

Values are reported to be erratic, and the cessation of mining is probably due to the fact that a trial crushing has proved the ore to be refractory.

The quartz is highly mineralised and contains sphalerite, pyrite, calcite, and probably chalcopyrite and galena. Other minerals may also be present in the quartz, and several specimens have been submitted to the Government Chemical Laboratory for determination. The results of the determinations are not yet to hand.

NOTES ON SOME MINING GROUPS IN THE MOUNT MARGARET GOLDFIELD.

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INTRODUCTION.

The following notes are the result of inspections made by the writer during the course of the 1939 field season in the Mt. Margaret Goldfield. Small

geological maps on a scale of five chains to one inch were made of the environs of most of the mining groups described in the following pages. Maps of the Victory Group, the Midas Group, the Baneygo Group, the Patch, the Connemara Group, the Mulga Queen and Famous Blue Groups and the Hutanui Group, were prepared with the aid of the plane table and telescopic alidade, using Mines Department Survey information as base data. Sketch plans of most of the remaining groups were made by means of pace and compass traverses.

No attempt was made to sample any of the shows. Any information as to assay values of underground workings was provided by the proprietors of the various mines concerned, and the writer can accept no responsibility for the accuracy of such information. All production data, however, was compiled from the official Mines Department Records.

For the precise locations of the different mining groups which have been described in the following pages, the reader is referred to the locality and structure-contour plan of portion of the Mt. Margaret Goldfield, which forms Plate II. of this Annual Report.

BROCKOFF'S FIND, MALLOCH'S WELL.

This group is situated at approximately nine miles due south of Burtville and 29 miles south-east of Laverton, and comprises G.M.Ls. 2425T, 2426T, 2427T, 2430T, and 2435T, of which G.M.L. 2426T, the site of the original "find" is the only one upon which any degree of mining activity is apparent. At the time of inspection (April, 1939), this lease was under sampling option to the Western Mining Corporation, and a programme of developmental mining with the object of testing the size and quality of the lode was then being carried out by that company.

The Geology.—The rocks in the vicinity of this group are all highly decomposed and provide very poor outcrops. They consist of white to yellowish-green schists which are rather talcose and greasy to the touch in places, and which frequently have a satiny sheen along the planes of schistosity. These rocks probably represent sheared and decomposed basic tuffs and lavas. The direction of schistosity is about N. 10°-15° W. Thin vuggy limonitic quartz bands can be seen running through the schists generally in a direction roughly parallel to the schistosity.

From about three-quarters of a mile to a mile to the eastward of this group the ground gradually slopes upward into broken, hilly country, consisting of fresh dark green chloritic schists and sheared basic lavas intruded by dykes and sills of sheared acid porphyry, and capped by a flat table-topped layer of ferruginous laterite. On the western edge of the breakaways formed by this laterite plateau is situated the old leases of the Rowena Group.

G.M.L. 2426T, "Nulli Secundus."—At the time of inspection the mining development completed consisted of the sinking of a shallow shaft about 15-20 feet deep upon the original lode discovered by the Brockoff brothers, and of the sinking and driving on a new parallel lode located by employees of the company. The shaft in this new lode had been sunk to about 70 feet, vertical depth. It is situated at

about 60-65 feet north-west of the original find. Driving had been continued for a distance of about 40 feet north and 20 feet south of the shaft at the 70ft. level.

The lode consists of a narrow lens or a series of lenses of iron-stained quartz stringers and slightly mineralised schist. The lode strikes about N. 10° W. and dips almost vertically and varies in thickness from less than a foot up to three and four feet. Sulphide minerals in the lode are not very abundant and consist of pyrite and a rather whitish metallic mineral which is probably arsenopyrite. The gold appears to be free and in very fine particles. Values within the lode channel are sporadic, ranging from thin lenses, assaying a few pennyweights per ton up to kidneys of ore assaying five to six ozs. per ton. Water level here is at about 110 feet. In the ore body forming the original find values failed to live at depth, the lode becoming impoverished at about 20 feet. At the time of inspection it was not possible to say over what total length payable values could be obtained in the two lodes.

The possibility of the existence of further parallel ore bodies cannot be disregarded, however, and this possibility had not then been investigated by underground crosscuts, though the writer was informed that careful loaming had failed to indicate the presence of further ore bodies at the surface.

The schist of both the country and the lode channel is for the most part soft and easily bored with augur drills, but it carries occasional hard "bars" consisting of secondary limonitic material formed by deposition from the seepage of iron bearing solutions along joint planes. It is not particularly good holding ground and requires fairly close timbering to ensure safe mining.

Since the date of inspection the sampling option held on this lease has been allowed to lapse and the property has reverted to the original finders. The irregularity and uncertainty of the values at depth, and the attendant probable high cost of mining would appear to mitigate against the development of this property by a big mining company.

Production.—During the latter part of the year (1939) two bulk crushings from this lease were put through the State Battery at Laverton. In all 217.25 tons of ore were crushed for a gross yield of 180.44 fine ozs. of gold. Despite the rather high costs of carting, these two crushings should encourage the owners to persist with the opening up of this show and with the prosecution of a more careful search for further parallel ore bodies.

The full details of crushings from this lease up to September, 1939, as obtained from the official returns, are as follow:—

Year.	Ore Crushed.	Plates.		Sands.	Total Gold.	Grade.
	tons.	bullion ozs.	fine ozs.	fine ozs.	fine ozs.	dwts. per ton.
1938	42.75	25.91	22.47	8.63	31.10	14.54
1939	217.25	189.94	131.23	49.21	180.44	16.60
Total	260.00	215.85	153.70	57.84	211.54	16.27

VICTORY GROUP, PAILLARD'S FIND.

Paillard's or Frenchy's Find lies about 1½ miles south of Cox's Find and approximately 40 miles north of Laverton. There are six leases in this group, namely, G.M.L.s 2411T, 2413T, 2414T, 2415T, 2416T and 2421T. At the time of inspection (August, 1939) only two of these leases (2411T and 2421T) were being worked, while there was very little evidence of any extent of prospecting having been carried out upon the other leases.

On the whole outcrop conditions in the neighbourhood of this group are poor and the rocks are mostly highly decomposed. Several low ridges and one sharp hill are formed by outcrops of banded ferruginous quartzite which occur in a number of very broken, narrow lenticular beds striking from N. 10° W. to N. 10° E. and dipping 65-80° E. At the northern end of the leases, several of these quartzite bands swing to the west and then back to north again in a gentle dragfold which pitches steeply northwards. These lenses of quartzite are embedded in reddish to yellowish decomposed ferruginous schists over which lies a thin layer of dark red soil and scattered quartz, quartzite and ironstone rubble.

G.M.L. 2411T "Victory."—The site of the original find lies within G.M.L. 2411T. The main shaft on this lease has been sunk to about 70 feet, the first 30 feet being vertical and the remainder underlay-

ing at about 75 degrees to the east. The ore body here consists of a narrow bluish-white quartz reef interbedded with lenticular bands of banded quartzite and whitish kaolinitic material, the whole enclosed in yellowish white decomposed schist. The reef strikes almost due north and south and varies in width from about three feet down to a few inches. Driving has been continued for about 40 feet south of the shaft at a depth of 24 feet, and for about 25 feet north of the shaft at a depth of 30 feet. There is also a drive at a depth of approximately 60 feet which runs south for 30 feet.

At the time of inspection stoping was being carried out in the upper south drive where values appear to be more consistent, averaging 14 to 15 dwts. per ton. Values up to a few weights are said to extend into the footwall for about nine inches. The gold is very finely divided and in the free state and there is very little sulphide mineral in the ore body. The cap of the reef is for the most part completely obscured by three to four feet of ferruginous cement. Floaters have been traced for a length of four or five chains. The country is fairly good holding ground, very little timbering having been so far required. Cost of carting the ore to Laverton for crushing is high, however, and greatly limits the minimum grade of ore which can be profitably worked.

