was previously believed. Sediments are particularly abundant in the Erlistoun-Duketon-Mulga Queen belt.

(4) Some of the coarse grained greenstones are pre-folding in age, while others are post-folding and post-granite.

(5) The occurrence of granite boulders in conglomerate beds in the Greenstone Complex is evidence of an older granite. No other evidence of this granite has been obtained, and the main granite is believed to have been intruded towards the end of the period of folding.

(6) Glacial erratics, previously known to exist, have been found to have a comparatively wide distribution.

(7) Large areas of the country are covered with alluvium, which completely obscures the underlying rocks.

(8) Stream erosion is considered to have been the principal agent of erosion in the production of the present topography. Breakaways are regarded as normal features of stream erosion under arid conditions.

(9) The principal ore bodies are parallel to the bedding of the rocks.

(10) The varying trends of the various "gold lines" is explained.

(11) The existence of one major crossfold has been recognised, but its precise position is not known. Minor crossfolding has not been recognised with certainty, but nevertheless gentle minor crossfolding may be present. There is evidence for a variation in the degree of pitch but not in the direction of pitch in the vicinity of Erlistoun and Duketon. The mining groups at Erlistoun and Duketon may be associated with this variation of pitch.

(12) The larger mining groups (Lancefield, Laverton, Morgans, etc.) are not associated with the major crossfold axis.

(13) There has been a greater production from the open, steeply pitching, Laverton-Mt. Margaret-Morgans fold than from the tight and more gently pitching fold of the Erlistoun-Duketon-Mulga Queen area.

(14) The main auriferous horizons are fairly high in the rock succession.

PROSPECTING RECOMMENDATIONS.

It has already been pointed out that there is a tendency for the mining groups to be arranged in zones at right angles to the axes of the folds. Generally then prospecting is recommended at any place on a known "gold line," where gold has not been previously found and which is opposite to an existing mining group. As a result of the broad mapping the following localities are recommended for prospecting. Reference should also be made to report on the mining groups by my colleague, Mr. K. R. Miles (p. 43).

(1) The belt of country, in the vicinity of the jaspilites, extending north from the Midas Group to a point five miles east of Duketon is especially worthy of attention. Gold has recently been found by Escreet and others approximately 11 miles north of the Midas Group and 2½ miles west of the jaspilites. Escreet's Find may be a continuation of the Mistake "gold line." Further east and probably on the east side of the jaspilites the King of Creation-Cox's Find-Midas line might reasonably be expected. This is the most promising belt of country in the Erlistoun-Duketon-Mulga Queen area.

(2) The country two miles west of Swanson Hill is worthy of short examination.

(3) Small finds may also be made north north-east from Duketon, and in the vicinity of Erlistoun Creek, five to six miles east north-east from Robinson Hill, but prospectors working in these areas are advised that the chances are better in the belt of country recommended in (1) above.

(4) The belt of country in the vicinity of the jaspilites extending from the north of Mt. Crawford, through a point just south of the Laverton railway station to the Nine Mile Hills. It is recommended that this belt of country should be prospected as far south as the vicinity of Mt. Weld Station homestead.

(5) The belt of country in the vicinity of the jaspilite and blue grey slate outcrops one and a half to two and a half miles west of the Mt. Morgans-Waihi jaspilite line. Some gold has been found approximately half a mile east of this belt of country and one and a half miles south south-west from Mt. Korong.

(6) The greenstone country west and north-west from the Camel Humps is worthy of short examination.

REPORTS ON SOME MINING GROUPS IN THE YILGARN GOLDFIELD.

(North of the Great Eastern Railway.)

(R. S. Matheson, B.Sc.)

CONTENTS.

PLATES.

EDNA MAY GROUP.

GENERAL INFORMATION.

The group is situated in featureless country approximately half a mile north of the Westonia townsite. Roads lead to Westonia from Carrabin

and Boddalin on the Great Eastern railway, and from Boodarockin and Warrachuppin on the Bullfinch-Wyalkatchem railway. The nearest railway station however is Carrabin, which is about 5½ miles south of Westonia.

At the time of inspection (November, 1939) there were seven existing leases at the group, namely, "Edna" G.M.L. 3579, "Edna Central" G.M.L. 3447, "Edna West" G.M.L. 3490, "Morris" G.M.L. 3524, "Consolidated" G.M.L. 3308, "Consolidated Deeps" G.M.L. 3467 and "Contemptible" G.M.L. 3556, and the late "Recovery" G.M.L. 3571 was being held as a prospecting area. Except for G.M.L. 3556, the leases were all under the control of the Edna May (W.A.) Amalgamated G.M. Company.

Some mining of a prospecting nature was also being carried out to the west of the group at what has been referred to by Blatchford* as the Battlefield centre. This work was being done on the "Pharlap" G.M.L. 3874, and the old "Weston's Reward," "Hill End" and "Battler" leases, but information concerning these activities will be published at a later date.

There is no public battery at the group, and prospectors send their crushings to the Coolgardie State Battery for treatment. Two privately owned batteries are in operation however. A 20-head battery, tube mill and cyanidation plant are erected on the Company's ground, but only 15 head were in operation at the time of inspection. A 3-head battery with no cyanidation plant is in operation on the "Pharlap" G.M.L. 3874.

A branch pipeline connects Westonia to the Main Eastern Goldfield water supply scheme, and water for domestic purposes, and partly for mining purposes, is obtained from this source. The Company uses mine water for milling, but scheme water for other mining purposes.

Adequate supplies of morrel, salmon gum and gimlet, which are suitable for mining purposes, are available in the district.

This group is described in detail by Blatchford† and reference should be made to his report.

GENERAL GEOLOGY.

The group is situated in a low-lying area, which is practically devoid of outcrops, being covered by a thick overburden of soil and laterite. Outcrops begin to appear at the western margin of the area mapped, and occur frequently thereafter, as far as the old "Hill End" lease. From an examination of the mine workings and the nature of the soils, and by reference to earlier reports, however, the underlying rocks are shown to consist of a greenstone-granite complex, which is presumably of Pre-Cambrian Age.

Petrological descriptions of the various rock types, by Farquharson‡ are given in Section D of Bulletin No. 71.

Greenstones.—Metamorphosed, interbedded, basic sediments constitute the major portion of the greenstones, and they consist of amphibolite schists, coarse grained amphibolite rocks, and hornblende-biotite schists and gneisses. The jaspilite and erosion sediments, which are associated with this belt of greenstones in the vicinity of Boddalin, are absent in this area. Blatchford refers to numerous rock types amongst the greenstones, but the writer believes that they could all have been formed from rocks differing only slightly in original composition, by the processes of metamorphism and by partial granitisation. Although the possibility of some of the coarse-grained amphibolites being pre-folding intrusives is admitted, it is more likely that they are coarsely recrystallised patches of the basic sediments.

The greenstones are sheared and contorted, and have a general strike N. 40° W. and a dip of 50° N.E. They are intruded by granite, and pegmatite and greenstone dykes.

Granite.—No outcrops of granite occurred in the area mapped, but the granitic soil occurring north-east and south-west of the greenstone belt is believed to overlie granite and/or gneiss. The nearest granite outcrops are in the vicinity of Boodalin Soak, and exposures of granite also occur at Yorkrakine Rocks, which stand out prominently six miles north-east of the group.

Gneiss.—The Edna May gneiss is believed to be of replacement origin and to have been formed by the granitisation of pre-existing basic sediments. The rock is mainly a biotite gneiss, but practically every transitional stage between amphibolite schist and biotite gneiss occurs. Two belts of gneiss were mapped at the group, and they are of economic importance as all the main ore bodies occur in this class of country. The gneissosity is more or less parallel to the general strike and dip of the enclosing greenstones. Other small belts of gneiss undoubtedly occur but owing to the paucity of outcrops they could not be mapped.

Pegmatite Dykes.—Pegmatite dykes are met with frequently in the underground workings and they intersect the greenstones, the gneiss and the auriferous quartz. They vary within themselves from fine to coarse grained, and are often mineralised with sulphides, but they are not garnetiferous.

Greenstone Dykes.—There is a certain amount of confusing information concerning these dykes, but there is little doubt that such exist. In his report on the Edna May mines, Blatchford refers to hornblendite dykes, which are younger than the auriferous quartz but older than the pegmatites. Due to the inaccessibility of the major portion of the workings, the writer was unable to check all these occurrences, but in one place he saw a greenstone dyke cutting through a pegmatite dyke. This evidence is suggestive of the age relationship between the pegmatite and greenstone dykes being the reverse of that mentioned by Blatchford, and is more likely the true sequence of events. The hornblendite dykes are probably of the same age as the dolerite dykes, which have been encountered in other localities in the Yilgarn Goldfield. It is possible that some of the greenstone dykes mapped by Blatchford are only remnants of the basic sediments, which have been unaffected by granitisation.

*Blatchford, T., G.S.W.A. Bull. No. 71, p. 111.
†Blatchford, T., G.S.W.A., Bull. No. 71, pp. 90-123.
‡Farquharson, R. A., G.S.W.A. Bull. No. 71, pp. 263-304.

Ore Bodies.—Auriferous quartz reefs, sometimes associated with small patches of lode material, constitute the ore bodies. The reefs are thought to have been formed by metasomatic replacement, and the occurrence of isolated "horses" of country within the quartz, supports this view.

THE MINES.

EDNA MAY (W.A.) AMALGAMATED GOLD MINES.

The leases under the control of the company embrace the workings of the old Edna May, Myrtle Central, Myrtle East, and Myrtle Consols South gold mines. Owing to the presence of ground water and to subsidence, however, only a small portion of these workings were accessible at the time of inspection (November, 1939).

Ground water level is 75 feet V.D. from the surface, and the water occurs in excessive quantities, 700-1,000 gallons per minute being pumped continuously.

The subsidence of the workings has occurred mainly in the zone of oxidation, the bottom level of which varied from 200 to 250 feet V.D. from the surface.

Due to these factors, and because the writer could see no reason to alter the geological boundaries shown on Blatchford's plans, another geological plan of the underground workings has not been compiled. The writer differs with Blatchford, however, concerning the mode of origin of the country rocks and the ore bodies.

The company has unwatered the workings to the 426 feet V.D. level, and mining of the old reefs is in progress in several places between this level and the surface. No new ore channels have been discovered, but further mining of the old reefs has been found possible, because of the amalgamation of the old mines, leading to a more efficient method of handling the water problem, and the enhanced price for gold.

The old alluvial workings, on the late Myrtle Central, were quite inaccessible at the time of inspection, but they are fully described by Blatchford.* According to Simpson† this gold "is not alluvial gold in the true sense of the term, but secondary gold deposited by chemical action out of percolating gold-bearing solutions during or after the burial of the stream bed."

The mine has been a rather large, high grade proposition, and the official records show that, to November 1939, the ground being held by the company has produced 443,980.97 long tons of ore for 304,880.15 fine ozs. of gold.

The writer would like to take this opportunity to acknowledge, with thanks, the assistance he received during the inspection from C. W. Cayzer, Esq., Mine Superintendent.

Ore Bodies.—The principal ore bodies are the Edna May Reef, the South Reef, the Middle Reef and the Consolidated Reef, and they occur within the main belt of biotite gneiss. Several smaller, auriferous, quartz reefs also occur in the workings, but they have apparently been of little economic importance.

Edna May Reef.—The ore body is composed of milky white, translucent quartz, which occurs in the form of an anticline pitching 50 degrees north-westward. The apex and northern limb of the fold are well developed, but the southern limb dies out at a short distance from the apex on encountering the footwall greenstones.

The reef attains its maximum width and values around the apex of the fold, and it becomes narrow and contains low and erratic values on the northern limb. The quartz is rather pegmatitic, and this is particularly noticeable in the main shoot, which contains abundant felspar. Laminations, parallel to the strike and dip, occur in the reef on the limbs of the fold, but it is not known whether or not this parallelism to the strike and dip persisted at the nose. Horizontal fractures were present throughout the reef, however, and the foliation planes of the gneiss are striking into the reef at the apex of the fold.

The ore body contained a great variety of minerals, as will be seen from the following extract, which is quoted verbatim from Blatchford's‡ report.

"Throughout the lode *wolfram* is of common occurrence, especially on the footwall side. This mineral usually occurs as bunches, but sometimes in elongated flat lenses on the footwall. *Galena* is found sometimes in fine grains or crystals, at others in bunches. *Wulfenite* and *crocosite* are occasionally found, more particularly where the quartz is inclined to be vuggy. In the oxidised zone *scheelite* was said to be present and concentrating tables were used to recover this mineral; unfortunately samples of the concentrate were not procurable, and there is some doubt as to whether the scheelite was not really wulfenite. *Molybdenite* is not at all infrequent and is found not only in the lode itself, but also in the gneiss. *Pyrites* and *marcasite* are found in bunches and minute specks scattered irregularly throughout both lodes and walls."

South Reef.—This reef also occurs in the form of an anticline, pitching 50 degrees north-westward, and it shows a marked parallelism with the Edna May Reef. The nature of the quartz in both reefs is very much the same, but the South Reef is less pegmatitic and more vuggy. The maximum deposition of quartz and the best values again occur at the apex of the fold, and the reef becomes unpayable on the limbs at about 100 feet from the apex. The southern limb of this reef is better developed than that of the Edna May Reef. The foliation planes in the gneiss are again seen to be striking into the reef at the apex of the fold.

A saddle shaped "horse" of mullock, which increases in size with depth, occurs within the quartz at the nose of the fold, and splits the reef into two branches. The hanging wall branch is reported to become unpayable at depth.

Abundant *galena* and *pyrites* occur in the richer parts of the reef, but the base minerals which occurred in the Edna May Reef are absent.

*Blatchford, T., G.S.W.A. Bull. No. 71, p. 107-108.
†Simpson, E. S., G.S.W.A. Bull. No. 71, p. 227.
‡Blatchford, T., G.S.W.A. Bull. No. 71, pp. 100-101.

Middle Reef.—This ore body consists of a mixture of quartz veins and biotite schist lode material, which is cutting across the foliation planes in the gneiss, and is apparently of a fissure type. The ore body strikes in a north-westerly direction, varies in dip from 70° N.E. at the south-east end to 70° S.W. at the north-west end, and appears to pitch steeply north-west. Of the sulphides in the ore body, *pyrites* is reported to be the most abundant.

Consolidated Reef.—This is another north-west pitching, anticlinal saddle reef, which is more or less parallel to the Edna May and South Reefs. Except for its slight difference in attitude, the reef is similar in all respects to the South Reef.

Mineral Associations.—The minerals at Westonia are dealt with fully by Simpson§, so that there is no need to make more than a brief mention here of the most important ones.

The sulphide minerals occurring in the ore bodies consist mainly of *pyrites, marcasite, galena* and *molybdenite,* but small quantities of *pyrrhotite* have also been met with from time to time. The presence of molybdenite is interesting as it is of rare occurrence in ore bodies in the Yilgarn Goldfield. It has been previously noted by the writer in the reefs at the "Radio" G.M., and Blatchford reports its occurrence in some of the ore bodies at Southern Cross.

The sulphides are apparently closely associated with the gold, as the richer portions of the ore bodies are said to be areas of dense mineralisation.

The commencement of the sulphide zone varies from 200 to 250 feet V.D. from the surface, being shallower at the western end of the workings.

Apart from the sulphides and gold the most important minerals in the reefs are *wolfram, wulfenite, crocosite* and *scheelite,* and they are also reported to occur in close association with the gold. Specimens showing gold embedded in wolfram have been obtained at various times.

Mode of Ore Deposition.—The gneissic belt is believed to have originally consisted of basic sediments, which, due to their composition and perhaps also to their position in the geological structure, acted as an incompetent zone during the regional folding of the area. As a result of these movements the basic sediments were highly contorted and the fracture cleavage was strongly developed, becoming much more pronounced than the bedding planes. The deformation of the rocks gave access to the gold-bearing solutions, and the reefs were deposited by metasomatic replacement. The folded reefs were formed by the selective replacement of certain beds in the contorted rocks, which were most suited to the process, and the other reefs were deposited by the same means in fractures intersecting the favourable horizons.

