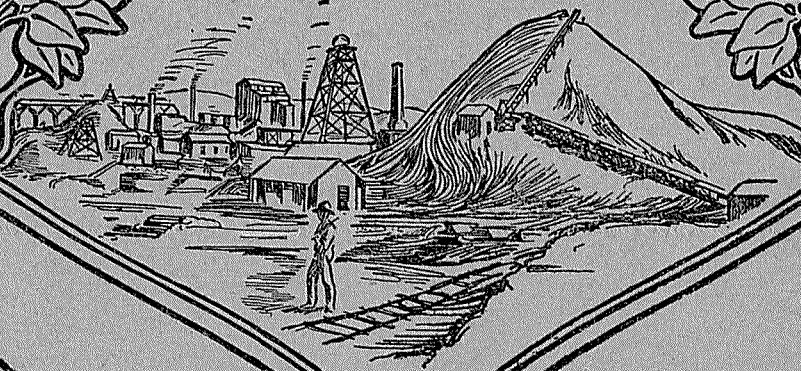




REPORT
OF THE
DEPARTMENT OF MINES
FOR THE YEAR
WESTERN · 1939 · AUSTRALIA



PRESENTED TO BOTH HOUSES OF PARLIAMENT

BY HIS EXCELLENCY'S COMMAND



H.D.C. HIGGINS

1940.

—
WESTERN AUSTRALIA.

REPORT

of the

Department of Mines

FOR THE YEAR

1939

PERTH:

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1940.

ANNUAL REPORT OF THE DEPARTMENT OF MINES, WESTERN AUSTRALIA, 1939.

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STATE OF WESTERN AUSTRALIA.

Report of the Department of Mines for the State of Western Australia for the Year 1939.

To the Hon. Minister for Mines.

Sir,—I have the honour to submit the Annual Report of the Department for the year 1939, together with reports from the officers controlling the Sub-departments, and comparative tables furnishing statistics relative to the Mining Industry.

I have, etc.,

A. H. TELFER,
Under Secretary for Mines.

Department of Mines,
Perth, 31st March, 1940.

Division I.

The Hon. Minister for Mines,—

I have the honour to submit, for your information, a report on the Mining Industry for the year 1939.

The estimated value of the mineral output of the State for the year was £5,647,755 (calculating gold at £4 4s. 11.45d. per fine ounce); an increase in value of £156,207 over the preceding twelve months. The estimated value of the premium paid to gold producers amounted to £A6,685,214, bringing the gross value of all minerals up to £A12,332,969, an increase of £A1,438,686 in Australian currency over the 1938 production.

There were increases in the quantities and value of antimony, felspar, gypsum, mica, scheelite, silver and vermiculite. Decreased quantities of arsenic, asbestos, coal, copper, glauconite, tantalite and tin were reported.

The estimated value of gold received at the Perth Branch of the Royal Mint and exported in gold-bearing material was £A11,842,964 (and equalled 96.03 per cent. of all minerals). (See footnote to Table I, Part II.) Other minerals realised:—Coal, £362,811; Arsenic, £25,488; Silver, £32,890; Tantalite, £19,969; Gypsum, £13,492; Felspar, £7,584; Antimony, £3,234; Tin, £1,447; Asbestos, £1,20; Glauconite, £710; Vermiculite, £250; Mica, £196; Bismuth, £138; Beryl, £60; and Scheelite, £28.

Dividends paid by mining companies amounted to £1,377,111, an increase of £273,867 when compared with 1938. (See Table 6, Part II.)

To the end of 1939, the total amount distributed by gold mining companies in dividends was £36,611,514. To the same date, the value of mineral

production amounted to £209,996,640 of which the gold production accounted for £193,643,683 based on normal values; but premiums on sales of gold during 1920-24 and 1930, and payments under the Gold Bounty Act, 1930, increased the total value of gold and mineral productions by £33,779,771.

GOLD.

The reported yield of gold, totalling 1,188,286 fine ounces, showed an increase of 15,336 fine ounces.

The calculated average value per ton of ore treated in the State as a whole declined from 26.50 shillings per ton in 1938 to 24.65 shillings per ton in 1939, calculated at the rate of £4 4s. 11.45d. per fine ounce, but the averaged premium obtained for gold during the twelve months (129.701 per cent.) would more than double this estimate. For the East Coolgardie Goldfield (which produced approximately 44.87 per cent. of the State's reported yield of gold) the calculated average value of ore treated dropped from 29.75s. per ton to 27.63s. per ton. The estimates for the East Murchison (Wiluna and Youanmi Gold Mines), Mt. Margaret (Sons of Gwalia and Lancefield Mines), Murchison (Big Bell, Triton and Mt. Magnet Mines), and Dundas Goldfields (Norseman Mines and Central Norseman Gold Corporation) were 16.48s. (17.94s.), 29.65s. (31.80s.), 16.83s. (18.55s.), and 27.32s. (30.66s.) respectively; 1938 figures in parentheses.

The tonnage of ore reported to have been treated in 1939, viz., 4,095,257 tons, was the highest recorded tonnage in the history of gold mining in this State, being 335,537 tons more than the previous highest tonnage recorded for the year 1938.

Increased tonnages were reported from various goldfields as follows:—Kimberley 592, Pilbara 6,042, Ashburton 1,247, Murchison 52,385, Mt. Margaret 49,874, East Coolgardie 203,991, Coolgardie 32,604, Dundas 79,827, Phillips River 73, Outside Proclaimed Goldfields 169, whilst the principal goldfields showing decreased tonnages were:—East Murchison 46,137, North Coolgardie 22,262, Yalgoo 9,880, and Yilgarn 6,598.

The East Murchison tonnage for 1939 exceeds that for 1937—the decrease when compared with the 1938 figure being due to the inclusion in the latter year of an accumulated tonnage short reported by the Moonlight Wiluna G.Ms., Ltd., in connection with their antimonial concentrates. The cessation of operations at the Lady Shenton and the Riverina G.Ms. would attribute largely to the decrease in the North Coolgardie Goldfield.

The quantity of gold recorded as being received at the Perth branch of the Royal Mint (1,115,497.76 fine ounces), and exported for treatment, in bullion, concentrates and other gold-bearing material (98,739.88 fine ounces) exceeded that of 1938 by 46,446.45 fine ounces (*vide* Table 1). The reported yield of fine gold from the tonnage of ore treated exceeded that of 1938 by 15,336 fine ounces (*vide* Table 3).

Nine goldfields failed to report yields of gold in excess of 1938 output, viz., Peak Hill 163 fine ounces, East Murchison 24,249, Murchison 5,160, Yalgoo 3,648, North Coolgardie 7,870, Broad Arrow 2,028, North-East Coolgardie 598, Yilgarn 7,124, Outside Proclaimed Goldfields 90 fine ounces. The principal increased out-turns came from East Coolgardie, Dundas, Mt. Margaret, and Coolgardie Goldfields of 29,904, 18,064, 10,010, and 6,327 fine ounces respectively.

The estimated average tonnage of ore raised and the number of ounces of gold produced per man engaged in the industry, both showed substantial increases, notably in the East Coolgardie, Coolgardie and Dundas Goldfields; a comprehensive comparison of 1938 and 1939 figures will be found in Table 4.

The completion during the year of the erection of new plants and the additions to other accounted for a slight reduction in the averaged number of men engaged in the industry; the relative figures for 1938 and 1939 being 16,418 and 16,199 respectively, a decrease of 219 men. The averaged number engaged in the production of gold dwindled by 149, whilst the averaged number engaged in the raising of and search for other minerals showed a decline of 70 men. Less men were reported as having been employed in operations at Koolan Island (8); in raising Coal (13); Asbestos (32); and Tin (15). The number engaged in raising other minerals showed very little fluctuation.

YILGARN GOLDFIELD.

This field experienced a very satisfactory year, although the ore crushed and the yield therefrom was less than in 1938.

The Bullfinch centre was, as usual, active and the leading producers were the "Copperhead Deeps," "Mistletoe" and "Rising Sun" mines.

The "Mistletoe" was taken over during the year by the Western Mining Corporation which has employed

eight men breaking ore which is treated at the South Kalgurli plant at Kalgoorlie.

At Corinthia, the "Corinthia North" mine is now producing sulphide ore which also has to be sent to the South Kalgurli plant. It produced 1,364 tons for 657 fine ounces of gold.

Eenuin's main producer, "Newfield Central" was purchased by Yellowdine Gold Areas N.L. in August last, and 20 men are now employed. A battery has now been erected and operations are proceeding satisfactorily.

The new Evanston Centre produced 4,325 fine ounces of gold from 8,250 tons of ore and kept 62 men engaged in operations on the field. The main property is the "Evanston Gold Mine" operated by Messrs. Ridge Brothers, and its output of 7,285 tons kept its battery going continuously throughout the year. This centre shows considerable promise.

At Golden Valley, the Ora Banda Gold Mines N.L. crushed 3,302 tons for a return of 2,322 fine ounces of gold. This mine has been a consistent producer during the year and employs 22 men.

The "Radio" lease, owing to plant troubles did not equal last year's output, recording 570 fine ounces from 714 tons treated.

Greenmount centre was rather quiet, while at Hopes Hill the "Pilot" mine was the only active property, treating 2,833 tons for 727 fine ounces.

At Holleton, work was confined to two shows, the "Holleton East" and the "North End." The cyanide plant on the latter mine treated sands continuously during the year.

The main mines operating at Kennyville were the "Battler," "Coronation," "Leviathan" and "Rainbow." Twenty-two men were employed in this locality during the year.

Marvel Loch was the most important and most popular prospecting centre, and contained an average of 171 men engaged in mining pursuits throughout the year. The main producers were New Yilgarn Gold Mine N.L., 2,164 fine ounces from 4,524 tons, which has subsequently gone out of production on account of a heavy inflow of water, the "Four Threes," 410 fine ounces from 36 tons, and "Ganymedes," 707 fine ounces from 935 tons; the "Kurrajong," 613 fine ounces from 2,382 tons; the "May Queen," 1,416 fine ounces from 1,460 tons and the "Sunshine Reward Amalgamated," 1,434 fine ounces from 3,150 tons.

During the year, the Lipis Gold Mining Company took over several of the leases held by the Marvel Loch Gold Development N.L., and is erecting a 10-head mill on the ground. It proposes to work the main shaft put down by the previous holder, and expects to come into early production.

In the Burbidge locality, some of the leases formerly held by the Great Victoria Company have been taken over by an Australian company which is at present erecting a crushing plant and expects to be in production shortly and to give employment to 35 men.

Mt. Jackson was quieter than usual, the main producer being the Mt. Jackson Gold Mines N.L.

Yellowdine Gold Development, Ltd., was practically the only producer at Mt. Palmer. It returned 23,893 fine ounces of gold from 47,534 tons of ore treated, and employed an average of 144 men.

The east lode, it is understood, has opened up very well and should considerably increase the life of the mine.

At Mt. Rankin only the "No Trumps" lease recorded any output, but at Parker's Range there were twelve leases producing in addition to other sundry holdings.

At Southern Cross, the main development was the re-opening of the "Three Boys" Mine which is now employing 20 men. This mine also has public crushing facilities, and has been responsible for increased local prospecting activity.

The Edna May, W.A., Amalgamated Gold Mines, N.L., was the main producer at Westonia with 5,977 fine ounces from 15,892 tons, and it employed 100 men. Very little other activity was reported.

COOLGARDIE GOLDFIELD.

The total production for this field for the year 1939 exceeded that of the previous year by 6,327 fine ounces of gold. It has, therefore, experienced a very successful twelve months.

Coolgardie District.—Bonnievale, known chiefly for its rich patches, was quite active. The "Jenny Wren" mine produced 95 fine ounces of gold from 44 tons, and is now under option to the Goldfields Australian Development Company, Ltd., which is sinking a new main shaft. Other good producers were the "Lucky Hit" mine and Prospecting Area No. 4984 held by W. R. Taylor.

Bulla Bulling received very little attention during the year, but Burbanks recorded some good returns and attracted quite a number of prospectors.

At Cave Rocks, the "Squeaker" mine produced 85 fine ounces from 223 tons treated, while several other low grade yields were reported.

At Coolgardie itself, the Consolidated Gold Mines of Coolgardie, Ltd., during the year commenced production from the Tindals Mine, and, from May to December, yielded 8,764 fine ounces of gold from 43,106 tons of ore. The company employs 130 men, and its operations to date have proved most satisfactory.

In the same centre, the Phoenix Gold Mines, Ltd., have now completed the erection of a treatment plant at the "Bayleys" mine and in December a trial parcel of 365 tons realised 77 fine ounces of gold. The early portion of 1940 should see the plant regularly in action. The mine employs 91 men.

Other active producers in the locality were the "Iron Duke" 148 tons for 202 fine ounces, the "Lucky Star" 214 tons for 45 fine ounces, the "Caledonia" 254 tons for 79 fine ounces and the "Lady Grace" 242 tons for 81 fine ounces.

Many other prospecting shows crushed, and altogether the centre recorded its best year for a long period.

Eundynie had small producers in the "Brilliant" and "Eundynie" leases, while at Gibraltar the "Lloyd George" syndicate erected a battery and recovered 157 fine ounces from 626 tons of ore, which proved payable.

Gnarlbine had several low grade producers, while at Grosmont, the main return was from the "Vice Regal" property where 642 tons produced 145 fine ounces.

Gunga centre was quiet, but Hampton Plains Block 59 reported some excellent returns. The "Surprise" mine consistently produced a total tonnage of 559, from which 463 fine ounces of gold were obtained. This lease appears to have a promising future.

The "Golden Eagle" also recorded highly satisfactory figures of 573 tons for 319 fine ounces.

There were numerous other prospectors engaged in this centre.

At Higginsville the principal producer was the "Two Boys" mine which treated 1070 tons of ore for a yield of 192 fine ounces. "Milesi's Scheelite" show crushed 59 tons for 42 fine ounces of gold, and is with other leases now under option to a Norseman company which hopes to treat the ore and ensure also a satisfactory return of scheelite.

Larkinville returned some very good prospectors' crushings and reported a large number of men at work.

Logan's Find and Londonderry were not very active gold centres, but at the latter, two mineral companies, The Australian Glass Manufacturers Proprietary Company, Ltd., and British Tantalite, Ltd., were engaged producing respectively felspar and tantalite.

Mungari and Nepean centres were paid only slight attention, but at the "Paris Group" centre a consistent producer in the "Lister" mine possessing its own plant recorded 752 fine ounces of gold from 1990 tons of ore.

Red Hill had a number of small crushings, while Spargoville, as a result of the regular operations of Spargo's Reward Gold Mines (1935), N.L., produced 4,191 fine ounces of gold from 13,361 tons of ore and 13,719 tons of sands. This company employs 57 men.

St. Ives and Wannaway attracted a few prospectors. At the former it was expected that a Perth syndicate will shortly re-open the old "Ives Reward" property.

Widgiemooltha, as usual, was a busy prospectors' centre, and the local public battery was crushing continuously.

Kunanalling District.—This district, compared with 1938, shows a decrease, both in tonnage treated and yield, of respectively 2,518 tons 1,747 fine ounces. This was the result of the cessation of underground operations by the Goldfields Australian Development Company, Ltd., at Kintore.

At Balgarrie, the Homeward Bound Gold Mines, N.L., treated 4,098 tons of low-grade ore for the return of 210 fine ounces, while 1,160 tons of sands realised 221 fine ounces. Otherwise the centre was rather inactive.

The "Carbine" Mine at the centre of that name recorded 192 fine ounces from 415 tons, together with 91 fine ounces from the treatment of 1,659 tons of sands.

At Chadwins the "Magdala" was the main producer, with a return of 228 fine ounces from 586 tons of ore.

Dunnsville was actively worked by prospectors, as also was Kintore.

Kunanalling centre was responsible for some very good returns, notably Leases 919S and 987S, which totalled 622 fine ounces from 960 tons, to-

gether with 78 fine ounces from 400 tons of sands. From lease 9138, the "Golden Bounty" syndicate obtained 343 fine ounces from 563 tons, while there were many other payable crushings.