To date, nearly 160 tons of stone have been crushed at the Laverton State Battery from this lease, and these have yielded an average return of about 13.7 dwts. of gold per ton. Bullion from these crushings carries approximately 86.7% of fine gold.

Recommendations.—Unfortunately the ore body does not appear to live at depth—in the 60ft. level the reef appears to pinch badly—while values become low and rather sporadic. However, there appears to be good possibilities either of this reef making again with further depth, or of other parallel reefs coming in to the lode channel with consequent makes of ore between the present bottom level and water level, which is probably at about 90 to 100 feet. Crosscutting for ten to fifteen feet from the bottom of the shaft into both footwall and hanging wall is recommended. Prospecting at depth can only be carried out by sinking the shaft further, preferably down to water level.

G.M.L. 2421T "Victory Extended."—This lease lies about 15 chains south of G.M.L. 2411T and its boundaries enclose a high, sharply pointed ridge of banded ferruginous quartzite and ferruginous schist. The workings lie at about four chains to the east of this ridge. Here a number of very rich shoots of gold are located just below the surface cement in whitish decomposed schist, cut by thin quartz stringers. A shaft has been sunk to 22 feet. The phenomenally high values, shown in the production table below, have all been obtained in several shoots at from 10 to 12 feet below the surface. These shoots appear to be pitching steeply to the southward. It appears probable that the high values obtained here are the result of secondary enrichment and considerably more development will be required before it will be possible to ascertain the possibilities of these shoots living to any depth.

Production.—The following table gives the production figures for G.M.L.s 2411T and 2421T, according to official returns, up to October, 1939:—

Year.	Ore Crushed.	Plates.		Sands.	Total Gold.	Grade.
		tons.	bullion oz.	fine ozs.	fine ozs.	fine ozs.	dwts. per ton.
<i>G.M.L. 2411T—</i>						
1938	81.0	42.42	36.38	16.19	52.57	12.89
1939	77.25	44.79	39.59	16.81	56.40	14.60
Total	158.25	87.21	75.97	33.00	108.97	13.77
<i>G.M.L. 2421T—</i>						
1938	8.0	111.46	98.43	13.85	112.28	280.7
1939	14.75	88.19	77.87	9.45	87.32	118.4
1939 ... ..	.025	...	...	...	*155.0	...
Total	22.775	199.65	176.30	23.30	354.60	302.2

* Dotted gold.

MIDAS GROUP, RUSSELL'S FIND.

This find is located at approximately 4½ miles north of Cox's Find and 46 miles north of Laverton. It comprises the four G.M.L.s. 2350T, 2352T, 2362T and 2402T, of which the last is the only one in which any degree of mining has been carried on, and which was at the time of inspection (September, 1939) the only lease being actively worked.

The Geology.—The find is situated on fairly high ground which slopes downwards on the northern, western and southern sides. The rocks in the vicinity are not well exposed, being for the most part covered by a lightish coloured gravelly soil. Where visible the rocks appear to represent red, yellow and whitish schists of probable sedimentary or tuffaceous origin. On the immediate western edge of the leases and cutting through the north-western corner of the most northerly lease of the group, is a belt of country about 10 to 12 chains wide consisting of a broken series of lenticular beds of black and white banded ferruginous jaspilite and pure white quartzite. These jaspilite and quartzite beds dip at angles varying from 50 to 80 degrees to the east. They lie interbedded with sedimentary schists and altogether form an horizon striking in the direction of N. 5-10° E. This horizon of jaspilite and quartzite can be traced northwards for several miles and southwards as far as Cox's Find where it forms a series of long broken

ridges to the immediate westward of the New Eristoun G.M. Thus it is evident that the Midas Group and the New Eristoun Group lie upon the same "gold line."

G.M.L. 2402T "Midas."—Both the ore bodies and the country in the vicinity of them are covered by a thick mantle of lateritic, gravelly soil. It is consequently very difficult to obtain very reliable data as to the precise direction of strike of the schists hereabouts but it would appear that the country as a whole is striking from N. 5° W. to N. 20° W.

Two parallel reefs have been located on this lease. Their outcrops can only be traced over a length of a few chains by means of floaters. They both strike at approximately N. 10-15° W. and are about 20 to 25 feet apart. The western or main reef is the one at present being mined. This consists of an ore body of fairly dense white quartz striking N. 15° W. and underlying steadily to the eastward at from 42 to 45 degrees. This reef has been opened up to a depth of 100 feet (underlay depth) and for a length of 95 feet. It varies in width from 1 foot up to 5½ feet but averages about 3 feet wide. An inclined shaft has been sunk on the reef to a depth of 100 feet (underlay depth) and levels have been driven at 40 feet and 100 feet.

About two-thirds of the ore above the 100ft. level has already been stoped and at the time of inspection preparations were in progress for the stoping of the remaining block of stone south of the shaft between the 40 and 100ft. levels.

The values in the reef run in the form of a broad shoot which pitches steeply to the south. Both the footwall and hanging wall of the reef are of yellowish decomposed schist. Running longitudinally down both walls is a series of fine rippling corrugations which pitch to the south at angles varying from 35 degrees to 40 degrees. Gold appears to be solely confined to the quartz reef and does not occur in the schist of the country rock. The reef is almost entirely free of sulphide minerals. The gold is stated to be fairly coarse in places in the upper levels but becomes more fine at depth. It is seldom visible in hand specimen. South of the shaft on the 100ft. level the values have remained fairly consistent, averaging from 16 to 18 dwts. per ton. The reef at the south face of the drive on this level shows signs of pinching and is here approximately one foot wide. Values, though decreased, extend right to the face, and it is possible that further driving may disclose other shoots of ore and corresponding widenings of the reef.

A vertical shaft has been sunk on the eastern reef at a point 90 feet bearing 155 degrees from the main inclined shaft. This vertical shaft was inaccessible at the time of inspection but is reported to pass through the eastern reef and to extend to a depth of about 45 feet where it meets the western reef. A small amount of stone has been won from the eastern reef but the writer was informed that values proved to be very inconsistent.

The western reef was opened up for a few feet but values here were poor, averaging about 4 to 5 dwts. per ton and no further driving has so far been carried out. The width of the reef at this point is unknown.

Recommendations and Conclusions.—Ground water level has not yet been reached in this mine. It is probably at somewhere between 100 and 120 feet (vertical depth) which means that the main inclined shaft can probably be sunk a further 40 to 60 feet on the underlay before the water level is reached. The country at present opened up is quite dry, and despite the comparatively flat dip of the reef, has proved to be excellent holding ground.

A pleasing feature of the main ore body is its consistency in width and values over a steady length. The appearance of the gold in the stone suggests its primary rather than secondary origin, and when considered together with the comparatively even distribution of values in the reef, this gives strong support to the view that payable values will be obtainable at depths well below the ground water level.

The fact that the main reef has been encountered in the vertical shaft at about 90 feet south of the main shaft, shows that it extends at least 30 feet further south of the southernmost point so far opened up, and probably considerably further. A continuance of the south drive at the 100ft. level for at least another 50 feet, in order to test this portion of the reef at depth is strongly recommended.

Crosscutting through the hanging wall of the main reef would provide valuable information as to the possibilities of the eastern reef at depth. This would need to be continued for at least 30 feet. Such a crosscut would also explore the possibilities of the existence of other parallel reefs between the main reef and the eastern reef.

Production.—The following is a complete table of the production of this mine since its discovery in 1936, up to October 1939. The figures indicate that, although the total tonnage crushed is not large, the average grade of the ore treated has remained fairly consistently good. Bullion has yielded a very constant average of approximately 88.5 per cent. of fine gold.