Subsequently to ore formation granitising solutions entered this structurally weak belt of country, and proceeded to alter the greenstones to biotite gneiss. The granitisation process continued until the highly incompetent zone was replaced, but the replacement has not been complete throughout the zone, as hornblende gneiss and biotite schist, representing transitional stages between the basic sediments and the gneiss, are frequently met with in the gneissic belt. The foliation planes in the gneiss are thought to represent the fracture cleavage planes of the original basic sediments.

At some later time the area was intruded by pegmatite and greenstone dykes.

Diamond Drilling.—The company has put down twelve bore holes, and a certain amount of diamond drilling was done by the earlier companies, but up to the time of writing this report the writer has been unable to examine the information to hand concerning them. Details of this diamond drilling will be published at a later date.

Conclusions and Recommendations.

1. The channel of the Edna May Reef is reported to be occupied by a pegmatite dyke where mining was discontinued, at the 810ft. V.D. level, and the writer is of the opinion that this reported dyke may only be a more pegmatitic phase of the reef itself. This is by no means certain, as these workings were under water, but when it is remembered that felspar occurs abundantly in the reef in the upper levels, there is definitely a possibility of the parent granite being at a shallow depth.

In putting forward this suggestion, it is assumed that the felspar is an original constituent of the reef, but it may have been deposited in the quartz during the granitisation process.

2. At depth, the biotite gneiss is expected to change to biotite granite, and the reefs to become unpayable. The depth at which biotite granite will occur is problematical, but the transition will probably be gradual, and the gold content of the reefs will decrease as the gneiss becomes more massive and loses its foliation. These expected changes may not, however, occur within the limits of depth of economic mining.

3. The Edna May Reef, the South Reef and the Consolidated Reef appear to be folded on the same axis, which strikes in an east-west direction. Parallel reefs may occur on this axis, and prospecting for them should be carried out east and west of the main workings.

There is also scope for prospecting, east of the present workings, on the northern limbs of these folded reefs, as dragfolds containing ore shoots may occur.

4. Good values were intersected by diamond drill hole No. 6, in a quartz reef, containing abundant galena, which occurs along the junction of the gneiss and the hanging wall greenstones, at the 385ft. V.D. level. On opening up the reef, however, it was found that payable values were very erratic, so that the work was discontinued.

This reef warrants further prospecting as it may increase in width and values along the strike. Any irregularity in the gneiss-greenstone junction, will probably be accompanied by an enrichment in the reef.

LATE "RECOVERY" G.M.L. 3571.

These workings are a short distance to the west of the main leases, and they were embraced in a prospecting area at the time of inspection (November,

§Simpson, E. S., G.S.W.A. Bull. No. 71, Section C., pp. 225-262.

1939). The prospectors were erecting machinery with a view to resuming mining operations.

The underground workings were not examined, but they are reported on by Blatchford.*

According to his report, the ore body consists of a quartz reef occurring in coarse hornblende gneiss, close to its junction with the greenstones. The junction appears to have been folded, and the main ore deposition occurs in this folded section.

The reef is mineralised with sulphides at depth, and specimens of the sulphide ore have been collected, from the dump of the main shaft, for determination.

The official records show that, to November 1939, these workings have produced 8,602.27 long tons of ore for 3,224.59 fine ozs. of gold.

"CONTEMPTIBLE" G.M.L. 3556.

The work done on this lease has been of a prospecting nature, and the workings were inaccessible at the time of inspection (November, 1939).

It is reported that auriferous quartz veins, occurring in country comprised of alternate bands of gneiss and greenstone intersected by a network of pegmatite dykes, have been mined.

The official records show that, to November 1939, this lease has produced 91.75 long tons of ore for 72.68 fine ozs. of gold.

CORINTHIAN GROUP.

GENERAL INFORMATION.

The Corinthian Group is situated on the western side of the Southern Cross-Bullfinch railway, approximately 10 miles north-west of Southern Cross, and it is one mile south-west of the 10-mile peg on the main road between these two centres.

At the time of inspection (April and July, 1939) there were three existing leases, namely "Corinthian" G.M.L. 3425, "Corinthian North" G.M.L. 3398 and "Deliverence" G.M.L. 3415. A short time before the inspection these leases were under option to the Big Bell Mines, Ltd., and the writer is indebted to that Company for copies of the mine plans and diamond drilling information.

A 5-head battery and cyanidation plant, which is sometimes available for public crushings, is in operation on the "Corinthian" lease. There is also a 2-head battery and cyanidation plant on the "Deliverence" lease, which is not available for public crushings.

Water for domestic and mining purposes is obtained from the Southern Cross-Bullfinch water supply pipeline, which passes through the group.

Adequate supplies of morrel, salmon gum and gimlet, which are suitable timbers for mining purposes, grow in the area.

GENERAL GEOLOGY.

The group is situated at the eastern boundary of the Southern Cross-Bullfinch greenstone belt, in rocks which are presumably of Pre-Cambrian Age.

The rocks consist of metamorphosed, interbedded, greenstones, jaspilites and some erosion sediments, and they grade eastwards into biotite gneiss of replacement origin. The series is sheared and contorted, has a general strike N. 35° W. and a dip 75° S.W., and has been intruded by pegmatite, aplite and dolerite dykes. These intrusives are younger than the granitic rocks.

The country rocks are similar to those occurring at the Pilot Group,† and their main characteristics are described below. The only marked difference in the geology of the two centres, is that the erosion sediments have a much more limited distribution at the Corinthian Group.

Greenstones.—Metamorphosed basic lavas and basic sediments constitute the major portion of the greenstones.

The lavas are dense to medium grained, dark green in colour, and they have only a rude schistosity. Amygdaloidal structure is frequently developed.

The basic sediments are represented by the greyish-green, amphibolite schists.

Anthophyllite Schist.—A band of this rock occurs in the greenstone series, 16 chains south-west of the jaspilite horizon. It is yellow to grey in colour, and is everywhere associated with chromite-bearing ironstone and cellular quartz, which are believed to be its decomposition products. This rock has been noted previously in other places in the Yilgarn Goldfield, and it has been determined as a pre-folding, ultrabasic sill.

Jaspilite.—The jaspilite is believed to be the north-western extension of the western band at the Pilot Group, the eastern band having been absorbed in the gneiss.

It is a meta-sediment, and, on the leases, the outcrop line has the appearance of a very ferruginous quartzite. An examination of bore cores from the jaspilite at depth however, shows that, in the fresh state, it consists of alternate bands of amphibole and quartz, and magnetite is also an important constituent.

The jaspilite is granitised at the north-western end of the area mapped, and has the characteristics of a white quartzite.

Erosion Sediments.—These rocks are believed to occur as a thin bed, close to the eastern boundary of the anthophyllite schist band. They were seen only in the dump of a shaft situated approximately 28 chains north-west of the north-west peg of G.M.L. 3425, where they consist of grey, graphitic and garnetiferous, phyllites.

Gneiss.—The gneiss has the composition of biotite granite, and is believed to have been formed by the granitisation of pre-existing greenstones. Owing to the replacement origin of the gneiss, the gneiss-greenstone contact is not sharp, and a zone of only partly granitised greenstone occurs between the footwall of the jaspilite and the gneiss proper.

Geological Structure.—Regional mapping has shown that the group is situated on the western limb of a major anticline, folded on a north-west-south-

*Blatchford, T., G.S.W.A. Bull. No. 71, pp. 91-92.

†Annual Prog. Rept. of Geol. Survey 1938, p. 17.

east axis. Minor folding on a parallel axis also occurs on this limb however, as the dragfolds in the jaspilite band prove it to be the eastern limb of an anticline overturned to the east.

Frequent reversals in pitch of the dragfolds, indicating the presence of crossfolding, occur along the strike of the jaspilite. One rather broad synclinal crossfold occurs on the "Corinthian North" lease, and it coincides with the zone of maximum ore deposition.

THE MINES.

"CORINTHIAN" G.M.L. 3398 AND "CORINTHIAN NORTH" G.M.L. 3425.

These leases were both being held by the same lessees at the time of inspection, and they embrace the main workings of the old Corinthian G.M., which is described by Blatchford.*

Only the 97ft. V.D. level was accessible at the time of inspection, the 200ft. level being under water. Ground water level was 137 feet V.D. from the surface in the old Main Shaft.

The lessees are mining patches of ore in several places in the old workings which have become payable due to the enhanced price for gold. Except for one crushing of sulphide ore, which was sent to Kalgoorlie for treatment, mining has been confined to the oxidised zone.

The mine has been a low grade proposition, and the official records show that, to November, 1939, this ground has produced 145,088.25 long tons of ore for 33,254.16 fine ozs. of gold.

Ore Bodies.—The main ore body consists of a milky white, vuggy, somewhat ironstained, fractured quartz reef, which occurs along the hanging wall of the jaspilite band. It is more or less parallel to the general strike and dip of the country, but absorbs portions of the jaspilite in several places along its strike forming a laminated type of quartz.

The reef has an average width of about 20 feet, and it has been mined sporadically over a length of 2,200 feet, between the surface and 200 feet vertical depth. The main ore shoot is situated on the "Corinthian North" lease towards the north end of the reef, and it is on this shoot that the major portion of the mining has been carried out. This ore body has been mined by open cutting and stoping, from the surface to the 97ft. V.D. level, over an average width of 25 feet and a length of 840 feet. The old plans also show that some stoping of this shoot has been carried out between the 97ft. and 200ft. levels, but the work does not appear to have been extensive. In these workings, payable values have been confined to the quartz, the jaspilite only being mined where portions of it are incorporated in the reef.

Beyond the limits of the main ore shoot payable values occur erratically, and only small ore bodies have been mined. Some jaspilite lode material, occurring on the footwall of the reef, has been mined in a few places towards the south-east end of the workings.

In places, the quartz and adjacent country is jointed in three directions, and this is particularly noticeable in the main ore shoot. One system of joints is parallel to the strike and dip, another is at right angles to the strike and dip, and the third is horizontal. This system of fractures has controlled the distribution of secondary gold, which has contributed considerably to the gold content of the ore shoots. According to Blatchford there is some proof that "the gold occcurred irregularly in more or less flat indefinite zones."

The ore body is believed to have been formed by metasomatic replacement, and isolated "horses" of greenstone and jaspilite within the quartz, support this view.

Several narrow, lenticular, quartz reefs occur in greenstone country on the hanging wall of the main ore channel, and they have also been mined in a few places. The reefs are parallel with the strike and dip of the enclosing greenstone, and the reef known as the West Reef has been the most important.

The values in these reefs are reported to have been higher than those in the main ore channel, but they have made only a small contribution to the total production from these leases.

Dolerite and pegmatite dykes were seen cutting through the ore bodies in several places in the workings.

Structural Control of Ore Deposition.—The main ore shoot is situated in an area of highly fractured and contorted rocks. The presence of opposing pitches at the ends of the ore body suggests the presence of a synclinal crossfold in this vicinity but the absence of any marked swing in the outcrop suggests that the movement producing the opposing pitches was taken up by solid flow of the rocks. For this reason no bowing of the beds such as would normally be expected in a crossfolded area has occurred. This view is supported by the highly contorted nature of the rocks, which indicates the action of local compressive forces.

More extensive local fracturing has probably been the reason for mineralisation being greater in this area than elsewhere, these fractures being the channels for the introduction of the mineralising solutions. The path of these mineralising solutions is not known.

Owing to the paucity of evidence regarding the relationship of geological structure to ore deposition, and the lack of mine openings to any considerable depth below water level, the writer is not in a position to assess the prospects of the ore body at depth.

By reference to the assay plans, it is seen that only small shoots of ore exist in the main ore channel beyond the limits of the main shoot, and on correlating the position of these shoots with dragfolds in the adjacent jaspilite, there is a strong suggestion that they may occur in small synclinal crossfolds. It would appear, therefore, that the synclinal crossfolds have been more favourable to gold deposition than the anticlinal crossfolds, but the evidence is by no means conclusive.

Mineral Associations.—The main ore body is heavily mineralised with sulphides at the 97ft. level, which consist mainly of pyrrhotite, pyrite and marcasite, but small quantities of other sulphides may be present. The sulphides are reported to become abun-

*Blatchford, T., G.S.W.A., Bull. No. 71, pp. 71-74.

dant in the main shoot at about 75 feet V.D. from the surface, but they do not occur in a fresh state in the remainder of the ore channel until 100 feet V.D. is reached. The vuggy nature of the quartz in the oxidised zone is due to the weathering out of sulphides.

The sulphides are closely associated with the gold, and Blatchford states that "the pyrrhotite occurs in such quantities as to seriously hamper the extraction of gold by direct cyanidation treatment." It is also reported that, owing to the abundant pyrrhotite in the ore, only a poor extraction is obtained even after roasting.

On decomposition the sulphides form melanterite (hydrous ferrous sulphate), and green encrustations of this mineral occur frequently on the walls of the drives in the semi-sulphide zone.

Diamond Drilling.—During their option the Big Bell Mines, Ltd., put down four bores to test the main ore shoot at depth. The cores of these bores have been made available by the Company, but up to the time of writing this report the writer has been unable to make a complete examination of them. Full information concerning them will be published at a later date.

Some metasomatism investigations are being carried out on these leases and the cores will be of great assistance to this work.

Recommendations.

The writer does not feel inclined to make any recommendations until he has had time to make an analysis of all the available information concerning these leases.

It should be borne in mind, however, that after an exhaustive sampling campaign, the Big Bell Mines, Ltd., surrendered their option, and it is assumed that they did not consider the deposit warranted large-scale mining.

"DELIVERENCE" G.M.L. 3415.

The lease embraces the south-eastern extensions of the ore bodies which have been mined on the "Corinthian" and "Corinthian North" leases.

Mining has been carried out on all these ore channels, but work was only in progress on the continuation of the West Reef, at the time of inspection.

Only the workings off the new shaft were accessible, and a lenticular quartz reef, striking N. 40° W. and dipping 80° S.W. with the schistosity of the enclosing greenstone country, has been opened up, between the surface and 102 feet vertical depth. The reef is only a stringer from the surface to 40 feet vertical depth, but it then gradually increases in size, and has an average width of two feet and a length of about 100 feet, at the 102ft. level. The average value of the quartz is reported to be 26 dwts. gold per ton, but no stoping has yet been done. The lessees anticipate that overhand stoping of the reef will be possible to the 70ft. level, where it has an average width of six inches. Sulphides occur abundantly in the reef at the 102ft. level, and there is frequently a blue staining in the quartz, which suggests that some copper-bearing sulphides may be present. This being the case, a poor extraction is to be expected by ordinary battery and cyanidation treatment of this ore.

The workings off the old main shaft were inaccessible at the time of inspection, but the following information has been supplied by the lessees. A quartz reef, striking N. 40° W. and dipping 80° S.W., situated in greenstone country a short distance west of the jaspilite horizon, constituted the ore body. The shoot was 200 feet long, 18 inches average width, and was stoped out to ground water level at 150 feet V.D. from the surface. Sulphides commenced to appear in the quartz at 50 feet V.D. and became abundant at depth. Some difficulty was experienced in the treatment of the sulphide ore.

The official records show that to November, 1939, this lease has produced 1,678.40 long tons of ore for 2,096.93 fine ozs. of gold.

BABYLONIAN GROUP.

GENERAL INFORMATION.

The group is situated on agricultural land 1½ miles south-west of the Corinthian Group, and a track runs between the two centres.

At the time of inspection (April, 1939) the only existing lease was the "Badaglo" G.M.L. 34PP, but this was forfeited shortly afterwards.

The lessees have an arrangement with the owners of the Corinthian battery, and crush their ore at that battery. The nearest public batteries however, are the Copperhead battery at Bullfinch and the Three Boys battery at Southern Cross.

Water for domestic and mining purposes is obtained from the standpipe at the Corinthian Group.

Adequate supplies of morrel, salmon gum and gimlet, which are suitable for mining purposes, occur in the vicinity of the leases.

GENERAL GEOLOGY.

