which has been worked by shallow shafts and surface stopes over a length of 150 feet. The strike of the reef is 128° and it dips to the south at 72°. At the 350-ft. level a crosscut was driven to intersect a reef worked by the Old Boys Company, but

the result of this work is unknown. Active operations were suspended in 1897, and the mine was let on tribute. Several small parcels of ore, won by tributors, were crushed at the City of Melbourne battery, and yielded 60 oz. of gold.

In 1900 the mine was purchased from the Tasmanian New Golden Gate Company by the Volunteer Gold Mining Company. A winze was sunk on the reef at the 150-ft. level, and at the 350-ft. level a crosscut was driven to intersect this reef. A level was also opened out at 250 feet, and a crosscut extended to cut the reef. The net result of this work was that a large but low-grade body of quartz was opened up above 150 feet, but at the 250-ft. level the amount of payable quartz was found to be small. The company's activities were then directed to developing the reef located to the west of Sling Pot Creek. The only recorded crushing during the Volunteer Company's tenure of the mine was one for the half-year ended June, 1901. This was for 52 tons, and yielded 30 oz. of gold. Other parcels of ore were probably won from the mine, but no records of them are available. The mine was shut down towards the end of 1901.

In recent years Brock Bros. have sunk prospecting shafts on two small reefs located a few chains north-west of the old main shaft. Both formations strike N.20°W. and dip west. The more westerly is composed of a number of small gold-bearing quartz stringers extending over a width of 6 to 12 inches. The second shaft has been sunk on a vein 5 inches wide, and this has been traced south for approximately 100 feet. Immediately north of the shaft the vein bends almost at right angles, and appears to die out. About 2½ tons of quartz obtained from this shaft yielded 7 dwt. of gold per ton. Between these shafts are some old workings on a vein striking N.15°E.

(20) City of Hobart Mine.

This is located on a 10-acre section, last held as 1688-G. This mine was abandoned in 1882, since when most of the workings have fallen in, and at present all that can be seen is the collar of an old shaft and some of the old surface workings.

The mine is described in both Montgomery's and Twelvetrees' reports. Montgomery was able to examine some of the old adit workings, and he obtained an account of the principal underground operations from Mr. Peter Irvine, who was manager of the mine from 1877 to 1882. Some further general information is given by Twelvetrees, and the following description of the mine has been derived mainly from the information contained in the abovementioned reports.

The reef strikes approximately N.15°E. and dips to the west for the first 200 feet in depth, after which the dip is westerly. It was first developed by means of an adit driven along its strike for 500 feet. Over 120 feet of the adit drive the reef averaged 1 oz. per ton, the width ranging from 3 to 4 feet; the remainder of the drive was poor. The main shaft was sunk to a depth of 660 feet. The quartz from the surface down to 300 feet was of a white, rather loose, nature, averaging about 3 feet in width, and containing gold to the value of rather more than 1 oz. per ton. Below 300 feet the quartz was laminated, and contained a good deal of arsenical pyrite; it averaged 16 inches in width, and the shoot of payable quartz was approximately 50 feet long. The country rock is reported as being hard, blue slate.

No official figures as to production are available, but Twelvetrees was informed that gold to the value of £80,000 was won from the mine.

According to Mr. Irvine the reasons for the closing down of the mine were:—

(1) The short shoot of payable quartz, viz., 50 feet.
(2) Lack of development.
(3) The hard nature of the country rock.
(4) The expense incurred in opening out levels at every 60 feet.

At a depth of 580 feet the reef is reported as having been displaced by a fault, the direction being north and west.

A small north-westerly vein was also worked in the adit-level. This varied in width from 3 to 4 inches, and contained about 13 dwt. of gold per

ton. It may be followed at the surface by a line of old stopes and by two winzes which connect with the adit-level. The dip of the vein, as indicated by the underlay of the winzes, is 68° to 80° south-west.

Two attempts were made to get round the broken ground at the main shaft in order to drive southward on the line of reef, but in each case the old workings were entered, and the drives were abandoned. These attempts were made prior to 1892. It seems probable that they were influenced by the possibility of an intersection between the main lode and the small north-west trending vein worked between the adit-level and the surface.

Some further work appears to have been carried out on the mine during 1901, as the "Mineral Industry" for the quarter ended 30th June of that year states that the City of Hobart Company expended £1000 on its property. According to Mr. R. Stone preparations were made for sinking a new main shaft, but funds ran out and the work was not completed.

In 1910 a shaft was sunk about 4 chains to the north of the old workings. This went down 100 feet, and some driving was done from the bottom, but, as far as is known, no quartz was crushed. This shaft was called the New City of Hobart.

(21) Section 451-G, 18 Acres.

This section was last held by A. F. Martyn. The mine workings are located on the western side of a small tributary of Black Horse Gully, and are approximately 60 feet above the creek bed.

The reef was located at the surface by trenching, and two shafts 150 feet apart were sunk, one on the outcrop and the other 8 feet east of it. The northern shaft was sunk to 80 feet, and the southern one to 50 feet. These are now in fair condition, but the ladders have been withdrawn. An account of the principal features of the mine is contained in Twelvetrees'([30]) report, and the following description has been obtained mainly from that source.

([30]) W. H. Twelvetrees: Report on the Mathinna Goldfield, Part II.

The reef strikes north and south and dips to the east. At a depth of 60 feet in the northern shaft a crosscut was driven east through a reef formation 9 inches wide. This is stated to have been well mineralised, and to have carried a little gold. The bearing of this formation is north-west, and some doubt exists as to whether it is the same reef as that followed from the outcrop. The latter went out of the shaft at a depth of 50 feet.

The southern shaft was sunk 8 feet east of the outcrop, and intersected the reef at a depth of 50 feet, beyond which point sinking was discontinued. In the bottom the reef was 8 feet wide, and consisted of hard, vuggy, mottled, blue quartz. It was sampled in 2-ft. sections by Mr. Martyn, the footwall section yielding 5 dwt. per ton. An old crosscut at 25 feet also cut the reef, exposing it over a width of 6 feet.

Trenches extend 1 chain north of the northern shaft and for 4½ chains south of the southern shaft. The southern trenches all show a little quartz on the dump, but nothing could be seen in the northern trenches.

A deal deal of dense bluish quartzite occurs on the dumps of the shafts, and some of this material contains small veins of quartz. Hence it seems probable that the reef occurs partly in quartzites, and that a good deal of the "formation" is comprised of a bed of quartzite veined with quartz and impregnated with pyrite.

(22) The Pride of the Hills Reefs.

The Pride of the Hills line of reef is located about 1½ miles south of Mathinna, on sections last held as 169-G, 170-G, and 1039-93G, the principal workings being on Section 170-G.

A description of the earlier workings may be found in Geological Survey Bulletin No. 2, by W. H. Twelvetrees.

In the vicinity of the leases the rocks consist mainly of slates and quartzites, the latter predominating. The main lode is a quartz vein, varying in width from 6 inches up to 3 feet, with an average width of 1 foot. It strikes N.18°W., and has been traced over a total distance of 1100 feet,

though it is not certain as to whether the quartz is continuous throughout. It contains gold, pyrite, arsenopyrite, and galena.

The earlier workings consist of a shaft, an adit, and several trenches. The shaft is situated near the north-east corner of Section 170-G, and was sunk to a depth of 70 feet on quartz varying in width from 6 to 12 inches. The adit is located 330 feet lower down the hill. Its length, measured from the portal, is 51 feet, and the vein maintains an average width of 16 to 20 inches, the quartz is white and vitreous, and contains only a little pyrite and arsenopyrite. The trenches extend between the shaft and adit, north of the shaft and south of the adit. Where exposed, the vein consists of glassy white quartz, the widths varying from 3 inches to 3 feet.

Twelvetrees' report states that about 80 or 90 tons of quartz was broken from these workings, and that 15 tons was crushed for a return of 15 dwt. of gold, an average of 1 dwt. per ton.

At the time of my examination a shaft was being sunk on the northern end of the reef, at a point about 20 feet north of the northern boundary of Section 170-G. The shaft had reached a depth of 6 feet. The reef formation was about 8 inches wide, and consisted of a narrow vein of vuggy quartz, on either side of which there was a few inches of fine sugary quartz carrying a little gold. Samples taken from the northern and southern ends of the shaft, over widths of 6 and 8 inches respectively, were assayed, with the following result:—

North end—
Gold: 0 oz. 1 dwt. 20 gr.
Silver: 0 oz. 0 dwt. 6 gr.

South end—
Gold: 0 oz. 1 dwt. 7 gr.
Silver: 0 oz. 0 dwt. 3 gr.

Small gold-bearing veins also follow joints in the quartzites in which this shaft has been sunk.

A vein, which is probably the southern continuation of this reef, has been picked up in a small creek at a point about 9 chains south of the adit and about 2 chains west of the fork in the creek.

It contained pyrite, arsenopyrite, and galena, but dish prospects failed to reveal gold, even after the quartz had been burned. In order to open up the vein a trench was put into the north bank of the creek for a distance of 14 feet. This revealed a quartzose formation 15 to 18 inches wide, which petered out towards the northern end of the trench. Dish prospects from this formation also failed to reveal gold. No attempt was made to trace the vein on the south side of the creek.

Although this reef has been traced over a considerable distance, its gold content is exceptionally low, and there appears to be nothing to justify further work on it. At the same time. it is a pity that the trench in the creek could not have been extended a few feet into the south bank. The presence of galena in the Mathinna quartz is generally regarded as a favourable indication for gold, and this portion of the vein contained galena when first discovered. The extension of the trench should not involve more than two days' work.

A parallel reef occurs about 3 chains east of the 70-ft. shaft described above. A shallow shaft has been sunk on it, and it has been traced by trenching over a distance of 250 feet. The work on this vein appears to have been carried out about the same time as the earlier work described above.

(23) Scott and Pickett Mine.

This mine is located on a small eastern tributary of Bowl Creek, and lies about 2 miles south-southwest of Mathinna. The sections were last held as 525-G, 10 acres; 526-G, 10 acres; 534-G, 5 acres; and 663-G, 2 acres—by the Scott and Pickett Gold Mining Company, N.L. The workings may be reached by following an old cart-track from the Old Boys Mine.

Very little can now be seen of the former workings. The adit north of the creek is accessible, and some of the old surface stopes south of the creek can be entered, but the southern adit has collapsed, and the main shaft is covered with debris swept down by the creek.

The adit north of the creek has been driven for 100 feet on a pug seam, containing occasional small

veins of quartz. At 30 feet from the portal there is approximately 4 inches of quartz, which continues for 20 feet and then narrows to 1 inch. From 70 to 90 feet the vein widens to 3 inches, but in the face of the adit it peters out to a pug seam containing a small quartz stringer approximately ½-inch thick. The general course of the drive is N.27°E. and the dip of the vein 80°N.W. The country rock consists of fissile black and grey slates.

Attempts have been made to locate the reef further to the north, but apparently with little success. A short adit has been driven into the hillside 100 feet north from the portal of the adit described above. It has followed a smooth vertical wall, faced with about 1 inch of quartz. Two and a half chains further north is a trench in slates and quartzites containing a few small quartz stringers.

The open stopes above the collapsed southern adit indicate that the shoot of quartz extracted was approximately 30 feet long. The unworked portions of the vein at the northern and southern ends of the stope are 8 inches and 2 feet 6 inches wide respectively. Twelvetrees gives the length of the southern adit drive as 110 feet, and describes its principal features as follows:—"Where the reef was cut in the adit it was puggy for a width of 8 inches, and slightly mineralised. Here it is not gold-bearing, and it gives place along the level to quartz 4 to 5 inches wide, but still without gold. At 20 feet from the flat shoot payable gold came in, and the reef has been stoped to the surface about 50 feet above the level. South of this shoot of stone there is only the puggy track of the reef visible, with a little quartz here and there."

In order to test the reef at depth a shaft was sunk to a depth of 62 feet and a crosscut driven in a south-easterly direction. This intersected the reef at 82 feet, and drives were then extended to the north-east and south-west, the respective distances being 80 feet and 110 feet. Where intersected by the crosscut the reef-channel was 2 feet wide, with a 4-inch vein of clean quartz, the remainder being scattered quartz, pug, and slate.