Year.	Ore Crushed.	Plates.		Sands.	Total Gold.	Grade.
		tons.	bullion ozs.	fine ozs.	fine ozs.		fine ozs.	dwts. per ton.
G.M.L. 2402r—						
1936	64.5	45.55	40.33	18.75	59.08	18.32
1937	385.0	199.58	176.30	85.72	262.02	13.61
1938	189.25	95.74	85.61	43.63	129.24	13.63
1939	108.25	86.67	76.28	33.36	109.64	20.26
Total	747.00	427.54	378.52	181.46	559.98	15.01

BANEYGO GROUP, ERLISTOUN.

The Baneygo leases cover a long strip of country about 3½ miles in length and about a quarter of a mile in width running in a north north-westerly direction from a point approximately one mile south-west of the old Eristoun townsite to about 2½ miles north-west of the townsite. The leases lie approximately 52 miles north of Laverton. Most of the workings have been abandoned for many years and no gold mining leases were being held at the time of inspection (September 1939.). A small amount of mining was being carried out on two prospecting areas, 2205T (late P.A. 1954T) and 2176T, which enclose the areas covered by the forfeited G.M.Ls. 2343T and 1809T respectively.

The Geology.—The country in the vicinity of the leases is fairly undulating and in places broken by cliff-like breakaways forming deep embayments. Rocks here are for the most part highly decomposed and are frequently concealed beneath a thick layer of soil and rubble. To the immediate west of P.A. 2176T is a narrow ridge of fairly fresh ultrabasic greenstone containing serpentine, which extends northwards for nearly half a mile, while to the east of the leases is a narrow belt of country containing numerous parallel reefs of white buck quartz. These quartz reefs all run in the direction N. 10-12° W. and some of them form high sharp ridges.

Up to half a mile to the westward of the leases is a series of beds of banded ferruginous quartzite. Several of these beds form conspicuous outcrops but

the remainder can only be traced as thin broken lenses and scattered ferruginous rubble. These quartzite beds strike in the general direction N. 10-15° W. but with many local variations. They dip for the most part at very steep angles to the west but are overturned in places.

To the west of the ferruginous quartzite beds are some low rounded outcrops of fresh basic lavas. The remainder of the country is made up of decomposed indeterminate greenstone schists, with local interbedded thin bands of undoubted sedimentary grits and fine grained kaolinitic shales, all striking N. 10-15° W.

Meade and Dwyer's P.A. 2205T (late P.A. 1954T).

This prospecting area includes an area which has at various times been pegged as G.M.L.s 725T, 1808T, 2113T and 2343T and is the site of the old "Baneygo North" G.M. The old workings are marked by a line of shafts and open cuts extending over a length of about 600 feet, but at the time of inspection they were not accessible. Recent work on this prospecting area has been confined to the opening up of two shoots of ore on the south end of the workings. These shoots appear to be in the same lode channel, and they have been opened up by means of two shafts, one being about 72 feet south of the other. The ore bodies consist of thin lenses of ironstained quartz and decomposed schist between fairly well marked walls in decomposed schistose country. The north shaft is about 20 feet deep and at the bottom of it is a drive running south for about 40 feet. The maximum width of the lode in this drive is about 12 to 18 inches. It dips to the west at approximately 60 degrees.

The south shaft is accessible to a depth of about 40 feet. At this level short crosscuts run both east and west from the shaft and from just west of the shaft is a drive running approximately N. 20° W. for about 48 feet. This drive follows a narrow leader of quartz ranging from three to six inches wide in yellow and

red schist. The lode here dips west at 73 degrees. At the time of my visit I was unable to obtain any direct information as to the distribution of values in the lode, or the pitch of the ore body. The hanging wall of the lode in the drive carries small rolls or corrugations themselves marked by fine striations. Both the folds and the striations pitch north at the flat angle of 20 to 25 degrees. The country here is very soft and rather talcose but nevertheless appears to hold fairly well. Water level is at approximately 90 feet vertical depth. There is a certain amount of decomposed sulphide mineral in the lode channel but the gold would appear from the battery returns, to be in the free stage. Some fine "paint gold" is met with in joint seams and channels of infiltration, and this is obviously of secondary origin.

W. Loudie's P.A. 2176T.—This prospecting area includes the late G.M.L. 1809T (part G.M.L. 720T) and lies approximately 30 chains south of the workings already described. Very little work has been done on this area recently and the old workings are mostly inaccessible. These include two parallel lines of shafts running in a roughly north and south direction for about 450 feet. These lines are approximately 60 feet apart. The eastern line appears to be in greenstone schist whilst the western line remains for the most part in a band of medium-grained kaolinitic sandstone, or grit.

At the time of inspection, the prospectors were opening up a small shoot of ore at the south end of the old workings. This shoot had been exposed to a depth of about 16 feet and consisted of thin stringers of fairly clear quartz in blocky kaolinitic grit. No attempt has been made, however, to carry out any systematic mining.

Production.—The following figures represent the production since 1905, for the area included by the present P.A.s 2205T (1954T) and 2176T, up to October 1939:—

Lease, etc.	Year.	Ore Crushed.	Plates.		Sands.	Total Gold.	Grade.
		tons.	bullion ozs.	fine ozs.	fine ozs.	fine ozs.	dwt. per ton.
G.M.L. 725r ...	1905-6	61.5	...	...	...	106.22	34.54
G.M.L. 1808r ...	1908-9	74.0	...	...	...	105.63	28.54
G.M.L. 2113r ...	1921-7	670.0	...	...	...	{ 213.4 } †29.31	6.37
P.A. 1954r ...	1938	59.25	31.77	*27.97	4.76	32.73	11.05
P.A. 2205T ...	1939	64.0	35.44	*31.21	21.77	52.98	16.55
Total ...	...	928.75	...	...	...	540.27	11.63
G.M.L. 1809r ...	1908-9	56.0	...	...	...	91.13	32.52
P.A. 2176r ...	1939	28.25	24.10	20.75	3.79	24.54	17.36
Total ...	...	84.25	...	...	...	115.67	20.18

* Approximately.

† Dollied.

RECENT FINDS, ERLISTOUN-DUKETON

During the last twelve to eighteen months there has been a considerable amount of prospecting activity in the belt of greenstone country running northwards from Cox's Find to Duketon. This activity has resulted in the discovery of a number of small new finds. None have as yet been opened up to any depth, however, and it is difficult to gauge their probable ultimate worth. Most of the reefs discovered are small and the values irregular in distribution.

A. Walsh's P.A. 2036T.—This prospecting area is situated about 2½ miles north north-west of the Midas Group and is thus approximately 49 miles north of Laverton. The reef lies about 10 chains west of a long ridge of red and black banded jaspilite which dips steadily eastwards at angles from 50 to 70 degrees.

The ore body is a reef of fairly coarse grained white quartz carrying stringers and lenses of a finer grained laminated quartz. The reef runs in the direction N. 8° W. and is divided into two shoots

lying about 200 feet apart. The reef is enclosed in decomposed yellowish schist and, together with the country it dips at about 60 degrees to the east. On the south shoot a vertical shaft has been sunk to about 80 feet, while driving and stoping have been carried out over approximately 100 feet at a depth of 60 feet. This shaft was inaccessible at the time of inspection (September, 1939). The values in the ore body are reported to pitch steeply to the north in this southern shoot. The northern shoot has been opened up to a depth of 20 feet. Here the values are said to pitch to the south at from 45 to 50 degrees. The best values are obtained in the narrow laminated quartz leaders.

Rich blebs of coarse gold have been found in this stone associated with a pale green coloured earthy mineral, and the writer is informed that wherever this mineral occurs gold values are invariably high. Practically no sulphide minerals were seen. Water level is at about 65 feet V.D.