The group is situated on the western margin of the Southern Cross-Bullfinch greenstone belt, in country which is presumably of Pre-Cambrian Age.

The greenstones consist of metamorphosed, interbedded, basic sediments and jaspilites, which have a general strike N. 50° W. and dip 70° N.E., and they give place westwards to biotite gneiss of replacement origin. There is a paucity of outcrops in the biotite gneiss country, but where seen, the gneissosity is parallel to the general strike and dip of the greenstones.

A prominent, milky white, quartz reef, striking in an east-west direction and dipping 50° S., occurs along a fault plane at the centre of the group. The faulting has been normal, and judging from the movement of the jaspilite horizons, the hanging wall country of the fault has a relative horizontal displacement of 75 feet east.

An examination of the underground workings has shown that the faulting occurred subsequently to ore formation, and it may also be post-granitisation* in

*Refer to report on Pilot Group, Ann. Prog. Rept. Geol. Survey, 1938, p. 18.

age. There is certainly an apparent displacement of the greenstone-gneiss boundary, but doubt exists, because granitisation frequently ceases at a definite horizon, and it is probable that pre-gneiss faulting would not materially affect the process.

Lenticular quartz reefs constitute the main ore bodies at the group, but the old workings scattered along the jaspilites suggest that patches of jaspilite lode material with quartz stringers have also been mined.

THE MINES.

"BADAGLO" G.M.L. 34PP.

The lease is situated in biotite gneiss country, and lenticular quartz reefs, of the fissure type, have been mined.

The main reef has a general strike N. 45° E. and a general dip of 30° N.W., and has been stoped out erratically between the surface and 87 feet linear depth, over a length of about 280 feet. The reef varies in width from 2 to 9 inches, and also has a very variable strike and dip. Spur veins branch off the main reef at intervals along its strike, and they have been mined in several places. The spur veins show no tendency to line up with the general strike and dip of the enclosing biotite gneiss.

At depth, the quartz reefs and the country adjacent to them have been mineralised with sulphides, and pyrite and covellite have been detected in specimens which were submitted to the Government Chemical Laboratory for determination.

The workings are confined to the country on the hanging wall of the fault, which is reported to cut off the main reef at its north-east end. These workings at the north-eastern end of the reef were not accessible, but good values are said to have occurred in the reef where it was faulted.

The official records show, that to November, 1939, this ground has produced 772.50 long tons of ore for 786.35 fine ozs. of gold.

Conclusions and Recommendations.

1. Owing to the narrowness and irregularity of the reefs, and the increasing hardness of the country with depth, it is unlikely that economical mining of the ore bodies will be possible to any great depth. At the time of inspection, the lessees were finding it almost impossible to hand mine the reef at the bottom level, 87 feet linear depth.

2. There is scope for prospecting on the footwall side of the fault, as a continuation of the main reef may be present. The continuation should be displaced about 75 feet north-west of the main reef, and prospecting for it could best be done by costeaning in a north-westerly direction on the footwall side of the fault, between 65 and 85 feet west north-west of the point where the main reef has been cut off in the workings.

EENUIN GROUP.

GENERAL INFORMATION.

The group is situated in very hilly country, on the northern side of Lake Deborah, 16 miles north north-west of Bullfinch, but the distance by road is slightly greater. A track branches off the old Jackson road about 16 miles from Bullfinch and leads to the mines.

The first discovery of gold in the eastern goldfields was made in this belt of country approximately 1¾ miles north-west of the area mapped. This discovery should not be confused with the first gold mining lease in the eastern goldfields, however, which was pegged at the Colreavy Group.

At the time of inspection (September, 1939) there was only one existing lease at the group, the "Eenuin Daisy" G.M.L. 3871, but four prospecting areas were also in existence. Of these prospecting areas, three were pegged over the old leases, "Star of Eenuin" G.M.L. 2803, "North Star of Eenuin" G.M.L. 2999 and "Crown and Anchor" G.M.L. 3479, and the other was in new ground.

The nearest public batteries are Lang's at the Manxman Group, and the Copperhead at Bullfinch, and either one or the other of these batteries was being used for the treatment of parcels of ore from this group.

Water for mining purposes is obtained from the Eenuin Tank, which is situated close to the 42-mile peg on the old Jackson road. Some prospectors also obtain water for domestic purposes from this source, but the majority obtain their supplies from the standpipe at Bullfinch.

Adequate supplies of morrel, salmon gum and gimlet, which are suitable for mining purposes, occur in the area.

GENERAL GEOLOGY.

The area is composed of metamorphosed, interbedded, basic lavas, basic agglomerates, basic sediments, jaspilite and erosion sediments, which have a general strike N. 25° W. and a vertical dip. Some coarse grained amphibolite, which may be an intrusive rock, also occurs in the series at the south-eastern end of the area mapped. The rocks are the north-western extension of the belt of country at the Colreavy Group, and they are presumably of Pre-Cambrian Age.

The basic lavas constitute the major portion of the greenstones, and they form bouldery outcrops with only a rude schistosity. Fine to medium grained varieties occur, which show amygdaloidal structure, and have the characteristic dark greenish colour. Besides the basic agglomerates, a peculiar, vesicular, talcose rock is associated with the lava and this is thought to be probably a decomposed, metamorphosed flow top. As in the case at the Colreavy Group, this talcose rock occurs in proximity to the jaspilites.

The basic sediments are represented in the series by amphibolite schists, which have a very limited distribution.

Several horizons of jaspilite are present on the eastern side of the area mapped, and they fall into two zones. The jaspilites are the ferruginous platey type, and contain abundant hematite and magnetite in the vicinity of the late "Star of Eenuin" G.M.L. 2803, where the compass variation is 30-40 degrees.

A belt of erosion sediments, consisting of grey phyllites, quartzites, grits and mica schists, has been mapped in the north-west corner of the area. This belt of country converges on the jaspilites going north.

Ore Bodies.—Small lenticular quartz reefs, and patches of jaspilite lode material with quartz stringers, constitute the ore bodies at this group. The values have been fairly high, but owing to the

smallness of the shoots and the hardness of the country, they become unpayable at shallow depths. Nowhere in the group has economical mining been possible below 100 feet V.D. from the surface, which is characteristic of this belt of basic lavas.

Geological Structure.—In the area mapped, the dragfolds in the jaspilites show frequent reversals in pitch, but south of Trig. HK48 a consistent south-easterly pitch prevails. This strong south-easterly pitch confirms the presence of a broad synclinal crossfold between Marie's Find* and the Eenuin Group. The frequent reversals in pitch north of Trig. HK48, may be partly the reason for only small ore shoots occurring in this area.

THE MINES.

"EENUIN DAISY" G.M.L. 3871.

On this lease a lenticular quartz reef, striking N. 10° W. and dipping 75° E., has been stoped out sporadically over a length of 128 feet, between the surface and 47 feet V.D. The reef is along the eastern boundary of a band of basic agglomerate, which occurs in the basic lavas, and is on the strike of the line of old workings on the late "Crown and Anchor" G.M.L. 3479.

Five shoots of ore, which pitch 60° N. and have a maximum individual length of 12 feet, have been mined in the reef. The quartz is the glassy, somewhat ironstained variety, and varies in width from a stringer to 2 feet 6 inches. The average width where it has been stoped, however, would be about 1 foot. Sulphides, which appear to consist entirely of pyrites, occur in the quartz at depth. Small amounts of other sulphides may also be present, but this cannot be established until the results of some determinations on the ore by the Government Chemical Laboratory have come to hand.

It is reported that only stringers of quartz with poor values occur at the extreme north and south ends of the workings.

At the time of inspection (September, 1939) the reef was becoming uneconomical to work at depth, and the lessee was contemplating forfeiting the lease.

The official records show that to September, 1939, this lease had produced 101.00 long tons of ore for 70.04 fine ozs. of gold.

Conclusions and Recommendations.—Other small ore shoots may exist along the strike of this reef, and on the strike of the reef being mined on P.A. 5431, but it is doubtful whether or not prospecting for them is warranted.

LATE "CROWN AND ANCHOR" G.M.L. 3479 *(NOW P.A.* 5431).

The prospectors are mining a small quartz reef, which is situated approximately 5 chains west of the line of old workings. It occurs in greenstone country, consisting of basic lavas and basic agglomerates, which have a general strike N. 10° W., and dip 70° E. The reef has the shape of a west limb, anticlinal dragfold, overturned to the west, and it pitches 55° N. Quartz deposition has been greatest at the anticlinal and synclinal portions of the fold, and the reef dwindles away to a stringer on both limbs. The reef has a maximum width of 2 feet, and it has been mined over a length of 5 feet, from a shaft put down on the pitch, between the surface and 57 feet V.D. The average value of the ore crushed is reported to be 30 dwts. gold per ton, but the reef is becoming uneconomical to work at the 57ft. V.D. level.

Sulphides, which appear to consist entirely of pyrites, occur in the quartz at the 57ft. V.D. level. Specimens of the sulphides have been submitted to the Government Chemical Laboratory for determination but the results are not yet to hand.

The official records show that to October, 1939, this ground has produced 83.00 long tons of ore for 58.77 fine ozs. of gold.

Conclusions and Recommendations.—Prospecting is warranted both north and south along the strike of the reef as other small "saddle reefs" may exist. Provided that there is no reversal in pitch, other shoots will be *en echelon* with the known one, and step east going north and west going south. No other line of prospecting can be recommended.

LATE "STAR OR EENUIN" G.M.L. 2803.

The workings on this prospecting area are situated close to the eastern boundary of the western jaspilite zone.

Two small, parallel, northerly pitching, "saddle reefs" of quartz have been mined, and some very rich patches of ore have been encountered.

At the time of inspection (September, 1939) only the workings on the southern reef were accessible. The reef has the shape of a west limb, anticlinal dragfold, overturned to the west, and pitches 70° N. It is enclosed in decomposed, schistose greenstone, which has a general strike N. 10° W. and a very steep easterly dip. The prospectors have mined the synclinal portion of the fold between the surface and 43 feet V.D., and have also carried out some work on the eastern limb of the reef, which goes away to the north. A rich shoot, maximum width 2 feet and length 3 feet, occurs in the synclinal portion of the reef, but the quartz dwindles away to a stringer and values become poor along the eastern limb. The western limb and the anticlinal portion of the reef appear to have been overlooked, and the prospecting of them is strongly recommended, because the reef is continuing west from the synclinal portion, and also both the anticlinal and synclinal portions of the parallel reef have been mined.

The quartz is the vuggy, ironstained, glassy variety, and it contains pyrites at depth.

The official records show that to November, 1939, this lease has produced 118.16 long tons of ore for 342.89 fine ozs. of gold, but this production has come mainly from the northern reef.

Conclusions and Recommendations.

1. As is pointed out above, the prospecting of the anticlinal portion and the western limb of the southern reef is strongly recommended.

2. Prospecting is also warranted along the strike of both lines of reef as other small, pitching "saddle reefs" may exist.

*Refer to the report on Marie's Find, p. 37.

LATE "NORTH STAR OF EENUIN" G.M.L. 2999.

This old lease was being held as a prospecting area at the time of inspection, and it is situated immediately to the north of the late "Star of Eenuin" lease. It has been described by Blatchford* under the name "Marionette."

Only a small portion of the workings were accessible, but this was sufficient to show that the ore bodies consisted of patches of jaspilite lode material and quartz stringers, occurring in dragfolds pitching 60° S. The shoots were confined to the anticlinal and synclinal portions of the folds, and they have been stoped out to a maximum vertical depth of about 60 feet.

The presence of southerly pitching dragfolds in these workings, means that the axis of a small synclinal crossfold occurs between them and the workings on the late "Star of Eenuin" lease.

There is no official record of any production from this lease. From the size of the workings, however, there is little doubt that several crushings have been mined and the production data for these must have been included with the sundry claims of the Eenuin Group.

ROWAN'S PROSPECTING AREA.

This prospecting area is situated in new ground approximately half a mile east south-east of Trig. HK48.

The find is in basic lava country, which strikes N. 30° W. and dips vertically, near the eastern boundary of this belt of rocks, and prospecting of the reef was in progress at the time of inspection. The basic lavas change to basic sediments a short distance east of the find. A thin jaspilite band also occurs near the reef on its western side, but it is folded, and assumes an east-west strike immediately to the south of the workings.

The ore body consists of an auriferous quartz reef, varying in width from 4 to 6 inches, which has been opened up in one shaft (15 feet V.D.) and a few potholes, over a length of 30 to 40 feet. The reef is of the fissure type, striking north-south and dipping 70° E., which is oblique to the general strike and dip of the country.

The prospectors report that this preliminary work has shown that further prospecting of the reef is warranted.

Conclusions and Recommendations.

1. The reef is striking into the jaspilite to the south of the present workings, and the intersection warrants prospecting as an enrichment may occur.

2. From the investigations already carried out in the Yilgarn Goldfield, it has been seen that the basic sediments are a more favourable host rock than the basic lavas. For this reason, prospecting in the basic sedimentary country north of the reef is recommended.

3. Prospecting of the block of country east of this show, south of an east-west line through Trig. HK48, and bounded by the north shore of Lake Deborah, is also recommended. The reason for this recommendation is that the block of country is believed to consist mainly of basic sediments, and it is in the broad synclinal crossfold, which occurs between Marie's Find and the Eenuin Group.

*Blatchford, T., G.S.W.A. Bulletin No. 71, p. 87.

COLREAVY (GOLDEN VALLEY) GROUP.

GENERAL INFORMATION.

The mining group is situated on the old Jackson road 8½ miles north-west of Bullfinch, and it is of historical interest as the first gold mining lease in the eastern goldfields was pegged in this area. A tablet stating this fact is erected near the north north-west boundary of the late "Kathleen" G.M.L. 3811.

Except for one prospector who was dryblowing on the late "Kathleen" lease, there was no mining activity at the group at the time of inspection (August, 1939). Some mining was in progress however, on the late "Great Willow" G.M.L. 3763, which is situated 40 chains south-east of the area mapped, and for convenience this lease is being included in the Colreavy Group.

Judging from the extent of the workings the late "Kathleen" G.M.L. 3811, the late "Violet" G.M.L. 2653, the late "Lake View" G.M.L. 3039 and the late "Baby Queen" G.M.L. 927, have been the most important mines in the area mapped.

The nearest public battery is Lang's at the Manxman Group, where 5 head and a cyanidation plant are available. The battery is 5½ miles by road from the Colreavy Group.

Water for domestic purposes is carted from the standpipe in Bullfinch. Water for mining purposes however, is obtained from the windmill and tank on Water Reserve 4233 at the south-west corner of the group. The water is being used for stock, but the supply is also sufficient to meet the requirements of prospectors. The Colreavy dam cannot be regarded as a possible water supply. It was absolutely dry and almost silted up, at the time of inspection.

Timber suitable for mining purposes is scarce in the immediate vicinity of the group, but adequate supplies are available at a few miles distant.

GENERAL GEOLOGY.

The area is composed mainly of metamorphosed, interbedded basic lavas and jaspilites, but minor quantities of basic sediments may also occur. A narrow belt of grey phyllites is also present in the series, approximately 6 chains west of the western jaspilite zone. The rocks are presumably of Pre-Cambrian Age, and they have a general strike N. 20° W. and a general dip 70° E.N.E.

Both fine grained and medium grained basic lavas occur, and they form bouldery outcrops, in which only a rude schistosity is developed. They have the characteristic dark green colour, and amygdaloidal structure is of frequent occurrence. A peculiar, vesicular, talcose rock occurs in the lavas in proximity to the eastern jaspilite zone, and it is thought that this rock may be a partly decomposed, metamorphosed, flow top.

Several bands of jaspilite are present in the series, but they occur in three main zones. The jaspilites of the eastern zone are the platey type while those of the other two zones are the more massive, siliceous variety. All the jaspilite zones show evidence of prospecting, but the only workings of any importance are those on the late "Violet" G.M.L. 2653.