Detailed descriptions of the drives are contained in Twelvetrees' report. Of the northern drive he writes ([31]) :—

> "Going north the quartz increases to a width of 14 inches, but after 20 feet the stone dies out, and its line is replaced by a track of pug. Further on the present manager has picked up a little quartz 6 inches wide. A little gold was carried from here to the face, and for about a foot it was shown to be payable. Beyond this is stone 10 to 12 inches wide, but with only a trace of gold, which continues in the roof. The reef in the face is 32 inches wide, with 3- or 4-inch bands of quartz interlaminated with slate. A pug seam occurs on the west wall, and on the east side is a lot of twisted greasy slate, favourable for reef formation. The slate foliæ have twisted round to a course of N.55°E., dipping south-east."

And of the southern drive—

> "At about 10 feet south of the crosscut gold began to make in the stone, which is from 10 to 20 inches wide, and has been followed up to the surface. Occasional bulges of stone, 3 feet in width, occur. The quality of the stone is said to improve as it goes up, but its length is diminishing. The length of stoping ground at the drive level was 30 feet, and there is said to be good stone going down. Beyond the south end of the stopes the track of the reef is marked by a line of pug. The face in the end of the drive has a little water issuing from it. It consists of sandstone, seamed and intersected by quartz veinlets."

From the foregoing description it will be seen that the shoot of gold-bearing quartz worked was about 30 feet long and 112 feet vertically, the width of the reef varying from 10 inches to 3 feet.

The mine was equipped with a 10-head battery. Twelvetrees ([32]) states that the official figures fur-

([31]) W. H. Twelvetrees: The Mathinna Goldfield, Part III., Bulletin No. 2, p. 9.

([32]) W. H. Twelvetrees: The Mathinna Goldfield, Part III., Bulletin No. 2, p. 10.

nished by the company give the crushings taken from the mine as 92 tons for 38 oz. 4 dwt., i.e., up to December, 1907. Though these are probably the correct figures, the "Mineral Industry," up to December, 1907, contains a record of only one crushing. This was for the quarter ended September, 1906, there being 35 tons crushed for a return of 6 oz. of gold. Another 80 tons was being crushed when Twelvetrees visited the mine, and this was expected to yield from 15 to 16 dwt. per ton. However, this crushing probably corresponds with that mentioned in the "Mineral Industry" for the quarter ending on 30th June, 1908. The official figures are 60 tons for a return of 9 oz.

Generally, the above returns indicate that the average value of the quartz taken from the mine was low. Active operations on the mine ceased towards the end of 1908, and there is no record of any further work having been attempted.

(24) THE COMMERCIAL REEF.

This is located on two 10-acre sections, last held as 1292-93G and 1293-93G, which lie about 2 miles due south of Mathinna. The principal workings extend across the boundary between the sections.

The reef strikes N.79°W. and dips to the north at 80°. It has been opened up by a shallow shaft, now partially filled in, from which some of the quartz has been stoped out, and by a trench extending westwards for approximately 30 feet. In the shaft the reef varies in width from 2 to 3 feet, and in the trench from a few inches up to 18 inches. Two trenches have been put in across the line of the reef within a chain of that mentioned above, and a line of trenches then extends north-west for 2 chains. Some quartz occurs on each of the dumps, but it is doubtful as to whether any solid quartz was located by the trenches. About 10 feet to the south-east of the abovementioned shaft another shaft has been sunk in fissile grey slates.

Twelvetrees ([33]) states that some returns from this reef have been reported as 1 dwt. per ton, others as 6 dwt.

([33]) W. H. Twelvetrees: The Mathinna Goldfield, Part III., p. 11.

In his report on the Scott and Pickett Mine, Twelvetrees mentions the possibility of an intersection between the Scott and Pickett and the Commercial reef-channels, but the Scott and Pickett channel is decidedly weak at is northern end, and the same applies to the Commercial reef at its western end. Hence the possibility of an intersection taking place seems rather remote.

(25) Section 1734-G, 20 Acres.

This section is located on the tableland above the Eldorado Mine, and lies about 1½ miles to the south of Mathinna. It was last held by the Mathinna Gold Mining Company, which suspended operations in 1926.

Work was commenced on two quartz reefs discovered by Lowe Bros. One of these is situated in the northern portion of the section and the other about 11 chains further to the south-east. The most northerly reef strikes N.42°W. and dips to the south-west at 70° to 75°. A shaft has been sunk on the outcrop to a depth of 36½ feet, the reef being approximately 12 inches wide. Ten feet north of the shaft is a shallow hole 9 feet long. Here the country rock is seen to consist of slates and quartzites striking N.65°W. and dipping 72°N. The reef is 6 inches wide at the southern end of this hole; it does not continue along its normal strike, but turns west along a joint plane for a few feet. From this point another small vein trends N.25°W. for about 6 feet, and beyond this the reef could not be traced.

From a point on the steep hillside east of the shaft an adit has been driven 227 feet on a bearing of 249°, and this intersects the lode 100 feet below the outcrop. The rocks exposed in the adit consist of interbedded slates, quartzites, and sandstones striking N.50°W. and dipping at 60° to the north-east. At 109 feet from the portal there are a few small quartz veins, and at 188 feet there is an irregular quartzose formation 4 feet wide containing quartz veins an inch or two in thickness. At the end of the adit there is a small vein, varying in width from 3 to 6 inches, and this probably

corresponds with the reef seen in the shaft. It strikes N.45°W. and dips to the south-west at 60°. On the eastern side of this vein a drive has been extended 12 feet in a north-westerly direction, and at the end a cuddy has been put into the west wall. This drive appears to be off the vein; only a few small veins are exposed in the face, and some quartzite containing veins of quartz is exposed in the cuddy.

The southern shaft has been sunk on the outcrop of a reef striking N.15°E. and dipping to the east at 75°. The depth of the shaft is 50 feet, but, on account of the condition of the ladders and timbering, it was unsafe to descend below 14 feet. At that depth the reef consisted of white vitreous quartz about 18 inches to 2 feet wide. The country rock consists of slates and quartzites. A trench south of the shaft does not appear to have located the reef.

No samples were taken from either of these reefs, and no information could be obtained as to their gold content. At the same time, the amount of work carried out appears to have been sufficient to test each of the reefs, and it is significant that no stoping was carried out on either.

(26) Twilight Mine.

This lies about 3¼ miles to the south of Mathinna. The mine workings are located on Sections 1547-G and 1548-G, each of 10 acres. Very little information could be obtained regarding this old mine, and no previous report has been made.

The reef trends N.25°E. and dips to the west at 80°. It has been traced on the surface for a distance of 9 chains, and three shallow shafts have been sunk on the outcrop. In addition, there are a number of trenches along the outcrop and some old stopes near the main shaft. The main shaft was sunk about 40 feet west of the oucrop, and is stated to have reached a depth of at least 200 feet. The quartz does not appear to have been continuous over the whole length of the reef-channel, and seems to have occurred in the form of short lenses. In the old stopes near the shaft the quartz

appears to have been about 2 feet wide, but in the trenches to the north it is much narrower, and in such places as it is now exposed the width varies from 1 to 6 inches.

The mine was worked by an English company, which also owned the Sunbeam Mine. No records exist of the amount of quartz treated, but the mine was equipped with a 10-head battery, and there is a large tailing dump nearby. In 1896 portion of the mine was let on tribute, and a few small parcels of quartz were extracted. The company suspended operations in 1897, and the battery was removed in the following year.

(27) Tower Hill.

Section 10,877-M, 10 *Acres.*

The mine is situated on the northern slopes of Tower Hill, and lies about 4 miles south of Mathinna. The section is held at present by P. J. Holdensen.

The workings are shown on the accompanying plan (Plate XIV.). The formation consists of a bed of quartzite, varying in width from 60 to 100 feet, and impregnated with innumerable quartz veins. The bed strikes N.30°W. and dips to the east at a steep angle. The rocks on either side consist mainly of greyish-coloured slates. The quartz veins, some of which are gold-bearing, vary in width from a fraction of an inch up to 12 inches or more. The larger veins trend generally across the strike of the quartzite and dip south, but many of the smaller veins may trend in almost any direction.

In the early stages of development work was confined to testing individual veins. Nos. 1 and 2 shafts were sunk each to a depth of 53 feet, and numerous small potholes were put down at various places. These shafts were sunk by the Tower Hill Gold Mining Syndicate N.L. According to existing mine reports, No. 1 shaft was sunk on a vein 2 inches wide occurring near the centre of the quartzite bed, and this dipped out of the shaft at 16 feet. At a depth of 50 feet a crosscut was driven south, and at 5 feet from the shaft this intersected

a vein 2 feet wide, which was presumed to be identical with that followed to 16 feet. The crosscut was extended to 50 feet, and over the last 15 feet entered a formation consisting of quartz veins and quartzite. The reef near the shaft was then driven on 46 feet east and 27 feet west, and a crosscut was extended 12 feet south from the latter. Both drives were extended to the slates.

The No. 2 shaft was sunk at a point 230 feet south of No. 1. This was commenced on a mineralised formation which left the shaft at 17 feet from the surface. At a depth of 50 feet a south crosscut was commenced, but this was only extended 5 feet.

In 1923 the Tower Hill Consolidated N.L. took over the property, and in the following year the sinking of a main shaft was commenced. This was put down in the slate country to the east, and reached a depth of 110 feet. A plat was cut at 100 feet, and a main crosscut was extended 75 feet in a south-westerly direction across the strike of the quartzite bed. At that point drives were extended north and south in order to intersect the quartz veins opened up at the surface and in the No. 1 shaft. The north drive was extended 25 feet, and it was intended to rise and connect with No. 1 shaft. The south drive was also extended 25 feet, and is stated to have entered a mineralised formation at 9 feet from the main crosscut. At this stage the company ceased operations.

In 1929 the property was taken over by Hart's Mines (Tas.) N.L., and during that year and the early part of 1930 a considerable amount of surface trenching was carried out with the object of ascertaining whether the whole of the quartzite bed could be worked. Good average results were reported, but these were not borne out by later sampling.

During 1929 and 1930 the formation was sampled on behalf of Bewick, Morling, and Company, and of 63 samples, consisting of quartzite and quartz, taken from five trenches and from various outcrops, 54 yielded only traces of gold on assay, the remaining 9 yielding from 1 to 10 dwt. per ton.

In 1930 an examination of the surface workings was made by the Government Geologist, Mr. P. B. Nye, ([34]) with the object of ascertaining whether the quartzites in which the quartz veins occur were gold-bearing. Nine representative samples were taken, one from each of the trenches Nos. 1, 2, 3, 4, 5, 6, 7, 10, and 14, and when assayed in the Government Laboratory, Launceston, each of these gave a result of " Nil " for both gold and silver.

The present section was taken up by P. J. Holdensen in 1931. Some further prospecting work was carried out from the main shaft, but without success. In addition, a prospecting shaft (No. 3) was sunk in the slates to the west of the quartzite bed. No quartz veins were intersected in it.

None of the veins exposed at the surface are of sufficient size to warrant mining or developmental work, and, judging by the results of the sampling operations, it is certain that the quartzite bed as a whole could not be worked at a profit. As stated by Nye in his report: " The onlv possibility of the existence of exploitable ore-bodies is that in some parts of the quartzite the veins and irregular masses of quartz are sufficiently numerous and closely spaced to render these parts of a nature suitable for mining." This, of course, is subject to the veins containing sufficient gold to enable them to be mined at a profit.

(28) Sunbeam Workings.

The old Sunbeam main shaft is located about 13 chains north-east of the Tower Hill shaft. Very little information can now be obtained, and no previous reports have been made on this mine. The workings are shown on Plate XIV.

About 1 chain north-west of the shaft is an old prospecting shaft sunk on a vein trending N.70°W. Two chains further north-west another shaft has been sunk on a reef formation trending N.65°W. This is 4 feet wide, and consists of five 2-inch quartz veins occurring along tiny fissures in the slates. The main reef worked, however, occurs approximately 4 chains north-west of the main shaft. This has been trenched over a length of 220 feet, and has been stoped below the surface in a few places.