Other centres were moderately active.

DUNDAS GOLDFIELD.

This field has shown marked progress during the year, and yielded 77,638 fine ounces of gold, and 88,107 fine ounces of silver from 241,358 tons treated. This is an increase of 18,064 fine ounces as compared with 1938.

The two largest operators are the Central Norseman Gold Corporation, N.L., and Norseman Gold Mines, N.L. The former more than doubled its yield and recorded 35,229 fine ounces of gold from 88,263 tons of ore. It expended on development work and plant on the "Phoenix" Mine the sum of £101,012 during the twelve months, while on the Ajax Shaft a further £41,000 was outlaid. This shaft is being sunk vertically to a depth of 2,070 feet with the object of cutting the main reef, and on 31st December last it had reached a depth of 1,153 feet.

The company employs 320 men, and when the Ajax eventually comes into production, this number will be greatly increased.

The Norseman Gold Mines, N.L., produced 30,611 fine ounces of gold and 51,551 fine ounces of silver from 123,404 tons of ore, and this return exceeds the previous year's output. A considerable amount of development work has been done and new equipment and plant installed, while also a diamond drilling campaign has been continued. Three hundred and sixty men are employed by the company.

Two subsidiary companies—Norseman Development, N.L., and Norseman Associated, N.L.—together employ 86 men, and produced, respectively, 3,481 fine ounces of gold and 5,900 fine ounces of silver, and 754 fine ounces of gold and 1,162 fine ounces of silver.

Blue Bird Gold Mines, N.L., continued to show remarkably rich returns, having treated 1,169 tons of ore for 4,004 fine ounces of gold. This company is now installing its own battery and treatment plant, and employs 50 men.

Copeland Mines, N.L., has developed the "Valhalla" lease and erected a five-head battery. Its production for the year amounted to 329 fine ounces from 680 tons of ore. It employs 33 men.

Numerous other smaller producers were active, and the prospects of the field are excellent.

EAST COOLGARDIE GOLDFIELD.

The year in this field has produced increased output figures compared with 1938, and the future prospects are particularly bright.

East Coolgardie District.—The tonnage treated in this district was 1,638,054 for a yield of 532,088 fine ounces of gold.

The Lake View and Star, Ltd., employing an average of 1,280 men, and leasing over 1,000 acres, retained its position as the premier producer of Western Australia. Its figures read 694,027 tons of ore for 155,554 fine ounces of gold. During the year further new plant was installed and development work underground continued uninter-

ruptedly. The 1940 programme includes the re-treatment of the Chaffers dump with a new plant, and retreatment at the Associated plant of the large Oroya Links dump east of Trafalgar.

The Great Boulder Company, employing 933 men, recorded a year of progress. Underground work disclosed satisfactory developments and future prospects are bright.

The North Kalgurli (1912), Ltd., is erecting a new treatment plant of 7,000 tons capacity on the Croesus Proprietary and this should be in operation during 1940.

The Boulder Perseverance from its one lease of 24 acres was the fourth largest producer. This lease has now recorded the remarkable figures of 4,545,999 tons for 2,547,969 fine ounces of gold.

Gold Mines of Kalgoorlie carried out much development work, and its future seems assured.

It has been decided by the Paringa Company that the plant capacity will be further increased during 1940. During 1939, this property practically doubled its output, and development work disclosed a promising future.

The South Kalgurli, a consistent producer, maintained its usual output.

With 59,336 tons for 19,274 fine ounces, the Kalgoorlie Enterprise enters the list of the large producers. The main shaft was deepened to about 1,600 feet and considerable development work was carried out.

The retreatment works of the Golden Horseshoe (New), Ltd., operated continuously, the treatment of 562,014 tons of Great Boulder tailings resulting in the recovery of 28,767 fine ounces of gold, a larger yield than in the previous year.

In Kalgoorlie, the principal producer was the Broken Hill Proprietary with a record yield of 17,022 fine ounces from 37,162 tons of ore. It now employs 130 men and has added considerably to its plant.

The Hannans Hill leases are still held up on account of litigation.

At Golden Ridge and Binduli centres, a few men were at work, but nothing of note had eventuated.

In August, Consolidated Gold Areas at Celebration entered the list of producers, and by the end of the year had recorded an output of 2,453 fine ounces of gold from 14,235 tons of ore. This company's operations are at White Hope.

The "New Hope," a large low grade proposition, worked by Messrs. Hansen and party was also a consistent producer at this centre.

At Mount Monger, the usual mining activity was displayed, and numerous satisfactory crushings recorded.

The "Milano" was, as usual, the leading producer, with 9,706 fine ounces from 3,291 tons. It has since been taken over by an Eastern States company.

Bulong District.—This district showed an increase in tonnage, but a slightly decreased gold yield. It continued to engage the attention of 82 men, and some fair crushings were recorded, but nothing of special importance unearthed.

NORTH-EAST COOLGARDIE GOLDFIELD.

A further increase in the gold yield from this field was recorded, but no developments of note were reported.

Kanowna District.—The "Sirdar" at Gordon was the largest producer, with 189 fine ounces of gold from 248 tons, and 292 fine ounces from 316 tons of sands.

"White-heads" Centre was brighter than for years, and quite a number of prospectors' crushings was raised.

Other centres were moderately active.

Kurnalpi District.—This district, as usual, had some remarkably rich crushings, but its total return was below that of 1938.

At Mulgabbie the "Ern Bill" lease produced 37 tons which realised 207 fine ounces of gold, while a further 105 fine ounces were dollied.

BROAD ARROW GOLDFIELD.

This field recorded another year of progress and consistent production, and, although the yield was less than in 1938, much activity was displayed in all centres.

The premier producer was the Ora Banda, Amalgamated, at Grant's Patch, with 8,019 fine ounces from 18,955 tons of ore.

Broad Arrow remained the chief prospecting centre and a large number of men were continually engaged there in the search for gold.

The "Golden Arrow" battery crushed continuously for the public. Some very rich returns were reported from prospecting areas in this centre, notably 71.55 tons for 275.71 fine ounces from Area No. 3,627 W., 34.53 tons for 59.47 fine ounces and 96 fine ounces dollied from Area No. 3697 W.

At Ora Banda, the United and Associated Northern groups were under exemption during the whole of the year, although on the latter one crushing was recorded and 1,500 tons of tailings treated.

Paddington and Bardoc centres also reported some excellent crushings.

At Lady Bountiful, the Carbine Gold Mines, N.L., had the "Bellevue" mine under option. Considerable development was done and 702 tons crushed for 449 fine ounces.

NORTH COOLGARDIE GOLDFIELD.

Menzies District.—The year's figures disclose a decrease of 5,549 fine ounces of gold as compared with 1938. This is the result mainly of the cessation of operations during the year at the Lady Shenton Gold Mine at Menzies.

The leading producer was the First Hit at Menzies, which recorded 7,949 tons for 5,034 fine ounces. This mine has been a consistent producer.

Menzies has always been known for the richness of its smaller reefs, and this was again exemplified during the year, many excellent crushings being reported from prospecting areas and leases.

Mt. Ida centre was active, and the State Battery treated all prospectors' ore forthcoming.

At Copperfield the most noteworthy return was 89 fine ounces from 47 tons from Prospecting Area 2091Z.

At Goongarrie prospectors were also busy and from Area No. 2041Z 80 fine ounces were recovered from dollying, and 94 fine ounces from the crushing of 19 tons of ore. Several other high grade parcels were reported from this centre.

Yunndaga was rather quiet, and Comet Vale inactive.

Ularring District.—An exceptional average of one ounce per ton fine gold is shown for the year in this district, due mainly to the remarkable returns from the "Two Chinamen" lease at Morley's Find.

Mainly owing to the cessation of operations by the Riverina Gold Mines, the district's total yield was much lower than in 1938, viz., 9,933 fine ounces, as compared with 11,395 fine ounces.

The "Two Chinamen" at Morley's Find reported 364.46 tons of ore for 3,705.97 fine ounces of gold. Although the reef "pinches" from time to time, it remakes with remarkable richness. To date this mine has produced 4,669.51 fine ounces from 500.96 tons of ore, and 864.61 fine ounces from specimen stone.

This centre has proved a very rich one for prospectors, and many other valuable crushings were recorded.

At Callion, the "New Callion" employed 22 men and produced 697 fine ounces from 2,578 tons of ore, and 231 fine ounces from 1,850 tons of tailing treated.

Mulline, Davyhurst and Riverina were all active prospectors' centres and all recorded good returns.

Yerilla District.—A marked increase in production was shown in this centre.

At Pingin, the "Ajax," a low grade property, treated 2,005 tons for 273 fine ounces of gold. The other main centres were Yarri and Yilgangi. All told, 137 men were engaged in mining operations in the Yerilla district.

Niagara District.—This district's yield was the smallest for some years. A battery has, however, now been erected on the "Grafter" lease at Tampa with Government assistance, and should encourage additional prospecting.

The four main centres in the district, viz., Desdemona, Kookynie, Niagara and Tampa, all reported some crushings, although nothing new of particular importance was unearthed.

MURCHISON GOLDFIELD.

This field includes the Cue, Day Dawn, Meekatharra and Mt. Magnet districts, and while a greatly increased tonnage was produced, the gold returned totalled slightly less than in 1938. The reason was, of course, the fact that with the high price of gold ruling, the operating companies were able to mine a lower grade of ore.

Cue District.—This district recorded a decreased gold production, the figures being 558,690 tons for 96,485 fine ounces, which is an increase of 43,539 tons, and decrease of 12,836 ounces compared with that of 1938.

At Big Bell, the company produced 59,727 fine ounces of gold from 447,322 tons of ore treated. The amount of gold obtained is considerably less than in 1938, but the tonnage treated has greatly increased. This increase meant the employment of an additional 100 men. The company completed further development work and erected more plant. It has given particular attention to the social amenities and is at present completing an air conditioned dormitory for night shift men and a modern concrete swimming pool. Its work in this regard deserves high praise.

At Cuddingwarra there was some activity, and a number of small crushings were reported.

Cue centre returned a total yield of 835 fine ounces from 1,135 tons of ore, and 2,928 tons of sands. These were mostly the result of prospectors' parcels.

Eelya and Mindoolah were moderately active, the "Two Reef" lease at the latter being outstanding, and giving promise of developing well.

At Reedy, the "Triton" property had a good year, producing 33,776 fine ounces from 106,931 tons treated. A fair amount of development was undertaken, and also some diamond drilling.

At Culleulli and Tuekabianna a number of prospectors were at work and numerous small crushings recorded.

The "Blue Peter" lease at Tuckanarra returned 490 fine ounces of gold from 86 tons, and has now been sold to Mr. G. B. Caddy. It shows promise.

Day Dawn District.—This district showed a small increase compared with 1938, the main producer being the "Lone Hand" mine at Day Dawn with 582 ounces from 610 tons. Numerous other prospectors' crushings were put through from Day Dawn, but the Lake Austin, Mainland and Pinnacles centres were fairly quiet.

Mt. Magnet District.—A substantial increase over 1938, both in tonnage and gold won, has been recorded in this district. 114,148 tons treated yielded 30,815 fine ounces.

Jimbulyer reported some good prospectors' crushings, and 14 men were operating there during the year.

At Lennonville, a great increase in activity took place, and some 67 men were employed. The "Souvernir" lease returned 68 fine ounces from 31 tons, and other producers on a fairly large scale were the "Galtee More" and "St. Mary" leases.

Mt. Magnet itself was the big producing centre, and recorded the largest return in its history.

Hill 50 Gold Mine, N.L., was the biggest producer, and during the year carried out a large exploratory and development programme with encouraging results.

Mt. Magnet Gold Mines, Ltd., treated 60,019 tons of 2.363 dwt. ore, which is probably the lowest grade ore treated in Australia. It undertook considerable development work and added a new 600 h.p. crude oil engine to its plant.

The Swan Bitter Gold Mining Company, N.L., has been operating continuously its 5-head mill and cyanide plant on its "Broken Bond" lease and is also steadily developing.

Mr. A. Cassey's "Edward Carson" Mine obtained 1978 fine ounces from 3727 tons of ore, while the Metropolitan Mining and Development Company treated from the "Black Cat" leases 2467 tons at the State Battery for 1,598 fine ounces.

The "Saturn" mine was also a good producer, and is now erecting a new plant.

The "Neptune" property is now equipped with a 5-head mill and treated 1,664 tons for 816 fine ounces of gold. There were many other good producers, and the prospects of the centre are very bright.

At Moyagee, the lease of that name which is equipped with a 3-head mill, air compressor, pumps, etc., yielded the fine return of 2,367 fine ounces of gold from 1,188 tons of ore.

Paynesville and Wynangoo were very quiet centres.

Meekatharra District.—This district's production showed a decrease for the year in both tonnage and gold, principally as a result of reduced activity in the Nannine and Quinns centres.

Abbotts and Burnakura were good prospectors' centres, while Gabanintha employed 11 men and reported some good crushings.

Meekatharra itself was again the mainstay of the district, and the "Ingliston Consols Extended" mine was the principal producer.

One hundred and one men were engaged in mining operations in Meekatharra and quite a large number of crushings was recorded.

Aladdin Gold Mines, Ltd., has now ceased operations at Nannine, and mining is at rather a low ebb there.

Quinns centre is in much the same position now that Quinns Gold Mines, Ltd., has closed down.

Yaloginda had quite a good year, and 20 men were working there. The "Blue Bird" and "Edenhope" were the main producers.

YALGOO GOLDFIELD.

Due mainly to the closure of the "Rothsay" gold mine by Rothsay Gold Mines, N.L., the production from this field was considerably less than that of the previous year.

At Bilbertha, "Blaneys" gold mine yielded 456 fine ounces from 506 tons.

Field's Find exhibited much activity as the Western Mining Corporation commenced a diamond drilling campaign on the "Rose Marie" lease over which it has taken an option, while Yalgoo Gold Areas, Ltd., an English company, carried out extensive operations on Lease 1119. It is expected that the latter company will have a 5-head battery in operation this year, and that the mine will be brought to the production stage.

Goodingnow was the largest producing centre in the field, the "Carnation" mine yielding 1,317 fine ounces from 2,720 tons, while the "Orchid" lease produced 794 fine ounces from 1,609 tons and the "Aster" 509 ozs. from 1,025 tons. There were several other good returns and the centre experienced a satisfactory year.

PEAK HILL GOLDFIELD.

An average of 67 men were engaged in mining operations in this field during 1939, but the yield declined somewhat in comparison with that of the previous year.

At Mt. Egerton, the "Pegasus" mine produced 771 fine ounces of gold from 247 tons of ore and 160 tons of sands. It has been a consistently rich producer for several years and employs five men.

At Peak Hill itself, the State Battery ran throughout the year, mainly on low grade cement material mined in the vicinity of the townsite. Other centres were fairly quiet and no new finds were reported.

EAST MURCHISON GOLDFIELD.

Black Range District.—This district showed an increased tonnage but a decreased gold yield. The main producing centres were Bellehambers, Hancocks, Jonesville, Nungarra, Sandstone, and Youanmi.

At Bellehambers, the "Lucky" Mine was the principal one in operation, treating 837 tons for 391 fine ounces.

The "North End" Mine is now the only one working at Jonesville, and it employs 13 men. Its output was 1,270 ounces from 4,428 tons of ore.

Several fairly large low grade parcels were raised in the Nungarra centre and treated at the Sandstone State Battery.

At Sandstone, 44 men were engaged in mining, and again the ore produced was low grade.

Youanmi was the largest producing centre, the active operator being, of course, the Youanmi Gold Mines, Ltd., which treated 77,221 tons for 20,696 ounces, a considerable increase over the previous year's yield. Development is being pushed ahead, and the 1940 production should be greater again.

The company employs 259 men.

The "Camberra" Mine which has been equipped with a three head battery treated 444 tons for 98 fine ounces of gold.