The regional distribution of the jaspilites shows that an anticlinal crossfold axis, striking in an east north-east—west south-west direction, passes through the centre of the group. The anticlinal crossfold is the west south-west extension of that occurring about midway between the Manxman Group and Marie's Find (refer Plate III). Insufficient mapping has yet been done however, to show whether or not the three jaspilite zones are repetitions of one zone, resulting from folding on a north-west—south-east axis.

The majority of the ore bodies at the group have been short, irregular, quartz reefs with fairly high values, which were parallel to the schistosity of the enclosing country, but patches of jaspilite lode material with quartz veinlets have also been mined in several places. As is characteristic of ore bodies occurring in this belt of basic lavas, however, due to the irregularity of quartz deposition and the hardness of the country rock, they become uneconomical to mine at shallow depths.

THE MINES.

LATE "VIOLET" G.M.L. 2653.

As the old workings on this lease are subject to spasmodic prospecting, it is thought advisable to put together a few notes concerning them.

The lease is pegged on the eastern jaspilite zone, and the ore body occurs on the hanging wall of the most eastern jaspilite band in this zone. The mine was inaccessible at the time of inspection (August, 1939), but it is described by Blatchford.*

From this report it would appear that a shoot of oxidised, jaspilite lode material and quartz stringers, have been stoped out, off a shaft underlying 60° N.E., from 70 feet linear depth to the surface. The shoot is 20 feet long, and it has been investigated to 100 feet linear depth. There is no stoping below the 70ft. level however, as in this section, the shoot is highly mineralised with antimonial and arsenical sulphides.

According to Blatchford, the ore body occurs at the junction of a spur of jaspilite with the main jaspilite band. The writer is of the opinion that this spur of jaspilite is a dragfold off the main band. This being true, the ore shoot would then be in a synclinal dragfold. The pitch of the ore body is not known, but the dragfolds in the jaspilite at the surface suggest that it is probably to the south-east.

The official records show that, to November, 1939, this ground has produced 947.14 long tons of ore for 555.47 fine ozs. of gold.

LATE "GREAT WILLOW" G.M.L. 3763.

This old lease was pegged as a prospecting area at the time of inspection (October, 1939).

The ore body consists of a lenticular quartz reef, which strikes north-south and dips 75° W., and it is parallel to the schistosity of the enclosing basic lavas. The reef has a maximum width of about 12 inches, and it has been mined sporadically over a length of 300 feet, to a maximum vertical depth of 90 feet. The quartz is the opaque, fractured, somewhat ironstained type, and sulphides have not yet been encountered. The ore shoots are reported to pitch to the south. It is unlikely that economical mining of these shoots will be possible below the 90ft. level.

The official records show that, to November, 1939, this ground has produced 215.00 long tons of ore for 160.84 fine ozs. of gold.

*Blatchford, T., G.S.W.A. Bull. No. 71, p. 86.

WITHER'S FIND.

GENERAL INFORMATION.

This find is situated in undulating country approximately five miles north-east of Bullfinch.

At the time of inspection (May, 1939) the only existing lease was the "Peter Pan" G.M.L. 3865, but several prospecting areas were also in existence.

The nearest public battery is the Copperhead, at Bullfinch, where five-head and a cyanidation plant are available for public crushings.

Adequate supplies of salmon gum, gimlet and morrel, which are suitable for mining purposes, occur in the immediate vicinity of the find.

Water for domestic and mining purposes is being carted from the standpipe at Bullfinch.

GENERAL GEOLOGY.

Poor outcrop conditions exist at the find, the major portion of the area being covered by an overburden of pink sandy soil. From an examination of shaft dumps and rock fragments in the soil, however, the underlying rocks are shown to consist of biotite gneiss with remnants of greenstone. The biotite gneiss is believed to have been formed by the granitisation of pre-existing basic sediments, which consisted mainly of amphibolite schists. Rocks, which appear to be transitional stages between the amphibolite schist and biotite gneiss, also occur, and the following types have been recognised: hornblende schist, quartz-hornblende schist, quartz-felspar-hornblende schist, biotite-hornblende gneiss and biotite gneiss. The series has a general strike N. 70° W., dips 45°—70° N.N.E., and has been intruded by post-gold pegmatite dykes. The rocks are presumably of Pre-Cambrian Age.

There is an absence of any structural information at the find, but it may have originally been on the south-easterly extension of the belt of greenstones at the Mornington Group.

There are four main lines of ore deposition at the find, which are parallel to the general strike and dip of the country. Auriferous quartz reefs, of the vitreous, fractured, somewhat ironstained variety, occur at intervals along these lines in both the greenstone and biotite gneiss, but judging from the distribution of the workings, payable values have been more or less confined to the reefs in greenstone country. The ore bodies are all narrow, lenticular, reefs, but the values are generally high. The reefs are fairly persistent both along their strike and down their dip, but as it is necessary to mine them selectively, they become uneconomical to work at shallow depths.

The granitisation of the country is thought to have occurred subsequently to ore formation, and the process seems to have had an influence on the gold content of the ore bodies. The reefs with the best values occur in either greenstone or partly granitised greenstone, while values are very low in reefs occurring in massive biotite gneiss, which represents the ultimate stage in the granitisation process

THE MINES.

"PETER PAN" G.M.L. 3865.

The lease is situated at the north-west end of the find, and it embraces the old workings at the late "Joke" G.M.L. 3249.

The only accessible workings at the time of inspection (May, 1939) were those off an underlay shaft at the extreme north-west end of the line of reef. In these workings, a lenticular quartz vein has been stoped out erratically over an average length of about 50 feet, from 29 feet vertical depth from the surface to ground water level at 124 feet V.D. The vein strikes N. 70° W., dips 60° N.N.E., and varies in width from one inch to one foot. Sulphides begin to appear in the quartz at the 86ft. V.D. level, but they are reported to cause no treatment difficulties. Specimens of the sulphide ore have been submitted to the Government Chemical Laboratory for determination, but the results are not yet to hand.

The vein is enclosed in biotite gneiss country, but a pegmatite dyke, one foot wide, occurs on its footwall. The dyke remains on the footwall of the reef to about the 124ft. V.D. level, where it splits the reef and usurps the reef channel for a few feet. A thin quartz stringer and pegmatite are showing in the face of the south-east drive at the 124ft. V.D. level.

The official records show that to November, 1939, the workings embraced by this lease have produced 307.00 long tons of ore for 281.61 fine ozs. of gold.

Conclusions and Recommendations.

1. Owing to the narrowness of the vein, selective mining is necessary, and for this reason it is unlikely that the ore body will warrant mining below ground water level.

2. The biotite gneiss country adjacent to the reef contains rather a preponderance of biotite, which suggests that the granitisation process has not been completed. Surface indications, however, point to the country changing to true biotite gneiss north-west of the workings so that prospecting in this direction is not warranted.

3. The old workings were not accessible at the time of inspection, but the lessees report that the reef was cut off sharply by a fault at the extreme south-east end, and the continuation has not yet been found. Where it is faulted, the reef is said to be two feet wide, and average 25 dwts. gold per ton. If this information is correct, there is scope for prospecting for the continuation of the reef.

PROSPECTING AREAS.

Several prospecting areas were in existence at the time of inspection (May, 1939), and they all embraced lines of old workings. Due to the enhanced price of gold, the prospectors found it possible to mine further sections of the reefs, in these old workings, above ground water level. The quartz reefs are lenticular, and megascopically are similar to the "Peter Pan" reef. They have a west north-westerly strike and dip 45-60° N.N.E. The country rocks, in proximity to the reefs, consist of either greenstone or partly granitised greenstone, and in no instance were they completely granitised greenstone. In some places though, the very biotitic gneiss occurs as the host rock.

Sulphides, which appear to consist entirely of pyrites, occur in the quartz reefs at depth. Minor quantities of other sulphides may be present, however, and specimens of ore have been submitted to the Government Chemical Laboratory for determination of the sulphides.

There was insufficient time at the writer's disposal when writing this report to make an analysis of the production data for these holdings.

DAY'S FIND.

GENERAL INFORMATION.

The find is situated in a valley between two prominent ranges of jaspilite hills approximately 4½ miles north-west of Bullfinch. It is also about half a mile east north-east of The Sisters' Trig.

At the time of inspection (May, 1939) there were three existing leases at the find namely, "Mistletoe" G.M.L. 3825, "Albatross," G.M.L. 3932 and "One Under" G.M.L. 3933. The "Mistletoe" is the main lease, and it was under option to the Western Mining Corporation.* The "One Under" and "Albatross" Leases are respectively at the north-west and south-east ends of the main lease, and they were being held by Mr. A. Barr of the "Radio" Mine. No work was in progress on the "Albatross" lease, however.

The find is reached by a road, which branches off the main Bullfinch-Marie's Find road, one mile from Bullfinch. Tracks also lead to the find from the Manxman Group, and from near the 27 mile peg on the old Jackson road.

The nearest public batteries are the Copperhead and Lang's which are situated 4½ and 2 miles respectively from the find.

Water for domestic and mining purposes is carted from the standpipe at Bullfinch.

Adequate supplies of morrel and gimlet, which are suitable for mining purposes, occur in the vicinity of the find.

The official records show that to November 1939, these leases have produced 1,709.00 long tons of ore for 1,518.99 fine ozs. of gold.

GENERAL GEOLOGY.

The find is situated in an area of highly metamorphosed, basic lavas, basic sediments and jaspilites, which have a general strike N. 30° W, and a steep dip, varying from north-east to south-west. Besides these rocks, minor quantities of metamorphosed erosion sediments are present in the series, and fragments of grey phyllite occur on the south-western side of the Sisters' line of jaspilite, 53 chains south of the main workings. Some rather coarse grained greenstone, which is probably intrusive, also occurs in the series. All the rocks are presumed to be of Pre-Cambrian Age.

Greenstones.—The greenstones consist mainly of basic lavas, which are fine to medium grained and show amygdaloidal structure. They form bouldery hills, and generally have only a rude schistosity, but this schistosity is strongly developed in the vicinity of the leases.

The basic sediments consist of amphibolite schists, and they occur in close association with the jaspilites.

Only two small patches of coarse grained, intrusive greenstone occurred in the area mapped; one in the northern corner of the area, and the other in the southern corner. The age relationship of this intrusive greenstone to the pegmatite and dolerite dykes, which have been encountered in other places in the Goldfield, has not been established.

*The Company has since exercised the option.

Jaspilites.—Several horizons of jaspilite occur in the area mapped and they fall into three zones; the eastern, the middle and the western zones.

The eastern zone is composed of three strong bands of jaspilite, which form a prominent line of hills on the eastern side of the leases. The bands vary in dip from 40° N.E. to 70° S.W., and are interbedded with decomposed basic sediments. The dragfolds in these jaspilites indicate a reversal in pitch, east north-east of the main workings.

The middle zone consists of one thin jaspilite band, which traverses the leases. The band outcrops in only a few places, and is interbedded with highly sheared, basic lavas and basic sediments. The main ore bodies at the find are in close proximity to this jaspilite band.

The western zone consists of three bands of jaspilite, the middle one of which is the strongest band. The middle band varies in dip from 70° N.E. to 70° S.W., and is dragfolded into north-westerly pitching folds at its northern end, forming a group of conspicuous hills. The Sisters' Trig is on one of these hills. These jaspilites are interbedded with basic sediments and minor quantities of grey phyllites. Mining of a prospecting nature has been done in several places along this jaspilite zone.

Geological Structure.—An examination of the dragfolds in the eastern jaspilite zone shows that the main workings are on the axis of an anticlinal crossfold. The crossfold is the west south-west extension of that which embraces the main workings at Rowan's Find.

The crossfold is the one immediately to the south of the "Radio" synclinal crossfold, the axis of which passes through the country at Day's Find, approximately 50 chains north-west of the main workings.

Further regional mapping is required before the structural position of the find, with relation to the north-west—south-east system of folding, is established. Tentatively however, the find is believed to be on the western limb of a major anticline, in rocks stratigraphically above the Manxman-Marie's Find belt of country.

THE MINES.

"MISTLETOE" G.M.L. 3825.

The ore body on this lease consists of an auriferous quartz reef, which is enclosed in actinolite schist. The actinolite schist is believed to be a recrystallised basic sediment, and its schistosity is parallel to the reef. As has been pointed out previously, ore deposition has occurred at a reversal in pitch, and this is substantiated by the distribution of the middle jaspilite zone, which occurs on the western side of the reef. The jaspilite bows out around the reef, and meets it only at its extreme north-west and south-east ends.

The auriferous quartz is the white, translucent, laminated variety, and the reef is lenticular both along the strike and down the dip. The length is approximately 180 feet, and the width varies from 3 to 18 feet. The reef is laminated parallel to the strike and dip, and it has probably been formed by metasomatic replacement, as thin seams of greenstone parallel to the laminations are of frequent occurrence. A very pronounced ribbing, which pitches 10° N.W. occurs on the face of the laminations, and this may or may not be direction of pitch of the reef. As will be seen later in the report, the distribution of the stoping tends to refute the possibility of this ribbing indicating the pitch of the reef.

The reef strikes N. 40° W. and has a dip varying from 65° S.W. to 65° N.E. The dip is almost vertical from the surface to the 51ft. V.D. level where it changes to 65° S.W. and this dip is retained to 156ft. V.D. level, where the reef rolls over and dips 65° N.E.

At the time of inspection (May 1939) the mine was under option to the Western Mining Corporation who were pursuing a development programme, but the vendors had stoped out a rich shoot of ore between the surface and the 156ft. V.D. level. The stoping pitches 70° S.E., has a horizontal length averaging about 60 feet, and increases in average width from 3 feet near the surface, to 5 feet at the 156ft. V.D. level. The quartz is 18 feet wide from the surface to the 51ft. V.D. level, and only 3 feet on the south-west side has been mined, but the quartz is stoped over its full width below this level. There are numerous minor changes in dip on the reef which are of economic importance. Width and values are best, where the reef is laminated and dips steeply.

The quartz is mineralised with sulphides at the 156ft. V.D. level, and the presence of arsenopyrite, chalcopyrite and pyrite, has been detected. The sulphides are closely associated with the gold, and it is necessary to send parcels of the sulphide ore to Kalgoorlie for treatment.

The company has driven on the reef over a length of 197 feet at the 156ft. V.D. level, but payable values exist only over a length of 155 feet. A quartz stringer is showing in the south-east face of the drive and quartz is entirely absent in the north-west face. The management report that in addition to the stoping already done, the reef can be stoped out above this level to 79 feet vertical depth from the surface.

The reef has been tested underfoot from the 156ft. V.D. level by means of three winzes, but only No. 2 North Winze was accessible at the time of inspection. Information concerning the other two winzes was made available by the management however.

It is reported that in No. 1 South Winze, the reef has a vertical dip to 20 feet below the level where it changes to 65° N.E. The winze continues to 54 feet V.D., where the reef is cut off, 3 feet 6 inches wide, by a flat fault. There is rather conflicting information as to whether or not the fault plane is occupied by a greenstone dyke, but in any case the faulting is post-auriferous quartz in age.

The No. 1 North Winze is reported to be 60 feet V.D., and 5 feet of quartz is showing in the floor. The reef is said to be vertical to about 50 feet V.D., where it commences to dip 65° N.E. The fault has apparently not been encountered in this winze.

The No. 2 North Winze was 33 feet V.D. at the time of inspection, and sinking was in progress. The quartz in this winze commenced to dip 65° N.E. at about 15 feet below the level, and it was 4 feet 6 inches wide in the floor of the winze.

Ground water level is not known, but a small make of water, quite insufficient for mining purposes, occurs at the 156ft. V.D. level.

The official records show that to November, 1939, this mine has produced 1,591.00 long tons of ore for 1,478.28 fine ozs. of gold.

Conclusions and Recommendations.

1. The stoping indicates that the ore body has a steep south-east pitch, while the ribbing in the quartz suggests a flat north-east pitch. Payable values in the quartz however, extend beyond the limits of the shoot already stoped, so that the stoping is not really a true indication of the pitch. Until further work is done, the direction of pitch will remain doubtful.