([34]) P. B. Nye: Report on the Tower Hill Mine, October, 1930.

It strikes a little to the north of west and dips south at 75°. The quartz, where visible in the old stopes, is about 6 inches wide.

The mine was worked by an English company, but as very little success attended its operations it was closed in 1897.

In 1908 a crushing of 12 tons from the old workings yielded 4 oz. of gold. This was probably taken out by prospectors.

A line of shallow alluvial workings extends north-east from the vicinity of the old stopes.

(29) Section 135P-G.

This is located about 20 chains south-east of the Tower Hill Mine, and until 1931 it was held by J. Woolcock, on behalf of Hart's Mines (Tas.) N.L. The principal workings are shown on Plate XIV.

The formation on this section is similar to that on the Tower Hill Mine, and consists of a bed of quartzite striking N.30°W. and impregnated with quartz veins. The latter, however, are not as numerous as is the case with the Tower Hill Mine. About 5 chains east of the road a deep trench has been extended 40 feet across the strike of the quartzites, and near the centre this has exposed a reef formation, 8 feet wide, consisting of numerous irregular quartz veins. In the trench on either side of this formation the quartzites contain only occasional small veins. Three chains further to the north-west another trench has been extended 70 feet across the quartzite bed, and this has exposed a similar reef formation 14 feet wide. These two are on approximately the same line of strike, and a shallow pothole sunk between them has exposed veins of a similar type.

Two chains west of this bed, two shallow trenches have been put in on a similar type of occurrence, and a shaft has been sunk on a vein 1 foot wide striking 290° and dipping south at 85°. This shaft appears to have been sunk partly in slates, as these constitute quite a large proportion of the dump.

No definite information could be obtained as to the gold content of the quartz, but the vein followed in the shaft is stated to have carried a few dwt. of gold in some places.

About 6 chains north of these workings some deep trenches have been extended along a reef striking north and south and dipping east at 75°. This occurs in slates and quartzites.

VIII.—CONCLUSIONS.

The Mathinna field has been thoroughly prospected on the surface, and it is fairly certain that all of the reefs outcropping have been found. Practically all of these have been well tested, and a large number have been worked to various depths, according to their size and gold content. The amount of work done on the various properties has been considerable, and, in many cases, does not appear to have been altogether justified. At the same time, it must be borne in mind that the New Golden Gate Mine has produced 253,865 oz. of gold from a number of reefs, and of these only the Upper West Reef, which is of comparatively little importance, has outcropped at the surface. The experience of the New Golden Gate Mine suggests that other hidden reefs may occur throughout the field, and it is to the search for such reefs that future prospecting operations should be confined. Unfortunately the geological mapping has failed to reveal any definite structural lines along which diamond drilling or other prospecting work could be carried out, and, apart from certain geological considerations, which have already been outlined, ([35]) the field must be viewed mainly from a mining standpoint. That is to say, attention should be confined to those portions of the field affording the greatest possibilities, and in which least underground prospecting work has been carried out. The portion of the field affording greatest scope in this respect is that extending northwards from the Gate Extended crosscut as far as J. Brock's Enterprise Mine.

When dealing with the mining properties it was suggested that it would be worth testing the Enterprise Mine at a depth of 100 feet, and that crosscuts from Holdensen's shaft on Section 10,998-M would test a large area of virgin country. The

([35]) See Chapter VI. (2), Relationship between the orebodies and the geological features.

country rock of this portion of the field consists principally of slates, and there are no adverse geological features which would indicate that payable reefs should not occur. Another factor worthy of consideration is that the main slide on the New Golden Gate Mine trends north-west towards this portion of the field, and many payable shoots of quartz in the New Golden Gate Mine were found close to it. It is impossible to state how far the slide persists in this direction, and, while it may be thought that it could be readily picked up by crosscuts, it must be pointed out that there would be considerable difficulty in recognising it.

South of the Gate Extended crosscuts exploratory crosscuts from the North Golden Gate, New Golden Gate, and South Golden Gate shafts, and the South Miner's Dream adit have tested the country east and west of the Golden Gate reefing belt without disclosing anything of importance.

With regard to the New Golden Gate Mine, it is fairly certain that any payable ore which has been developed has been worked out. Nevertheless, a close examination of the mine plans, viewed in conjunction with the various occurrences of payable shoots of quartz, shows that a large block of untested ground exists south-west of the slide between the 1000-ft. and 1400-ft. levels. This portion would probably be best tested by driving along the slide itself, and searching for payable shoots coming off it. Furthermore, very little driving has been carried out on the East Reef north of the New Golden Gate shaft. The mine plans show that, beyond the ends of the drives in the New Golden Gate Mine, this reef has been cut in only six places, viz., in the boreholes from the 1200-ft., 1300-ft., 1500-ft., and 1600-ft. levels at the North Gate shaft, and in the two crosscuts from the North Gate workings at 1400-ft. The available records of the results obtained are certainly not encouraging, but these six points represent only a small fraction of the untested portion of the reef.

K. J. FINUCANE, M.Sc., A.M.Aus.I.M.M.,
Field Geologist.

Mines Department,
Hobart, 21st June, 1933.

APPENDIX.

REPORT ON THE JUBILEE MINE, MATHINNA.

(Now Consolidated Lease 11,090-M, 55 Acres.)

BY

P. B. NYE, M.Sc., B.M.E., Government Geologist.

Location.

The workings of the Jubilee Mine are situated upon the following leases:—

1624-G, 10 acres, H. E. Brock.
1625-G, 10 acres, A. H. Solomon.

These leases are located on the east bank of Long Gully, one and three-quarter miles south-south-east of Mathinna.

Access.

The mine is connected with the township of Mathinna by a cart road about two miles in length. The road crosses the low spur at Mathinna between the Black Horse Gully and Long Gully, and follows the latter until opposite the mine, when it turns up a small tributary on the eastern side and terminates at the old main shaft.

Previous Literature.

Descriptions of the mine appear in the following official publications dealing with portions or the whole of the Mathinna goldfield:—

Montgomery, A.: Report on the Mathinna Goldfield; Secretary for Mines' Report, 1891-2.
Twelvetrees, W. H.: Report on the Mathinna Goldfield, Part II., 1906.
Twelvetrees, W. H.: On Some Gold Mining Properties at Mathinna, Geological Survey Report No. 5, 1914.

History.

The quartz reefs on this property were apparently discovered some time prior to 1870. The first lease was applied for by Messrs. H. J. Turner and Wm. Harris, but was abandoned. A lease was surveyed in 1870 for W. St. P. Gellibrand and others, and a company known as the Derby was formed, the mine receiving the same name. It is reported that this company continued operations until 1881. Both the Main, or Derby, Reef and the Flat Reef were worked,

and rich gold-bearing quartz was obtained from certain portions of these reefs. The Derby Reef was opened up by underhand stoping from the surface and by an adit, while later a main shaft was sunk to 150 feet and a level opened out and connected with a winze from the surface workings. The Flat Reef was opened up by two shallow adits.

The Jubilee Gold Mining Company began work on the Flat Reef in 1887, and is reported to have raised stone worth 9 to 10 dwt. per ton. A small battery was erected, the crushing appliances being a Huntingdon mill. This company did not continue operations for any great length of time, and, in 1892, tributors were working the Flat Reef.

In 1896 the Tasmanian Exploration Company Ltd. took over the leases and resumed mining operations. The main shaft was repaired to 160 feet and later sunk to 272 feet. Exploratory work was carried out at both the 160-ft. and 260-ft. levels on the Derby Reef. No payable ore was apparently exposed and no stoping performed.

In 1913 the mine was again opened up as the New Jubilee Gold Mine, and further prospecting work carried out at the 160-ft. and 260-ft. levels, which resulted in the discovery of Lyons Reef. A 10-head battery was installed, and mining and crushing operations were carried on until 1916. The operations were apparently not profitable, and the mine was closed down on account of financial difficulties.

In 1923 Messrs. H. E. Brock and A. H. Solomon leased the ground upon which the workings are located. Work was commenced at the northern end of the Flat Reef, and resulted in the finding of rich, but narrow, veins of quartz at several points.

Topography.

The mine workings are situated on the east bank of the Long Gully. The hills rise steeply above the gully on both sides to heights of several hundred feet. A small creek flows from the east into the Long Gully, most of the surface workings being situated to the north of this creek. The reef outcrops near the foot of the hills, and so, though the conditions are favourable for development by adits, the amount of backs obtained do not exceed 100 feet.

Geology.

The leases are occupied almost entirely by the Cambro-Ordovician slates. Only one set of structural planes are generally recognisable, and these either represent the bedding- or the cleavage-planes. No means of distinguishing these is generally possible, and the planes are assumed to be those due to cleavage and to completely mask the bedding-planes. These cleavage-planes have a strike of 315° to 335°, and are either vertical or dip at high angles to the north-east or south-west. At a few localities two series of planes are visible, the other set cutting across the cleavage at an acute angle and dipping to the north-east at medium angles. The latter probably represent the bedding-planes, and the general direction and dips agree with those observed by Montgomery in other parts of the Mathinna

District. The slates are light-coloured at and near the surface, but those from the deeper workings are dark-blue or green in colour.

On the south side of the small creek, numerous lumps of completely decomposed basic igneous material are obtainable on the surface, but at no place has it been located *in situ*. Similar material occurs in other portions of the north-eastern district of Tasmania, and represents decomposed basic igneous dykes intrusive into the Cambro-Ordovician strata. They are probably of Devonian age, and generally occur in the vicinity of gold quartz veins, but the relationship between the two has not yet been determined. Future work will, it is hoped, settle this problem.

Recent river gravels and alluvian occur along the course of the Long Gully and the small creek flowing into it.

Economic Geology.

The formations of economic importance are the auriferous quartz reefs which occur in this part of the Mathinna goldfield. The reefs are of the gold-arsenopyrite-quartz type. The quartz is white, and varies from opaque to slightly translucent. When associated with sulphides it assumes a faint bluish tinge. Arsenopyrite is the most abundant sulphide, but pyrite, chalcopyrite, and galena occur in small quantities. The gold occurs mainly as "free" gold, but a small proportion is also intimately associated with the sulphides. The galena and chalcopyrite are always favourably regarded as indicating the presence of gold. Arsenopyrite is not so favourable, and at some points appears to occur to the exclusion of gold. Small amounts of a carbonate, probably calcite, are associated with the quartz from the deeper levels of the mine.

The reefs vary in strike and dip. The vertical parts of the Derby and Flat Reefs where they outcrop have bearings of 328°, and their courses are conformable to the cleavage-planes. The eastern vertical part of the Flat Reef, Stevens Reef, and the Mountaineer Reef have bearings similar to those of the bedding-planes of the slates, but appear to differ from the latter as regards the amount and direction of dip. The City Reef and a similar outcrop to the west of Lease 1625 have bearings of 355°, and occupy channels cutting across both the bedding- and cleavage-planes. The flat parts of the Flat and Lyons Reefs cut across the cleavage-planes and probably also the bedding-planes, although at places they appear to follow anticlinal and synclinal folds, but this is not so in the case of the Flat Reef. The cap of the Derby lode at its junction with Stevens Reef resembles a saddle reef, but it is due solely to the junction of these differently dipping reefs.

Faulting, in particular faulting which would effect the reef, has not been recognised to any great extent. The "slide" between the 160-ft. and 260-ft. levels was formed before the reefs. The Derby and Lyons Reefs make strongly to the south of this slide, and shoots of gold were also formed on that side of the slide. The slide does not appear

to have the same effect on the Derby Reef as regards the extension and the location of shoots near the surface. Whether it has any effect on the Flat Reef could only be proved by prospecting work.