Production.—According to official records four crushings have been taken from this prospecting area since August, 1938. Though the total tonnage so far treated is quite small, some good yields have been obtained. The following table gives the figures up to October, 1939:—

Year.	Ore Crushed.	Plates.		Sands.	Total Gold.	Grade.
		tons.	bullion ozs.	fine ozs.	fine ozs.	fine ozs.	dwts. per ton.
1938	12.25	22.64	19.99	1.19	21.18	34.58
1939	22.5	50.46	44.58	4.72	49.30	43.80
Total	34.75	73.10	64.57	5.91	70.48	40.56

Swanson's Creek Group.—At about 17 miles north of Cox's Find and 63 to 65 miles north of Laverton are a number of scattered prospecting areas marking new finds. The country hereabout is mostly flat and covered by a thick mantle of laterite soil and rubble, while outcrops are very scarce and much decomposed. This makes prospecting for new reefs a slow and arduous task. The following is a brief description of these new finds:—

J. Escreet's P.A. 2174T.—This prospecting area is about 63 miles north of Laverton. The ore body is a dense white quartz reef, striking N. 50° W. and dipping flatly to the east at about 35 degrees for 55 feet when it steepens to about 60 degrees. The reef is enclosed in a decomposed schistose granular rock which may be either an acid sediment or a porphyry. It is traceable at the surface only by means of scattered floaters.

An inclined shaft has been sunk on this reef to a depth of 74 feet (underlay) and short drives have been cut at depths of 28 feet and 74 feet. In the bottom level the reef is exposed over a total length of about 40 feet. It varies in width from 6 to 18 inches but averages approximately 9 to 12 inches. The gold in the stone is fairly fine grained and there is only a very small amount of sulphide mineral, mostly pyrites, to be seen.

A second shaft has been sunk on a small parallel reef approximately 4½ chains west north-west of the main workings. This reef has been opened up to a vertical depth of about 50 feet, but the width of the reef and the distribution of values have proved to be very irregular and not particularly encouraging. Ground water level has not yet been reached in any of these workings.

Production.—Two crushings were put through the Laverton State Battery, up to October, 1939. According to official records the total tonnage treated was 27.75 for a return of 55.01 ozs. of bullion, yielding 48.64 fine ozs. of gold over the plates and 7.44 fine ozs. in the sands. The average grade of ore treated was thus 40.4 dwts. of gold per ton. This yield should amply repay the prospectors for their labour and, it is to be hoped, will encourage them

to continue the development of their show at depth, and extend their activities to include a further search for other possible parallel reefs.

T. Lockie's P.A. 2210T (late P.A. 2162T).—This prospecting area is situated about three-quarters of a mile north of P.A. 2174T. The reef here consists of a finely granular quartzite cut by white quartz stringers and enclosed in yellow to purplish greenstone or tuffaceous schists. The strike of the lode is N. 15° E., and it has been traced over a length of about 150 feet. At the time of inspection (October, 1939) the main workings on this lode were confined to the northern end, where two shafts about 40 feet apart had been sunk on the reef to a depth of about 40 feet, and driving was in progress. The reef averages about one foot in width here, and though small rich patches are occasionally met with the average value of the stone is not very high. Water level is here considered to be at about 110 to 120 feet.

Production.—Official records show that there have been two crushings from this prospecting area during 1939. A total of 65.75 tons have been treated for 34.5 ounces of bullion, yielding 30.9 ozs. of fine gold over the plates, and for 13.8 ozs. of fine gold from the sands. The total yield of 44.7 fine ozs. of gold have thus been obtained at an average grade of 13.59 dwts. per ton.

Douglas and Moore's P.A. 2221T and Horne and Shaw's P.A. 2222T.—These two prospecting areas lie at about 1½ miles to the north-west of those already described. Workings here consist of shallow shafts and pot holes on a number of white, rather blocky, frequently highly mineralised quartz reefs enclosed in decomposed kaolinic schist. The general strike of the reefs is parallel to that of the schist and is N. 5-10° W. None of these reefs have been opened up to any depth and it would appear that the prospects so far obtained have been rather discouraging. The costs involved in carting stone 65 miles to the Laverton State Battery are such as to necessitate the crushing of only high-grade ore, and consequently stone which in more conveniently placed centres would be considered as good ore, must here be discarded as unpayable.

One small crushing from P.A. 2221T was put through the Laverton State Battery in October, 1939. This was for 9.75 tons and yielded approximately 4.5 ozs. of bullion. There are no official records of any crushings from P.A. 2222T.

THE PATCH, DUKETON.

The Patch is situated at about three miles west of the old Duketon Townsite and is approximately 73 miles north of Laverton. It has been the scene of a number of extremely rich alluvial finds, and following a rush to the area in 1912-13, a line of numerous small but very rich patches of gold was discovered in decomposed country at depths up to 40 feet below the surface.

The Geology.—The rocks in the neighbourhood are ill-exposed but appear to consist mainly of ferruginous-capped, kaolinitic, frequently rather gritty schists of probably sedimentary origin. The regional strike of these schists is about N. 15-20° W. and they dip at 40 to 50 degrees to the west. Cutting through these schists at a very acute angle and dipping steeply to the west is a narrow, fine grained basic dyke, approximately 2 chains wide. This dyke strikes about N. 25° W. The gold appears to occur in patches along a contact fault occurring along the eastern wall of the dyke, and is associated with quartz veins in shrinkage cracks that abut against the contact fault.

There appears to have been very little further work done in this area since 1916 when it was inspected and reported upon by C. S. Honman.* At the time of the present writer's inspection (October, 1939) practically all of the shafts were inaccessible, and consequently he found very little to add to Honman's excellent report and accompanying prospecting recommendations. The only work at present in progress here is being done by one prospector, who has been working an alluvial claim at the south end of The Patch for the last three years. His efforts to trace the source of the alluvial gold to a reef in rising ground to the north of the main workings have so far met with no success.

THE CONNEMARA GROUP, DUKETON.

This consists of a group of three old leases situated at about two miles north north-west of The Patch. At the time of inspection (November, 1939) these leases were abandoned and it did not appear as if there had been any mining activity in the neighbourhood for some considerable time. The three leases are the late G.M.Ls. 1552T "Connemara," 1521T "A1," and 1656T (1794T) "Great Derwent."

The Geology.—The country here is almost identical with that of The Patch, except that although still completely decomposed, the rocks outcrop more freely and are less completely concealed by the ubiquitous soil than in the latter area. The principal rocks are kaolinitic and gritty sedimentary schists having a regional strike of from N. 5° W. to N. 30° W. with

*Honman, C. S., Gold Deposit at Field's Find (The Patch), Duketon, Mt. Margaret Goldfield, G.S.W.A. Bulletin 74, pp. 41-47.

a steady dip of 70-75 degrees to the west. Cutting across these schists at an acute angle is a dyke of blocky medium-fine grained greenstone (probably dolerite). This dyke is for the most part running in the direction N. 60° W. Just west of G.M.L. 1552T it swings further to the northward. At about 30 chains south of G.M.L. 1656T it runs away in a south-easterly direction straight towards The Patch. This dyke is in all probability the northern extension of the basic dyke which cuts the leases at The Patch and along the contact of which rich patches of gold have been found. Here, however, the dyke is much wider than that at The Patch, as it has an average width of 10 or 11 chains.

Numerous small white quartz reefs cut through both the basic dyke and the schists at various angles. Very few of these reefs are traceable for more than one or two chains.

The Ore Bodies.—The ore bodies in these three leases appear to be of two types. In G.M.Ls. 1521T and 1656T they consist of narrow quartz reefs running parallel to the sedimentary schists which enclose them. In both leases the reefs appear to be narrow, probably averaging less than 2 feet wide, their direction of strike being N. 15-20° W. and dip 70 degrees and 75 degrees west respectively. In the former lease the reef appears to have been traced over a length of about 250 feet, but in the latter the reef cannot be followed on the surface for any distance at all. In neither of these leases are the underground workings accessible so that no information as to the depth of workings, pitch and values of ore body, etc., were obtainable. About 250 feet south of the workings in G.M.L. 1656T are several quartz reefs cutting the schists in an east-west direction, but apparently these carry no gold.