Lawlers District.—A greatly increased output from this district was reported, and mining was generally active. Kathleen Valley, Mt. Sir Samuel and Lawlers itself had a number of good producers, the main one being the Emu Gold Mines at the latter town, which was responsible for 12,575 fine ounces of gold from 8,542 tons of ore, a very fine production.

Wiluna District.—A considerable decline in both tonnage and gold occurred in this district as compared with 1938.

Coles' Find was an active prospectors' centre, and employed 17 men, and Corboy's Find and Diorite reported numerous crushings.

At Joyner's Find Linden (W.A.) Gold N.L., produced 1,867 fine ounces of gold from 7,541 tons of stone, and employed 25 men.

The main producer at Kingston was the "Pomme D'Or" (Options Ltd.) with 176 fine ounces from 480 tons crushed and 102 ounces from the treatment of 1,100 tons of sands.

Mt. Fisher, Mt. Keith and New England centres were quite busy, the latter employing an average of 30 men.

At Wiluna itself, the two big producers were the Wiluna Gold Mines, Ltd., and the Moonlight Wiluna Gold Mines, Ltd., which recorded respectively 581,245 tons for 90,169 fine ounces and 95,805 tons for 26,816 fine ounces.

A disappointing report was issued by the former company during the year in regard to the mine's future, and the outlook does not look promising.

Considerable development took place on the Moonlight property, while on the Starlight group which has now been purchased by the Moonlight company, some diamond drilling and prospecting was undertaken.

The average number of men employed at the Wiluna centre during the year was 1,045.

MT. MARGARET GOLDFIELD.

This field showed a decided increase, both in tonnage and gold won, and this was attributable to new finds and the continuous working of the larger mines. The output was 324,830 tons for 113,373 fine ounces.

Mt. Margaret District.—At Burtville, the outstanding find was that by D. Cable, who is working on a rich leader on the old Boomerang lease. Two excellent returns of 39½ fine ounces from 5¼ tons, and 125 fine ounces from 6¾ tons were reported. Further good ore is in sight. Altogether 31 men were operating at this centre.

Considerable activity by prospectors was also displayed at Duketon.

At Erlistoun, the Cox's Find property was a steady producer with a total of 11,446 fine ounces of gold from 16,264 tons of ore. Eighty-nine men were employed by the lessee company. Many of the smaller shows recorded good crushings.

At Laverton, the Lancefield Gold Mine, employing 253 men, treated 128,443 tons for 32,038 fine ounces, a large increase on the 1938 figures.

The Gladiator Gold Mines, Ltd., recorded 24,109 tons for 6,760 fine ounces, and expects to increase the rate of production in 1940, having installed new machinery. Other leases and prospecting areas were operating successfully.

Mt. Barnicoat was an active centre, and one show, that of Messrs. Devlin and Taghafferri, crushed 52 tons for 63 fine ounces and 56¼ tons for 240 fine ounces.

Mt. Morgans District.—This district more than doubled its 1938 output. This was to some extent due to the large tonnage of sands treated.

Linden centre reported a phenomenal return from the "Coronation" lease of 834 fine ounces from 3¾ tons of ore. This lease has an excellent record.

Most of the producing shows in this vicinity average from 1 to 3 ounces to the ton.

At Mt. Morgans itself the main activity was that of Sands Treatment, Ltd., which employed 25 men and recorded 3,733 fine ounces from 78,225 tons of sands. Of the other centres, Murrin Murrin and Yundamindra were the most active.

Mt. Malcolm District.—An increase of 833 ounces in the goldfield, as compared with 1938, was recorded, and the year can be regarded as entirely satisfactory, as activity was maintained and a large number of men employed.

Cardinia and Lake Darlot centres both reported numerous crushings and employed a number of prospectors.

At Leonora, the Sons of Gwalia treated 136,114 tons for a yield of 45,617 fine ounces of gold. This property looks particularly well.

During the year Messrs. W. Powell & Sons took over lease 1594C owned by Leonora Central Gold Mining Coy., Ltd. Powells commenced operation in August and soon had the 5-head battery and other equipment in order. They intend to add to the plant and increase production, and no doubt the mine will develop into a large and consistent producer. The production for the year was 50 fine ounces from 650 tons of ore and 62 fine ounces from 1,020 tons of sands.

The "Forrest" lease was another good producer of low-grade ore.

Mr. D. Wilson's "Reefer" battery was in operation throughout the year, and treated 4,166 tons of prospectors' ore and cyanided 2,190 tons of sands.

Mertondale, Mt. Clifford and Randwick centres all reported good returns.

At the latter, the "Mighty Splash" lease, which was equipped with Government assistance with a 5-head battery and cyanide plant, appears to have overcome its difficulties and recorded 175 fine ounces from 455 tons, together with 196 fine ounces as the result of the treatment of 1,220 tons of sands.

At Websters, 667 fine ounces of gold were obtained from specimen stone and a crushing of 15 tons by Messrs. Gervan and Molloy. This was all obtained from a patch which has since been abandoned.

PHILLIPS RIVER GOLDFIELD.

An increase in both tonnage and gold production was recorded, while 74 men were engaged in the industry. The three main centres were again Hatter's Hill, Kundip and Ravensthorpe. No new finds were reported but tributaries were active at both the two latter centres.

PILBARA GOLDFIELD.

Marble Bar District.—Mining activity was again maintained during 1939, and the field's production was a very satisfactory one. Comet Gold Mines were again the largest producers with 2,326 fine ounces from 4,777 tons crushed and a further 3,717 fine ounces from sands treated. The company completed its treatment plant during the year and also pursued an active development policy.

Ora Banda South Gold Mining Company continued working and developing the "Tassy Queen" lease and produced 965 fine ounces from 1,454 tons of ore. It hopes to instal a new plant at an early date.

The "Homeward Bound" property, privately owned, recorded the good yield of 724 fine ounces from 963 tons.

At Wyman's Well and Warrawoona several good crushings were reported, and a public crushing 10-head mill was erected at the latter centre.

Bamboo Creek was responsible for a regular output, the producers being in the main the same ones as in the previous year, viz., the "Mt. Prophecy," "Kitchener," "Bulletin," "Bonnie Doon," "Bamboo Queen," "Prince Charlie" and "Mickey" leases.

Nullagine District.—Middle Creek and 20-Mile Sandy were again the principal centres of production. The "All Nations North," "Blue Spec" and "Hopetoun" group recorded good returns.

The Consolidated Gold Areas, N.L., has exercised its option of purchase over the "Blue Spec" and intends to proceed with a vigorous developmental policy.

The "Barton" owners hope to complete their battery in 1940.

At 20-Mile Sandy, the "Little Wonder" treated 1,756 tons for 362 fine ounces, and was the principal producer.

Eastern Creek was active, while several payable crushings were reported from Nullagine. At this centre another attempt is being made to treat the conglomerates by a sluicing method.

KIMBERLEY GOLDFIELD.

The two batteries erected with Government assistance, viz., Messrs. Smith and Downings, at Ruby Creek, and Messrs. Ross and McIntyres, have been instrumental in increasing the gold yield of this field as compared with 1938.

A number of prospectors are at work in the field, and a further improvement next year is anticipated.

WEST KIMBERLEY, GASCOYNE AND ASHBUEFON GOLDFIELDS.

Very little activity has been displayed in these fields.

OUTSIDE PROCLAIMED GOLDFIELD.

From districts outside proclaimed Goldfields, gold production was reported from Burracoppin, Donnybrook, Jumperding and West Pilbara.

At the latter centre, the five-head Weerianna Mill, which re-opened last year, crushed 192 tons for 222.5 fine ounces of gold.

With this battery available, greater activity should be shown in future.

TIN.

The quantity of tin exported was valued at £3,871, a decrease of 40 tons, and in value of £3,550. The production reported was 11 tons from the Greenbushes Mineral Field, valued at £1,447. The average number of men employed being 58, or seven less than in 1938.

TANTALITE.

Fourteen (14) tons valued at £19,969 were exported; an increase of two (2) tons and in value of £6,875.

The reported production was eight tons from the Pilbara Goldfield, valued at £12,073.

ASBESTOS.

The reported production of asbestos for the year was 33 tons valued at £1,320, twenty-seven (27) tons of which came from Outside Proclaimed Goldfields.

The exported figure being 275 tons of £11,036 in value.

COAL.

The coal output was 557,535 tons valued at £362,810, a decrease of 47,257 tons, of £12,272 in value.

The whole production came from the Collie Coalfield, and the average number of men employed was 752, the output per man working out at 741 tons, compared with 791 tons in the previous year.

GYPSUM.

The quantity of gypsum reported was 14,340 tons valued at £13,492, an increase of 911 tons and £1,083. The production came entirely from Outside Proclaimed Goldfields.

OTHER MINERALS.

The quantity of silver obtained as a by-product and exported was 287,439 fine ounces, valued at £32,890; an increase of 16,993 fine ounces and £4,038.

Felspar amounting to 3,792 tons was produced at Coolgardie and the value was £7,584. This was an increase of 919 tons and £1,838 on the previous year.

Glauconite valued at £710 from 142 tons was reported from Outside Proclaimed Goldfields, while the export figures were 151 tons for £3,770 in value.

Arsenic totalling 1,416 tons, valued at £25,483, was recorded from Wiluna, a decrease of 2,583 tons valued at £46,494, when compared with 1938.

Antimony amounting to 364 tons valued at £3,234 also came from Wiluna, an increase of 25 tons and £625 on last year's figures.

The first recorded productions of mica and vermiculite amounted to 444 lbs. valued at £196 and 30 tons valued at £250 respectively, the latter mineral coming wholly from Bulong.

Ten tons of scheelite ore valued at £28 were reported from Menzies.

Operations at Yampi Sound on the iron ore deposits have been continued during the year. On Koolan Island, the lessee company has carried on under arrangement with the Commonwealth Government regarding finance. Considerable exploratory work has been done, and the results to the end of the year, although not determinate, are exceedingly satisfactory.

Last year I stressed the importance of many of our mineral deposits, and expressed the hope that some of them would at an early date be utilised for commercial and industrial purposes. Some attention has been given to several of them during the year, but nothing of a definite nature concerning their utilisation has occurred. With the progress of the war, however, and the increasing difficulty in obtaining supplies from other countries, further attention must eventually be given to our native deposits.

MINING GENERALLY.

The only base metals produced were again tin, tantalite, copper and antimony.

As anticipated in my last report, a considerable increase in the gold yield was recorded for 1939, while the actual value in Australian currency of such yield was easily the highest in the State's history: 1940 should show an improvement again on this year's figures, as several companies only came into production late in the year, while others are increasing output and treatment plants.

The assistance to prospectors was continued, and the total number helped since the inception of the Scheme in June, 1933, totalled 8,262.

At the end of the year, the number receiving assistance was 643. At that date, the total cost of the Scheme including rations, rail fares, equipment and supervision, amounted to £230,940 2s. 4d., while refunds from successful prospectors totalled £42,435 12s. 4d. Of the cost of the Scheme quoted above, £80,904 was provided by the Commonwealth Government, under its Vote "Assistance to Metalliferous Mining."

Crushings reported by prospectors while actually on the Scheme amounted to 62,936 tons of ore for 31,522 fine ounces of gold. Of this total, 6,175 fine ounces were produced in 1939 from 13,486 tons. Once payable gold is struck, the men go off the Scheme and their progress is not then followed. Thus the Scheme has been responsible for a much greater production than that quoted.

MINING DEVELOPMENT ACT.

The expenditure incurred in rendering assistance to mine owners and the industry generally under the provisions of this Act totalled £47,458 18s. 4d., and in the preceding year £21,915 17s. 9d.

THE INDUSTRY AND THE EFFECT OF THE WAR.

The main effects of the war to date have been as follows:—

(a) *Commodities*: Essential commodities have risen in price, and in such cases as quicksilver, cyanide, zanthates, etc., have been difficult to obtain, as they are mostly only procurable from abroad.

(b) *Commonwealth Gold Tax*: This tax, introduced after the outbreak of war, comprises a levy of 50 per cent. of the value above £9 of each ounce of gold produced. It falls very heavily on low grade mines, many of which were operating on ore bodies which barely paid to treat. If the tax is continued in its present form, it is quite possible that some of these properties will be forced to close down.

(c) *Skilled Labour*: Many young employees have joined the Military forces, and as the war proceeds, more will continue to do so. Fitters, turners, young engineers, etc., are in demand for the Air Force, and there are many of these on the goldfields.

AERIAL, GEOLOGICAL AND GEOPHYSICAL SURVEY OF NORTHERN AUSTRALIA.

Although the field work of this organisation was completed last year, some time had naturally to elapse before the reports could be compiled.

By the end of June, the Senior Geologist, Mr. K. J. Finucane, had completed his reports, and although many of them are still in the typescript form, a complete set is now lodged with the Geological Survey of Western Australia, and a card index has been compiled by means of which information on any mine or district examined by this organisation can be readily obtained.

Many of the reports still await publication by the Commonwealth Government, but steady progress is being made in this direction.

PART II.—MINERALS.

TABLE 1.—Quantity and Value of Minerals produced and/or exported during Years 1938 and 1939.

Description of Minerals.	1938.		1939.		Increase or Decrease for Year compared with 1938.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Statute Tons.	£A.	Statute Tons.	£A.	Statute Tons.	£A.
Antimony (reported)	339	3,859	364	3,234	+ 25	— 625
Arsenic (reported)	3,999	71,982	1,416	25,488	— 2,583	— 46,494
Asbestos (exported)	334	17,711	275	11,036	— 59	— 6,675
Beryl (reported) ... ..	...	...	7	60	+ 7	+ 60
Bismuth (exported) ... ..	...	...	1	442	+ 1	+ 442
Coal (raised)	604,792	375,083	557,535	362,811	— 47,257	— 12,272
Copper (exported)	29	1,275	25	1,373	— 4	+ 98
Felspar (reported)	2,873	5,746	3,792	7,584	+ 919	+ 1,838
Fireclay (reported) ... ..	...	...	830	522	+ 830	+ 522
Glauconite (exported)	219	5,470	151	3,770	— 68	— 1,700
Gold (exported and minted)	1,167,791	10,363,023	1,214,238	11,842,964	+ 46,447	+ 1,479,941
	Fine ozs.		Fine ozs.		Fine ozs.	
Gypsum (reported)	13,429	12,409	14,340	13,492	+ 911	+ 1,083
Lead Ore (reported)	350	590	...	...	— 350	— 590
Magnesite (reported)	10	12	...	...	— 10	— 12
Mica (reported) ... ..	...	...	44½ lbs.	196 lbs.	+ 444	+ 196
			Statute Tons.		Statute Tons.	
Molybdenite (exported) ... ..	...	...	6	1,310	+ 6	+ 1,310
Red Ochre (reported) ... ..	...	...	142	1,398	+ 142	+ 1,398
Scheelite Ore (exported) ... ..	...	...	3	249	+ 3	+ 249
	Fine ozs.		Fine ozs.		Fine ozs.	
Silver (exported)	271,346	28,852	287,439	32,890	+ 16,093	+ 4,038
	Statute Tons.		Statute Tons.		Statute Tons.	
Tantalite (exported)	12	13,094	14	19,969	+ 2	+ 6,875
Tin (exported)	68	7,421	28	3,871	— 40	— 3,550
Vermiculite (reported) ... ..	...	...	30	250	+ 30	+ 250
Wolfram (exported) ... ..	...	...	1	60	+ 1	+ 60
...	...	10,906,527	...	12,332,969	...	+ 1,426,442

Included in the Value of Gold for 1938 and 1939 are the following estimated premiums :—£A5,402,565 and £A6,685,214 respectively.