The localisation of the various small shoots is due to different causes in each instance, and no general conclusions could be deduced from which it might be possible to indicate where to search for others. The shoot in Lyons Reef is connected with the slide as described above. The shoot near the surface of the Derby Reef may be partly due to superficial enrichment. The short shoot at the cap of the Derby Reef owes its origin to the junction of this reef and Stevens Reef. There may be recurring shoots of this type to the south-east. The shoot in the Flat Reef is irregular, and may be due partly to secondary enrichment, by which means the shallow shoot at the outcrop appears to have been formed. The shoot at the eastern vertical part of the Flat Reef was formed above the junction of the flat and vertical parts. The good grade quartz in the northern part of the Flat Reef owes it presence to the convergence of the two vertical walls.

The Flat Reef.

This reef outcrops in the south-western part of Lease 1624-G, and also extends a short distance into the northern part of 1625-G. The total length of outcrop is about 700 feet, which is one of the greatest lengths on the Mathinna Field. The bearing of the outcrop is 328°, and the reef is parallel to the Derby Reef. In the portions of their lengths where the two reefs outcrop side by side, the Flat Reef is 20 feet to the north-east of the Derby Reef. The dip of the reef varies considerably. It is generally to the south-east from angles of almost 90° at its outcrop down to 20° and less in the underground workings. At some points the dip is reversed and is to the south-west.

This reef has been opened up on the surface by means of numerous trenches, shallow shafts, and underhand stopes. Underground it has been developed by four adits (which for descriptive purposes have been numbered from 1 to 4) and the accompanying drives, winzes, &c.

The most southerly opening on this reef is a shallow shaft on the north side of the small creek and almost covered by the dump from the main shaft. Large blocks of white quartz typical of the Flat Reef occur on the dump of this small shaft. The southerly continuation of the reef should be exposed in the road cutting to the south of the creek at this locality, but only a narrow vein, representing the track of the lode, is visible. Between the above shaft and the No. 1 adit, several trenches cut during the writer's visit to the mine exposed the reef which contained gold at some points and also a large amount of arsenical pyrite.

In the No. 1 adit the Flat Reef is cut at 60 feet from the entrance where it dips from the back of the adit and is carried in the adit until 73 feet, where it dips below the floor. The reef is 1 to 2 feet thick, consists of white massive quartz, and contains a large amount of slate. A sample

over a width of 18 inches was assayed in the Geological Survey Laboratory, Launceston, with the following results:—

Gold: 16 gr. per ton.
Silver: 5 gr. per ton.

The reef has not been exposed on the surface between the No. 1 and No. 3 adits, but has been intersected by the No. 2 adit between these points. In this latter adit it was cut at 130 feet from the entrance, and passed below the adit at 165 feet. Between these intersections the reef is practically horizontal, and varies greatly in thickness and character. The quartz is white and dense and forms irregular veins throught the slates. Numerous veins pass below the adit floor from the flat part of the reef. A few feet beyond the point where the Flat Reef dips below the adit, a short drive has been put into the north-west along a smooth wall with pug against it. Two small makes of quartz occur against this wall, one striking to the east and one to the west, but these do not extend any distance. The Flat Reef appears to dip into this wall below the adit and a winze was sunk on the junction. Mr. Twelvetrees reports: "A winze was began 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." It is apparent, therefore, that the Flat Reef has taken its course along the wall, and dips easterly 1 in 6. From a point 145 feet from the entrance of the No. 2 adit, a drive has been put in to the north-west along a portion of the Flat Reef. The reef is more defined in the drive than in the adit, and appears on both sides as a solid body of white quartz at least 3 feet thick. At 18 feet a winze was sunk, but, as would be expected, it is reported that the bottom (or footwall) of the reef was soon passed through. The reef is carried in the sides of the drive for 55 feet, but at this distance it has passed above the back of the drive due to its very low pitch to the south-east. A drill-hole was put up into the reef for a distance of 3 feet. The borings contained abundant arsenopyrite, and on assay in the Geological Survey Laboratory gave the following results:—

Gold: 1 dwt. 13 gr. per ton.
Silver: 17 gr. per ton.

At 56 feet from the adit, a connection has been made over the back of the drive with the workings from the No. 3 and No. 4 adits. The reef at this point undergoes a reversal of dip on the eastern side of the drive and dips to the south-west. Near the face of the drive a wall was encountered to the east with a strike of 295°. This is the continuation of the wall exposed in the No. 2 adit and short drive on the eastern side of the Flat Reef. The reef appears to turn up into this wall instead of down as it did in the adit. This is confirmed in the old workings above the drive in which the vertical portion of the reef was stoped out.

The No. 3 adit was driven as a dip-adit on the Flat Reef, which here dips at 15° to the north-east. At the entrance the reef is well defined, and from 18 to 36 inches wide, and, except for one small break, extends along the adit below water-level.

A sample from the south side was assayed in the Geological Survey Laboratory with the following results:—

Gold: 2 dwt. 15 gr. per ton.
Silver: 1 dwt. 19 gr. per ton.

No stoping was performed on the south side of the adit, but portions of the reef on the north have been stoped as far as the No. 4 adit, but the greater part of these are now inaccessible. In those which can be inspected the reef where left maintains its usual width and character. A winze was sunk from the drive or working forming the lowest portion of these stopes, and connects with the north-west drive from the No. 2 adit referred to above. In this winze the reef has a higher dip and consists of a large, somewhat irregular, body of quartz about 3 feet wide. At the bottom of the winze the dip of the reef decreases and the reef becomes horizontal and forms the flat portion occurring above the drive from the No. 2 adit. No stoping was carried out from the winze, but a small amount appears to have been done at the bottom of it.

In addition to the flat portion of the reef immediately above the drive, another branch appears to occur above it, dipping to the south-west at 30° to 45°, and making onto the same vertical wall to the east. A connection occurs between the bottom of the winze and some old stopes on the vertical wall. These stopes extend to the north-west as far as the No. 4 adit, from which they were worked by underhand methods. The two branches of the Flat Reef make against this wall, and a vertical extension of the reef occurs upwards along the wall. It was this vertical portion of the reef that was stoped out in these old workings. There is a fairly even wall to the east, and, while the dip of this varies somewhat, it maintains a generally vertical aspect. The upward extension of the reef decreases in thickness and the reef peters out in the back of the stopes. The reef has been stoped right up to the "cap," which has a pitch of about 40° to the south-east.

On the surface between No. 3 and No. 4 adits the reef has been stoped by underhand methods for nearly the whole distance, some of the stopes being connected with those from the No. 3 and No. 4 adits. The reef is here exposed with a vertical dip, which must however quickly change to a low dip to the east at shallow depths.

The No. 4 adit can only be entered a short distance, as it is blocked by a fall of ground, and the workings from it cannot be entered. A portion can, however, be entered from a shaft recently sunk to the north-east of No. 4 adit. It is seen that both the flat and eastern vertical portions of the reef have been stoped and that some of the stopes connect with those from No. 3 adit.

The reef maintains its usual bearing and a high dip for 90 feet to the north of No. 4 adit, and has been worked

by shallow underhand stopes. Shallow workings also exist to the east of the outcrop, and gold-bearing quartz has apparently been obtained from these points.

Recently a shaft was sunk from a point 18 feet east of the outcrop. Numerous small, but rich, veins and stringers of quartz were found between the outcrop of the Flat Reef and the shaft, especially towards the shaft. The shaft was sunk 16 feet, with a steep underlay to the east, on the course of some of these veins. The southern end of the bottom of the shaft connected with the north end of the stopes on the flat portion of the reef. The eastern side of the shaft broke through into the northern end of the stopes on the eastern vertical portion of the reef. The northern end of these stopes show the flat portion of the reef to be one to two inches wide and the vertical portion a similar width. The flat vein passes through the vertical vein at this point without affecting it, instead of turning up or down along it as in previous exposures.

A short drive was driven along the flat vein to the north of the shaft, and crosscuts driven east and west from it. The vein of quartz was only 2 inches wide at the beginning, but increased in width until over 1 foot occurred throughout a formation 3 feet wide. The crosscut to the east showed the Flat Reef turning upwards along the extension of the vertical wall as at other parts of the reef. Another formation, 1 foot wide and parallel to the vertical reef, is exposed near the face of the crosscut. The crosscut to the west exposed the flat vein on both sides for a distance of 20 feet, where it turns up along a vertical wall similar to that on the east. The flat portion of the reef in these crosscuts varies in width from a few inches to 2 feet. The quartz is mineralised in places, and contains a fair content of gold. A combined sample from several portions of the reef gave the following results when assayed in the Geological Survey Laboratory:—

Gold: 15 dwt. 4 gr. per ton.
Silver: 2 dwt. 15 gr. per ton.

The eastern wall up which the reef turns is situated directly below the vertical portion of the reef at its outcrop, and the two are, therefore, one and the same. At this point of its length the Flat Reef therefore consists of a horizontal portion extending between two vertical portions on the east and west respectively. The vertical portion on the west outcrops at the surface, but that on the west does not outcrop. The same features have been found in the other workings to the south (described above), the only difference being that at the most southerly point (No. 2 adit) the reef on its eastern side turns downwards. In the No. 1 adit the Flat Reef also dips down at its eastern side, but this occurs 115 feet west of any possible extension of the eastern vertical wall, and it cannot be stated as to whether the flat portion ultimately extends to the vertical wall or not.

In the workings from the above recently-sunk shaft the two vertical portions are 20 feet apart. This distance is greater towards the south and increases regularly in that

direction. This is due to the converging bearings of the two vertical portions or walls—that on the west represented by the outcrop having a strike of 328°, and that on the east 307°. It is evident that these two vertical portions will intersect one another to the north-west of the shaft. This point of intersection coincides with the sudden change in the bearing of the outcrop of the eastern portion of the reef. The surface works show that the strike of the outcrop changes from 328° to 3°. Recent underhand workings on this north and south part have proved narrow gold-bearing quartz veins to occur along a length of 30 feet. These workings have an underlay to the east of 30°.

To the north of these workings an old shaft was sunk to 10 feet, and in the bottom exposed a reef 2 to 3 feet wide, the eastern portion dipping easterly at a moderate angle. The quartz in this reef is stated to be of poor quality. Another old shaft to the north was sunk apparently to cut this east-dipping reef, but no quartz is visible in it, although a drill-hole from the bottom is stated to have entered quartz.

The reef changes its course again between the two shafts, and the northerly extension resumes the normal strike of 326°.

A short adit driven to the south-east was not extended sufficiently to cut the reef. A winze was sunk from it on several small gold-bearing quartz veins. Recently a crosscut was driven to the north-east and intersected the reef which consisted of irregular veins of quartz throughout slates forming a formation 3 to 4 feet wide. In the back the reef is vertical, but in the bottom of the crosscut it dips to the south-west. It was proposed to sink a winze on this reef in order to test it below the crosscut.

Several old and recent trenches to the north-west have been cut along the course of this reef in a search for the source of the rich "loams" of gold obtained in the immediate vicinity. The recent trenches exposed only narrow veins of quartz distributed over a width of several feet of slates. Some of these veins are gold-bearing, but others are barren. The gold in the surface soil and rubble was derived from these gold-bearing veins, some of which may have been much richer at levels higher than the present surface.

The reef cannot be traced further to the north-west, and apparently does not continue beyond the reef of white quartz which occurs to the west (City Reef).

The Derby Reef.

This reef outcrops on the southern part of Lease 1624 and on the northern portion of lease 1625.

It was cut by the No. 1 adit, and a drive was driven to the north-west, which connected with the No. 2 adit. In the No. 2 adit the reef does not occur, but along the drive to the No. 1 adit the track of it becomes visible, with a few inches of quartz making on it, and then the reef makes further to the south-east. The surface workings on the reef do not extend further north than the No. 2 adit, and so this point may be taken as the northern limit of the

Derby Reef. The reef has been stoped from the outcrop to shallow depths along the whole of its course from the northern end as far as, and beyond, the entrance to the adit on the south side of the creek. The general bearing is 328° and the dip at high angles to the north-east. A winze from the No. 1 adit to the east of the reef is reported to have intersected quartz of fair grade, and this probably represents the Derby Reef cut at depth due to its dip.

On the steep hillside to the south of the creek the outcrop gradually alters in bearing until it has a north and south strike. This is due to the combined effect of the decreased easterly dip of this portion of the reef and the steeply rising surface of the hill. The outcrop has been stoped to a depth of several feet as far south as the underlay shaft to the underground stopes.