2. The reef has been cut off below the 156ft. V.D. level by a fault, and a greenstone dyke may or may not occur along the fault plane. In any case, the faulting is post-gold, and a continuation of the reef is to be expected. The change in dip to 65° N.E. below the 156ft. V.D. level suggests a drag on the fault, and the continuation of the reef will probably be displaced to the north-east. Whether or not prospecting for the continuation of the ore body is warranted, depends on the thickness of the dyke (if such exists), the values in the reef where it was cut off, and the displacement on the fault.

3. Prospecting on the strike of the reef, south-east of the main workings, has already been carried out, but there is scope for further prospecting to the north-west. Prospecting for shoots north-west of the workings could best be done by continuing the drive at the 156ft. V.D. level.

4. Lateral prospecting for the occurrence of parallel ore bodies is recommended, and this could be done to the best advantage from the 156ft. V.D. level. Besides the possibility of the occurrence of parallel quartz reefs, patches of lode material may be present in the jaspilite.

"ONE UNDER" G.M.L. 3933.

A considerable amount of prospecting has been done on this lease, but the only discoveries of any importance are two small parallel lenses of quartz, situated near the south-east boundary. The leases have a general strike N. 40° W., dip vertically, and have been mined over a length of 15 feet to about 20 feet V.D. from the surface. The quartz is similar in appearance to that at the "Mistletoe" lease, and there is a suggestion of a south-easterly pitch. The lenses are enclosed in amphibolite schists, in proximity to, but on opposite sides of, the middle jaspilite zone. The schistosity of the greenstone country is parallel to the strike and dip of the reefs.

The reefs have a maximum width of about 4 feet but they pinch out altogether underfoot, and at both ends. There appears to be a change in strike of the country at the ends of the lenses, which suggests that other shoots may be found *en echelon* with them. The strike of the country swings north-east at the north-west end, and south-west at the south-east end. It is unlikely that shoots of any size will be located however, as the country has been fairly well prospected.

The only other avenue left for prospecting is the testing of the jaspilite, which is believed to occur between the two quartz lenses.

The official records show that, to November, 1939, this lease has produced 118.00 long tons of ore for 40.71 fine ozs. of gold.

ROWAN'S FIND.

GENERAL INFORMATION.

The find is situated on the main Bullfinch-Marie's Find road, approximately three miles from Bullfinch.

At the time of inspection (May, 1939) no mining was in progress at the find, but there were signs of recent activity on the late "Magpie" G.M.L. 8PP.

The Copperhead and Lang's are the nearest public batteries, and they are situated three and two miles respectively from Rowan's Find.

Water for domestic and mining purposes is carted from the standpipe at Bullfinch.

Adequate supplies of timber suitable for mining purposes occur in the vicinity of the find.

The main workings are on G.M.L. 8PP, and the official records show that to November, 1939, this ground produced 100.25 long tons of ore for 120.77 fine ozs. of gold.

GENERAL GEOLOGY.

The find is situated in an area of metamorphosed interbedded, basic lavas, basic sediments and jaspilites, which have a general strike N. 40° W. and dip 55°-75° S.W. The rocks grade eastwards into biotite gneiss, which is believed to be of replacement origin. All the rocks are presumed to be of Pre-Cambrian Age.

The basic lavas show amygdaloidal and "spear-head" structures, and occur as a wide belt on the western side of the area mapped. The prominent hills, which can be seen to the south of the leases, are composed entirely of basic lavas.

The basic sediments consist of fine to medium grained amphibolite schists, and they occur as a narrow belt to the east of the lavas. This belt of rocks passes into biotite gneiss further to the east.

Jaspilites, of the platey type, occur in both the basic sediments and basic lavas, but the main zones are in the basic sedimentary country.

Geological Structure.—By reference to the structure outline map (Plate III.), it will be seen that Rowan's Find is on the western limb of a north-westerly pitching anticline with a north-west—south-east axis. An examination of the dragfolds in the jaspilites at the find, shows that the main workings are also on an anticlinal crossfold axis, and this system of folding has probably been an important factor in bringing about ore deposition. A synclinal crossfold, the axis of which passes through the late "Rowan Finch" G.M.L. 1074, also exists at the find, south-east of the main workings. There are no workings of any importance in this crossfold.

The jaspilites are intersected by a system of fissures striking in an east north-easterly direction. The displacements due to the faulting are small, and in all cases are to the west going north-west. This system of fissures is approximately parallel to that in the Manxman-Marie's Find belt of country, but the deposition of auriferous quartz in the fissures has not taken place at Rowan's Find. There is however a thin auriferous quartz vein, which falls more or less into the Manxman type of fissure reef, situated in the biotite gneiss approximately 12 chains north-east of the main workings on the late "Magpie" lease. It has been prospected by a line of potholes, which strike in a north-easterly direction, but apparently it could not be exploited to any depth.

THE MINES.

As has been pointed out previously, there was no mining activity at the find at the time of inspection, and consequently no underground workings were examined.

A surface examination in the vicinity of the workings on the late "Magpie" G.M.L. 8PP, however, showed that a lenticular quartz reef parallel to the enclosing amphibolite schists had been mined. Small patches of jaspilite lode material with quartz stringers have also been mined in several places at the find, but the shoots have apparently become unpayable at shallow depths.

Except for a few potholes and shafts in the biotite gneiss, mining activity has been confined to the belt of basic sediments. This substantiates evidence obtained elsewhere, which has shown that the basic sediment are a more favourable host rock than the basic lavas.

Recommendations and Conclusions.

It is unlikely that any ore bodies of great importance will be discovered at the find, but other small lenticular ore bodies may exist. The synclinal cross-fold south-east of the main workings offers the best scope for future prospecting.

ELLIOT'S FIND.

GENERAL INFORMATION.

The find is situated in a featureless strip of country approximately 6 miles south of the Newfield leases.

A track branches off the old Jackson road and leads to the find.

The discovery of gold at Elliot's Find was made previously to that at the Newfield Group.

At the time of inspection (October, 1939) the only existing lease at the find was the "Trump" G.M.L. 3893. The official records show that the production from this lease to November, 1939, is 132 long tons of ore for 93.48 fine ozs. of gold.

The nearest public batteries are at Marda and Bullfinch, and the lessees have been making use of the Marda battery.

Water for domestic and mining purposes is carted from Currajong Tank.

There are adequate supplies of timber suitable for mining purposes in the immediate vicinity of the find.

GENERAL GEOLOGY.

The area is devoid of outcrops, being covered by a thick overburden of red soil. The overburden contains greenstone, quartz and granitic boulders, however, and it is believed that the underlying rocks are mainly greenstones.

In the underground workings the greenstones consist entirely of coarse grained, decomposed, actinolite schist, which is probably a recrystallised basic sediment. The greenstones are contorted and consequently have a very variable strike and dip. The strike varies from N. 10° E. to N. 80° W., and the dip is about 65° and varies from east to north.

The greenstone country is intruded by granitic and dolerite dykes. The granitic dykes are of the aplite type, and are younger than the auriferous quartz, but probably older than the dolerite. The dolerite is reported to occur as a flat dyke at the bottom of one of the shafts, and from all accounts it is similar to that encountered in the "Newfield Central" workings.

All the rocks are presumed to be of Pre-Cambrian Age.

THE MINES.

"TRUMP" G.M.L. 3893.

Three ore bodies, parallel to the schistosity of the enclosing greenstone country, have been mined on this lease. The ore bodies consist of glassy, fractured quartz with patches of secondary lode material. No sulphides occur in the ore bodies, and ground water level has not yet been encountered.

Eastern Workings.—In the eastern line of workings, quartz and lode material, with an average width of 2 feet has been mined over a length of about 90 feet, to 28 feet V.D. from the surface. The ore body is folded sharply at about its middle point on an axis striking north-eastward. In plan, the ore body is convex to the north-east and it pitches 65° N.E. The north-west limb strikes N. 50° W. and dips 60° N.E., and the south-east limb strikes N. 10° E. and dips 70° E. Values are reported to have been best where the ore body changes its strike.

A thin quartz vein is showing in the north-west face of the workings, but quartz is entirely absent in the south face. The presence of a thin auriferous quartz vein, striking N. 40° W., in a pothole further to the south-east, however, suggests that the country near the south face is folded sharply to the south-east.

The ore body becomes thin and contains unpayable values immediately below the 28ft. V.D. level. It was thought by the lessees that the ore body may show an improvement in width and values at a slightly greater depth, and a vertical shaft was sunk at the crest of the fold to test this possibility. The shaft is reported to have encountered a horizontal dolerite dyke, of unknown width, at 50 feet vertical depth from the surface, however, and shaft sinking was discontinued.

Western Workings.—The new shaft at the northern end of this line of workings was the only accessible one at the time of inspection. The shaft is vertical, and is being sunk to intersect at depth the reef which has been mined in the workings immediately to the south. In these workings a lens of quartz, striking N. 80° W. and dipping 60° N., has been mined to about 30 feet vertical depth from the surface. The lens had a maximum width of 5 feet and was 20 feet long. Quartz is reported to be present underfoot at the 30ft. V.D. level, but it has pinched out in both faces. Aplite dykes occur on both hanging wall and footwall of this reef.

Another small, parallel, lens of quartz has been stoped out to 17 feet vertical depth from the shaft immediately to the south of these workings.

Conclusions and Recommendations.

1. There is insufficient evidence available to come to definite conclusions concerning the structural control of ore deposition, but what information is available suggests that ore deposition is associated with the small anticlinal folds. The reefs are thought to occur as small north-easterly pitching saddle reefs on the anticlinal folds. Values will probably be best at the crests of these folds, and will diminish along the limbs towards the adjacent synclines.

For this reason, prospecting in a general direction north-west or south-east from the known ore bodies is recommended, as other shoots may exist. Other ore shots will occur *en echelon* with the known ones; stepping south going south-east, and north going north-west.

2. The strike of the two lenses mined in the western workings suggests that they are on the north-western limb of an anticline. The country is expected to fold sharply to the south at the eastern end of both these reefs and there is a possibility of other lenses occurring on the south-eastern limb of the anticline so formed. Prospecting along these lines is therefore warranted.

3. Prospecting for parallel ore bodies north-east or south-west of the known ore shoots, may also prove advantageous.

4. Because the ore bodies are small and the geology is complicated by the intrusion of aplite and dolerite dykes, the prospects for depth are not attractive. The presence of evidence for rather extensive secondary enrichment also detracts from the prospects of the ore bodies at depth.

COLOSSUS GROUP.

The group is situated on a low rise approximately two miles north-west of Boddalin, in the south-easterly extension of the Westonia belt of greenstones. The mines were abandoned at the time of inspection (November, 1939).

The official production from this group to November 1939, is 40.00 long tons for 20.31 fine ozs. of gold.

The main workings are, on the late "Colossus Central" G.M.L. 2334 and the late "Emma May Main Lode" G.M.L. 3028, but they are not very extensive, and nowhere has mining been carried to a greater depth than 50 feet.

The ore bodies consisted of lenticular quartz reefs, which were parallel to the enclosing basic sedimentary country. The basic sediments have a general strike N. 45° W., dip 65°-75° N.E., and are intruded by garnetiferous pegmatite and dolerite dykes. The pegmatites are believed to be younger than the auriferous quartz, but older than the dolerite dykes.

A geological subsurface map of this group was not compiled, because apart from the outcrops in the vicinity of the leases, the area is entirely soil covered.

COMSTOCK GROUP.

This group is situated on a conspicuous ridge 2½ miles west of Boddalin.

There was no activity at the group at the time of inspection (November, 1939), and what work has been done suggests that it was only of a prospecting nature. The workings consist of a few potholes, which have been sunk on thin quartz veinlets occurring in grey phyllites. The phyllites strike N. 40° W., dip steeply to the north-east, and, except for the presence of pegmatite dykes, appear to constitute the entire ridge. The remainder of the area is devoid of outcrops, being covered by soil and ferruginous laterite.

The sediments occur on the western side of the south-easterly extension of the Westonia belt of greenstones, and have been mapped by Blatchford*.

MORNINGTON GROUP.

This group is situated on the main Mt. Jackson road, approximately four miles from Bullfinch.

There was no activity at the group at the time of inspection (April, 1939), and the extent of the workings suggests that mining has been only of a prospecting nature.

The main workings are on the late "Mornington" G.M.L. 1918, and late "Mornington North" G.M.L. 1919, which are pegged on a small greenstone remnant entirely surrounded by biotite gneiss. The greenstones are comprised of metamorphosed, interbedded basic sediments, amygdaloidal basic lavas, and jaspilites, which have a general north-westerly strike and a vertical dip. There is a paucity of outcrops at the group, most of the area being covered by a thick overburden. The soil overlying the greenstone country contains abundant concretionary travertine, and is the powdery morrel type.

As will be seen by reference to the Structure Outline Map (Plate III.), the find is on the western limb of an anticline pitching 60° N.W. Some dragfolds, confirming the north-westerly pitch, were seen in the jaspilites. The group is also on the east north-east extension of the anticlinal crossfold, which embraces the main workings at Rowan's Find.

Two types of ore bodies have been mined at the group, but the workings are not extensive. Lode material with quartz stringers appears to have been mined, from shafts scattered along the jaspilites, on the late "Mornington" G.M.L. 1918. On the late "Mornington North" G.M.L. 1919, however, a quartz reef, which appears to belong to the fissure type seen in the Radio-Marie's Find belt of country, constitutes the ore body. The reef strikes N. 40° E., dips 65° S.E., and is exposed over a length of about 380 feet. This reef warrants further prospecting, as it may show an improvement in width and values at a slightly greater depth.

There is no official record of any production from this group.

RUTHERFORD'S FIND.

The find is situated, on a prominent range of laterite covered hills, approximately six miles east of Bullfinch. The leases are half a mile south-east of the south-eastern corner of location 1097.

*Blatchford, T., G.S.W.A. Bull. 71. Frontispiece to Atlas.

The place was abandoned at the time of inspection (April, 1939), but there were signs of recent activity at the main workings on the late "Hansfordhaven" G.M.L. 3340.

The country in the vicinity of the leases consists entirely of biotite gneiss, which is believed to be of replacement origin. In the vicinity of the main workings the gneiss has a general east-west strike and a steep southerly dip.

On the late "Hansfordhaven" G.M.L. 3340, a quartz reef, striking east-west and dipping 60°-80° S., has been mined sporadically over a length of about 500 feet. As a whole, the quartz is the white, opaque, laminated variety, but it becomes vuggy and heavily mineralised with pyrites where the ore shoots occur. The presence of laminations and internal folding in the quartz, besides the rather excessive mineralisation, suggests the possibility of the reef being granitised jaspilite.

It is interesting to note that jaspilite boulders were seen lying on typical gneissic country, 1¼ miles north of the leases.

The official records show that to November, 1939, the "Hansfordhaven" line of workings had produced 339.10 long tons of ore for 194.27 fine ozs. of gold.

Two other quartz reefs which strike north-westward and dip 50° S.W. occur in proximity to the south-eastern corner of location 1097. The reefs consist of milky white, fractured, quartz, and they have been prospected to shallow depths.

REYNOLD'S FIND.

GENERAL INFORMATION.

The find is situated in the south-eastern corner of Location 664, approximately 8 miles north-east of Bullfinch. The find is reached from Bullfinch by a road, which passes through Wither's Find, and the distance by road is about 9½ miles.

At the time of inspection (April, 1939), mining was in progress on the "Reynold's Find" G.M.L. 10PP,* but the other leases were abandoned. Practically no work has been done on the other leases, however.

The area is devoid of outcrops, being covered by a thick overburden of red, sandy soil. Boulders of biotite gneiss occur in isolated places, and the presence of these boulders along with the information obtained by the underground examination, suggests that the country consists entirely of biotite gneiss. Some greenstone remnants may also be present however. The gneiss is believed to be of replacement origin, and its gneissosity strikes east-west and dips 45°-50° S.

A 3-head battery with no cyanidation plant is in operation on the lease, but it is not available for public crushings.

Water for mining purposes is obtained from a sump at the bottom of the main shaft, and ground water level is reported to have been at 100 feet vertical depth from the surface. Water for domestic purposes is carted from Bullfinch.