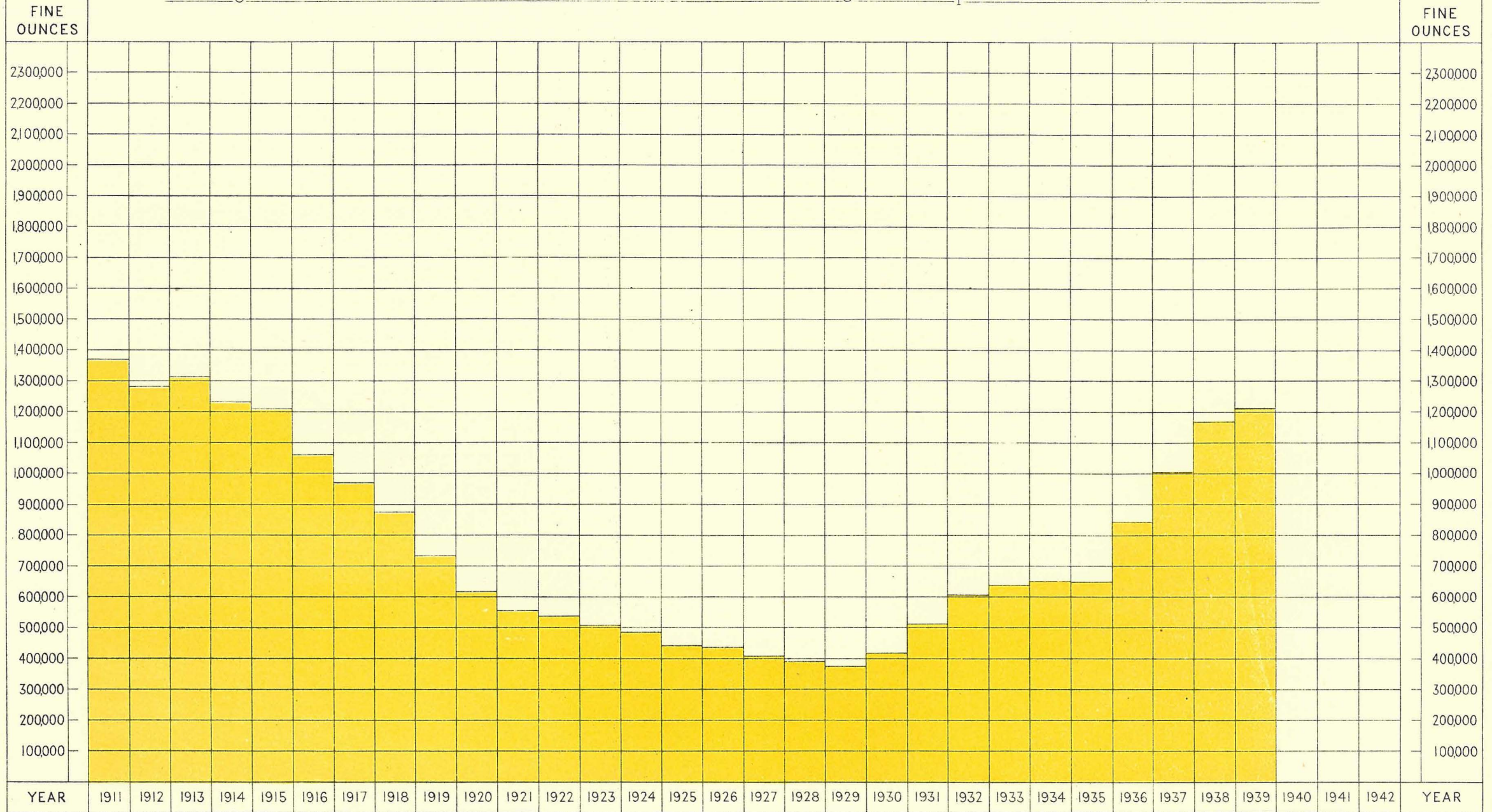
TABLE 2.—Value and Percentage of Mineral Exports in relation to the Value of Total Exports from Western Australia.

Year.	Total Exports.	Mineral Exports	Percentage.
		(exclusive of Coal).	
	£	£	
1902	9,051,358	7,530,319	83·20
1903	10,324,732	8,727,060	84·53
1904	10,271,489	8,625,676	83·98
1905	9,871,019	7,731,954	78·33
1906	9,832,679	7,570,305	76·99
1907	9,904,860	7,544,992	76·17
1908	9,518,020	7,151,317	75·13
1909	8,860,494	5,906,673	66·66
1910	8,299,781	4,795,654	57·78
1911	10,606,863	7,171,638	67·61
1912	8,941,008	5,462,499	61·09
1913	9,128,607	4,608,188	50·48
1914	8,406,182	3,970,182	47·23
1915	6,291,934	2,969,502	47·19
1916	10,878,153	6,842,621	62·92
1917	9,323,229	5,022,694	53·87
1918	6,931,834	2,102,923	30·34
1919	14,279,240	6,236,585	43·67
1920	15,149,323	3,096,849	20·44
1921	10,331,405	1,373,810	13·30
1922	11,848,025	2,875,402	24·27
1923	11,999,500	3,259,476	27·16
1924	13,808,910	1,424,319	13·24
1925	13,642,852	173,126	1·27
1926	14,668,184	1,597,698	10·89
1927	15,805,120	472,041	2·99
1928	16,911,932	996,099	5·88
1929	16,660,742	1,802,709	10·82
1930	19,016,639	6,370,396	33·49
1931	14,266,650	4,333,421	30·37
1932	16,771,465	5,657,870	33·74
1933	18,098,214	5,328,869	29·44
1934	16,784,705	5,759,324	34·31
1935	17,611,547	5,698,721	32·36
1936	19,564,716	7,130,381	36·45
1937	21,594,942	9,026,313	41·80
1938	24,220,864	10,417,603	43·01
1939	23,108,349	11,967,397	51·79
Total since 1902 ...	502,585,566	198,732,606	39·54

Exclusive of Arsenic prior to 1935.

DIAGRAM OF GOLD OUTPUT

Showing amount, in Fine Ounces, received at Perth Mint, and in Gold-bearing Material exported for treatment, from 1911 onwards



*Note - Previous to 1911, Gold Produced, 2,307,7600 Fine Ozs.
Peak Year 1903, Gold Produced, 2,064,801 " "*

TABLE 3.

Showing for every Goldfield the amount of Gold reported to the Mines Department as required by the Regulations; also the percentage for the several Goldfields of the total reported, and the average value of the yield of Gold per ton of ore treated.

Goldfield.	Reported Yield.		Percentage for each Goldfield.		Average Value per ton of Ore Treated. (Gold at £4 4s. 11.45d. per fine oz.).	
	1938.	1939.	1938.	1939.	1938.	1939.
	fine ozs.	fine ozs.			shillings.	shillings.
1. Kimberley	659	965	.056	.082	69.16	83.560
2. Pilbara	14,721	15,249	1.255	1.283	69.39	52.330
3. Ashburton	338	741	.029	.063	24.47	27.998
4. Gascoyne	4	64	...	...	...	...
5. Peak Hill	2,699	2,536	.230	.213	26.05	39.040
6. East Murchison	186,206	161,957	15.875	13.630	17.942	16.485
7. Murchison	145,038	139,879	12.365	11.772	18.549	16.834
8. Yalgoo	11,444	7,795	.976	.656	30.42	30.616
9. Mt. Margaret	103,363	113,374	8.812	9.542	31.80	29.651
10. North Coolgardie	29,804	21,933	2.541	1.846	45.404	63.815
11. Broad Arrow	20,629	18,602	1.759	1.565	39.073	40.426
12. North-East Coolgardie	2,863	2,265	.244	.191	50.288	68.884
13. East Coolgardie	503,331	533,235	42.911	44.875	29.754	27.629
14. Coolgardie	19,961	26,288	1.702	2.212	31.942	26.832
15. Yilgarn	70,062	62,938	5.973	5.297	42.567	40.161
16. Dundas	59,574	77,638	5.079	6.534	30.656	27.327
17. Phillips River	1,486	2,149	.128	.181	20.97	30.002
Outside Proclaimed Goldfield	768	678	.065	.058	...	...
Totals and Averages	1,172,950	1,188,286	100.000	100.000	26.504	24.650

The total yield of the State is as shown in Table 1, being the amount of the gold received at the Royal Mint, the gold exported in bullion and concentrates, and alluvial and other gold not reported to the Mines Department.

When comparisons are made as to the yield from any particular Field with the preceding year, the figures reported to the Department are used.

TABLE 4.

Average Quantities of Gold Ore raised and treated, and Gold produced therefrom, per man employed on the several Goldfields of the State, during 1938 and 1939.

Goldfield.	1938.				1939.			
	Tons of Gold Ore raised and treated.		Fine ounces of Gold produced therefrom.		Tons of Gold Ore raised and treated.		Fine ounces of Gold produced therefrom.	
	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.
	tons.	tons.	fine ozs.	fine ozs.	tons.	tons.	fine ozs.	fine ozs.
1. Kimberley	43.22	13.89	73.25	23.54	54.51	33.83	53.62	33.28
2. Pilbara	129.05	60.36	101.53	47.48	159.70	72.81	98.38	36.02
3. Ashburton	91.14	28.64	30.75	9.66	160.66	59.19	52.94	19.51
4. Gascoyne ... ..	...	...	...	...	...	...	...	...
5. Peak Hill	310.42	136.15	107.95	47.34	239.93	84.90	110.26	39.01
6. East Murchison	797.78	453.76	168.66	95.93	786.63	470.20	152.64	91.24
7. Murchison	838.94	419.47	186.18	93.09	800.35	429.91	158.59	85.19
8. Yalgoo	195.72	88.27	71.08	32.06	162.64	70.69	58.68	25.38
9. Mt. Margaret	416.60	202.62	156.61	76.17	395.65	215.98	138.09	75.38
10. North Coolgardie	110.67	52.03	64.09	30.13	77.66	36.55	58.33	27.45
11. Broad Arrow	132.43	61.53	64.07	29.77	131.18	60.70	62.42	28.88
12. North-East Coolgardie	49.88	20.94	42.11	17.67	52.72	23.47	42.74	19.04
13. East Coolgardie	550.46	323.19	192.99	113.29	612.93	370.11	199.34	120.37
14. Coolgardie	78.24	36.55	30.85	14.41	131.07	66.37	41.39	20.96
15. Yilgarn	267.69	148.97	114.13	63.51	277.94	146.63	131.39	69.31
16. Dundas	303.06	185.24	111.17	68.32	361.86	239.44	116.40	77.02
17. Phillips River	105.48	82.36	26.06	20.35	121.71	82.23	42.98	29.04
Total Averages	459.45	244.55	143.34	76.29	490.39	273.73	142.29	79.43

TABLE 5.

Output of Gold from the several States of Australia, the Northern Territory, Papua, the Mandated Territory of New Guinea, and the Dominion of New Zealand.

	Output of Gold.	Value.*	Percentage of Total.	
			Output of Commonwealth.	Output of Australasia.
	fine ozs.	£.		
1. Western Australia	1,214,238	5,157,752	63·754	58·278
2. Victoria	156,522	664,862	8·218	7·512
3. New South Wales	87,189	370,355	4·578	4·185
4. Queensland	147,248	625,469	7·731	7·067
5. Tasmania	19,984	84,887	1·049	·959
6. South Australia	3,930	16,694	·207	·189
7. Papua	(a) 36,118	153,419	1·897	1·734
8. Northern Territory	16,586	70,453	·871	·796
9. Mandated Territory of New Guinea ...	(a) 222,748	946,173	11·695	10·691
10. New Zealand	178,955	760,152	...	8·589
	2,083,518	8,850,216	100·000	100·000

* Exclusive of premium. (a) Subject to revision.

TABLE 6.

Dividends, etc., paid by Western Australian Mining Companies during 1939 and the Total to date.
(Mainly compiled from information supplied to the Government Statistician's Office by the Chamber of Mines, Western Australia.)

Goldfield.	Name of Company.	Dividends.	
		1939.	Grand Total paid to end of 1939.
		£	£
Peak Hill	Various Companies ... ..	...	199,305
East Murchison	Linden (W.A.) G.Ms., N.L.	4,750	9,500
Do.	Various Companies ... ..	...	1,689,553
Murchison	Big Bell Mines, Ltd.	170,000	170,000
Do.	Hill 50 Gold Mine, N.L.	12,500	18,750
Do.	Triton Gold Mines, Ltd.	24,000	192,000
Do.	Western Gold Mines, N.L.	5,000	23,750
Do.	Various Companies ... ..	...	2,044,805
Mt. Margaret	Lancefield (W.A.) G.Ms., Ltd.	100,000	362,500
Do.	Central G.Ms., N.L.	5,000	15,000
Do.	Sons of Gwalia, Ltd.	81,250	1,737,863
Do.	Various Companies ... ..	...	415,852
North Coolgardie	First Hit (1934) G.Ms., N.L.	18,644	37,287
Do.	Various Companies ... ..	...	614,671
Broad Arrow	Ora Banda Amalgamated Mines, Ltd.	20,000	60,000
Do.	Ora Banda Mines, N.L.	2,500	2,500
North-East Coolgardie	Various Companies ... ..	...	129,493
East Coolgardie	Boulder Perseverance, Ltd.	(a) 89,928	1,984,921
Do.	Golden Horseshoe (New), Ltd.	(b) 41,250	229,167
Do.	Gold Mines of Kalgoorlie, Ltd.	45,750	99,125
Do.	Great Boulder Proprietary, Ltd.	125,000	6,675,547
Do.	Lake View and Star, Ltd.	(c) 280,000	1,987,000
Do.	Kalgoorlie Enterprise G.Ms., Ltd.	34,375	34,375
Do.	North Kalgoorlie (1912), Ltd.	96,250	528,750
Do.	Paringa M. and E. Co., Ltd.	43,413	63,319
Do.	South Kalgoorlie Consolidated, Ltd.	(d) 37,501	805,628
Do.	Various Companies ... ..	...	14,967,134
Coolgardie	do. do. ... ..	...	379,134
Yilgarn	do. do. ... ..	...	788,819
Dundas	Blue Bird G.M., N.L.	60,000	110,000
Do.	Norseman G.Ms., N.L.	80,000	353,898
Do.	Various Companies ... ..	...	277,264
		£1,377,111	£37,007,910

(a) Also £45,091 in bonuses and profit sharing notes in years 1935-36.
(c) Also £42,000 in bonuses and profit sharing notes in year 1934.
notes and £93,750 Capital returned in years 1932-35.

(b) Also £55,000 Capital returned in year 1932.
(d) Also £75,000 in bonuses and profit sharing

COMPARATIVE STATISTICAL DIAGRAMS

RELATING TO

OUTPUT AND VALUE OF GOLD AND OTHER MINERALS, LANDS LEASED FOR GOLD MINING IN WESTERN AUSTRALIA

AND THE GOLD PRODUCTION OF AUSTRALASIA FOR THE YEAR 1939

FIG. 1. Output of Gold from various Goldfields as reported to Mines Dept.

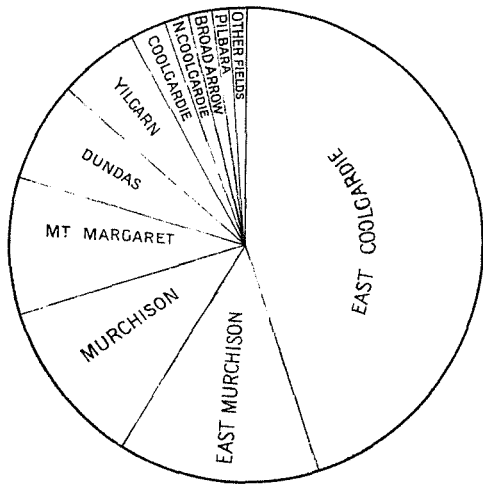


FIG. 2. Gold produced from various Goldfields as given by the Export and Mint Returns.