An adit to the south of the creek cuts the reef at 90 feet, and then follows the reef to the south-east for 90 feet. The reef was formerly driven on and stoped to the north-west, but these workings have fallen in.

Along the adit to the south-east the reef has been stoped, both above and below, for a distance of 70 feet, and these stopes also extend probably to the north-west. In depth the stopes connect with those from the 160-ft. level on the Derby Reef.

Towards the face of the drive the reef has not been stoped below, but a winze has been sunk on it at the face. Further back along the drive another winze connected with the bottom levels and formed a travelling way from these levels. Along this drive the reef varied in width from 6 inches to several feet, and apparently also in value, the richer portions being stoped and the others left standing. The dip was 70° to the east in the northern part, but in the winze at the face it was only 55°.

Ten feet back from the face of the drive a branch drive was driven 30 feet to the north-west on what was called Stevens Reef. This reef has a bearing of 300° with a dip to the south-west of 65°. The reef varies in width up to 15 inches, and is exposed in the face and back of the drive. In the old stopes above the drive it is seen that the Derby and Stevens Reefs junction and form a flat cap, the whole structure resembling a saddle reef. In the central part of these stopes narrow veins of quartz continue above the saddle on the upward extension of the Derby Reef plane. In the northern part of these stopes the saddle is not in evidence, and the Derby Reef extends upwards to the surface where it has been stoped. The saddle, however, continues to the south-east beyond the stopes with a pitch of 20° in that direction. The large, flat body of quartz seen in the top of the winze at the face of the drive on the Derby Reef represents the saddle. No veins extend above it at this place, and any downward extension of the Derby Reef from it was probably followed in the winze. The saddle pitches to the south-west beyond the winze, but has not been tested in that direction. In the stopes it was apparently sufficiently rich to stope, but at the top of the winze it was apparently unpayable.

The underground workings from the main shaft are filled with water and, therefore, inaccessible. The following description of the main features in connection with the reef in these workings are taken from the descriptions by the late Mr. Twelvetrees and information received from Mr. Brannan, the last manager of the mine, together with the plans of the underground workings.

At the 160-ft. level the crosscut was driven to the south-west for a distance of 330 feet. Quartz reefs or formations containing quartz veins were intersected at the plat, at 90 feet (the Derby Reef), 180 feet, and between 200 and 270 feet (the more definite groups of veins being at 200, 230, and 270 feet). Except for the Derby Reef these reefs or formations have not been driven on, due probably to the fact that they were not auriferous where cut. The Derby Reef was driven on to the north-west and south-east. In the north-west drive the reef was reported to be 2 to 3 feet wide, but low in gold values. The drive was continued for 80 feet, but at the face the reef was small and irregular, although occurring below portions which were stoped near the surface.

Conflicting reports are in existence as to what was encountered in the south-east drive on the Derby Reef, and it is not certain that the reef was carried in the drive for the first 80 feet of its course. At this distance a "slide" was intersected which has a bearing of 50° and a dip to the south-east varying from 30° to 50°. To the south of this "slide" the Derby Reef made strongly, while to the east of this reef another (termed Lyons Reef) was also found making on the south-east side of the slide.

The Derby Reef was driven on to the south of the slide for 110 feet, which exposed the portions of it below those stoped below the adit on the south side of the creek. The reef varied in width up to 2½ feet, but was reported to contain, in places only, 4 dwt. per ton of gold. At the face of the drive the reef was still exposed, but was reported to be "broken." About 200 to 300 feet of driving would be necessary to intersect the south-pitching cap of the Derby Reef as exposed in the face of the adit. A winze was sunk 42 feet on the Derby Reef at the 160-ft. level from a point 30 feet south of the slide, and proved that the dip of the reef flattened with depth.

A short crosscut along the slide to the west of the Derby Reef exposed Lyons Reef. This was followed down by a winze at its junction with the slide, against which its northern end abuts. Later the reef was stoped between the 160-ft. and 260-ft. levels, and it is reported by Mr. Brannan that about one-half has been extracted between these two levels. It was found that in this part of the Mine, the dip of the Derby Reef became less and less with depth until finally it became horizontal. A horizontal portion occurred to the east, and formed a series of rolls, the occurrence being similar to the Flat Reef. On the east side of this horizontal portion the reef turns upwards, but does not persist for any distance, as it breaks up into a number of narrow veins in a slate formation. It was this horizontal

portion and the eastern vertical portion that were stoped as Lyons Reef.

It is evident though that the Derby and Lyons Reefs are parts of the same reef, the character of the Derby Reef altering in depth and giving rise to Lyons Reef.

At the 260-ft. level the crosscut was driven to the south-west for 190 feet. Quartz reefs or formations containing quartz veins were intersected at 20 feet, 80 feet, and 120 feet. The formation at the latter distance was driven on to the south for 100 feet, but apparently revealed nothing of value. This formation did not represent the Derby Reef, which should, if it maintained the same dip as at the 160-ft. level and above, have been cut near the shaft. The stoping on Lyons and the Derby Reefs below the 160-ft. level proved, however, that the Derby Reef did not extend north of the slide. As the dip of the slide carries it a considerable distance to the south of the 260-ft. crosscut, it was impossible therefore, for this crosscut to intersect the Derby Reef.

The south-east drive referred to above was later extended in an easterly direction to reach a point below the stopes on Lyons Reef, and a rise up to connect with these stopes. The drive was also extended to cut the Derby or Lyons Reef at this level. A number of short drives occur near the end, some being on the course of the reef, but others apparently off it. A winze was sunk on a part of the reef below the 260-ft. level to a depth of 30 feet.

Eastern Reef.

In addition to the above crosscuts and workings to the south-west of the shaft, crosscuts were driven to the north-east. The crosscut at the 160-ft. level cut the Eastern Reef at 35 feet. This reef was driven on both to the north and south. At some places the reef-channel was reported to be over 3 feet in width, with 2 feet of mineralised quartz, containing little or no gold. The north drive was continued to 280 feet, but no information is available as to what was passed through beyond 30 feet from the crosscut. The strike of the reef would be 343°, and the dip is reported as being 50° to 70° to the east.

At the 260-ft. level the north-east crosscut was extended 38 feet, but would not at this distance cut the Eastern Reef if the above dip was maintained.

City Reef.

The name of City has been applied for descriptive purposes to the formation cut in the old City P.A. adit on Lease 1637. This formation consists of soft, altered slates, with a width of 25 feet and containing several narrow quartz veins. The strike of the walls and the quartz veins is 355° with a dip of 85° to the east.

On the line of strike of this reef to the south, wide exposures of quartz occur on the surface as far as the dump of the No. 4 adit. The quartz is white and barren-looking. The reef generally consists of massive quartz of the above type, but at other places it consists of veins

in altered slates. The northern extension of the Flat Reef would junction with the City Reef near the north-west corner of Lease 1624. It has not been traced beyond the City Reef, and apparently does not extend beyond it.

Mountaineer Mine.

The shallow shaft of this mine is situated on the eastern boundary of Lease 1625. The reef has been stoped from this shaft to shallow depths over a width of 2 to 2½ feet. It has a strike of 310° and is vertical.

An adit was driven along the reef from a point 40 feet to the south-east of the shaft. At the entrance the reef is 15 inches wide, and dips south-westerly at 85°. Within the adit the reef appears to have been stoped below. Large makes of quartz occur to the north of the footwall and also on a smooth wall 5 feet to the south-west of the footwall. In the face of the fallen-in adit no quartz is visible.

To the north-west of the shaft, two adits have been driven, one to cut the Mountaineer Reef and the other to cut apparently both the Mountaineer and the Derby Reefs. The latter adit would be situated some distance above the south-pitching cap of the Derby Reef, and could not therefore intersect it. Both adits are now blocked and cannot be entered.

Other Reefs, Formations, and Veins.

In the No. 1 adit between the Derby Reef and the Flat Reef another vein occurs. It consists of white quartz, 12 inches in width, and has a dip of 60° to the north-east. It has not been exposed at any other point, and apparently has no great lateral extent.

A 9-inch sample was assayed in the Geological Survey Laboratory with the following results:—

Gold: Trace.
Silver: Trace.

The quartz is thus only very slightly auriferous.

At the face of the No. 1 adit another vein is exposed. It varies in width from 3 to 12 inches and dips to the south-west in conformity with the slates. The quartz is slightly mineralised, and a 6-inch sample was assayed in the Geological Survey Laboratory with the following results:—

Gold: 2 dwt. 0 gr.
Silver: 13 gr.

Conclusions.

Numerous quartz reefs, veins, and formations have been exposed in the various workings of the Jubilee Mine. Of these, the most important are the Flat Reef and the Derby, including the part known as Lyons Reef.

The Flat Reef has been opened up at numerous places, and a quantity of gold-bearing quartz has been stoped from it. The gold values were located at the outcrop of the vertical western part, at the junction of the flat and vertical

eastern parts, and in an irregular shoot between No. 3 and No. 4 adits. Good grade quartz exists in the northern end, but the veins are narrow. At the southern end the reef should be intersected by any upward extension of the slide exposed between the 160-ft. and 260-ft levels, and shoots of gold may have been formed at the intersection. The slide should appear at the surface, midway between the No. 1 adit and the small shaft on the Flat Reef at the toe of the dump from the main shaft.

The similarity in form and structure of the Flat Reef and Lyons Reef suggests that the two might represent one and the same reef. The relative positions and the dips or pitch are also such that this might be the case. In the northern part the Flat Reef joins a vertical portion parallel to, and 20 feet east of, the Derby Reef, while in the southern part Lyons Reef joins the Derby Reef. If the Flat and Lyons Reefs are therefore one and the same, a change is involved in the vertical portions to which they are joined on the west, but this, however, is no objection to the above possibility. If the two are the same, it would appear that Lyons Reef occurs along the slide above and to the north of the 160-ft. level, and then gives place to the Flat Reef. It has been noted above that the slide should be exposed at the surface between the No. 1 adit and the small creek, where however it has not been located. If the reefs are the same, the slide must have lost its prominence in the vicinity of the Flat Reef. In the workings north of the 160-ft. level, it would appear that portion of the Derby Reef extended below the flat portion of it.

The Derby Reef has been stoped to shallow depths along practically the whole length of its outcrop. The stopes below the adit south of the creek extended to greater depths. Between the 160-ft. and 260-ft. levels Lyons Reef and the adjacent parts of the Derby Reef have been stoped. The slide which was the chief factor in influencing the shoots in this part of the Mine does not appear to have had the same effect near the surface as the surface shoot extended both north and south of any upward extension of it. Any future possibilities of this reef are associated with—

(1) The following of Lyons and adjacent parts of the Derby Reefs below the 260-ft. level.
(2) The prospecting of the south-easterly pitching cap of the Derby at its junction with Stevens Reef in the end of the adit south of the creek.

Lyons Reef is pitching to the east-south at an angle of 32°, and the cap of the Derby Reef to the south-east at 20°. These occur to the south of the main shaft, which is, therefore, unfavourably situated for their development. A vertical shaft on the south side of the creek or an inclined shaft would be more suitable for any future work carried out on the above lines.

The other reefs and formations exposed on the surface and in the underground workings do not appear to have been sufficiently auriferous to warrant further work on them.

The mine and adjacent country undoubtedly occur within one of the auriferous mineralised zones of the Mathinna Goldfield, and from this viewpoint must be regarded as favourable for the occurrence of gold reefs. Whether these can be located and found to be of sufficient size and value to render their extraction a profitable enterprise can only be determined by further prospecting work.

P. B. NYE, Government Geologist.

Hobart, 29th January, 1924.