*Mining operations ceased on this lease also in June, 1939.

Salmon gum and gimlet are sufficiently plentiful in the vicinity of the find to meet with requirements.

The whole of the production from this find has come from "Reynold's Find" G.M.L. 10PP and the official records show that to November, 1939, 1,392 long tons of ore have been treated for the recovery of 514 fine ozs. of gold.

THE MINES.

"REYNOLD'S FIND" G.M.L. 10PP.

The ore bodies on this lease occur in a strong quartz reef, with a general strike N. 80° W. and dipping 45° S., which has been prospected over a length of 520 feet between the surface and the 155ft. V.D. level. The reef varies in width from 3 feet 6 inches to 20 feet, and is enclosed by biotite gneiss, the gneissosity of which is parallel to the strike and dip of the reef.

Two ore shoots, known as the east and west shoots, have been mined in the reef. The shoots have only been stoped above ground water level, which suggests that they owe their origin to the processes of secondary enrichment.

The quartz is the white, translucent variety, and it is laminated parallel to the reef channel.

West Shoot.—The west shoot occurs near the main shaft, and it has been stoped out over an average width of 3 feet 6 inches, from 25 feet vertical depth from the surface to the 116ft. V.D. level. The stoping has a length of 50 feet near the surface, but it diminishes with depth and is only 6 feet long at the 116ft. V.D. level. The quartz is mineralised with pyrites between the 65ft. and 116ft. levels.

Driving east and west from the main shaft, with the object of locating any continuation of the reef, has been done at the 155ft. V.D. level, but the work has apparently been fruitless.

The workings on the west shoot are connected with those on the east shoot at the 65ft. V.D. level, where the reef has been driven on for about 520 feet. Except where the drive encountered the west shoot, the quartz is reported to contain unpayable values. The reef is 6 feet 6 inches wide in the west face, and 4 feet 6 inches wide in the east face at this level.

The shape of the stoping of the west shoot suggests that it has a steep easterly pitch.

East Shoot.—The east shoot commences about 180 feet east of the west shoot, and it has been stoped out over a length of 215 feet between the surface and 42 feet vertical depth. The stoping varies in width from 3 feet 6 inches to 5 feet, and probably the average width is about 4 feet. Values are reported to have become unpayable at 42 feet vertical depth, and no ore was encountered at the 65ft. V.D. level immediately below the shoot.

Conclusions and Recommendations.

1. The ore shoots have been formed by the process of secondary enrichment, and for this reason it is unlikely that other shoots will be located at depth. Deeper prospecting in the mine is therefore not warranted.

The only chances of locating further ore shoots, is by prospecting for parallel shoots, or by prospecting along the strike of the reef. The prospects of locating further ore shoots however are by no means bright.

2. The lessees report that the reef as a whole contains a few dwts. gold per ton, which they believe could be worked profitably with a more efficient plant than the one in operation.

The reef is certainly very strong, but whether or not it is an attractive low grade proposition, can only be determined by systematic sampling of the workings.

MANXMAN (RADIO) GROUP.

GENERAL INFORMATION.

The Manxman or Radio Group is situated on the main Bullfinch-Marie's Find road 5 miles from Bullfinch.

At the time of inspection (June, 1939) there were six existing leases at the group, namely, "Radio" G.M.L. 2994, "Radio West" G.M.L. 3266, "Radio North" G.M.L. 3347, "Radio Deeps" G.M.L. 3248, "Radio Deeps Extension" G.M.L. 3387, and "East Radio Deeps" G.M.L. 3402, but mining activity was confined to leases 2994 and 3248.

A 5-head battery and cyanidation plant, which is available for public crushings, is in operation on G.M.L. 3248. This plant is known as Lang's Battery. There is also a 5-head battery and cyanidation plant on the "Radio" lease, but it is not available for public crushings.

Water for domestic purposes is obtained from rain water tanks attached to the dwellings, but it is necessary to augment this supply by carting water from the standpipe at Bullfinch. Water for mining purposes is obtained from the underground workings.

There is no suitable mining timber in the immediate vicinity of the group, but adequate supplies can be obtained at a few miles distant.

The official production return shows that to November, 1939, the mines at this group have produced 18,663.80 long tons of ore for 39,522.22 fine ozs. of gold, and specimens total 24.57 fine ozs.

GENERAL GEOLOGY.

The group is situated in an area of highly metamorphosed, interbedded, basic sediments, basic lavas and jaspilites, which are intruded by a network of post-gold, garnetiferous pegmatite dykes. The intrusion of the pegmatites has been accompanied by a considerable amount of granitisation of the greenstones, and it is impossible to map the biotite gneiss separately from the pegmatite. It is nearer the truth to regard the granitic area shown on the plan as a granitic complex rather than any particular type of granitic rock. All the rocks are presumed to be of Pre-Cambrian Age.

In the vicinity of the leases the series has a general north-westerly strike, and a very steep westerly dip. North of the leases, however, due to rather large scale folding, the rocks have a rapidly changing strike, and a medium angle, though variable direction, of dip.

Outcrops are practically non-existent in the immediate vicinity of the leases.

Greenstones.—The basic sediments and basic lavas are similar to other rocks of these two types seen elsewhere in the Yilgarn Goldfield. Due to metamorphism the basic sediments have been recrystallised, and occur as rather fresh, fine to coarse grained amphibolite schists. A biotitic alteration of the basic sediments is a common occurrence near the ore channels. The basic sediments give place to basic lavas in the south-west corner of the area mapped, beyond the southern zone of jaspilite. Ore bodies are non-existent in the basic lava country.

Jaspilites.—Two zones of jaspilite occur in the area, and they are the ferruginous, platey type. The distribution of these zones of jaspilite has been of much use in interpreting the geological structure.

Pegmatites.—As has been pointed out previously, the pegmatites are generally in close association with biotite gneiss, believed to be of replacement origin.

Pegmatite dykes have been seen in the underground workings cutting through quartz ore bodies, which proves that they are definitely post-gold in age.

The pegmatite is often garnetiferous, and the garnet has been determined by the Government Chemical Laboratory as *spessartite*. It is interesting to note that spessartite garnet also occurs in the pegmatites at Marie's Find.

Geological Structure.—By reference to the accompanying Structure Outline Map (Plate No. III.), it will be seen that the group is situated at the intersection of the axes of two systems of folding. One axis is a north-west—south-east anticlinal axis, and the other east—west synclinal axis. The crossfolding has been established by the distribution of the jaspilites and the reversal in pitch. An anticline pitching 65° S.E. can be seen on the 5 chain to the inch map, approximately half a mile north of the leases. Another anticline pitching 65° N.W. occurs approximately three-quarters of a mile south-east of the leases.

A system of fissures striking north north-east and dipping east south-east occurs in the crossfold, and it is in these fissures that the auriferous quartz reefs have been deposited. There are three main fissure lines, which are referred to as the "Radio" line, the "Radio Deeps" line and the "Queenslander" line. The fissure reefs show a marked similarity to those at Marie's Find, in that they are parallel in strike and dip and die out to the west on encountering the belt of basic lavas. Except for the reefs at the old "Manxman" mine, which occur in biotite gneiss on the northern extension of the "Radio" fissure line, the fissures lose their character in the granitic complex. This is supporting evidence for the belief that the fissuring is pregranitic in age.

THE MINES.

"RADIO" G.M.L. 2994.

The lessees, Barr and Clements, also hold "Radio North" G.M.L. 3347 and "Radio West" G.M.L. 3266, but mining activity was confined to the "Radio" lease at the time of inspection (June, 1939).

The mine has been a remarkably rich and consistent producer, and to November, 1939, had produced 18,663.80 long tons of ore for a recovery of 39,522.22 fine ozs. of gold, and specimens totalled 24.57 fine ozs.

A study of the surface and underground plans shows that a strong fissure striking N. 30° E. and dipping approximately 40° S.E. traverses the "Radio" lease, and persists north-eastward, through the late "Manxman" lease to the late "Bulwark" lease. An irregular deposition of auriferous quartz has occurred along the fissure, and in places the width and gold content of the quartz are such that ore shoots exist.

In the "Radio" workings three quartz reefs, parallel to the fissuring, have been stoped out sporadically from the surface to the No. 4 level (139 feet V.D.). The reefs are known as the West Reef, the Middle Reef and the East Reef. They occur generally as parallel reefs, but join one another along their strike in the vicinity of the main underlay shaft, and again at the northern end of the workings. Spur veins also connect the reefs in a few places. The Middle and East Reefs show a convergence down the dip, and come very close together, in the east branch, south drive, at the No. 4 level. They are being mined as one reef at this level.

The reefs throughout the mine consist of vuggy, somewhat ironstained, translucent quartz which frequently shows free gold. The quartz is mineralised with sulphides below the No. 1 level (44 feet V.D.), and pyrite, molybdenite and chalcopyrite (?) have been detected. It is interesting to note that molybdenite also occurs in the quartz ore bodies at the Edna May mine, Westonia.

The reefs are lenticular and vary in width from a stringer to 5 feet, and have been mined over a maximum length of about 420 feet. There appears to be no pitch to the ore shoots. The reefs are separated by metamorphosed basic sediments, which have a schistosity parallel to them. This schistosity is believed to have been imposed on the basic sediments by the fissuring, and is not their true bedding. Biotite gneiss is present on the footwall of the west reef and the hanging wall of the east reef, but the gneissosity is not always parallel with the distribution of the gneiss. In the north drive at the No. 2 level (71 feet V.D.), the gneissosity can be seen striking obliquely to the reef. The gneissosity in this instance probably represents the original bedding of the granitised basic sediments. The country rocks have probably been contorted but the general strike should be north-westward, and the dip almost vertical.

Underhand stoping in east branch, north drive, at the No. 4 level, was in progress at the time of inspection.

A 5-head battery and cyanidation plant is in operation at the mine, and the No. 5 level (170 feet V.D.) is being used as a sump for battery water. Ground water level is reported to have been 90 feet V.D. from the surface, but the make of water is poor. There is generally a shortage of water for battery purposes when the "Radio Deeps" G.M.L. 3248 is unwatered.

Conclusions and Recommendations.

1. The reefs being of the fissure type should persist to some depth, as the following evidence tends to show.

The reefs are showing strongly underfoot at the No. 4 level, and they are reported to be equally as favourable at the No. 5 level.

Diamond drilling of the ore channel at depth has been carried out from the "Radio Deeps" lease and the information reported concerning the bores is supporting evidence for the belief that the ore channel lives to some depth. The ore channel is said to have been intersected between 400 and 500 feet vertical depth, but it was impossible to recover cores of the reefs. The bores showed however, that the same sequence of quartz and country, as occurs in the workings, existed at depth.

2. Provided that there is no faulting, or change in dip of the ore channel, the East reef (hanging wall reef) will pass into the "Radio Deeps" lease at approximately 300 feet down the dip from the No. 4 level. This will be at about 325 feet vertical depth from the surface. The West reef (footwall reef) will of course pass into the "Radio Deeps" lease at a greater depth.

3. In the west branch, north drive, No. 4 level, just south of its intersection with the east branch, north drive, a vein of quartz is going away into the north-east wall at the gneiss-greenstone contact. Driving north on this quartz vein is warranted, and it is expected to increase in width along the strike. The vein can be regarded as the northern continuation of the West reef, as greenstone will be present on its hanging wall and gneiss on its footwall.

4. In the northern workings at the No. 4 level, the driving north of the intersection of the two reefs is on the continuation of the East reef. There is 2 feet 6 inches of quartz showing in the face of the drive, and further driving is recommended. No further driving is recommended, however, in the southern workings at the No. 4 level.

5. The possibility of parallel ore bodies should not be overlooked, and the footwall country offers good opportunities in this respect. Another line of reef may occur where the footwall biotite gneiss contacts with greenstone.

"RADIO DEEPS" G.M.L. 3248.

The mine embraces the old workings of the late "Glideaway" and "New Green Harp" leases, which have been reported on by Blatchford.*

The lessees of the "Radio Deeps" lease also hold "Radio Deeps Extension" G.M.L. 3387 and "East Radio Deeps" G.M.L. 3402 but mining activity is confined to lease 3248. The workings were inaccessible however at the time of inspection (June 1939), as there was a temporary stoppage in pumping the underground water. There is reported to be a considerable make of water in the workings, and ground water level is approximately 65 feet vertical depth from the surface.

A 5-head battery and cyanidation plant (Lang's), which is available for public crushings, is in operation on the lease.

The official production returns show that to November 1939 "Radio Deeps" G.M.L. 3248 produced 4,992.60 long tons of ore for 6,005,00 fine ozs. of gold. These figures do not take into account any production from earlier leases embracing this ground. As near as can be established, the total production from this ground is 8,445.00 long tons of ore for 9,558.07 fine ozs. of gold.

The ore body on this lease consists of a lenticular quartz vein in a fissure striking north-eastward and dipping 45°-50° S.E. The fissure is more or less

*Blatchford, T., G.S.W.A. Bull. 71, p. 82.

parallel to the "Radio" fissure. The ore occurrence in both fissure lines is similar, except that in the "Radio Deeps" workings the main reef is practically enclosed in basic sediments. The quartz from both places is also very similar in hand specimen. The quartz contains sulphides at depth, and pyrite and pyrrhotite were detected in a specimen submitted for determination.

The following information has been reported by Mr. Lang, the lessee of the mine.

The reef strikes about north north-east, dips 45°-50° E.S.E., and pitches steeply to the south south-west.

The reef has been entirely stoped out from the surface to the No. 2 level, at approximately 200 feet linear depth. The stoping has been carried out over a total length of 500 feet, but this is divided into two sections by a fault, which intersects the roof between the main underlay and main vertical shafts. The fault plane is occupied by a vertical pegmatite dyke, 30 feet wide, which cuts across the strike of the reef almost at right angles. As a result of the faulting the reef on the north-east side of the pegmatite is displaced 60 feet to the west. There is 300 feet of stoping on the north-east side of the pegmatite and 200 feet on the south-west side. The quartz had an average width of 16 inches between the surface and the No. 1 level (80 feet linear depth), and the average width was 22 inches between the No. 1 and No. 2 levels.

Mining is in progress on the south side of the pegmatite at the No. 2 level, and underhand stoping has been carried down to 20 feet. The reef here is reported to have an average width of 30 inches and to assay 15 dwts. gold per ton.

The reef is cut off by granitic rocks at the extreme north-east and south-west ends of the workings.

Numerous granite dykes, which meet the reef at an oblique angle but never pass through it, are said to occur in the hanging wall country. The reported granite dykes are in all probability biotite gneiss, and the occurrence is due to selective granitic replacement of bands in the basic sediments which are displaced by the lode channel fissuring.

The line of shafts near the north-west boundary of the lease was put down to prospect an auriferous quartz vein occurring in granitic country, which was encountered during the diamond drilling of the deeps of the "Radio" ore channel.

Conclusions and Recommendations.

1. The reef is reported to be 30 inches wide and to assay 15 dwts. gold per ton in the floor of the bottom level in the mine. This evidence together with the fact that the reef is of the fissure type suggests that the ore body will persist to some depth.

2. As has been pointed out previously the "Radio" ore channel dips into the "Radio Deeps" lease.

The testing of the deeps of the "Radio" ore channel and "Radio Deeps" reef, constitutes a rather attractive prospecting venture.

LATE "QUEENSLANDER" G.M.L. 3379.

This lease was known as the "Rosalie" G.M.L. 2739 at the time of Blatchford's inspection.*

*Blatchford, T., G.S.W.A. Bull. 71, p. 85.

The mine was abandoned at the time of inspection (June, 1939), but sufficient evidence was obtained to show that the reef occurs in a fissure striking north north-easterly and dipping about 50° E.S.E. The country rocks in the vicinity of the workings are basic sediments, the schistosity of which strikes N. 35° W. and dips vertically.

According to the official production returns the ground has produced 1,031.75 long tons of ore for 749.64 fine ozs. of gold and specimens total 9.93 fine ozs.

MARIE'S FIND, YILGARN GOLDFIELD.

GENERAL INFORMATION.