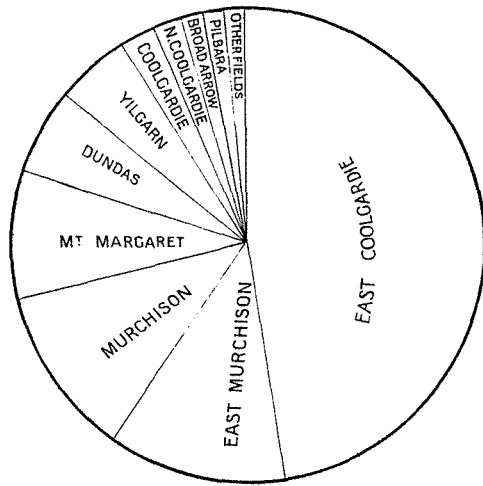


FIG. 3. Value of Gold and other Minerals.

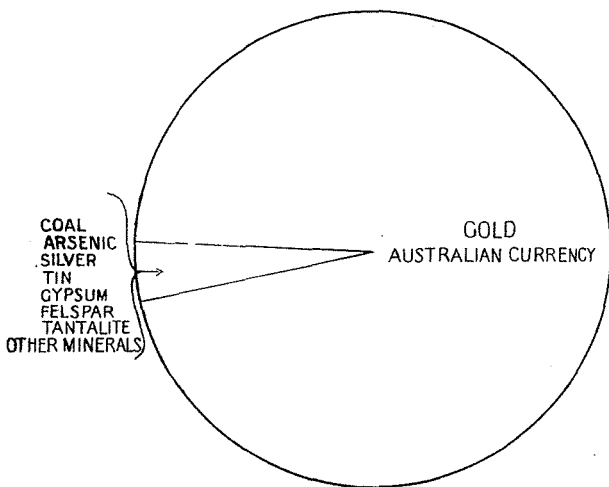


FIG. 4. Value of Minerals other than Gold.

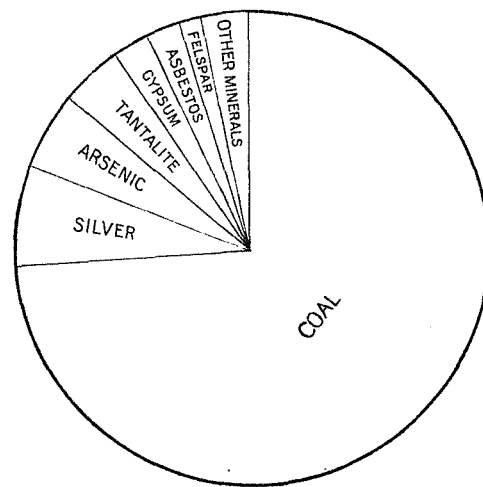


FIG. 5. Areas of land leased for Goldmining on various Goldfields.

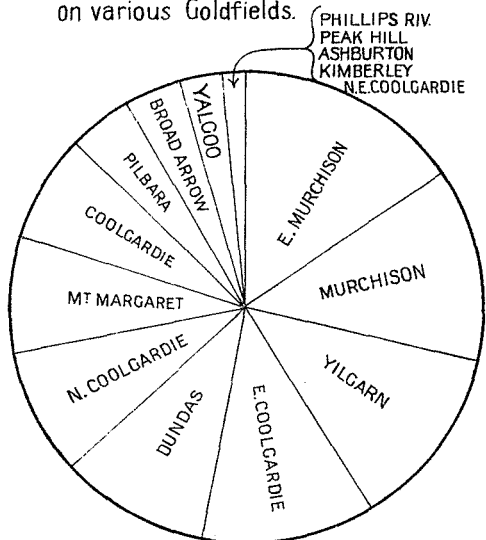


FIG. 6. Output of Gold in the States of Australia and the Dominion of New Zealand.

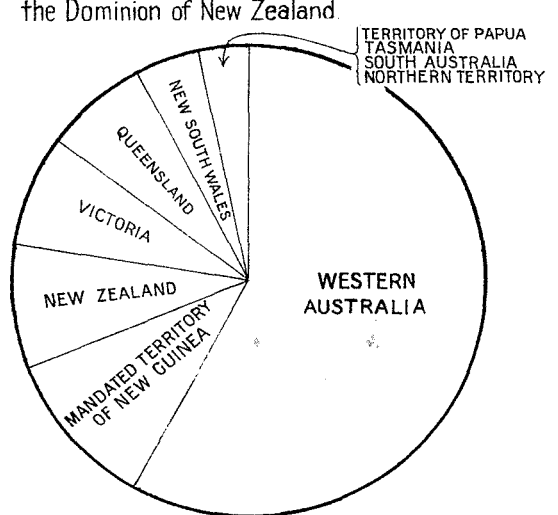


TABLE 7.

Quantity and Value of Minerals, other than Gold, reported to the Mines Department during 1939.

Goldfield District or Mineral Field.	1939.		Increase or Decrease as compared with 1938.	
	Quantity.	Value.	Quantity.	Value.
	tons	£s.	tons	£s.
	ANTIMONY.			
East Murchison (Wiluna)	364	3,234	+ 25	— 625
	ARSENIC.			
East Murchison (Wiluna)	1,416	25,488	— 2,583	— 46,494
	ASBESTOS.			
Pilbara (Marble Bar)	1	202	...	+ 127
Pilbara (Nullagine) ... ..	...	...	— 66	— 2,796
East Coolgardie (Bulong)	5	20	+ 5	+ 20
Outside Proclaimed Goldfield	27	1,098	— 27	— 1,345
	BERYL.			
Outside Proclaimed Goldfield	7	60	+ 7	+ 60
	BISMUTH.			
Gascoyne ... ..	...	138	...	+ 138
	COPPER.			
Ashburton Goldfield	1	23	+ 1	+ 23
East Murchison (Wiluna) ... ..	...	...	— 3	— 161
Phillips River ... ..	...	...	— 2	— 85
	FELSPAR.			
Coolgardie	3,542	7,084	+ 669	+ 1,338
Outside Proclaimed Goldfield	250	500	+ 250	+ 500
	GLAUCONITE.			
Outside Proclaimed Goldfield	142	710	— 41	— 205
	GYPSUM.			
Yilgarn ... ..	...	...	— 2,296	— 2,296
Outside Proclaimed Goldfield	14,340	13,492	+ 3,207	+ 3,379
	LEAD ORE.			
Northampton ... ..	...	...	— 350	— 590
	MAGNESITE.			
Coolgardie ... ..	...	...	— 10	— 12
	MICA.			
Outside Proclaimed Goldfield	444 lbs.	196	+ 444 lbs.	+ 196
	RED OXIDE (FeO ₂).			
Pilbara (Nullagine)	142 tons.	1,398	+ 142 tons.	+ 1,398
	SCHEELITE ORE.			
North Coolgardie (Menziess)	10	28	+ 10	+ 28
	TANTALITE.			
Pilbara (Marble Bar)	8	12,073	— 12	— 15,484
	TIN.			
Pilbara (Marble Bar) ... ..	...	...	— 1	— 75
Greenbushes	11	1,447	— 40	— 4,806
	VERMICULITE.			
East Coolgardie (Bulong)	30	250	+ 30	+ 250

TABLE 8.

Quantity of Coal raised during 1938 and 1939, estimated Value thereof, Number of Men employed, and Output per Man.

Coalfield.	Year.	Quantity raised.	Estimated Value.	Men Employed.		Quantity Raised.	
				Above ground.	Under-ground.	Per Man employed under-ground.	Per Man employed above and under-ground.
		tons.	£			tons.	tons.
Collie	1938	604,792	375,083	158	607	996	791
	1939	557,535	362,811	155	597	934	741

The quantity of coal raised during the year 1939, and the estimated value thereof showed a decrease amounting to 47,257 tons of coal, valued at £12,272; the average number of men employed and the averaged number of tons raised per man employed also decreased by 13 men and 50 tons respectively, when compared with figures for 1938.

PART III.—LEASES AND OTHER HOLDINGS UNDER VARIOUS ACTS RELATING TO MINING.

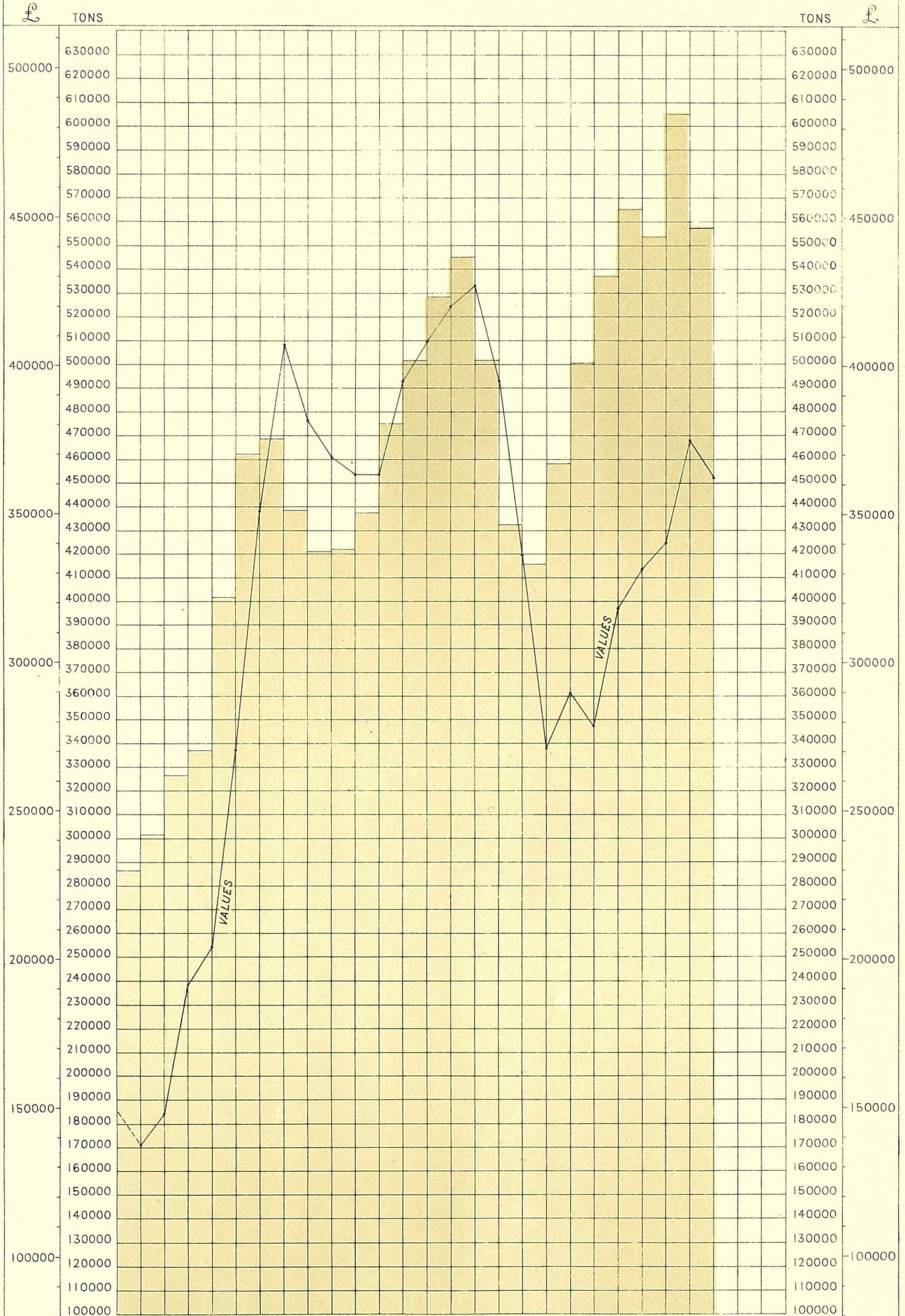
TABLE 9.

Total Number and Acreage of Leases, Mineral Claims, and Prospecting Areas held for Mining on 31st December, 1938 and 1939.

Description.	1938.		1939.	
	No.	Acreage.	No.	Acreage.
Gold Mining Leases on Crown Land	1,584	27,152	1,574	27,037
do. do. Private Property	7	108	4	80
Mineral Leases on Crown Land	163	38,506	163	38,517
do. do. Private Property	2	64	...	...
Mineral Claims	115	10,856	115	6,950
Prospecting Areas	1,825	44,850	1,776	34,786
Total	3,696	121,536	3,632	107,370

DIAGRAM OF COAL OUTPUT

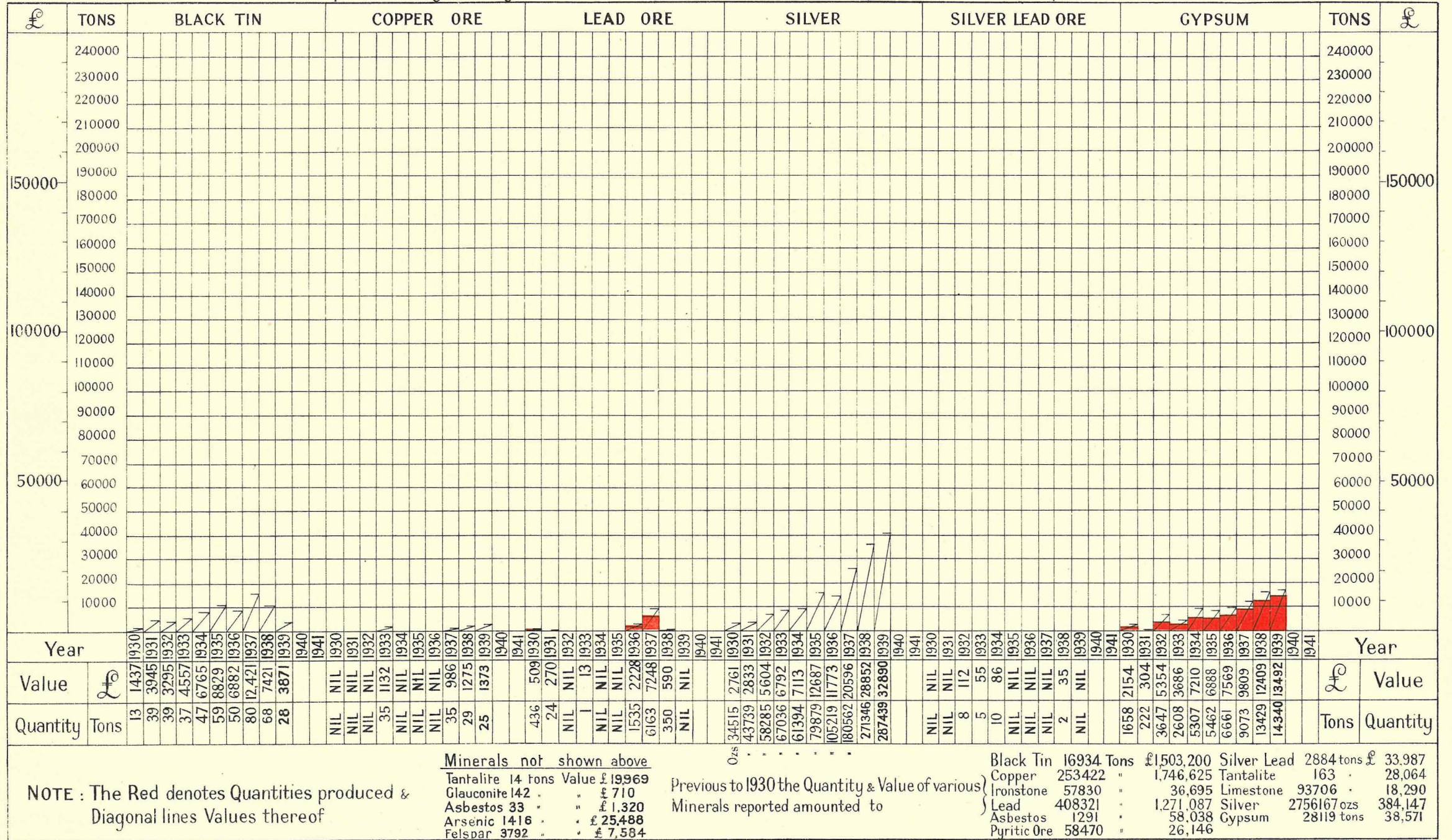
Showing Quantities and Values, as reported to Mines Dept., from 1915 onwards



YEAR		1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	YEAR		
VALUE	£	137589	147823	191822	204319	270355	350346	407117	381555	368949	363255	363203	394400	407967	420145	426706	394758	336178	270630	289806	278701	318013	331565	340444	375083	362811				£	VALUE	
QUANTITY	Tons	286666	301526	326550	337039	401713	462021	468817	438443	420714	421864	437461	474819	501505	528420	544719	501425	432400	415719	458399	500343	537188	565075	553510	604793	557535				Tons	QUANTITY	

D I A G R A M

of the Mineral Output showing Quantity & Value of Minerals other than Gold & Coal reported to the Mines Dept from the Year 1930 onwards



NOTE : The Red denotes Quantities produced & Diagonal lines Values thereof

Minerals not shown above
 Tantalite 14 tons Value £ 19969
 Glauconite 142 " " £ 710
 Asbestos 33 " " £ 1,320
 Arsenic 1416 " " £ 25,488
 Felspar 3792 " " £ 7,584

Previous to 1930 the Quantity & Value of various Minerals reported amounted to

Black Tin	16934 Tons	£1,503,200	Silver Lead	2884 tons	£ 33,987
Copper	253422 "	1,746,625	Tantalite	163 "	28,064
Ironstone	57830 "	36,695	Limestone	93706 "	18,290
Lead	408321 "	1,271,087	Silver	2756167 ozs	384,147
Asbestos	1291 "	58,038	Gypsum	28119 tons	38,571
Pyritic Ore	58470 "	26,146			

PART IV.—MEN EMPLOYED.