PLATE I

GEOLOGICAL SKETCH MAP OF THE MATHINNA AND TOWER HILL GOLDFIELDS

5 cm

0 5 0 10 20 30 40 CHAINS
0 ¼ ½ MILE

TO FINGAL

WELCOME STRANGER
GOLDEN STAIRS 20ac.
11276 M
RECREATION RESERVE
11229 M 6ac.
11268 M 5ac.
POLICE RESERVE
ENTERPRISE
V733 G 5ac.
11268 L 5ac.
10797 M 5ac.
V737 G 5ac.
MATHINNA
10798 M 5ac. M.L.
10898 M
VOLUNTEER CONS. LD.
YELLOW BOYS
OLD BOYS
1704 G
CHESTER & MURRAY
1688 G
CITY OF HOBART
10714 M 19 ac.
CALEDONIAN WORKINGS
TAS. CONSOLS MINE
10 ac.
GOLDEN HINGES
NEW GOLDEN GATE MINE
1153 338
CONSOLIDATED LEASE Nº 1201 G 72 AC.
SOUTH GOLDEN GATE MINE
VICTORIAN GOLDEN GATE
856 G 10ac
451 G 18ac
NORTH ELDORADO 744 G
NEW ELDORADO
1021 G
10726 M
MINERS DREAM
SOUTH MINERS DREAM
1734 G 20ac.
1735 G 20ac.
GLADSTONE 1033 87G
359 G 20ac
HORSESHOE V603
TELEGRAPH 957 10ac.
CITY P.A.
JUBILEE
11090 M 55ac. MOUNTAINEER
169 G 10
PRIDE OF THE HILLS 170 G 10
1039 93G 10
534 G
663 G
525 G
SCOTT & PICKETT 526 G
1293 93G
COMMERCIAL 1292 93G
407 87G
1547 G 10ac
1548 G 10ac
TWILIGHT
10877 M 10
TOWER HILL MINE
SUNBEAM
135 P G 14ac.

VOLUNTEER MINE
SLING POP CREEK
BOWL CK.
BLACK HORSE CREEK
LONG GULLY CREEK
ROAD TO TOWER HILL
TOWER HILL
COX CK.
Probable Anticlinal Axis
CLOSE FOLDING

LEGEND

SEDIMENTARY

RECENT	River Gravel, Sands etc
PERMO-CARBONIFEROUS	Conglomerates, Sandstones & Mudstones
CAMBRO-ORDOVICIAN	Slates & Quartzites

North
Magnetic

Diagrammatic Section along the line AB

Bowl Ck. — Black Horse Creek — Long Gully Creek — Derby Reef — Lyons Reef — B Datum Mathinna 820' (Approx 1000ft above Sea Level)

A

Scale. Vertical } One inch to 10 Chains
Horizontal }

CHARACTERISTICS

Roads 1st Class	
Roads (reserved)	
Cart Roads	
Geological Boundaries	
Reefs	
Strike & Dip	
Anticlines	
Cleavage	
Shafts	
Adits	

K.J. Finucane M.Sc.
Field Geologist
8-9-33.

Photo Algraphed by Walter E. Shimmins, Government Printer, Hobart, Tasmania May, 1935 G.J.H.

PLAN
OF
ENTERPRISE WORKINGS

SCALE

40 30 20 10 0 40 80 120 160 200 feet

1749
G
11 ac.

Mineralised Quartz rib

BORE 370 ft. D 56°

Quartz formation

E 14° S

No 1 SHAFT 76'
34' level

OPEN CUT

No 2 SHAFT 76'
50' level

Trench

10796
M
5 ac.

1753
G
5 ac.

X Probable position of intersection.

5 cm

No 3 SHAFT 100'

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8-5-33.

PLAN OF WORKINGS

SECTIONS 10998 M, 1201 G & 10714 M

LINKS 100 50 0 1 2 3 4 5 6 7 8 9 10 CHAINS

5 cm

KING ST.

SMITH ST.

10998 M

5 ac.

SHAFT 100'

P.J. Holdenson M.L.

Golden Spur SHAFT

Magnetic Ref SHAFT

Star of Nathinna SHAFT

Caddy in Bank

East Gate Workings MAIN SHAFT

Magnetic North

Gate Extended Workings

400' level

MAIN SHAFT

10714 M

Caledonian Adit 19 ac

1201 G 72 ac

North Gate Workings

392'

MAIN SHAFT 1600'

Slide

OPEN CUT

Golden Gate Adit

Workings

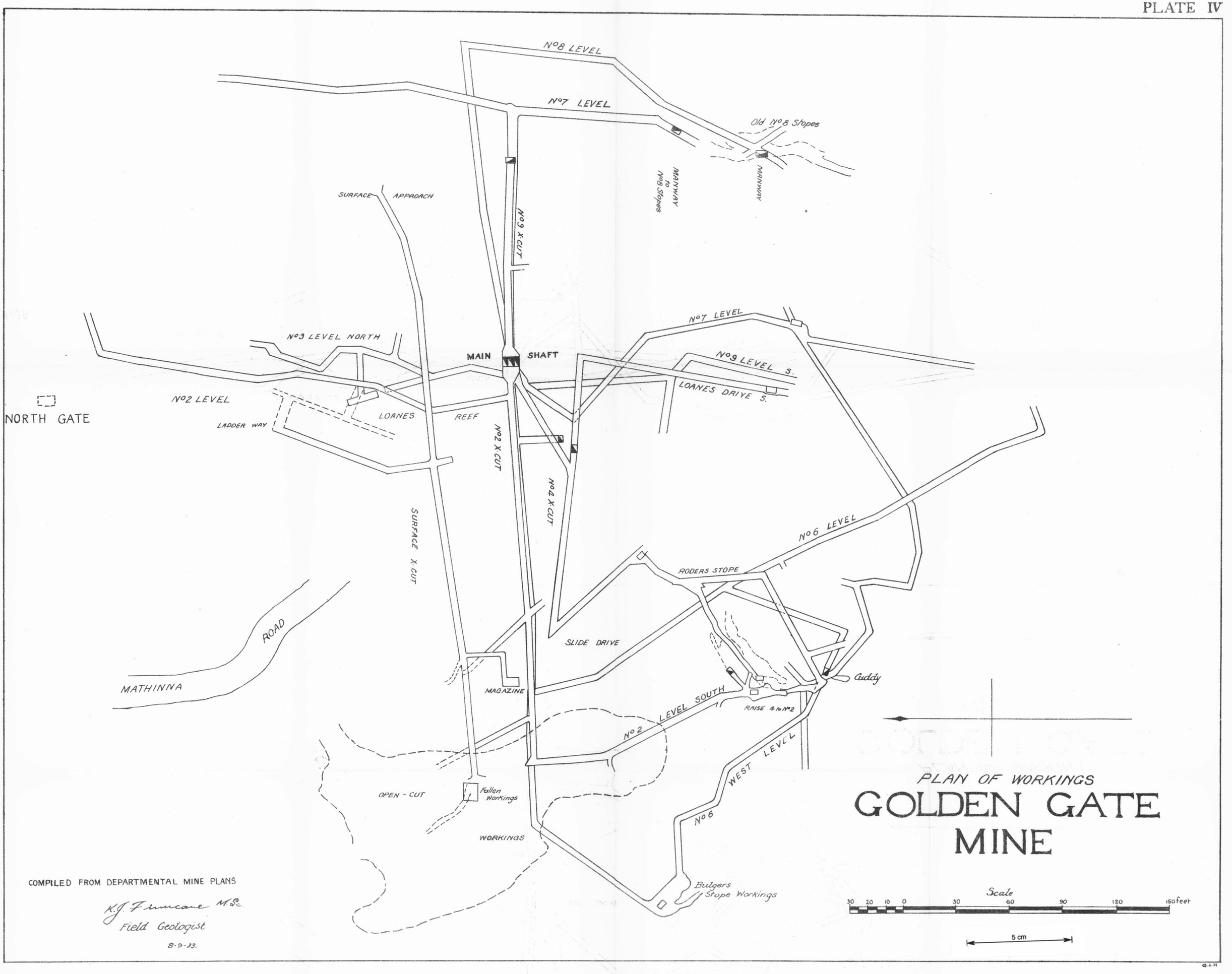
MAIN SHAFT 1800'

Level

P.J. Holdenson G.L.

K.J. Finucane M.Sc.
Field Geologist
8-9-33

Q.J.H.



COMPILED FROM DEPARTMENTAL MINE PLANS

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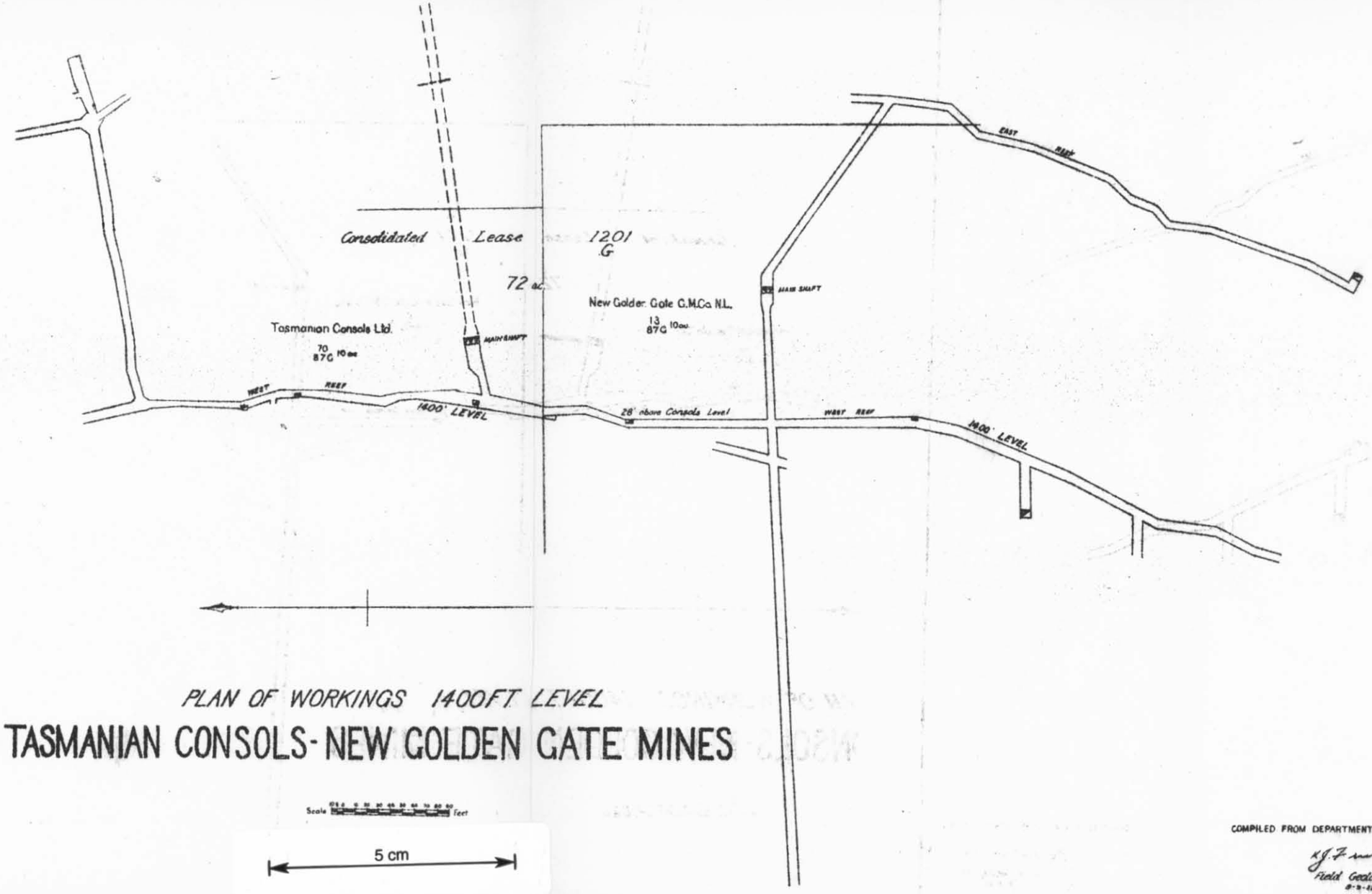
Field Geologist
8-9-33.