"Marie's Find" (sometimes referred to as the Redwing Group) is situated on a peninsula of Lake Deborah, approximately six miles north north-west of the Manxman (Radio) group of mines.

The find is reached by a track which branches off the main Bullfinch-Eenuin road about 11 miles from Bullfinch.

At the time of inspection (June, 1939) there were four existing leases at the find, namely, "Marie's Find" G.M.L. 3573, "Marie's Find Extended" G.M.L. 3574, "Great Bingin" G.M.L. 3575 and "Queen Marie" G.M.L. 3822. Leases 3573, 3574 and 3575 were being held by the Ora Banda Mines, N.L., but mining activity was confined to G.M.L. 3575. One prospecting area, adjoining the south-east boundary of G.M.L. 3575, was also in existence. This prospecting area embraces the workings of the late "Deborah" G.M.L. 2755.

There are no business facilities or accommodation available at "Marie's Find," and water for domestic purposes is carted from Bullfinch. An adequate supply of saline underground water, suitable for battery purposes, occurs in the area, however.

Useful mining timber is non-existent in the immediate vicinity of the mines, but adequate supplies can be obtained at a few miles distant. Morrel, salmon gum and gimlet constitute the main mining timbers.

A five-head battery, with no cyanidation plant, is in operation on G.M.L. 3575, but it is not available for public crushings.

Ore won from holdings outside those of the company is carted to Lang's Battery at the Manxman Group, or the Copperhead Battery at Bullfinch for treatment.

At the time of inspection the tailings from the company's battery were being stacked for treatment at some later date. It was reported (October, 1939) that there were 2,400 tons of accumulated sands averaging 1.9 dwts. per long ton.

PRODUCTION.

As far as can be ascertained from an examination of the official records, the whole of the production shown in the following table, with the exception of that from G.M.L.'s 2357, 2755 and 3822, has come from the ground embraced by the leases of the Ora Banda Mines, N.L. Bearing this fact in mind it will be seen that to 30th September, 1939, the company's ground has produced 5,054.35 long tons of

ore for a yield of 3,462.71 fine ounces of gold. These figures do not take into account approximately 2,500 tons of accumulated sands, which have yet to be cyanided.

The production from the "Queen Marie" G.M.L. 3822, adjoining the north-east boundary of G.M.L. 3575, comes from the same line of reef as that being mined by the company.

As has been previously pointed out the late "Deborah" G.M.L. 2755 is now pegged as a prospecting area, and it will be seen that the grade of ore from this line of reef is the highest at the find. The improvement in grade is due to the occurrence of enrichments in the reef where it intersects the jaspilite horizons.

The late "Light Wing" G.M.L. 2357 embraced the shaft situated approximately 10 chains west south-west of the west peg of G.M.L. 3573.

OFFICIAL PRODUCTION FROM MARIE'S FIND GROUP, TO 30TH SEPTEMBER, 1939.

Name of Lease.	Lease No.	Year.	Ore Treated.	Gold Therefrom.	Grade.
			Tons (2,240lbs.).	Fine ozs.	Fine ozs. per ton.
Lady Mollie	2435	1911	17·25	6·76	0·39
Light Wing	2357	1911	4·50	1·75	0·39
Marie's Find	2389	1912–14	336·00	460·51	1·37
Sand King	2712	1914	66·00	29·12	0·44
Deborah	2755	1915–16	122·50	182·27	1·48
New Marie's Find	2389 and 2390	1916	226·00	144·35	0·64
Great Bingin	3311	1928–31	186·10	125·16	0·67
Queen Marie	3822	1936–39	138·50	133·58	0·96
Marie's Find	3573	1938	742·00	353·15	0·47
Great Bingin	3575	1938–39	3,481·00	2,343·66	0·67
Totals	...	...	5,319·85	3,780·31	0·71

GENERAL GEOLOGY.

The mines are situated in an area of highly metamorphosed, interbedded, basic sediments, basic lavas and jaspilites, which are presumably of Pre-Cambrian age. The series has a general strike varying from N. 50° E. to N. 15° W., and a general dip varying from 40 to 70 degrees to the west and north-west respectively. These rocks are intruded by a network of post-gold garnetiferous, pegmatite dykes.

A geological subsurface map* of the area, on a scale of 5 chains to 1 inch, has been compiled, and it shows the distribution of the various rock types.

Outcrop conditions in the vicinity of the Find are poor, except on the western side of the area mapped and on the south-eastern shore of the peninsula. Most of the peninsula is covered by sand dunes, or a heavy overburden of pink sandy soil.

Small deposits of "seed" gypsum occur along the northern shore of the peninsula.

Greenstones.—The major portion of the greenstones are comprised of metamorphosed basic sediments, and it is entirely this class of greenstone, which occurs in the vicinity of the leases. The basic lava commences on the western side of the western jaspilite zone.

The basic sediments are greyish-green to black in colour, and amphibolite appears to be their main constituent. Some specimens rather brownish in appearance, however, were seen in the dump of the main shaft on G.M.L. 3575. The brownish colour is due to a biotitic alteration near the lode channel of the original amphibolite schist, which is a common type of alteration of the basic sediments in the Yilgarn Goldfield.

The basic sediments are very schistose and vary in texture from fine to medium grained.

*Map not published.

These rocks also possess a system of joints striking N. 40° E. and dipping 60° S.E., and as will be shown later, it is in fissures parallel to this system of jointing that the auriferous quartz reefs have been deposited.

The *basic lavas* are typical of those seen in other places in the Yilgarn Goldfield. They are dark greenish in colour, and vary in texture from dense to medium grained. Only a rude schistosity is developed in this class of greenstone, and volcanic structures are absent in the area mapped, though amygdaloidal structure is very obvious in this belt of country further to the west.

Jaspilites.—Two zones of jaspilite occur in the area, and they are of the ferruginous, platey type. The jaspilites have been dragfolded and these folds, along with the distribution of the zones of jaspilite, have been very useful in interpreting the geological structure. The dragfolds pitch 70 degrees in the direction N. 30° W. The geological structure is dealt with more fully in a later section of this report.

Pegmatites.—The pegmatites are the youngest rocks in the area and are also post-gold. They intersect the auriferous quartz reefs in several places.

The pegmatite dykes vary in character, and a number of them appear to be a mixture of biotite gneiss and pegmatite.

The pegmatites have an irregular distribution, and are highly garnetiferous.

The following mineral determinations have been carried out by the Government Chemical Laboratory on specimens of pegmatite:—

*Field No. N*113. (*Lab. No.* 4064.)

Locality—Near west peg G.M.L. 3575.

[Spessartite in a pegmatite consisting of quartz, microcline, and muscovite with a little limonite and dendritic manganese oxide.]

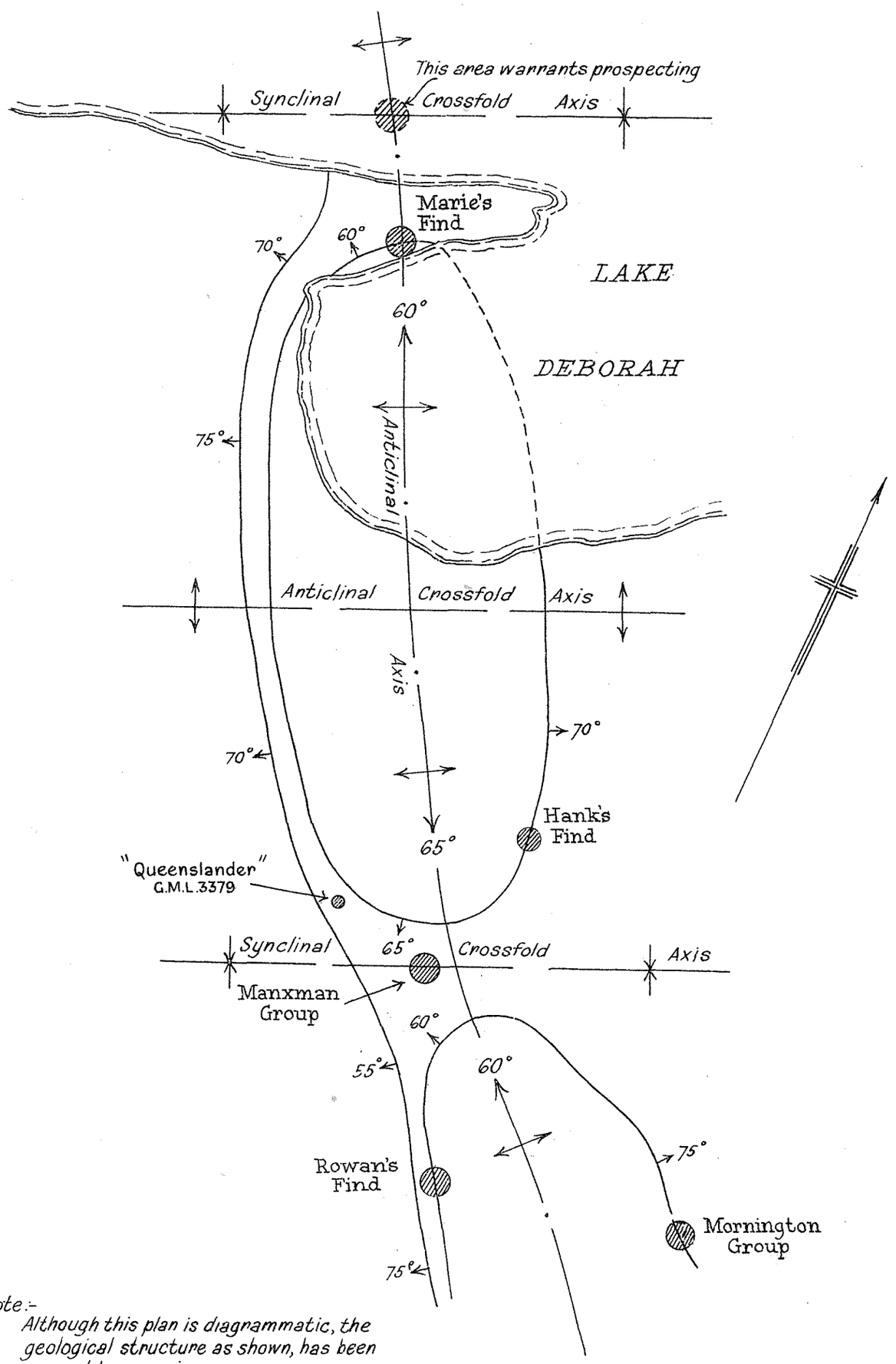
DIAGRAMMATIC STRUCTURE OUTLINE PLAN

OF

BELT OF COUNTRY BETWEEN ROWAN'S FIND AND MARIE'S FIND

YILGARN GOLDFIELD

Not to scale



Note:-
Although this plan is diagrammatic, the geological structure as shown, has been proved by mapping.

Sketch by R.S. Matheson, Jan. 1940

*Field No. N*128. (*Lab. No.* 4081.)

Locality—From dyke in No. 1 Shaft, G.M.L. 3575.

[Quartz and sericite.]

*Field No. N*129. (*Lab. No.* 4082.)

Locality—From dyke near west peg of G.M.L. 3575.

[Quartz and sericite with some plates of muscovite in which is embedded a white columnar mineral showing straight extinction and negative elongation with a specific gravity between 3.1 and 3.3 and Ng 1.684 Np. 1.668]

Geological Structure.—Detailed mapping has shown "Marie's Find" to be situated at the nose of an anticline folded on a north-west south-east axis and pitching 60° N.W. (Refer Plate No. III.) Its position in the geological structure is very similar to that of the Manxman Group. Both these groups are in synclinal crossfolds in basic sediments between two zones of jaspilite. The ore bodies in this strip of country are all fissure reefs striking north-eastward and dipping south-eastward. These fissure reefs contain a high gold content.

The fissures appear to die out to the west on encountering the belt of basic lavas.

THE MINES.

ORA BANDA MINES, N.L.

At the time of inspection (July, 1939) the company held three leases, "Marie's Find" G.M.L. 3573, "Marie's Find Extended" G.M.L. 3574 and "Great Bingin" G.M.L. 3575, but only the workings on G.M.L. 3575 were accessible.

From a study of the surface and underground plans and sections it will be seen that a strong fissure striking N. 35° E. and dipping 60° S.E. traverses the three leases. An irregular deposition of auriferous quartz has occurred along the fissure, and in places the width and gold content of the quartz are such that ore shoots exist. The ore shoots are lenticular both horizontally and vertically and occur *en echelon.*

In the workings on G.M.L. 3574, four lenticular ore shoots have been partially stoped out between the surface and the 147ft. V.D. level. The shoots consist of vuggy, somewhat ironstained translucent quartz, which strikes parallel to the enclosing basic sediments and dips across them almost at right angles. This fact, along with the occurrence of large quartz crystals and brecciated material in the ore bodies, substantiates the belief that the reef has been formed by the mechanical filling of a pre-existing fissure. It is noticeable in the workings that the quartz becomes more white and opaque where values are unpayable.

The four ore shoots have an aggregate length of 440 feet at the 147ft. level, and vary in width from 3 inches to 6 feet, having an average width of 3 feet 6 inches to 4 feet. The extent of the stoping at the 147ft. level can be seen on the accompanying plans.

At the time of inspection No. 1 lens was apparently worked out above the 147ft. level and stoping was confined to No. 2 lens. The leading stope only, had been taken off No. 3 and No. 4 lenses, but it was reported that the stoping of these two shoots would be proceeded with at a later date. Shoots of ore have also been mined from the surface to 70 feet linear depth, between No. 1 and No. 4 shafts, but as these workings were full of water, no details of the extent of the stoping could be obtained. These ore bodies are reported to be lenticular, however, and occur immediately above the blanks in the reef at the 147ft. level. The shoots will therefore be more or less elliptical in shape and *en echelon.* This control appears to be persisting in depth as the values in No. 1 north winze are becoming poor at the bottom, while on the other hand the values are improving at the top of No. 1 south rise. From the information available the pitch of the ore shoots appears to be vertical.

Sulphides are distributed erratically throughout the quartz ore bodies, and are reported to have first been noticed in a fresh state at the 83ft. level, though it is most likely that they first appeared immediately below ground water level. Specimens of the sulphides were submitted to the Government Chemical Laboratory for determination, and the presence of *pyrite, chalcocite* and *galena* was detected. It is said that the best values occur in the quartz in the vicinity of the zones of sulphide mineralisation.

Thin films of pyrite have also been deposited on the joint surfaces of the greenstones in proximity to the ore bodies, but gold deposition is confined to the quartz.

Some thin quartz veinlets similar in appearance to the auriferous quartz, but striking N. 35° E. and dipping 40° N.W. were mapped in the workings. These were very likely spur veins off the main reef deposited in the schistosity of the country. It is reported that these veinlets do not contain payable values themselves, but enrichments occur where they meet the main reef. One such veinlet has been mapped in the crosscut from the main vertical shaft.

Garnetiferous pegmatite dykes, striking N. 45° E. and dipping steeply N.W., occur in the workings, but their relation to the auriferous quartz is rather obscure in the workings. The relation of the pegmatites to the quartz rather suggests that the quartz is post-pegmatite, but definite evidence to show that the pegmatite is post-quartz has been obtained in other places at the find.

A large pegmatite dyke is seen in the north-east drive at the 147ft. level, and by reference to the transverse section it will be seen that this dyke only occurs on the hanging wall of the reef and does not intersect it. It causes a flattening and pinching of the reef, however, immediately below the contact. It is believed that the pegmatite has been intruded from the east and on encountering the hanging wall of the reef has run up along it. The junction between the reef and pegmatite pitches 19 degrees to the north-east.

In the south-west drive at the 147ft. level, the quartz cuts through the pegmatite and appears to be younger than it. However, bearing in mind rather conclusive evidence to the contrary, obtained elsewhere at the find, an explanation of this occurrence is that the pegmatite has been intruded separately in the same fissure on both hanging wall and footwall of reef. It will probably be seen to cut through the quartz at a greater depth.