TABLE 10.

Average number of Men reported as engaged in Mining during 1938 and 1939.

Goldfield.	District.	Reef or Lode.		Alluvial.		Total.	
		1938.	1939.	1938.	1939.	1938.	1939.
1. Kimberley ... ..	...	22	29	6	5	28	34
2. Pilbara	Marble Bar	237	265	3	3	240	268
3. Ashburton	Nullagine	66	75	4	4	70	79
4. Gascoyne ... ..	...	35	38	...	1	35	39
5. Peak Hill ... ..	...	...	...	3	5	3	5
6. East Murchison	Lawlers	57	65	...	6	57	71
	Wiluna	192	215	...	...	192	215
	Black Range	1,347	1,184	...	...	1,347	1,184
	Cue	402	375	...	...	402	375
7. Murchison	Meekatharra	765	813	3	2	768	815
	Day Dawn	244	204	7	5	251	209
	Mt. Magnet	64	72	6	3	70	75
8. Yalgoo ... ..	...	469	553	...	...	469	553
	Mt. Morgans	357	306	...	...	357	306
	Mt. Malcolm	139	210	...	...	139	210
9. Mt. Margaret	Mt. Margaret	487	472	...	...	487	472
	Menzies	731	822	...	...	731	822
	Ularring	427	309	15	14	442	323
10. North Coolgardie	Niagara	261	288	9	10	270	298
	Yerilla	61	54	...	...	61	54
11. Broad Arrow ... ..	...	209	148	7	7	216	155
12. North-East Coolgardie	Kanowna	666	644	27	25	693	669
	Kurnalpi	105	81	8	9	113	90
	East Coolgardie	44	38	5	4	49	42
13. East Coolgardie	Bulong	4,397	4,356	44	35	4,441	4,391
	Coolgardie	94	74	8	5	102	79
14. Coolgardie	Kunanalling	927	945	73	75	1,000	1,020
	...	353	309	32	35	385	344
15. Yilgarn ... ..	...	938	908	...	...	938	908
16. Dundas ... ..	...	851	1,008	21	...	872	1,008
17. Phillips River ... ..	...	73	74	...	...	73	74
18. State Generally ... ..	...	60	27	4	2	64	29
Total—Gold Mining		15,080	14,961	285	255	15,365	15,216
MINERALS OTHER THAN GOLD.							
	Arsenic	19	10	...	...	...	10
	Asbestos	58	26	...	...	...	26
	Beryl ... ..	...	2	...	...	...	2
	Bismuth ... ..	...	4	...	...	...	4
	Fireclay ... ..	...	4	...	...	...	4
	Coal	765	752	...	...	...	752
	Copper	4	4	...	...	...	4
	Felspar	9	16	...	...	...	16
	Glass Sand ... ..	...	2	...	...	...	2
	Glauconite	3	3	...	...	...	3
	Gypsum	22	21	...	...	...	21
	Iron Ore	54	46	...	...	...	46
	Lead Ore	4	2	...	...	...	2
	Magnesite	1	1	...	...	...	1
	Mica	5	5	...	...	...	5
	Red Oxide	2	3	...	...	...	3
	Potassium Aluminium ... ..	...	2	...	...	...	2
	Scheelite ... ..	...	3	...	...	...	3
	Tantalite	34	25	...	...	...	25
	Tin	65	50	8	...	...	50
	Vermiculite ... ..	...	2	...	...	...	2
Total—Other Minerals		1,045	983	8	...	1,053	983
GRAND TOTAL		16,125	15,944	293	255	16,418	16,199

PART V.—ACCIDENTS.

TABLE 11.

MEN EMPLOYED IN MINES KILLED AND INJURED IN MINING ACCIDENTS
DURING 1938 AND 1939.*A.—According to Locality of Accident.*

Goldfield.	Killed.		Injured.		Total Killed and Injured.	
	1938.	1939.	1938.	1939.	1938.	1939.
1. Kimberley ... ..	...	...	...	...	...	...
2. West Kimberley ... ..	...	...	...	...	...	...
3. Pilbara	3	...	4	3	7	3
4. West Pilbara ... ..	...	...	...	...	...	...
5. Ashburton ... ..	...	...	2	...	2	...
6. Gascoyne ... ..	...	...	...	...	...	...
7. Peak Hill ... ..	...	...	...	...	...	...
8. East Murchison	2	7	135	156	137	163
9. Murchison	5	9	58	107	63	116
10. Yalgoo	1	...	2	2	3	2
11. Mt. Margaret	3	3	136	159	139	162
12. North Coolgardie ... ..	...	1	16	11	16	12
13. North-East Coolgardie ... ..	...	...	...	...	...	...
14. Broad Arrow	1	...	1	6	2	6
15. East Coolgardie	7	7	570	494	577	501
16. Coolgardie ... ..	...	1	3	16	3	17
17. Yilgarn	2	5	25	21	27	26
18. Dundas	2	5	55	99	57	104
19. Phillips River ... ..	...	...	...	...	...	...
MINING DISTRICTS—						
Northampton	1	...	...	...	1	...
Greenbushes ... ..	...	...	...	...	...	...
Collie	1	1	364	233	365	234
South-West ... ..	...	...	83	88	83	88
Total	28	39	1,454	1,395	1,482	1,434

From the above table it will be seen that the number of fatal accidents for the year 1939 was 39, as against 28 in 1938. The number injured showed a decrease of 59. In the report of the State Mining Engineer, published in Division II. of this report, these accidents are classified according to their causes.

B.—According to Causes of Accidents.

Cause.	1938.		1939.		Comparison with 1938.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. Explosives	1	8	6	13†	+ 5	+ 5
2. Falls of Ground	9	82	8	85	— 1	+ 3
3. In Shafts	5	37	9	42	+ 4	+ 5
4. Miscellaneous Underground	7	987	9	906	+ 2	— 81
5. Surface	6	340*	3	346‡	— 3	+ 6
6. Fumes ... ..	...	...	4	3	+ 4	+ 3
Total	28	1,454	39	1,395	+ 11	— 59

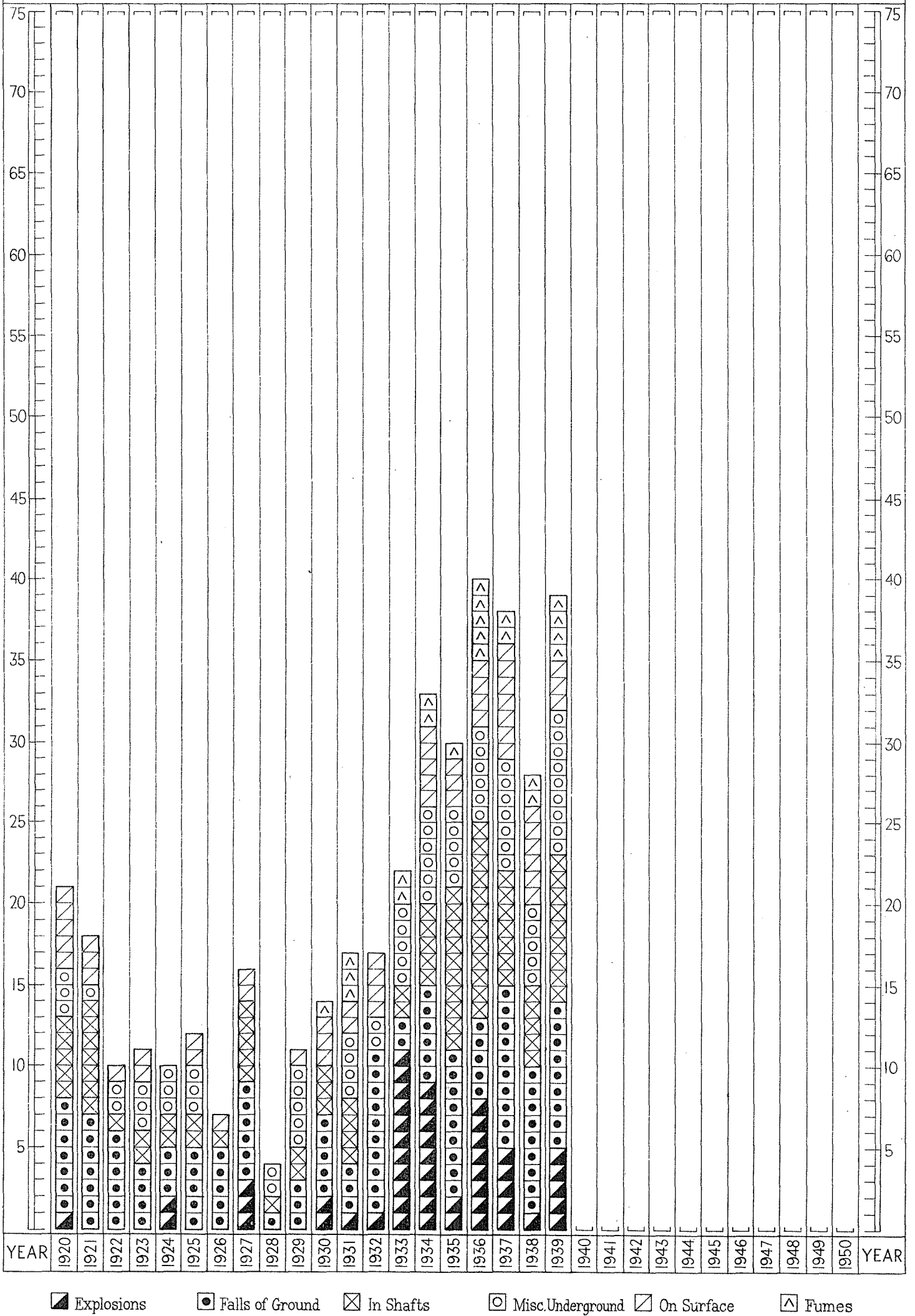
* Includes 83 serious in Quarries. † Includes 2 serious in Quarries. ‡ Includes 86 serious in Quarries.

Thirty-eight fatal accidents occurred on gold mines and one in a coal mine.

The death rate per 1,000 men employed at gold mines was 2.56, as against 1.49 in 1938.

DIAGRAM OF ACCIDENTS

Showing the number of Deaths, arranged in Six Classes, in the Mines of Western Australia, from 1920 onwards



Explosions
 Falls of Ground
 In Shafts
 Misc. Underground
 On Surface
 Fumes

PART VI.—STATE AID TO MINING.

1. The number of State Batteries existing at the end of the year was 23 with three leased. From inception to the end of 1939 Gold and Tin to the value of £10,705,741.77 including Gold Premium estimated at £2,168,098.82 has been recovered from State plants. 2,387,785.6 tons of auriferous ore have been treated and have produced £8,516,185.71 plus estimated premium by amalgamation; £1,913,510.25 by cyanidation; £265,266.11 by slimes; £10,779.7 from residues; and 81,786 tons of tin ore produced tin to the value of £93,834, and, in addition, a sum of £572 was recovered from residues.

2. During the year 101,443.75 tons of ore were crushed for 53,141 ounces of bullion estimated to contain 44,995 ounces of fine gold, equal to 8 dwts. 21 grs. per ton. The average value of tailing produced was 4 dwts. 2 grs., making the average head value 4 dwts. 23 grs. per ton.

52.82% of the tailing produced assayed over 2 dwts. 8 grs. per ton; 42.5% had an average value of 1 dwt. 10 grs. per ton and 4.68% contained too much copper to treat.

The estimated value of gold produced was 44,995 ounces by amalgamation and 14,877.77 ounces from tailing treatment; a total of 59,872.77 ounces valued at £570,339A.

3. The working expenditure for all plants for this year was £110,690 3s. 11d., and the Revenue £121,104 17s. 6d. which shows a profit of £10,414 13s. 7d. on the year's operations.

4. The capital expenditure since inception of the scheme has been £536,795 1s.; £401,335 14s. 1d. from General Loan Fund; £93,051 5s. 6d. from Consolidated Revenue Fund; £28,621 13s. 5d. from Assistance to Gold Mining Industry and £13,786 8s. from Commonwealth Assistance to Metalliferous Mining.

5. Head Office expenditure, including insurance under the Workers' Compensation Act, was £6,313 17s. 9d., against £6,808 15s. 9d. for 1938.

The working expenditure from inception to the end of the year exceeds the Revenue by £71,000 11s. 7d.

GEOLOGICAL SURVEY.

The work of the Geological Survey during the year 1939 is represented by the following reports, which are published in the Annual Progress Report of the Geological Survey for that year:—

- Mineral Claims Nos. 34, 36, 37, 38, 39, 40, Greenbushes Tinfeld,
- A Kyanite Deposit 10 miles S.W. of Bridgetown,
- A Bismuth Carbonate Deposit in a Pegmatite Dyke, M.C. 173 H. Yinnitharra Station (Gascoyne River),

Progress Report on the Geology of Portion of the Mt. Margaret Goldfield,

Some Mining Groups in the Yilgarn Goldfield, (North of the Great Eastern Railway),

Notes on Some Mining Groups in the Mt. Margaret Goldfield.

The systematic examination of the gold deposits and regional geology of a large area in the Mount Margaret Goldfield was carried out, and numerous mining groups in the northern part of the Yilgarn Goldfield were examined.

The field officers provided much practical assistance to prospectors and mine owners in the course of their field work, and as usual the Head Office of the Geological Survey continued to meet the numerous requests for information of a very diverse type concerning the natural mineral resources of our State.

ASSISTANCE UNDER MINING DEVELOPMENT ACT, 1902.

The following statement shows the sum advanced during the year, 1939, under this Act:—

	£
1. Advanced in aid of mining work and equipment of mines with machinery ..	8,340 10 1
2. Subsidies on stone crushed for the public, being amounts paid to owners of plants crushing at fixed rates. Total crushed during the year 4,176 tons	534 16 3
3. Providing means of transport equipment and sustenance for prospectors ..	38,191 3 9
4. Other assistance granted from the Vote during the year on various matters totalled	392 8 3
	£47,458 18 4

The receipts under the Mining Development Act, exclusive of interest payments, amounted to:—

	£
Refund of Advances	2,781 11 1
Sale of Securities	25 0 0
Prospecting Refunds	6,006 15 0
Miscellaneous Refunds	19 7 0
Total receipts for year ..	£8,832 13 1

PART VII.—INSPECTION OF MACHINERY.