PLAN OF WORKINGS

GOLDEN GATE MINE

Scale
30 20 10 0 30 60 90 120 150 feet

5 cm



PLAN OF WORKINGS 1400FT LEVEL

TASMANIAN CONSOLS - NEW GOLDEN GATE MINES

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

5 cm

COMPILED FROM DEPARTMENTAL PLANS

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8-2-48

GSB43

PLATE VI

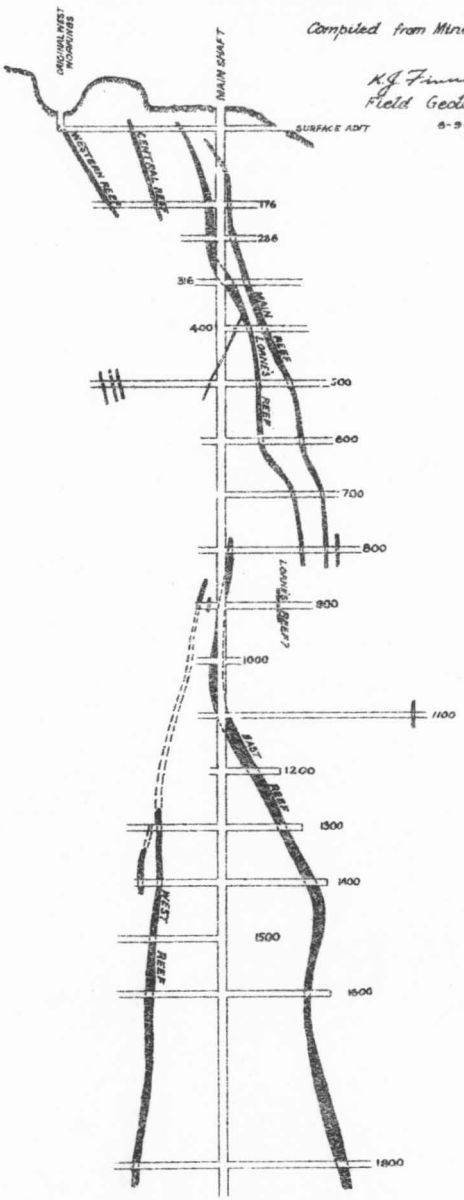
NEW GOLDEN GATE REEFS

Cross section looking North

Scale 100 50 0 100 200 300 feet

Compiled from Mine Plans

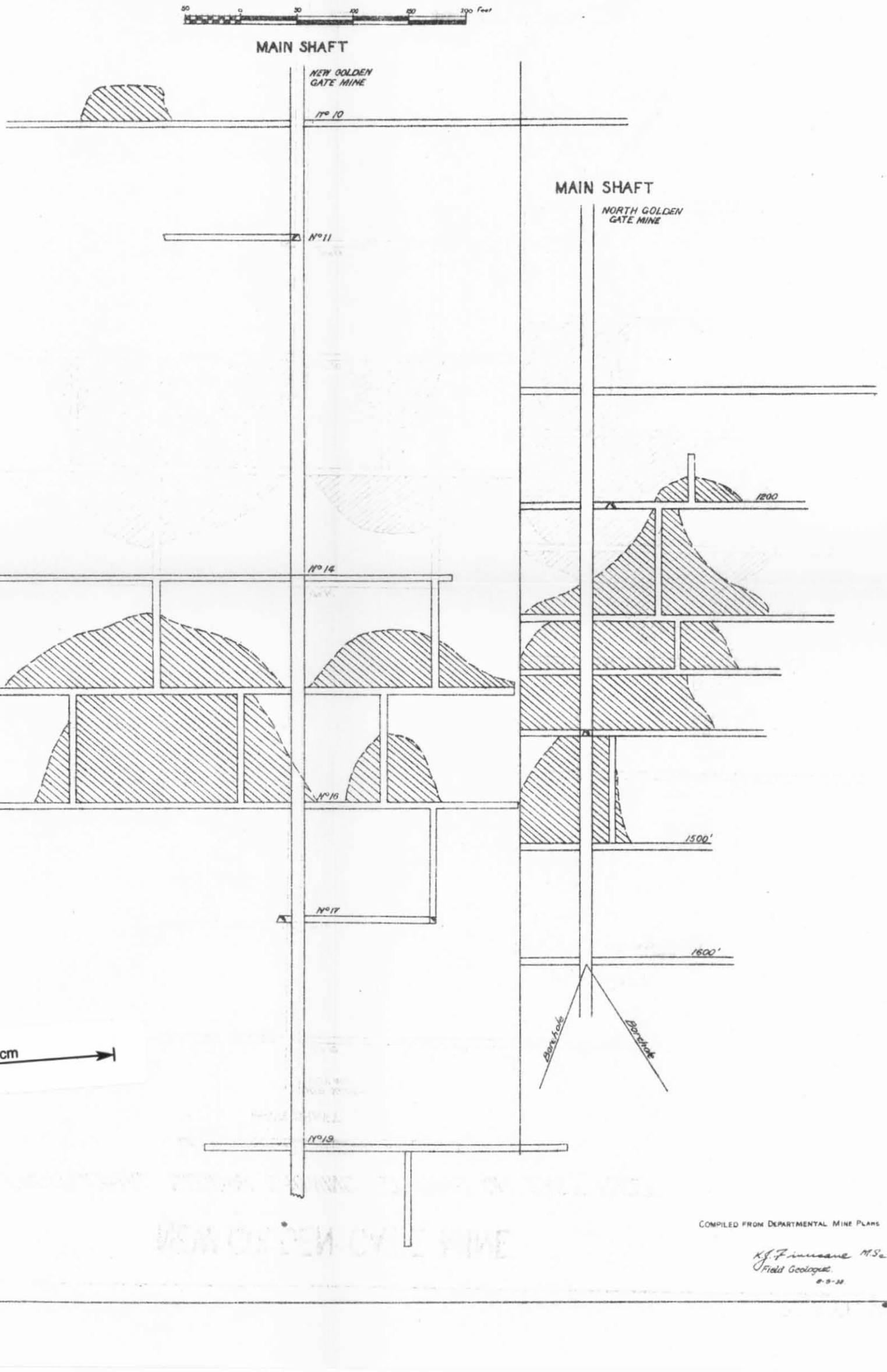
K.J. Finucane M.Sc.
Field Geologist.
8-9-33.



5 cm

NEW GOLDEN GATE MINE

LONGITUDINAL SECTION SHOWING STOPING ON EAST REEF



Stoping shewn thus ▨

COMPILED FROM DEPARTMENTAL MINE PLANS

K.J. Finnane M.Sc
Field Geologist.
6-3-38

TASMANIAN CONSOLS - NEW GOLDEN GATE MINES

LONGITUDINAL SECTION SHOWING STOPING ON WEST REEF

50 25 0 50 100 150 200 feet

5 cm

MAIN SHAFT
NEW GOLDEN GATE MINE

MAIN SHAFT
TASMANIAN CONSOLS MINE

No 9 (200FT. LEVEL)
No 10
No 11
No 12
No 13
No 14
No 15
No 17
No 19

Slide (from old workings)

Borehole @ 1200'
Borehole @ 1300'
Borehole @ 1400'
Borehole @ 1500'
Borehole @ 1500'

Tasmanian Consols Boundary

Drive in East Reef

Stoping shown thus

COMPILED FROM DEPARTMENTAL MINE PLANS.

K J Finucane M.Sc.
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11-9-35

G6843

PLATE IX

TASMANIAN CONSOLS REEFS

Cross section looking North

Scale 100 50 0 100 200 300 feet

After Twelvetrees with additions from Mine Plans in office.

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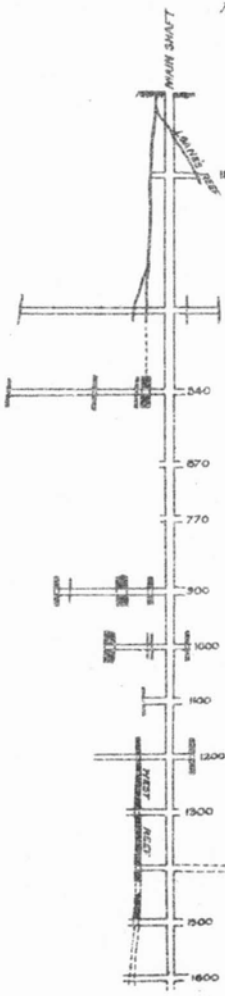
8-9-33.



5 cm

PLAN OF WORKINGS
SOUTH GOLDEN GATE - MINER'S DREAM - & HORSESHOE MINES

LINKS 100 50 0 1 2 3 4 5 6 7 8 9 10 CHAINS

5 cm

Consolidated Lease

1689
G

62 ac

MAIN SHAFT 280'

Old Stopes

Connecting Shaft

Miner's Dream Workings

10726
M

12 ac

D.R. Dick, M. Barnes & A.D. Dick.

South Golden Gate Workings.

MAIN SHAFT

400'

200'

400'

25°

30°

Horseshoe Workings

1603
G

10 ac

1710
G

8 ac

35°

6" Quartz

30°

35° Quartz

1'-3" Quartz

South Miner's Dream Wkgs.

4" Quartz

K.J. Finucane M.Sc.
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8-9-33

G.J.H.