A five-head battery, with no cyanidation plant, is in operation on the property and approximately 300 tons of ore per month are being crushed. Water for battery purposes is obtained from the underground workings, where there is an adequate supply of

saline water. Ground water level is 16 feet vertical depth from the surface and the make of water 4,000 gallons per hour.

Conclusions and Recommendations.

1. The auriferous quartz occurs in a fissure striking N. 35° E. and dipping 60° S.E., cutting across the enclosing basic sediments, which strike parallel to it but dip 40°-55° N.W. A system of joints parallel to the fissure occurs in the country, and there is every likelihood that parallel reefs may occur in some of these joints. The country, particularly the footwall country, should be prospected for the occurrence of parallel reefs for some distance from the known line of reef. The broad geological structure indicates that the whole of the peninsula on the footwall of the reef is favourable for the existence of parallel reefs, but prospecting must be confined to the country on the eastern side of the western jaspilite zone.

2. The present line of reef being of the fissure type should persist both along the strike and down the dip. There is scope for further prospecting along this line of reef north-east of the "Queen Marie" G.M.L. 3822. The country in this direction is covered with sand but there is every likelihood that further ore shoots will exist. The reefs should live to some considerable depth but the ore shoots therein will occur *en echelon* as has been previously explained. An enrichment should occur where the main line of reef intersects the jaspilite zone and the accompanying sketch* shows that this will take place between about 900 feet and 1,050 feet linear depth. It is suggested that a vertical bore be put down to intersect the probable enriched zone. The bore site should be situated 540 feet on a true bearing of 231° 30′ from the east peg of G.M.L. 3575, and the hole would have to be continued to 1,000 feet. Depending on the results of this bore other sites could be selected to test this probable enriched zone as far west as the "Marie's Find" G.M.L. 3573. As will be seen from the accompanying sketch* the suggested bore will also prospect some of the hanging wall country.

The reef between the bottom of the present workings and the probable enriched zone should also be tested by drilling, but the selection of sites to do this should present no difficulties.

Evidence to support the belief that an enriched zone will occur where the jaspilite zone is intersected is obtained from the workings on late "Deborah" G.M.L. 2755. On this lease a line of reef parallel with the main line intersects the jaspilite zone at a shallow depth and enrichments have undoubtedly occurred as the grade of ore from this lease is the highest at the find.

3. In reefs of this class there is always a strong possibility of spur veins branching off the main reef from time to time, and this fact should be borne in mind when mining them. The spur veins will be parallel to the strike and dip of the schistosity of the enclosing country. Some spur veinlets are to be seen in the present workings, but none of appreciable size and values have yet been encountered.

4. The broad geological structure indicates that a strong reversal in pitch (crossfold) occurs on the axis of the "Marie's Find" anticline, approximately 1½ miles north-west of "Marie's Find". (Refer Plate No. III.) Structurally the position is ideal for ore deposition and prospecting is warranted in this vicinity. The favourable area, however, is in the middle of Lake Deborah and the excessive ground water may prove an insurmountable problem.

"QUEEN MARIE" G.M.L. 3822.

The workings on this lease are situated on the north-eastern extension of the "Marie's Find" line of reef. The prospects for this line of reef as described in the report on the Ora Banda Mines N.L. are also applicable here.

An ore shoot 120 feet long is being mined, and it is limited on the south-western end by the lease boundary and on the north-eastern end by a post-quartz garnetiferous pegmatite dyke. The reef strikes N. 35° E. and dips 55° S.E., cutting across the enclosing basic sediments, which strike parallel to the reef and dip 45° N.W. The quartz is similar in all respects to that in the company's workings, and varies in width from 6 inches to 3 feet. The quartz is mineralised with pyrites and galena, and has been partly stoped out from the surface to the 80ft. V.D. level off the whip shaft.

At the time of inspection (July 1939) work was in progress at the 80ft. V.D. level, but the workings were not extensive. The south-west drive was 38 feet long and two feet of payable quartz was showing in the face. The north-east drive ceased at 20 feet where the reef was intersected by a pegmatite dyke. It is reported that a block of ore 20 feet linear height has yet to be stoped from above this level.

The workings are extremely wet and ground water level is 30 feet vertical depth from the surface.

The reef should persist on the north-east side of the pegmatite dyke and driving through the dyke at the 80ft. level is warranted. It is thought that there will be little if any displacement of the continuation of the reef on the north-east side of the pegmatite.

LATE "DEBORAH" G.M.L. 2755 (now a Prospecting Area).

The prospecting area embraces a line of workings 800 feet long, which are situated approximately 900 feet south-east of the main Marie's Find line of reef.

The general strike of the line of old workings is N. 50° E., and a lenticular quartz vein, dipping 60° S.E., has been mined. The vein outcrops in a strip of basic sedimentary country, which strikes N. 45° E. and dips 45° N.W. and which occurs between two lines of jaspilite. The reef is obviously of the fissure type, and it should persist to some depth.

The vein varies in width from 2 to 18 inches and contains good values. Enrichments are said to occur where the vein intersects the jaspilite horizons. The quartz becomes rather broken up at these points, and a mass of veinlets occur in the jaspilites forming patches of lode material.

The reef was mined formerly down to 45 feet linear depth where a general narrowing in width occurred all along the line of reef. Recent prospecting has shown that the reef increased to a payable width a few feet below the 45ft. level. At the time of inspection the prospectors were engaged in removing a block of ore between the 45ft. level and ground water level at 60 feet linear depth from the surface.

Post-gold pegmatite dykes are encountered in the workings, and sulphides occur erratically throughout the quartz at depth.

*Sketch not published.

NEWFIELD GROUP.

GENERAL INFORMATION.

The Newfield Group is referred to locally as the Mayfield Group, but Newfield has been adopted as it is the registered name of the main mine.

The group is situated at Carterton, approximately 40 miles north-west of Bullfinch. A track branches off the old Jackson road about 38 miles from Bullfinch, and leads to the mines.

Gold was first discovered at this centre by H. Carter, who pegged the ground now occupied by G.M.L. 3938 on 16th May, 1938. The main line of reef however, has since been proved to be on the adjoining lease, G.M.L. 3936.

At the time of inspection (October 1939), there were four existing leases at the Group, namely, "Newfield Central" G.M.L. 3936, "Newfield" G.M.L. 3937, "Newfield East" G.M.L. 3938, and "Mayfield East" G.M.L. 3954. Leases 3936 and 3937 were being held by the Yellowdine Gold Areas G.M. Co., while G.M.L. 3954 was under exemption. "Mayfield East" G.M.L. 3954 is situated approximately 90 chains south-east of the "Newfield" leases, and is known locally as Gorman and McKinnon's show.

Adequate supplies of salmon gum, gimlet and morrel, suitable for mining purposes, occur in the area.

At the time of inspection water for domestic and mining purposes was being carted from Currajong Tank, which is approximately 2½ miles north-west of the leases. When the proposed 5-head battery and cyanidation plant are erected, however, water for mining purposes will be obtained from a bore near the edge of Lake Currajong approximately three miles north north-west of the leases.

The nearest public batteries are at Marda, Manxman Group and Bullfinch. The company has already put through trial crushings at the Marda and Copperhead Batteries.

GENERAL GEOLOGY.

The area is composed of metamorphosed, interbedded, basic sediments, basic lavas and jaspilites, which have a general strike N. 25° W. and a vertical dip. The series has been intruded by biotite granite, pegmatite, aplite and granodiorite dykes, and barren quartz reefs. These granitic rocks are younger than the auriferous quartz. Besides the granitic rocks, olivine dolerite has been intruded into the series and a dyke of this type occurs in the main workings. The olivine dolerite is believed to be younger than the granitic rocks, but the evidence supporting this belief is meagre. All the rocks are presumed to be of Pre-Cambrian Age.

The basic sediments and basic lavas are similar to those seen elsewhere in the Yilgarn Goldfields. The basic lavas show no volcanic structures however, and, in the main workings, the basic sediments contain brownish bands due to a biotitic alteration.

The jaspilite is the massive siliceous type, and is useless from the structural point of view.

The ore bodies are of the fissure type and consist mainly of quartz reefs, but isolated patches of lode material, which are probably of secondary origin, are reported.

No minor geological structure could be seen in the area mapped, but it is hoped that future regional mapping will reveal some broad structure, which has been a factor in bringing about gold deposition.

THE MINES.

NEWFIELD G.M. (YELLOWDINE GOLD AREAS).

At the time of inspection (October, 1939) the company held two leases "Newfield Central" G.M.L. 3936 and "Newfield" G.M.L. 3937, but the main workings were on G.M.L. 3936. Up to the present, the production from this mine has been low owing to the fact that, till recently, the company was holding the leases under option. During the option period the company pursued a development programme, and, apart from a few trial crushings, made no attempt to treat the ore. Now that the option has been exercised however, a 5-head battery and cyanidation plant are to be erected, and the mine should soon be among the producing gold mines of the State. The management report that ore reserves amount to 6,256 tons averaging 21.6 dwts. gold per ton, and this estimate allows for a 10 per cent. dilution of the ore.

The Ore Bodies.

From a study of the plans it will be seen that an irregular deposition of auriferous quartz has occurred in a fissure, striking N. 50° E. and dipping 70 degrees east. In places, the width and gold content of the quartz are such that ore shoots exist. Four lenses of quartz, with an average width of 3 feet, and pitching 50 degrees north, have been developed to the 100ft. level by the company.

The shoots are enclosed in greenstone country and are known as the North Lens, Middle Lens, South Lens and No. 4 Lens. The country rocks enclosing the ore bodies consist of basic sediments and basic lavas, which have been intruded by pegmatite and olivine dolerite dykes. Both these intrusives are younger than the auriferous quartz, and the dolerite is very probably post-pegmatite in age. The presence of what appear to be granitic fragments, in the breccia associated with the dolerite, is supporting evidence for this belief.

The quartz is the white, fractured, translucent variety, and it is laminated parallel to the ore channel. Thin seams of greenstone parallel to the laminations occur within the quartz at frequent intervals, which is suggestive of the quartz having been formed by metasomatic replacement. The quartz is mineralised with pyrites at the 100ft. level, but minor quantities of other sulphides may be present.

North Lens.—At the 100ft. level in the main workings, the lens has an average width of 3 feet and a length of 98 feet, but payable values only occur in the lens to 82 feet from the southern end. The lens dwindles away at the northern end to a brecciated shear zone containing fragments of quartz, pyrites and calcite. Going south from the north face, this seam of quartz breccia diverges from the reef and runs away into the hanging wall at the No. 1 winze.

The shearing which formed the lode channel has probably been responsible for the seam of brecciated material which occurs along the footwall of the shoot. This brecciated material is somewhat different in character to the breccia on the hanging wall of the shoot. The footwall country below the brecciated material consists of basic sediments, but these give place to basic lavas at the southern end of the shoot. Basic sediments also occur on the hanging wall of the ore body except on the north side of No. 1 winze, where massive greenstone, of the intrusive dolerite

type, occurs. The No. 1 winze, being full of water, was not accessible at the time of inspection but it is reported that the shoot is cut off by a horizontal greenstone dyke at approximately 25 feet V.D. in the winze. A seam of quartz breccia occurs on the upper surface of the dyke, and it is similar to the hanging wall seam of breccia seen at the 100ft. level. Besides the quartz, fragments of granitic material are present in the breccia, and its matrix is mainly the intrusive greenstone. Petrological work has shown that the intrusive greenstone is an olivine dolerite. The ore body is 36 inches wide and assays 28.75 dwts. gold per ton, where it is cut off by the intrusive greenstone.

A small amount of ground water, which rose to approximately 103 feet vertical depth from ground level, was encountered in the winze. The make of water is reported to be 400 gallons per day.

Middle Lens.—This lens which commences 35 feet south of the north lens, has a length of 122 feet and an average width of 3 feet. The dip of the lens is slightly flatter than that of the north lens, being 65 degrees east instead of 70 degrees east. Massive, jointed greenstone believed to be basic lava occurs on both hanging wall and footwall of this shoot.

As in the case of the north lens, this shoot is cut off underfoot by the dolerite dyke and the quartz breccia is again associated with the dolerite. It is reported that the shoot is cut off at 25 feet V.D. in the No. 2 winze, but this winze was also inaccessible. The shoot is 36 inches wide and assays 19.08 dwts. gold per ton where it is cut off by the intrusive greenstone.

South Lens.—This shoot commences 13 feet south of the middle lens, and continues for 86 feet to the south face of the 100ft. level. Megascopically, all the quartz appears favourable, but assaying has shown that payable values exist only to 48 feet from the northern end of the shoot. The average width of the shoot is 3 feet 6 inches, and it dips 65 degrees east.

The hanging wall country is basic sediments and the footwall country the massive, jointed basic lava. Nothing is known about this shoot below the 100ft. level.

No. 4 Lens.—This shoot does not occur in the main workings, and has been prospected from the shafts situated approximately 3 chains north of the north main shaft. The quartz is lenticular and appears to be in the northern extension of the main ore channel. The shoot has been opened up over a length of about 50 feet at the 40ft. V.D. level. The average width of the quartz is 2 feet 6 inches, and values are reported to be payable. The shoot is cut off on the south end by a granitic dyke, but quartz is still showing in the north face. The country rock consists of decomposed basic sediments.

Conclusions.

The quartz lenses have been formed by metasomatic replacement in a fissure striking N. 5° E. and dipping 70 degrees east. The fissure cuts across the enclosing greenstones, which have a general strike N. 25° W. and a vertical dip. The brecciated material on the footwall of the north lens is thought to belong to the faulting, which formed the ore channel.

Subsequently to ore deposition, granitic dykes were intruded into the country rocks, and these were followed by the intrusion of olivine dolerite. The hanging wall breccia and the breccia in the winzes was formed during the faulting which immediately preceded the intrusion of the dolerite. The dolerite subsequently formed the matrix of these breccias.

The dolerite is believed to dip steeply west on the hanging wall side of the ore shoots down to about the 100ft. level. It then begins to flatten in dip and cuts across the ore channel as seen in the winzes.

Sulphides occur frequently in both types of breccias, but payable values are absent.

Recommendations.

1. The dolerite, which cuts off the ore shoots at depth, is younger than the auriferous quartz, so that diamond drilling for a continuation of the ore shoots below the dyke is warranted. The success of the prospecting, however, will depend on the thickness of the dolerite and whether or not it has usurped the ore channel. A displacement of the lode channel may also occur below the dyke, which will add to the difficulties of prospecting.

2. In the underground workings it would appear that driving south on the south shoot is warranted. Prospecting in this direction at the surface has been unsuccessful, however, and it is unlikely that an improvement in values will occur at depth.

3. Driving north from the No. 4 lens is warranted, however, as other small ore shoots may exist along the strike.

4. Ore shoots may exist in the main fissure on G.M.L. 3937, but it is expected that they will be smaller than any of the shoots so far disclosed.

5. There is no evidence to recommend lateral prospecting, but the possibility of parallel ore bodies should always be borne in mind.

"NEWFIELD EAST" G.M.L. 3938.

A network of auriferous quartz veinlets associated with patches of secondary lode material, are being mined on this lease. The veinlets have no consistent strike and dip, and the deposit is more or less a stockwork. The deposit has been worked on a roughly north-south strike, over a length of 20 feet and to a depth of 20 feet. The official production returns show that, in September 1938, 18 tons of ore were treated for 21.19 fine ozs. of gold. These are the only production figures available.

The country rocks in the vicinity of the workings consist of decomposed basic sediments.

The first discovery of gold at the Newfield Group was made on this lease.

"MAYFIELD EAST" G.M.L. 3954.

This lease is situated approximately 90 chains south-east of the "Newfield" leases, and it was under exemption at the time of inspection.

The workings are not very extensive, and a narrow quartz vein, striking N. 30° W. and dipping 75 degrees south-west, has been prospected over a length of 50 feet and to a maximum depth of about 25 feet. The vein is parallel to the enclosing greenstone country, and is situated 300 feet north-east of the south-eastern extension of the jaspilite line, which occurs to the east of the "Newfield" leases.

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.

K. R. Miles, B.Sc. (Hons.).

CONTENTS.

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