The Chief Inspector of Machinery reports that the number of useful boilers registered at the end of the year totalled 4,572 as against 4,401 total for the preceding year, showing an increase after all adjustments of 171 boilers.

Of the total 4,572 useful boilers, 2,617 were out of use at the end of the year; 1905 thorough and 172 working inspections were made, and 1905 certificates were issued.

Permanent condemnations totalled 16 and temporary condemnations 31. There were 4 conversions. Two boilers were transferred beyond the jurisdiction of the Act.

The total number of machinery groups registered was 15,711 against 15,156 for previous year, showing an increase of 555.

Inspections made total 11,631 and 4,293 certificates were granted.

Three hundred applications for engine-drivers' and boiler attendants' certificates were received and dealt with, and 287 certificates, all classes, were granted as follows:—

Winding Competency (including certificates issued under regulation 40 and section 60)	27
First Class Competency (including certificates issued under regulations 40 and 45, and sections 60 and 63)	8
Second Class Competency (including certificates issued under regulation 40 and section 60)	28
Third Class Competency (including certificates issued under regulations 40 and 45 and sections 60 and 63 of Act)	54

Locomotive Competency (including certificates issued under regulation 40 and section 60)	5
Traction Competency (including certificates issued under regulation 40 and section 60)	—
Internal Combustion Competency (including certificates issued under regulation 40 and section 60)	80
Crane Hoist Competency (including certificates issued under regulation 40 and section 60)	10
Boiler Attendants' Competency (including certificates issued under regulation 40 and section 60)	71
Interim	1
Copies	2
Transfers	1
	<hr/> 287 <hr/>

The total revenue from all sources during the year was £8,762 3s. 11d. as against £8,706 13s. 4d. for the previous year, showing an increase of £55 10s. 7d.

The total expenditure for the year was £7,533 17s. 4d. as against £7,168 1s. 11d. for the previous year, showing an increase of £365 15s. 5d. Profit on operations for year was £1,228 6s. 7d.

PART VIII.—SCHOOL OF MINES.

(a) *Kalgoorlie*.—The individual enrolment for 1939, exclusive of Correspondence Course students, reached a maximum of 563 as compared with 606 during 1938, a decrease of 43. The Correspondence Course enrolment totalled 74.

In the Public Assay Branch of the School 720 assays for gold, and 81 mineral determinations were carried out, mainly for prospectors.

The metallurgical laboratory completed 29 investigations into the treatment of ores and mill products, thus greatly assisting mines confronted with ore problems.

(b) *Wiluna*.—The new Wiluna School of Mines building was opened by the Minister for Mines in February, 1939, and consists of a science laboratory, drawing room, engine room and necessary offices and storerooms.

The average class enrolment was 181, compared with 139 during the previous year, an increase of 42.

The school generally experienced a successful year.

(c) *Norseman*.—This school began class work in September last, when 93 individuals making 163 class enrolments, registered. Accommodation has been secured through the enthusiasm and generosity of the local mining companies, road board and semi-public bodies.

A much increased enrolment is anticipated for 1940, as during the year just passed epidemics of measles and mumps at Norseman reduced registrations and somewhat affected classes.

STAFF.

During the year the Department suffered the loss of two of its outstanding officials in the persons of the late Dr. E. S. Simpson, Government Mineralogist

and Analyst, and Mr. E. McGinn, Warden and Resident Magistrate of Kalgoorlie.

Dr. Simpson died very suddenly in August last and left behind him a wonderful record of service. His reputation as a scientist was Empire wide, and his knowledge of Western Australia's minerals was second to none. He has been succeeded by Mr. H. Bowley, who was for many years Assistant Government Analyst.

Mr. McGinn retired during the year and left a vacancy very hard to fill. As warden he was renowned for his wide knowledge of mining law, and for his ability in administering same with wisdom and justice. He was a tower of strength to the Department during the exceedingly busy years from 1930 on, when, on account of the continued rise in the price of gold, there was a rapid and regular increase in mining activity.

CONCLUSION.

In dealing with the various activities, I have commented only on the principal items. Detailed information is given in the reports of the responsible officers, published in Divisions II. to VIII. of this report.

In conclusion, I desire to acknowledge the loyal support received from every officer of the Department during what proved to be a very busy year.

I have, etc.,

A. H. TELFER,
Under Secretary for Mines.

Department of Mines,
Perth, 31st March, 1940.

Division II.

Report of the State Mining Engineer for the Year 1939.

The Under Secretary for Mines.

Sir,—I have the honour to submit for the information of the Hon. Minister for Mines, my report on this branch of the Mines Department for the year 1939.

STAFF.

District Inspector D. G. Matheson resigned his position in January. Travelling to London, he received an appointment in West Africa, but later in the year returned to this State as Underground Superintendent of the Wiluna Gold Mines, Limited. During his two and a half years term as Inspector of Mines, Mr. Matheson carried out his duties in an exemplary manner and it was with great regret that his resignation was accepted.

Mr. C. F. Adams was appointed District Inspector of Mines at Cue in place of Inspector Matheson, taking up his duties in March.

District Inspector I. W. Morley, who was stationed at Kalgoorlie, resigned in October, in order to accept the position of Assistant State Mining Engineer for Queensland.

Mr. L. C. Olive was appointed District Inspector of Mines, filling the vacancy caused by Inspector Morley's resignation. His appointment dates from early in the New Year.

Mr. J. E. Lloyd was appointed Assistant Ventilation Officer, taking up his duties in February. Mr. Lloyd was previously on the staff of the Forests Department.

ACCIDENTS.

The total number of accidents reported to the Department for the year was 39 fatal and 1,395 serious (including one fatal and 321 serious accidents in coal mines and quarries). These figures show an increase of 11 fatal and a decrease of 59 serious accidents on the previous year.

Of the fatal accidents 38 occurred on gold mines and one on a coal mine. Six of the victims were prospectors, eight were employees of small mines and the remainder were employed on the principal mines. There were no fatalities in quarries.

The total number of serious accidents reported on gold mines was 1,074, as compared with 1,007 for the previous year, an increase of 67. The average number of men employed decreased from 15,374 to 15,216.

On the coal mines the number of serious accidents decreased sharply from 364 to 233, while the average number of men employed decreased from 765 to 752.

Table A (page 22) shows a classification of the serious accidents sub-divided into major and minor injuries. The accidents are shown for each goldfield, the Collie Coalfield and the South-West Mining District.

It will be noted that the proportion of major injuries involved in the serious accidents is 20% on the goldfields, 1.1% in the quarries and 11.9% in the Collie coal mines.

Hand and finger injuries again comprised about one-third of the total accidents, while foot and toe injuries accounted for about 13%.

It is interesting to note, in view of the fact that the wearing of helmets underground was made compulsory towards the end of the year, that the total head accidents was reduced from 81 in 1938 to 60 in 1939, although it is perhaps too soon to hope for a definite reduction of accidents due to this regulation.

Mines Safety Committee.

This committee, which was formed in 1937, held six meetings during the course of the year, at which various matters were discussed and much useful information collected.

The question of combating the danger from explosives fumes received special attention and arrangements were made with the Mines Department to have experiments conducted with this object in view.

A considerable amount of experimental and research work was carried out by Messrs. Lewis and Dod of the Kalgoorlie School of Mines in the direction of minimising the toxic properties of explosives fumes. The method adopted was the introduction of chemical bullets into the blasting charges which, on firing, would form gases capable of neutralising

TABLE A.
SERIOUS ACCIDENTS—1939.

Goldfield.	Major Injuries—Exclusive of Fatal.																					Minor Injuries.														
	Fractures.											Amputations.					Loss of Eye.	Serious Internal.	Hernia.	Dislocations.	Other Major.	Total Major.	Fractures.		Head.	Eyes.	Shoulder.	Arm.	Hand.	Back.	Rib.	Leg.	Foot.	Other Minor.	Total Minor.	
	Head.	Shoulder.	Arm.	Hand.	Spine.	Rib.	Pelvis.	Thigh.	Leg.	Ankle.	Foot.	Arm.	Hand.	Finger.	Leg.	Foot.							Toe.	Finger.												Toe.
East Coolgardie	1	3	5	8	...	9	...	1	6	3	1	1	...	6	1	1	7	7	2	14	76	22	17	22	8	11	19	132	57	9	37	49	35	418
Yilgarn	1	...	1	1	2	1	2	1	...	1	10	1	1	1	4	2	...	1	1	...	11
Broad Arrow	1	3	4	1	1	...	2
Coolgardie	1	...	...	...	...	...	...	1	...	1	...	...	1	...	...	...	...	...	...	...	...	4	...	...	2	1	...	2	3	...	...	1	3	...	12
Dundas	...	2	...	...	...	4	...	1	...	...	2	...	1	...	...	...	2	1	1	8	22	4	5	2	1	3	4	26	11	1	6	7	7	77	
North Coolgardie	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	2	...	1	...	...	...	2	5	1	...	...	...	...	9
Mt. Margaret	1	...	1	...	1	3	...	1	...	...	...	...	16	...	...	...	1	2	2	1	1	30	6	1	4	4	5	12	40	19	1	21	10	6	129
East Murchison	3	...	1	...	...	4	...	1	4	3	...	...	...	...	...	...	1	2	1	5	25	9	4	4	2	1	10	46	8	3	15	15	14	131	
Murchison	2	...	1	3	1	6	...	5	1	9	...	...	4	...	...	...	...	1	...	12	45	8	5	3	5	4	2	16	4	...	4	6	5	62	
Yalgoo	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pilbara	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	1	...	...	...	...	...	...	2
South-West Mining District	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	3	3	9	2	8	16	10	1	13	9	12	87	
Collie Coalfield	...	...	2	2	...	14	...	1	...	4	...	...	4	...	...	...	...	1	...	...	28	1	14	11	8	9	22	40	17	4	43	17	19	205	
Total	9	5	11	14	2	41	...	1	17	8	19	3	...	35	1	3	14	15	5	47	250	52	50	51	39	36	82	330	129	19	141	117	99	1,145

the toxic gases released by the explosion. In these experiments the assumption is made that in addition to carbon monoxide (CO), nitrogen peroxide (NO₂) and sulphuretted hydrogen (H₂S) may be present in dangerous quantities. A number of tests of this method have been made in practice and some success is claimed.

Sample gas masks were given particular attention by the committee.

Safety first methods and posters were dealt with and it is hoped that, by continually bringing the necessity for care prominently before persons engaged in the mining industry, many accidents and mishaps will be prevented.

The wearing of hard hats by all underground workers was made compulsory by regulation during the year.

The use of safety boots, gloves and eye protectors has received attention and the compilation of useful data is in progress, on the completion of which recommendations will be made.

In reporting a considerable increase over the previous year's total of fatal accidents, it is regrettable to note that a larger proportion than usual of these fatalities consisted of what might be termed easily preventable accidents and were largely due to carelessness, and in some cases ignorance, on the part of the victims themselves.

On account of the occurrence of numerous accidents due to fumes, previously reported as "Miscellaneous Underground," I have this year included these under a separate heading in segregating the accidents according to cause (Table C).

Table 11, showing the locality of all fatal and serious accidents, is forwarded herewith for inclusion in your Annual Report, together with a diagram showing fatal accidents year by year arranged according to their causes.

Table B, hereunder, shows the number of fatal accidents recorded during the last five years and the death rate per 1,000 men employed.

Hereunder is a brief description of all fatal accidents that occurred during the year.

FATAL ACCIDENTS.

Explosives.

There were six fatal accidents during the year due to explosives.

James Kerrisk, a miner employed by the Western Mining Corporation, was employed in boring a hole into a broken piece of rock in order to break it into

smaller lumps. He was guiding the drill while another man named Healy was holding it. An explosion suddenly occurred, killing Kerrisk and totally blinding Healy. No miss holes had been reported from the previous firing and it is thought that the rock that was being broken must have included part of a hole containing unexploded fractureur.

There was no evidence of carelessness or neglect.

John Harkins, a machine miner employed by the Youanmi Gold Mines, had recharged five missed holes in a sub-level, and was in the act of lighting up the charges when an explosion occurred which inflicted fatal injuries on him and also injured a bogger standing a few feet away.

There is no evidence as to what caused the explosion, but it would appear that possibly no firing cartridge was used.

Peter Alba and Giacomo Armani were two of a party of three prospectors sinking a shaft on their prospecting area at Wither's Find. They had fired three holes at the bottom of the shaft and had suspected a misfire. The following morning Alba descended the shaft and cleaned out all the dirt. No fractureur was found lying about. It was then decided to clean out the missed hole with the object of recharging and firing it. An attempt was made to do this with the scraper, but this method was discarded as too slow. Alba and Armani then started to use the hammer and drill while the third man climbed about 12 feet up the shaft. After cleaning out about two inches of dirt they scraped the hole out and started drilling again. An explosion immediately occurred, inflicting shocking and fatal injuries on Alba and Armani and hurling the third man to the bottom of the shaft.

No terms can be too strong to describe the shocking stupidity of the method adopted to clean out this hole.

Russell Holt, a machine miner employed at the Mt. Barker Mine at Norseman, was charging a hole preparatory to firing. He was in the act of tamping when the charge exploded and blew the tamping stick through his body. It is thought that the "rubbly" nature of the tamping used and perhaps the fact that the hole itself was rough and uneven may have contributed towards the accident, as fractureur in the form of a thin film on the side of the hole will explode much more readily than in the form of a plug.

Thomas John Callaghan was a miner employed at the North End Mine at Jonesville. He was working in a shallow winze seven feet deep in which he had charged eight holes. He was having some difficulty in getting the fuses to light, and as the time since

TABLE B.

	1935.	1936.	1937.	1938.	1939.
Fatal accidents to men engaged in mining (exclusive of quarries)	30	38	38	28	39
Total number of men engaged in mining (average)	15,557	16,652	17,136	16,419	16,199
Accident death rate per 1,000 men	1.93	2.28	2.22	1.70	2.41
Fatal accidents at quarries ... ..	...	2	...	...	...

lighting the first fuse was advancing, he was advised by his mate to leave. He would not do so, and as he was lighting the last fuse the first shot went off. His mate, at great personal risk, went to his assistance, but the second shot went off and buried him. The other shots then went off in order, and when he was extricated he was dead.

No firing cartridge was used, as required by the Mines Regulation Act, and the deceased showed great lack of judgment in remaining in the winze so long. This accident was definitely preventable.

Falls of Ground.

Fatalities under this heading during the year numbered eight.

Leonard Thomas Bills, a shoveller on the Triton Gold Mine, had just gone on shift and was waiting at the intersection of a drive and a crosscut with three other shovellers for the machine man to bar down some heavy ground. The machineman had to adjust his lamp, which was out of order, before barring down, and having done this had just returned to the face when a fall occurred from the roof and wall, knocking down all five men and fracturing Bills' skull, killing him instantly.

There was no evidence of any neglect.

Archibald Douglas Corbett, a pipe fitter in the employ of the Lake View and Star Ltd., with a mate, was laying pipes down a rill stope, when a piece of ground fell on them, which killed Corbett and seriously injured his mate.

A miner had previously endeavoured to pull down this ground with a bar, but was unsuccessful and he thought it was reasonably safe for the time being, but had decided to shoot it down at the end of the shift.

There was no evidence of neglect or carelessness.

Giacomo Rinaldi was a miner employed on the Phar Lap Gold Mine at Meekatharra. He and a mate were picking mullock in a stope above the 70 ft. level when a piece of rock about 7 ft. long and 12 inches thick came away without warning, and fell on the two miners, causing fatal injuries to Rinaldi and lesser ones to the other man.

The loose piece of rock had previously been sounded and was considered safe.

Ritchie Longueville Egan was employed as a timberman by Wiluna Gold Mines, Limited. He had occasion to go to a sub-level to obtain some explosives. While there the contractors, who were barring down some bad ground, told him that there was more bad ground in the sub-level further ahead. He went in with one of the contractors to look at the ground when a fall occurred, which killed Egan and slightly injured the contractor.