The second type of ore body is to be found in G.M.L. 1552T. This is a quartz reef which follows the contact of the eastern wall of the basic dyke with the intruded sedimentary schist. At this point the contact is following the direction N. 70° W. and the schist is striking at N. 10° W. The reef has been opened up at the surface over about 130 feet. It dips south at from 40 to 50 degrees following the contact of the dyke with the schist. The reef is traceable altogether in a north-curving arc over a length of about 8 chains. Just to the east of the workings it appears to forsake the dyke contact wall and cut across the schist, but this portion of it apparently carries no gold. In the vicinity of the workings the reef appears to be very dense and milk-white in colour, and is about 3 feet wide. No sulphide minerals were noticed in the quartz. A short stope has been opened up from the surface down to about 15 feet (underlay) but the remainder of the underground workings were inaccessible at the time of inspection.

Production.—From the following table it will be seen that the total tonnage of ore treated from these three leases up to 1908 when they had all been abandoned, is quite small. There is no record of any work having been done here since 1908.

Lease.	Year.	Ore Crushed.	Gold Therefrom.	Average.
		tons.	fine ozs.		dwts. per ton.
Connemara, 1552r	1905	96.5	29.91	6.2
A1, 1521r	1905	46.0	54.48	23.6
Great Derwent, 1656r (1794r)	1906-8	33.5	28.13	16.8

Recommendations.—From the close geological relationship between this area and that of The Patch it would appear that prospectors could pay some attention to both the northern and southern contact walls of the basic dyke and schist. These two contacts are comparatively easily traceable. Any small reefs in the vicinity of the contacts should be very carefully tested. Although from the small area of workings which were accessible, it was impossible to determine whether there has been any faulting along the contact, as is apparently the case at The Patch, it seems to the writer that there is a distinct possibility of locating further occurrences of gold along the dyke.

KELLY'S FIND, DUKETON.

Kelly's Find lies at approximately $4\frac{1}{2}$ miles N.N.W. of the old Duketon Townsite and is about three-quarters of a mile west of what appears to be the northern extension of the main Duketon "gold line." The find, which was made late last year (1938) consists of one gold mining lease (2436T "Acacia") which at the time of inspection (November, 1939) had been applied for but had not been surveyed.

The country in the vicinity of the lease is fairly open, elevated land. Outcrops are poor and the rocks where seen are completely decomposed. The ground is covered for the greater part by three to four feet of ferruginous and gypsum-bearing cement, with scattered quartz and ironstone rubble. The underlying rock appears to be a rather blocky medium grained greenstone.

The Ore Body.—The ore body here is a narrow quartz reef running in the direction of N. 30° W. and dipping to the east at a very steep angle. This reef outcrops very poorly at the surface and is traceable only by a few floaters over a total length of about 180 feet. Two shafts have been sunk on this reef, a shallow northern one to a depth of about 25 feet and at about 20 feet further south the main shaft down to about 45 feet (vertical depth). At 40 feet driving has been completed over a distance of 39 feet north and 46 feet south of the main shaft.

The quartz reef has an average width of about nine inches to one foot. At the face of the south drive it appears to break up into several thin stringers. The quartz is milky-white and rather porous, containing numerous small vugs. The best gold occurs in these vugs in the form of coarse crystalline patches. This gold is mostly secondary in origin, and it is to be expected that its greatest concentration will be in the vicinity of the ground water level. Water level here is at approximately 30 feet.

On the west wall of the south drive are a number of fine parallel ripples or corrugations, each about one inch apart, pitching steadily away to the south at approximately 20 degrees. The best values appear to be concentrated in the form of three parallel shoots and these shoots pitch south at about the same angle.

Recommendations and Conclusions.—The unfortunately shallow depth of ground water level here has probably placed rather narrow limits on the scope of mining activity on this lease. From the appearance and distribution of the gold, it is doubtful whether the values will be maintained to any depth

below water level. The surest test of this would be to follow the shoots southward, down the pitch. The decomposed greenstone forming both the footwall and hanging wall of the lode are well jointed, the joint planes being cut by the reef at varying angles. There is a possibility of quartz stringers running off the main reef to form leaders following these joint planes after the manner of small gash veins. Such leaders may carry rich patches of gold at times and are worth testing.

Official records as to the production of this area so far are confined to one crushing in May, 1939, of 20.55 tons for a yield of 14.64 fine ozs. of gold.

FAMOUS BLUE GROUP, MULGA QUEEN.

The Famous Blue leases are situated at approximately $1\frac{1}{2}$ miles east south-east of the old Mulga Queen Townsite, 14 miles west north-west of Duketon, and about 88 miles by road north of Laverton. The group comprises a block of nine gold mining leases whose original numbers were 1509T, 1554T, 1558T, 1559T, 1567T, 1575T, 1582T, 1608T, 1642T. Although there is evidence of a certain amount of mining have been carried on upon G.M.L.s 1509T, 1554T, 1575T and 1642T, the only lease which has been really worked to any extent is G.M.L. 1509T ("Famous Blue"), more recently G.M.L. 2089T, and at present held as G.M.L. 2401T. At the time of inspection (October, 1939) this property, which had been lying idle since about 1918, was being opened up in preparation for further development. A five-stamp battery and a gas-producer engine had been erected and final adjustments to the plant before protracted crushing operations were commenced, were then in progress.

The Geology.—The country in the vicinity of the leases is fairly flat, having a gentle slope to the southward. About three-quarters of a mile to the north-east it slopes upward to meet a conspicuous flat topped rise known as Mt. Maiden, carrying the Trig Station J R 57. Outcrops near the leases are very poorly covered with red cement-like soil and scattered quartz rubble upon which grows a moderately thick mulga vegetation. Wherever rocks outcrop they are highly decomposed and it is very difficult to determine their exact nature with any degree of certainty. The greater part of the workings appear to be in a whitish indeterminate kaolinitic schist, though towards the south-eastern corner of the block of leases there are outcrops of decomposed rock whose blocky form suggests an original fine grained greenstone. The regional strike of the schists is N. $30-50^{\circ}$ W., and they dip at a fairly steep angle to the eastward.

The Reefs.—Numerous quartz reefs cut through the schists, and these reefs appear to have been intruded along three major directions of jointing or fracturing, their resulting outcrops forming a clearly defined fracture pattern. The greatest number of reefs follow the direction N. $35-45^{\circ}$ W., these being parallel to the regional schistosity. Apparently they carry no payable gold.

A second series of reefs run at N. 25° W. The best developed of this type is the main Famous Blue Reef. This is clearly traceable over a length of about 14 chains and probably it extends still further northward, but here its outcrop is masked by overlying soil. The reef dips steadily to the east at

from 35 to 40 degrees. Where opened up it has an average width of four feet, but varies from 18 inches up to seven feet in places. The old workings here were not accessible at depth at the time of inspection, but I am informed that the main values in this reef were obtained over a length of about 100 feet and that they pitched flatly to the south. The quartz is very dense, white and glassy, and appears to carry very little sulphide mineral. About seven chains east of the main reef is a parallel reef near the eastern boundary of G.M.L. 1509T. Values in this reef were apparently unpayable, however, as very little work has been done on it.

Members of the third series of quartz reefs run in an almost east-west direction, averaging about N. 80° E. These reefs are mostly short and fairly narrow. One of them in G.M.L. 1509T dips at about 50 degrees to the south. They are not so well developed as either of the first two types, and apparently carry little or no gold.