PLAN OF WORKINGS

ELDORADO - GOLDEN HINGES & VICTORIAN GOLDEN GATE MINES

Eldorado Workings compiled from Departmental Mine Plans

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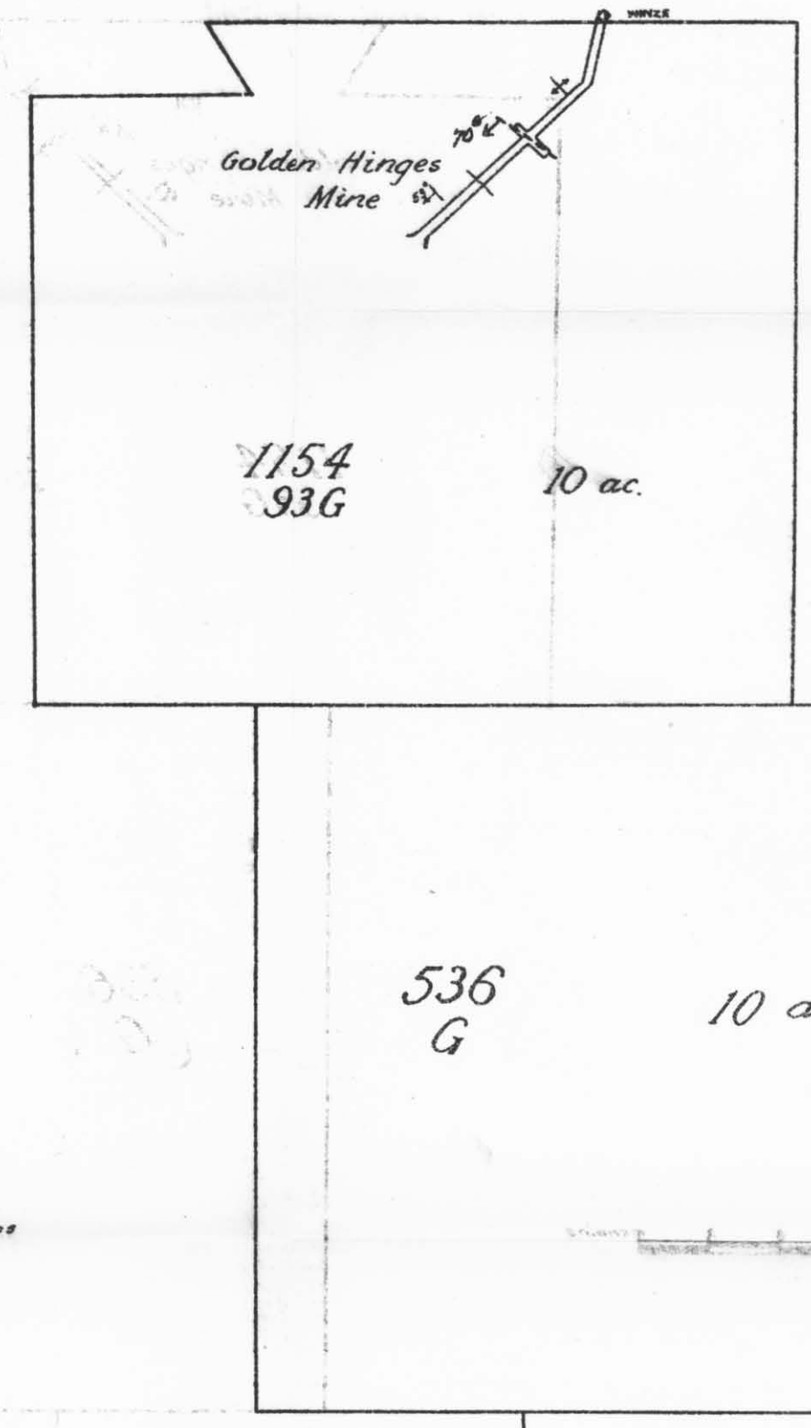
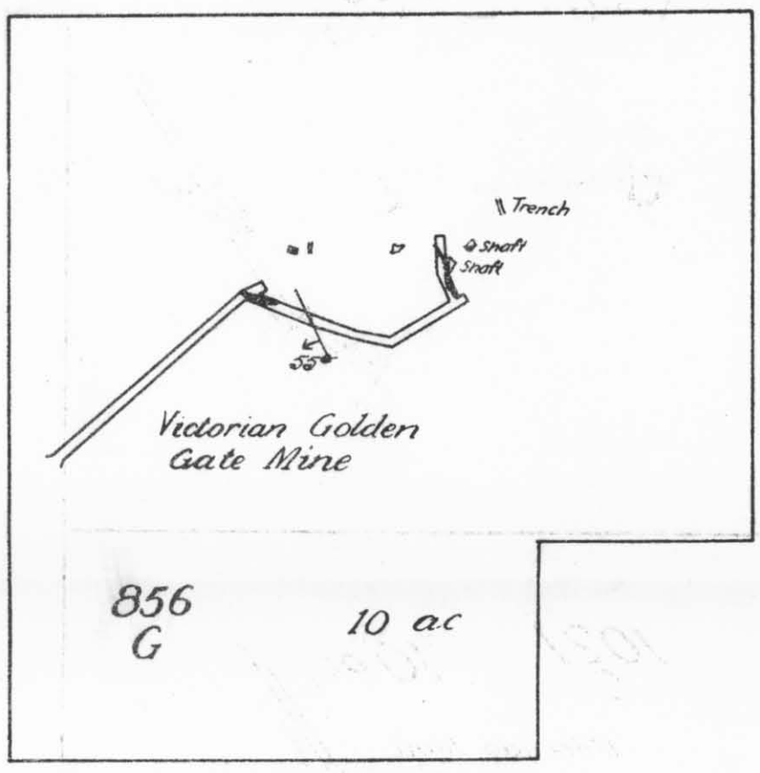
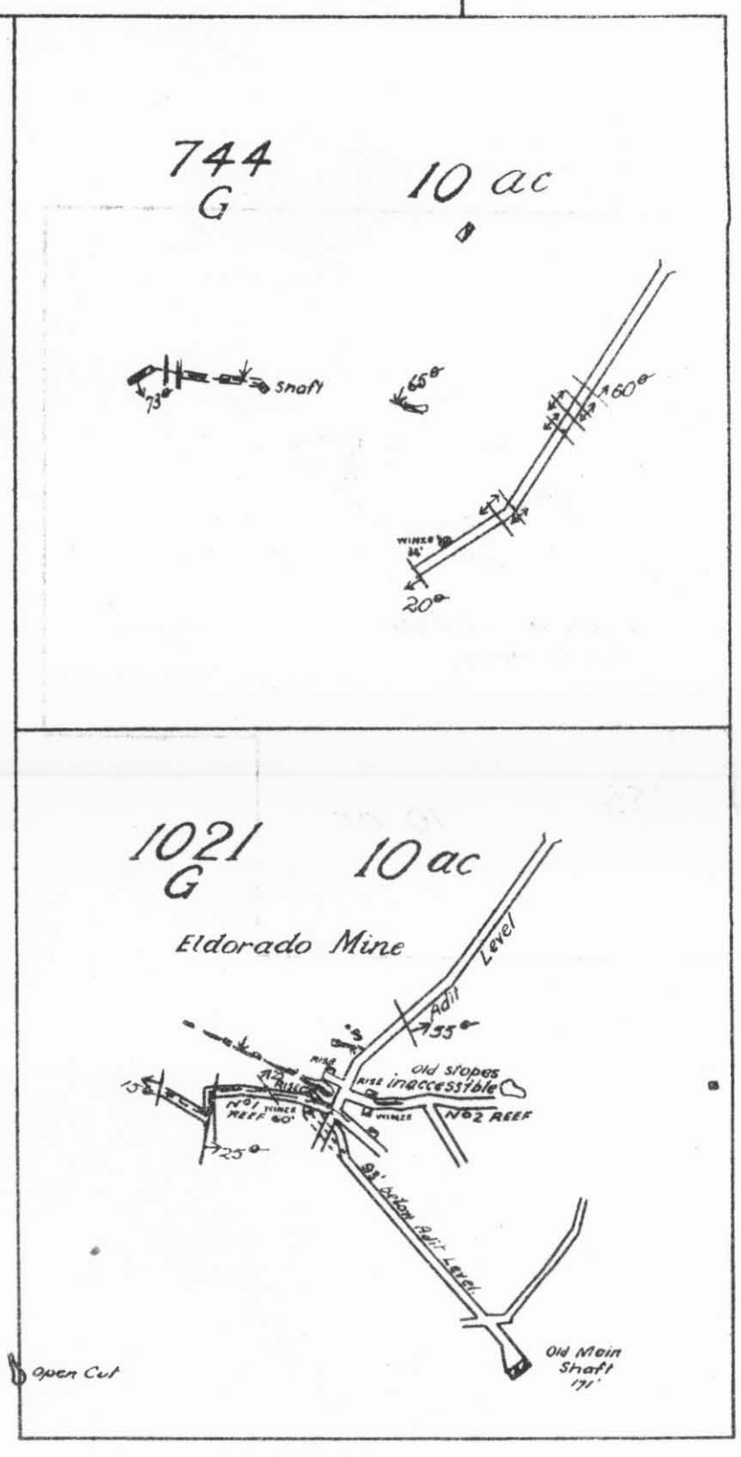
N

Scale
0 1 2 3 4 5 6 7 8 9 10 chains
Q.J.H.

5 cm







Q.J.H.

PLATE XII

PLAN OF THE UNDERGROUND WORKINGS JUBILEE MINE

SCALE

FEET 50 40 30 20 10 0 50 100 150 200 FEET

CITY P.A TUNNEL

1728 G

10 ac.

CREEK

GULLY

LONG

TRENCH

No 3 ADIT

No 2 ADIT

No 1 ADIT

MAIN SHAFT

ROAD TO SHAFT & BATTERY

CREEK

DERBY LODE

160' Level

260 Level

Consolidated Lease 11090 M 55 ac

LEGEND

STOPES from surface & shallow adits

160 ft. LEVEL

260 ft. LEVEL

No 1 INTERMEDIATE LEVEL

No 2 INTERMEDIATE LEVEL

5 cm

Plan prepared 1923 present day leases shown

R.B. Clyde B.M.E. M.Sc.
GOVERNMENT GEOLOGIST
24-8-33

MOUNTAINEER MINE

No 3 Adit

No 2 Adit

No 1 Adit

Veins & irregular branches of quartz

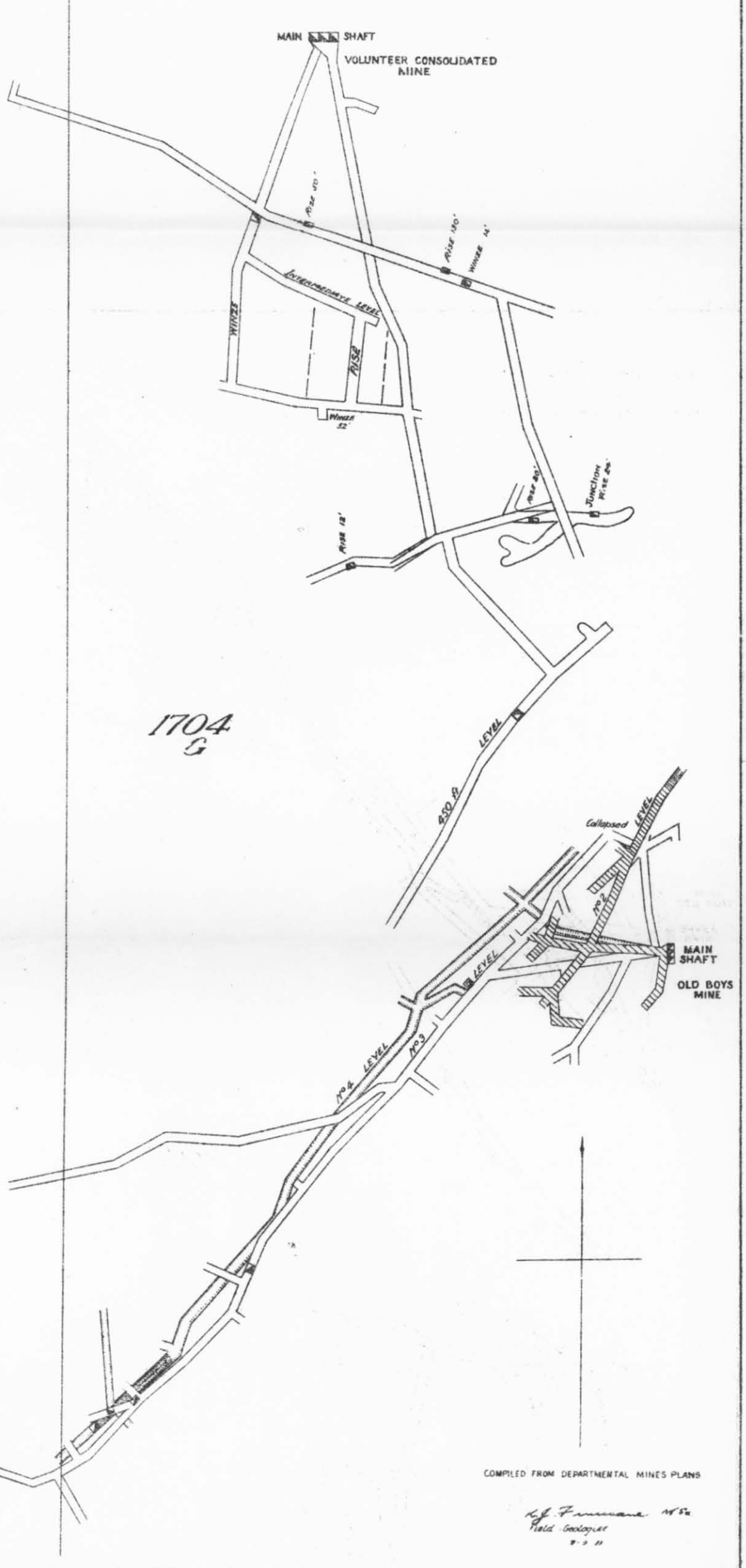
N.W. Corner
1704
S

PLAN OF WORKINGS

VOLUNTEER CONSOLIDATED & OLD BOYS MINES

40 30 20 10 0 40 80 120 160 200 feet

5 cm



COMPILED FROM DEPARTMENTAL MINES PLANS

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Field Geologist
9-9-11

GJR

PLAN OF WORKINGS
TOWER HILL MINE

1773
G
30 ac

10877
M
10 ac

P.J. Holdenson
M L

Tower Hill Workings
MAIN SHAFT
No1 Shaft

Quartzite with numerous quartz veins

No3 Shaft

No2 Shaft

BASIC DYKE (Approx.)

Sunbeam Workings
MAIN SHAFT

Line of Alluvial Workings

Line of Alluvial Workings

126P
G
20 ac

135 P
G
14 ac

SCALE

1 inch · 2½ chains

LINKS 100 50 0 1 2 3 4 5 6 7 8 9 10 CHAINS

5 cm

K.J. Finucane M Sc
Field Geologist
8-9-33.

Q.J.H