Recent developmental work includes the sinking of a new vertical shaft at a point about 140 feet east of the old main inclined shaft on the Main Reef. This new shaft has been sunk to water level (75 feet V.D.). At a depth of about 20 feet a narrow quartz leader, striking and dipping roughly parallel to the main reef, was encountered. Moderate values were

found in this leader. Future development will, I am informed, include the driving of a crosscut from the bottom of the vertical shaft, in a westerly direction to cut the main reef, which will then be further opened up. Water here, though not particularly plentiful, is fresh and can be used for domestic as well as mining purposes.

Production and Recommendations.—The Famous Blue Gold Mine was opened up in 1904. It was worked continuously until 1908, when according to official records all production ceased. An abortive attempt to resuscitate the mine seems to have been made in 1918. It is to be hoped that the enterprise and optimism of the present proprietors will be fully rewarded. It must be realised that a considerable drop in values is almost inevitable below the ground water level, however, and it may be necessary to sweeten the ore from lower levels with better stone from above water level. There is quite a good possibility of locating small parallel ore bodies which may prove to be payable. Very careful testing of the other diagonal quartz reefs on the lease should also be carried out. This may disclose the presence of some low-grade stone which, considering the existing high price of gold and the comparative cheapness of the mining on the surface at least, may be profitably crushed. The following table gives the recorded production for this mine since 1904:—

Lease.	Year.	Ore Crushed.	Gold Therefrom.	Average.
G.M.L. 1509T	1904-8	10,107·0	{ fine ozs. 4,695·22 *7·65 30·8 }	9·28
G.M.L. 2089T	1918	40·0		15·4
Total	...	10,147·0	4,733·67	9·33

* Dotted.

MULGA QUEEN GROUP, MULGA QUEEN.

This group lies about three-quarters of a mile west of the old Mulga Queen townsite. It comprises five gold mining leases, all of which are now void. They are G.M.L.s 1517T, 1550T, 1573T, 1589T and 1976T. This last gold mining lease embraces part of the area originally contained by two earlier G.M.L.s 1519T and 1522T. At the time of inspection (October, 1939), the only active mining in progress was being carried out on the old main lease G.M.L. 1517T "Mulga Queen" (more recently G.M.L. 1875T and still later G.M.L. 1990T), the area being held at the present time as a prospecting area (P.A. 2189T). Of the rest of the abandoned workings the only other place where there is evidence of considerable activity in the past is in the extreme southern end of the group on the late G.M.L. 1522T ("Mulga Queen No. 1 South").

The country hereabouts is flat and covered with soil, cement and rubble. Outcrops are few and all highly decomposed. The underlying rock is evidently greenstone, and judging from specimens of comparatively fresh rock examined from the dump of the main water shaft, the greenstone is probably of volcanic origin, being either a basic amygdaloidal lava or a dense basic tuff.

"Mulga Queen."—The ore body here is a long, dense, white quartz reef which has been traced definitely over a length of nearly three-quarters of a mile, while it probably extends still further to the southward for another 25 chains. The reef runs fairly steadily in the direction N. 35° W. and at the main inclined shaft dips at 30° to the south-west. To the north and south of the main shaft the dip appears to steepen. It varies in width from two to four feet. Narrow open-cuts and shallow shafts have opened up the reef at the surface almost along the entire length of G.M.L. 1517T. The main inclined shaft has been sunk on the reef for about 310 feet, where it meets a vertical shaft (the water shaft) at a point 215 feet vertically below the surface. The ground water level here is at approximately 70 feet, V.D., the water being fairly plentiful and fresh, though rather hard. Several other vertical shafts have been sunk to intersect the lode at points some distance west of the surface outcrops. None of these old shafts were any longer accessible however, and it was thus found impossible to examine any of the underground workings. Values in this reef appear to have been fairly steady and fairly evenly distributed to well below water level, though occasionally rich patches of fine gold have been located in vugs caused by the leaching away of sulphide minerals.

Recent work on this area has been confined to the opening up of several small shoots of stone at shallow depths at both the north and south ends of the property, and to the retreatment of portion of the old tailings dump on the lease.

"*Mulga Queen South.*"—At the southern end of the group of leases on the old G.M.L. 1522T, there is a line of shafts running in the direction N. 30° W. These shafts appear to have been sunk on a narrow white quartz reef which is in all likelihood the continuation of the Mulga Queen Reef. The reef is here enclosed in pure white kaolinitic material which is probably very poor holding ground. It apparently dips at about 45 degrees to the south-west. Water level is here about 40 feet V.D.

General Remarks.—A notable feature of the country around the Mulga Queen and in marked contrast to the neighbouring Famous Blue, is the apparent complete absence of either parallel or cross reefs. The Mulga Queen reef is almost the only one to be found in the neighbourhood and this forms a long steady line. This reef, too, dips flatly to the west, whereas at the Famous Blue the main reef has an equally flat dip to the east. It is possible that other parallel and cross reefs do occur but in the immediate vicinity of the leases at least, there are almost no surface indications of their existence.

Near the northern corner peg of G.M.L. 1517T is a shallow open cut about 100 feet long running parallel to and at about 130 feet to the east of the main reef. Near this open cut can be seen occasional floaters of iron-stained quartz, but since the cut has been largely filled in with mullock it is doubtful if any parallel reef was actually located here.

Production.—The Mulga Queen Gold Mine commenced production in 1904 and operated continuously until 1908, by which time over 10,000 tons of ore had been treated. In 1907 the original G.M.L. 1517T became G.M.L. 1875T. Production at a considerably reduced rate continued from 1911 to 1916, the lease number in 1914 being changed to 1990T. Since 1916 all active mining ceased, until the last few years when various prospectors at different times held prospecting areas over the property and sporadic attempts were made to take out small crushings. The present holder has held different prospecting areas over the lease since 1937 and during that time has, according to the rather incomplete records available, treated about 110 tons of ore.

Since 1906 there has been no more work on the old Mulga Queen No. 1 South. G.M.L. 1522T. During recent years a few very small crushings have been obtained from the strip of country between G.M.Ls. 1522T and 1517T but this portion of the group has not proved very promising.

—		Year.	Ore Crushed.	Gold Therefrom.	Average.
Mulga Queen G.M.—			tons.	fine ozs.	dwts. per ton.
G.M.L. 1517T	...	1904	2,910	2,560.48	17.58
		1905-6	2,987	2,611.94	17.48
G.M.L. 1875T	...	1907-8	4,328	3,228.75	14.58
		1911-12	420	221.08	10.52
		1913-14	480	98.19	4.08
G.M.L. 1990T	...	1914-16	720	858.61	23.84
P.A. 1886T	...	1937	41	{ 44.79 *1.93 }	21.84
P.A. 2014T	...	1939	70	30.62	8.74
P.A. 2189T	...				
Total		...	11,956	9,656.39	16.15
Mulga Queen No. 1 South G.M.—					
G.M.L. 1522T	...	1905-6	576	391.20	13.58

* Dollied.

SOME ABANDONED MINING GROUPS—MULGA QUEEN DISTRICT.

The following notes were made at the time of a brief inspection (October, 1939) of a number of abandoned leases situated to the north and east of the old Mulga Queen townsite. These notes are not intended to provide a complete description of the geology and workings of these old mines but merely to give some indication of the type of ore bodies which have been worked here in the past, and of the conditions at present existing in this field.

"*Famous,*" G.M.L. 1508T (1843T):—Workings on this group are situated at about 1½ miles N.E. of Mulga Queen Townsite. There are three old leases, G.M.Ls. 1508T, 1651T and 1652T, all production, however, being confined to G.M.L. 1508T. Outcrops here are very poorly exposed and where visible are very decomposed. The ore body is an irregular

milk-white quartz reef running in the direction N. 20° W. and dipping flatly (about 30°) to the west. It is traceable over a length of about 200 feet. On the east side of the reef the rocks appear to be rather schistose and very kaolinitic (probably sedimentary) while to the west of it they are more blocky and ferruginous and appear to represent original greenstones. The reef is rather bumpy, but where exposed in a short open cut averages about 3 feet in width.

To the west of the outcrop, several shafts have been sunk to pick up the reef at depth but these were inaccessible. A small cross reef of white quartz can be seen running in the direction N. 80° E. on the east side of the lease but apparently this reef is barren. Water level here is at about 60 feet. Some very rich stone has been obtained from this mine but it is probable that a good deal of the gold has been secondary and that the values below water level are comparatively low.

"*Stockwhip and Blanket*," G.M.L. 1708T.—This small lease is approximately half a mile slightly south of east from the Famous G.M. A small patch of dryblowing surrounds the north-western end of a number of white and bluish-white quartz reefs. These quartz reefs are very numerous. Their main direction of strike is N. 45-60° W., but several short cross reefs also occur. One of the north-westerly striking reefs has been opened up in several places by means of two shafts and a shallow open cut, but no mining of any importance has been done. This reef dips in a south-westerly direction at about 45°. Many other quartz reefs can be seen scattered about this locality and the country is here covered by a thick talus of quartz rubble. Most of the reefs are very white and hungry-looking, however, and are apparently barren. The country rock is completely decomposed blocky greenstone.

"*Riccaboni*," G.M.L. 1643T (1801T).—This lease is situated at about 2½ miles due east of the Famous G.M. to which it is joined by a cut track. The country here is gently sloping and consists principally of schistose greenstone, whose direction of schistosity varies from N. 50° W. to N. 60° W., covered for the most part by lateritic ironstone and ferruginous cement. The ore body here is a quartz reef which, contrary to the usual occurrences in this district, cuts across the regional schistosity, swinging from N. 60° E. to N. 45° E., and dipping to the north-west at 75 degrees. This reef does not outcrop at the surface, for the most part being covered by three to four feet of red ferruginous cement, but judging from the workings, it has been traced over a total length of 600-700 feet of which at least 300 feet has been opened up by underground driving.

As none of the shafts were accessible it was found impossible at the time of inspection (October, 1939), to estimate the amount of underground work which has been carried out, but several large opencuts indicate that a considerable quantity of stone has been stoped from the upper levels. The reef appears to have averaged about 3 feet in width but may be somewhat lenticular. No information could be gathered as to the distribution of values in the lode or the depth of the workings. This lease was actively mined during the years 1905-7 and 1909-10, when a total of 1,408 tons of stone was treated for an average yield of 13.48 dwts. of fine gold per ton. On the south-western edge of the lease is a short reef of white quartz running parallel to the regional schistosity in the direction N. 60° W. Values in this reef appear to have been quite unpayable.

"*Mourillian*" G.M.L. 1693T.—This lease lies about a mile south-east of G.M.L. 1643T and is approximately 8 miles east north-east of the old Mulga Queen townsite. Like the Riccaboni reef, the ore body here appears to cut across the regional schistosity of the country. Outcrops are very poor, the country being mostly covered by a thick mantle of white quartz rubble. From the few exposures visible it appears that the country consists of decomposed indeterminate whitish schist striking about N. 50-60° W.

The workings are on a small white quartz reef having a maximum width of about 2½ feet at the surface and striking about N. 25° E. and dipping to the north-west at 75°. The reef is traceable at the surface over a total length of about 150 feet. A

shallow open cut has exposed the surface of the reef over about 60 feet and two vertical shafts have been sunk on the western side in order to cut it at depth. Neither shaft was accessible, but it would appear that very little mining at depth has been completed here. Ground water level is unknown.

"*Parramatta*" G.M.L. 1684T.—This group is situated about 5¼ miles due east of the old Mulga Queen Townsite and is approximately 1½ miles north of the Mulga Queen-Duketon road. The country in the immediate vicinity is flat, and covered with soil and ironstone rubble. Outcrops are very poor but where visible appear to represent highly decomposed blocky greenstone showing a trace of regional schistosity running in the direction N. 25° W.

There are two leases here, viz.:—G.M.L. 1684T and 1696T. All the old workings seem to be confined to G.M.L. 1684T. They are in two groups. In about the centre of the lease is an ore body consisting of two parallel narrow quartz leaders each little more than six inches wide enclosing 2½ to 3 feet of schistose greenstone. This lode is striking in the direction N. 15-20° E. and dips at 62 degrees to the east. An inclined shaft has been sunk on the ore body to a depth of more than 50 feet and stoping to the surface has been completed for about 40 feet north of the shaft. The ore body is here cutting across the regional schistosity at an angle of approximately 45 degrees. About 4½ chains south of the main inclined shaft on a bearing of about 195 degrees are two shallow shafts on a narrow reef of white quartz. This reef is traceable in all for about 70 feet, running in the direction of the northern workings, but as it cannot be followed for any distance on the surface it is impossible to say whether this is the same ore body as that exposed further north. Apparently the values at the south end did not prove at all encouraging. Some quartz rubble is scattered about in the vicinity of the lease but no other reef of any size appears to have been located here.

Summary and Conclusions.—From the foregoing brief notes the principal features of the ore bodies in the Mulga Queen-Duketon district may be listed as follows:—

Firstly, the ore bodies so far located have almost invariably consisted of auriferous quartz reefs, mineralised lode formations being almost entirely unknown in this district. These quartz reefs are generally very white in colour and are frequently rather unpromising in appearance.

The auriferous quartz reefs are apparently of two types—those which follow the regional schistosity and those which cut across either its strike or its dip. The latter type appears to be the more common. These reefs have probably been intruded along a series of major joints.

The influence, if any, of the host rocks upon these reefs is not clear, but it would appear that they are rather better developed in the blocky greenstone than in the other principal type of rock recognised in the district—the schistose kaolinitic, rather gritty rock of probable sedimentary origin. The blocky greenstone would probably be more liable to develop a definite jointing system than the softer kaolinitic schists.

Apart from the auriferous quartz there are numerous other similar looking quartz reefs running both with and across the country, which are apparently

barren of payable gold. Though the writer did not take samples of these reefs they were invariably seen to bear the marks of the prospector's pick, and most of them have evidently been tested and found to be unpayable.

Judging from what is accessible in the different workings it may be said that only the larger of the reefs have permitted of any extent of underground development being carried out. Apparently mining costs have prevented the opening up of small and lenticular shoots.

Finally, it would appear that in most cases the gold content of the reefs decreases considerably with increasing depth, and that in the past at any rate, values at or below water level were unpayable. This indicates that there has been a definite secondary enrichment of gold at shallow depths below the present surface level. This has probably been produced

by the downward leaching of the gold from what were the original surface exposures of the reef, but which now represent weathered and scattered fragments lying over the existing land surface.

It must be remembered that at the time most of these reefs were being mined the price of gold was at less than one-half of its present value, and consequently large quantities of stone, which would now be considered quite payable, have probably been left at the bottoms of the workings. Unfortunately, in order to get at these old workings, it would frequently be necessary to sink new shafts, retimber old drives, install pumps, etc. Such operations are far too costly for the average prospector.

Production.—The following table gives a complete record, according to official figures, of the production of each of the abandoned leases, described in the preceding sections:—

Name and Number of Lease.	Year.	Ore Crushed.	Gold Therefrom.	Grade.
		tons.	fine ozs.	dwt. per ton.
Famous—				
G.M.L. 1508r	1904-7	659	550.46	16.70
G.M.L. 1843r	1910	8	2.10	5.34
Total	...	667	552.56	16.56
Stockwhip and Blanket—				
G.M.L. 1708r	1906-7	12	16.83	28.04
Riccaboni—				
G.M.L. 1643r	1905-7	845	655.81	15.52
G.M.L. 1801r	1909-10	563	293.51	10.42
Total	...	1,408	949.32	13.48
Mourillian—				
G.M.L. 1693r	1906-7	96	117.54	24.48
Parramatta—				
G.M.L. 1684r	1905-7	279.5	182.71	13.07

HUTANUI GROUP, ERLISTOUN CREEK.

The Hutanui leases are situated just to the north of Robinson Hill, about eight miles north-west of the old Mulga Queen townsite and approximately one mile north of Eristoun Creek. The group consists of the three leases, G.M.Ls. 1679T, 1742T and 1743T. These leases have been void for many years, though the area has been pegged several times since 1911 as various prospecting areas.

The Geology.—The country in the vicinity of the leases is quite hilly and rock exposures are excellent. Just to the west of the leases the country slopes down to the valley of a creek which drains away southward to join Eristoun Creek. Portion of this valley marks the contact line of granite and greenstone country. To the west the country is for the most part flat and open, and is covered with sparse mulga scrub and flat floors of gneissic granite, but at about half a mile due west of the leases it rises steadily to form a high, gently rounded hill of bare gneissic granite. On the eastern side of the valley running in an almost north and south direction, is a belt from eight to 14 chains wide, of a well banded platy gneiss or schist, which appears to represent

a narrow zone of granitisation or "lit par lit" injection. The schist contains alternate layers of dark basic material and light coloured acidic bands and is fairly fine in grain. The strike of this banding is from N. 10° W. to N. 5° E. and the dip is uniformly to the eastward at angles varying from 60 to 80 degrees.

Immediately to the east of this "granitised zone," whose boundary where not obscured by rubble is very sharply defined, are outcrops of the principal greenstone of this district. This is a coarse grained amphibolite. It is frequently quite schistose but where massive and blocky is usually highly jointed. Running through this greenstone in a north-south direction, and cutting through the leases, is a narrow belt of dense, hard, coarse porphyritic rock containing quartz and felspar, and abundant large phenocrysts of hornblende—probably a granodiorite. This rock appears to be more massive and resistant to weathering than the surrounding amphibolite, and consequently forms several steep, high ridges.

Some 25 chains to the north-east of the leases is a long ridge consisting of a series of red-brown to yellow coloured fine banded sandy shales capped by a

siliceous laterite. These shales strike from N. 15° to N 35° W. and dip at a steady 55° to the east. The contact boundary between the shales and the amphibolite runs in the direction N. 10° W. Along the contact the shale has been altered due to the metamorphic effects of the intrusive amphibolite, to a sandy micaceous schist. The total width of this belt of sedimentary rocks is unknown.

Cutting into the amphibolite-greenstone and granodiorite belt of rocks are three different types of intrusive rocks. The oldest of these is a series of thin lenses of yellowish coloured schistose rock which for convenience sake has been termed a "porphyry." These "porphyry" lenses are irregular in size and shape but are usually never more than five or six yards wide and can seldom be traced over distances greater than 10 or 15 chains. These "porphyries" may very possibly represent zones of infiltration and granitisation by solutions which have travelled from the intrusive gneissic granite magma into the greenstone along narrow shear planes, joints, and other lines of weakness. They have been seen cutting both the amphibolite and the granodiorite but, though they occasionally cut the boundary of amphibolite and the granitised contact zone described above, they have never been seen running through either this contact zone or the adjacent granite.

The second group of intrusives are quartz veins and reefs. It appears as if there are two ages of quartz in this area but both types are younger than the acid "porphyries." Small rather glassy white quartz reefs can be seen running through joint fissures at various angles in the coarse amphibolite.

Some of these reefs are apparently auriferous and they form the ore bodies which have been worked in the leases. In the immediate neighbourhood of the reefs the amphibolite is usually quite schistose and frequently shows pyrite mineralisation. Specimens of such amphibolite taken from a dump at the main workings on G.M.L. 1679T was abundantly peppered with small pink garnets. Similar garnets were found associated with glassy quartz veinlets and small pegmatite lenses in the gneissic granite hill to the west of the leases. No traces of gold were found in any of these veinlets however.

The second type of quartz reefs found in this area are coarse and milk-white in colour. Such reefs can be seen cutting through granite, greenstone and "porphyry" alike at various angles, though the predominant direction seems to be east north-easterly. Robinson Hill just south of the leases, forms portion of such a reef. It consists of a long high ridge of iron stained white buck quartz running in the direction N. 60° E. The reef is traceable in all for a distance of over a mile and it runs to the westward right across the greenstone and granitized zone and out into the granite. The reefs of this second type are apparently non-auriferous, and are probably of a slightly younger age than the gold bearing quartz veins of the first type described above.

The third variety of intrusive rock in this area is a dark fine grained basic dyke rock, probably a dolerite. The best example of this type is a long dyke ranging from 40 to 100 feet in width which runs in the direction N. 50° W. at about 4 chains N.E. of the leases. This dyke is traceable for over a mile and has been seen to cut right through the greenstone belt and pass to the north-westward out into the granite. There is no sign of any quartz in this dyke and the dolerite is believed to be the youngest intrusive in the district.

The Workings.—Practically all the workings are confined to G.M.L. 1679T ("Hutanui"). The ore bodies consist of a number of short narrow lenses of fine grained amphibolite. The vein-bearing joints run in three main directions. These directions are, firstly, east and west with a flat dip (30°) to the south; secondly, north and south with a moderate dip (40°-60°) to the east; and thirdly, north-east and south-west with a flat dip (30°) to the south-east. Several shallow inclined shafts have been sunk on reefs of the first two types but the main workings appear to have been confined to two reefs of the third type. The two groups of workings are approximately 300 feet apart on a line bearing approximately N. 45° E.

In the southern workings the reef has been exposed at the surface over a length of less than 50 feet. It is about 2 feet wide at its widest point. The main inclined shaft sunk on this reef is reported to extend for about 300 feet on an underlay of 40 to 50 degrees. The shaft was not accessible at the time of inspection, (November, 1939) and it was thus found impossible to examine the underground workings here. Both the footwall and hangingwall of the reef appear to consist of a strongly schistose amphibolite in which has developed a considerable quantity of dark brown mica. The more micaceous portions are studded with small red garnets.

The northern workings have exposed about 70 feet of narrow quartz reef enclosed in schistose, "porphyry." This "porphyry" appears to occupy a shear zone running in a north-easterly direction through amphibolite and granodiorite. The reef and the "porphyry" dip away flatly to the south-east at 30 degrees. These workings were not accessible but judging from the size of the dumps near them, the reef appears to have been opened up to an underlay depth of at least 200 feet. There is no sign of any of the workings having reached ground water level and the depth and quality of ground water here are not known.

Production and Conclusions.—During the years 1906 to 1910 active mining was in progress at this centre, and though the total quantity of ore obtained was not great some very high grade stone was treated. Official records disclose that for this period 455 tons were crushed for a total yield of 2,027.2 fine ozs. of gold, or an excellent average of 4.45 ozs. to the ton. The very nature of the occurrence of the quartz reefs in this area suggests that though rich they are liable to be short lived, however, and the production figures support this view. The reefs never extend for any distance on the surface and appear to be limited to short shear zones and joints which are cut off laterally by cross joints. The amphibolite and granodiorite country rock appears fresh and unaltered and all mineralisation is apparently strictly confined within narrow walls. Under these conditions the gold is liable to occur in short rich shoots of no considerable size. Numerous thin quartz stringers running through the greenstone belt here seem to have been tested by prospectors at various times, but most of them appear to be far too small to be worth opening up. The great distance of this centre from the nearest railhead (110 miles from Laverton) has resulted in high costs of living and mining, and evidently only rich and high grade ore bodies of reasonably large size can be profitably worked.