There was no evidence of any neglect or carelessness.

Ernest Robert Boyd, a coal miner, employed at the Stockton Colliery, with a mate was firing a shot in the bottom rib of a bord. Having lit up, the mate walked down the heading to a safe position, while Boyd went up the heading. After the shot had gone off, the mate returned to the face and

noted that the roof appeared safe. Boyd then returned from the opposite direction and had almost reached the bord when a fall of coal occurred from a pillar about 21 feet from where the shot was fired, and knocked him over, badly fracturing his skull. Such a fall is unusual and unexpected and there was no evidence of carelessness or neglect.

Don Melendez was a miner employed by the Great Boulder Proprietary Gold Mines. He was working in a stope and, accompanied by his mate, had just gone on day shift and had started to bar down to make the back safe when a large slab of rock fell on him and killed him. According to the evidence the place did not look dangerous, and there was a suggestion that the slab may have been loosened by an earth tremor which occurred some hours previously.

Robert Crosby, a miner employed by the Big Bell Mines, N.L., and his mate were instructed to fire a piece of bad ground on a bench in No. 16 Glory Hole. They had previously tried without success to bar this ground down. The two men were standing on the bench, each fitted with safety belt and rope, and were boring a pop when the bench came away. Crosby's rope broke and he was precipitated to the bottom of the glory hole and killed. His mate's rope held.

It is probable that Crosby was working with too much slack on his safety rope. Measurements of the ropes after the accident showed that he had 13 feet more slack than his mate.

Daniel Crowley was an employee of the Riverina Gold Mine. He was shovelling ore in a shrink stope which had been nearly emptied when a small slab of rock fell from the hanging wall, about 25 feet above where he was working, striking him on the head and killing him. He had a hard hat, but does not appear to have been wearing it at the time of the accident. The Inspector of Mines, after viewing the scene of the accident, was of the opinion that had he been wearing his hat the injury would not have proved fatal.

Shafts.

There were nine fatalities for the year under this heading.

Jacques Bosh was one of a party of four putting in a set of shaft timber 51 feet from the bottom of the Big Bell main shaft. In the course of his work he walked along the north wall plate, which was supported by three hanging bolts, when it tilted, precipitating him to the bottom of the shaft. The nut and washer had evidently become disconnected from one of the hanging bolts, which slipped out of the hole in the wall plate, causing it to tilt. No one appeared to know how or when the nut came adrift.

Thomas Henry Manning, a prospector at Westonia, was filling buckets with dirt at the bottom of a shaft 80 feet deep and his son and another man were pulling them to the surface by windlass. When a bucket of dirt was within two feet of the brace, the rope broke, the full bucket falling on Manning and killing him instantly.

The evidence showed that the rope was rusty and rotten and the timber in the shaft badly ant eaten. Evidently no one thought it was his duty to examine the rope, and a definite risk was taken with defective equipment.

Frank Langford, a prospector, was working in an old shaft on the Copperhead lease at Bullfinch. The shaft was not close timbered and a loose stone, about 50 lbs. in weight, finding its way out between the timber and after falling perhaps 30 feet, struck Langford on the head, causing fatal injuries.

From inquiries it would appear that both Langford and his mate had examined the stone, which was part of some old filling and was protruding into the shaft, and had considered it safe. They appear to have shown lack of judgment or to have been careless in the matter.

This accident could have been prevented by taking more care.

Henrik Henriksen and Ezzio Guiseppa Bombardieri were working at the bottom of the main shaft at the Triton Gold Mine with three other men. Shaft mullock was being hoisted from the bottom of the shaft to the No. 6 Level. A full kibble was being hoisted, and, when about halfway between Nos. 10 and 11 Levels, the rope broke and the full kibble fell to the bottom of the shaft, striking and killing Henriksen and Bombardieri and injuring one other man. The other two men escaped uninjured.

Investigations showed that a portion of the cast iron sheave at the No. 6 Level had broken away. Some of the strands of the rope were cut where they struck the broken sheave and the weakened rope broke when it came off the sheave and struck the axle of the sheave wheel.

There was no evidence of neglect or carelessness and a test of the rope subsequently carried out in the Midland Junction Workshops showed that it was in good order.

George Harry Schildt, an employee of the Central Norseman Gold Mines, was riding in the skip with four other men, including the platman. The shaft is an underlay, and the timber trolley was attached to the bottom of the skip. The skip descended to the 1,200ft. level and the platman and one other man got off in order to unload some timber from the trolley. The platman rang to the driver to pull the trolley to the plat level and then called to Schildt to throw out a small parcel of nails that was in the skip. Schildt stood up to throw out the parcel as the skip moved away and was caught by the cap piece of the first set above the plat, and crushed between the timber and the top of the skip.

The platman should not have asked Schildt to throw out the parcel while the skip was in motion, although Schildt could have thrown it without standing up.

This accident was due to thoughtlessness.

Herbayne Wakeford Turrell was employed as a platman by the Great Boulder Proprietary Gold Mines. One of his duties was to grease the sheave wheel in the sinking compartment, about 50 to 60 feet above the 2,650ft. level plat. The middle compartment, in which the sheave was situated, was covered above the wheel with a penthouse, so that nothing could fall and hit Turrell so long as he remained in that compartment. He was hoisted up the middle compartment on a monkey, and while he was

thought to be greasing the wheel, the service cage descended the haulage compartment and for some unexplained reason it struck Turrell and he fell down that compartment on to the penthouse below the 2,650ft. plat, sustaining fatal injuries.

It is not an easy matter to get from the sinking to the hauling compartment and there appeared to be no reason why he should wish to do so.

Giulio Annibale Aiberti was a miner employed on the Klondyke Gold Mine at Day Dawn. In descending the shaft by the ladders he fell a distance of about 100 feet, sustaining fatal injuries. The ladders were in good condition and there was no evidence to show what caused him to fall.

Peter Deboni was the victim of a peculiar accident on the Youanmi Gold Mines. He was riding in the cage with two other men when, according to the evidence, a sudden jerk occurred, throwing all three men off their feet, and Deboni was apparently crushed between the shaft timbers and the cage, receiving multiple injuries which caused his death.

The ostensible cause of the accident was that the winding rope rode on the flange of the drum and dropped back suddenly into position, causing a jolt. The winder driver stopped the engine as soon as he felt the jolt and waited for a further signal before he moved it again.

It seems strange that a jolt caused in this manner should be sufficient to throw three men off their feet, but no other solution was offered at the inquest.

Fumes.

There were four deaths during the year due to asphyxiation by poisonous fumes.

Thomas Felby Gomm, William Fraser and Alfred Robins were the victims of a most unfortunate and quite unnecessary triple tragedy on the Maybelle Gold Mine at Norseman.

Two faces comprising 34 holes had been fired the previous afternoon at four o'clock in a short cross-cut off a winze 50 feet below the 50ft. level. The winze was not blown out after firing, the usual practice being to leave it until the next day. On the following morning about 8.30, Gomm and Fraser were instructed by the manager to go below and prepare to clean out the dirt from the winze, Gomm being instructed to give it a good blow out. It generally took from a quarter to half an hour to clear the foul air out.

Gomm evidently only waited a few minutes before descending by the ladders. Before reaching the bottom he was overcome by the fumes and fell to the bottom. Fraser, after giving the alarm, returned to the winze and climbed down the ladders to Gomm's assistance, followed by Robins. These men did not take the precaution to attach ropes to themselves as they descended and they were both overcome and fell to the bottom of the winze. The bodies covered the nozzle of the air hose and restricted somewhat the free flow of the air. When the men were finally extricated all were dead.

Had the usual practice of blowing out the winze been followed, no accident would have occurred.

Had the rescuers attached ropes to themselves as they descended, they could have been hauled back into safety as they collapsed.

Had the rescuers not fallen on Gomm, there would possibly have been sufficient air from the hose to save his life.

The mine and appliances were in safe working condition and the accident was not due to any neglect on the part of the management.

Thomas McKenzie was one of a party of three men who were making an examination of an old shaft, 130 feet in depth, called the Lady Luck, near Coolgardie road, about 15 miles from Kalgoorlie.

A windlass had been erected and Mr. W. J. Martin, one of the party, descended in the bucket to the bottom and entered a drive. Finding bad air there, he signalled to be pulled to the surface. In an endeavour to get rid of the foul air, the party lit a fire in the bucket and moved it up and down the shaft several times in order to draw out the fumes. In doing so they were badly advised, as the shaft was not connected with any other workings and consequently no draught was set up, and the effect of the fire was to use up the oxygen in the air.

A few hours later McKenzie decided to go down the shaft. He took a rope with him, but, although recommended to do so by Martin, he did not tie himself to the winding rope. This omission cost him his life.

When he had descended about 50 feet he called out to his mates to stop and pull him up. When 20 feet from the surface he again called to them to stop. They did so and almost immediately heard him fall down the shaft.

Martin, after obtaining assistance, tied himself into the kibble, put a wet cloth over his mouth and nostrils and descended the shaft and recovered the body.

The jury, in their finding of accidental death, added a rider commending William Joseph Martin for his bravery in going to the aid of the deceased under dangerous circumstances.

Miscellaneous Underground.

There were nine fatalities for the year classified under this heading.

Milan Sumich was a member of a party working a tribute on the Great Boulder Mine. He was standing on a ledge in a winze barring down some bad ground after firing a stope cut, when he missed his footing and fell some 60 feet into the stope below, receiving severe head injuries, which caused his death later.

Before starting to bar down he was advised by his mate to tie a rope around himself, as the ledge on which he was standing offered a rather insecure foothold. He refused, however, saying that the job would only take a few minutes.

This accident would not have occurred had Sumich taken proper precautions and used the rope provided for the purpose.

Clarence Stanley Kyrwood, a miner in the employ of the Big Bell Gold Mine, was engaged in charging up some holes for electric firing on a bench in a glory hole, some 40 feet below the surface. Other miners were working on the same bench and all were provided with ropes and safety belts. Kyrwood was heard to call out and was seen to fall to the bottom of the glory hole. He received fatal injuries.

Strict instructions are issued by the management that safety belts be worn by all men working

in glory holes. Kyrwood was seen wearing his belt some time prior to the accident, but the reason why he took it off is not known.

This is another accident which would have been averted had the victim observed the ordinary precautions.

Ilija Martinovich was electrocuted at the No. 29 Plat on the Sons of Gwalia Gold Mine. It is not known exactly how this occurred, but it is surmised that he attempted to hang his lamp on the electric light wires, which were about 7 feet 3 inches above the floor of the plat. The wires were broken and the lights extinguished simultaneously with the accident.

An examination of the wiring arrangements disclosed no faults.

Leslie Chisholm Cox, a surveyor on the Wiluna Gold Mines, with his assistant, had been measuring up some stoping about 120 feet below the 1,400ft. level. Having completed the work, the assistant climbed the ladders to the 1,400ft. level and, on receiving the signal from Cox, proceeded to hoist him up to that level on the kibble. When the kibble was a few feet below the sub-level at 1,440 feet, a slight jerk on the rope was felt, and the assistant stopped the hoist. On investigation he found the kibble empty. Cox had fallen out and was found fatally injured on the stage at the 1,475 ft. sub-level. The evidence did not reveal the cause of his fall.

There was no evidence of carelessness or neglect.

Marin Separovich was a miner working on afternoon shift with several others in No. 16 glory hole on the Big Bell Gold Mine. At crib time, 8 p.m., all men left their work, climbed to the surface and went to the change room for their crib. It was usual to climb up the ropes or ladders on the hanging wall side of the open cut, which was not so steep as the footwall side, although the distance to travel was somewhat greater.

Separovich, although all the other men travelled up the hanging wall side, chose the steeper footwall, and it was noticed after crib that he was missing. A search located his body in a chute just above the main haulage level.

It is not known what caused him to fall, but the evidence showed that he chose to climb to the surface by a steeper and more difficult route than that chosen by the other men.

There was no evidence of carelessness or neglect.

Eric Paul Davis was driving a hoist at a winze in the Bulletin Shaft workings of the Wiluna Gold Mines. While his mate was working in a crosscut off the winze, Davis fell down to the bottom and sustained extensive head injuries, causing his death.

The cause of the fall is unknown, as there were no witnesses.

Dane Stankovich, a miner employed by the Wiluna Gold Mines, and his mate were preparing to fire a pillar in a stope above the 450ft. level. It was necessary, before firing, to remove the ladders from the manway and was apparently customary to drop them down the manway to the level below. Stankovich had descended to the level in order to remove the ladders as they were dropped. He had removed the first ladder that was dropped and had stepped back into a safe position and given the signal to drop the second ladder. For some unknown reason he

stepped back into the manway as the second ladder was dropped and it struck him, inflicting fatal injuries.

Vincent Braovich, an employee of the North Kalgurli (1912) Gold Mine, was working in a shrink stope when he was called out by another miner who was about to fire. He had to walk over some loose broken ore, and, in doing so, appears to have slipped and fallen back, striking his head on a rock and causing fatal injuries. He was wearing boots with smooth rubber soles and no laces at the time, and it is thought that this fact may possibly have been contributory to the accident.

John McCarthy, a miner on Hannan's North Gold Mine, was engaged in running a beaten out shrink stope. As the ore was not running freely out of the chinaman chute, he walked out on top of the ore to ascertain the cause of the trouble. He apparently poked the top of the rill and the broken ore ran suddenly, carrying him some 60 feet down the rill and leaving him buried under it. He was recovered with great difficulty some 12 hours later, still alive, but died shortly afterwards from shock and heart failure.

Considerable difficulty was experienced in digging him out, owing to the rill running and refilling any excavation made. The method finally adopted was to put bearers across the stope and driving drill steel behind them, which stopped the rilling of the broken ore and allowed the victim to be extricated. (See Appendix No. IV.)

Had McCarthy taken a rope with him when he went to examine the rill, he would probably have escaped with a few bruises. This was an accident that could have been prevented by a little forethought.

Surface.

There were three fatalities during the year under this heading.

Danilo Vukicovich was employed at the Morgans sands retreatment plant in shovelling sand from a dump into a truck. The height of the face was about 28 feet. The method of working was to shoot the sand loose from the top of the dump and shovel it into trucks. A fall of sand from this face forced Vukicovich against a steel truck and caused injuries to which he eventually succumbed. The fall of sand was probably caused by heavy rains which had permeated the dump. Under ordinary conditions the method of working was reasonably safe.

Work was continued on this face after the accident without the permission of the Inspector of Mines. This fact seriously hampered investigations and the manager was prosecuted and fined.

Arthur Ball, a winding engine-driver employed on the May Queen Gold Mine, received instructions to blow down a boiler and prepare it for cleaning. This was a routine job. Whilst so employed he received extensive scalds, which resulted in his death at the Southern Cross District Hospital some ten days later.

There were no witnesses to the accident, but circumstantial evidence tends to the conclusion that Ball attempted to open the manhole door while there was still a considerable amount of steam in the boiler and sustained scalds from escaping steam and water.

Harry Jennings was employed making tamping by Lake View and Star, Limited. He had finished his day's work and left the tamping room on his bicycle. On turning a corner of the road at the mine store, he swung rather far out and collided with a truck coming from the opposite direction, receiving injuries which proved fatal.

Table C shows the total number of fatal and serious accidents reported to the Department in 1939, classified according to the gold or mineral field in which they occurred and also according to the causes of the accidents.

TABLE C.

Fatal and Serious Accidents showing the Causes and Districts in which they occurred.

	Explosives.		Falls of Ground.		In Shafts.		Fumes.		Miscellaneous Underground.		Surface.		Total.	
	Fatal.	Seri-ous.	Fatal.	Seri-ous.	Fatal.	Seri-ous.	Fatal.	Seri-ous.	Fatal.	Seri-ous.	Fatal.	Seri-ous.	Fatal.	Seri-ous.
1. East Coolgardie ...	...	4	2	9	1	5	...	...	3	381	1	95	7	494
2. Mt. Margaret ...	1	2	...	13	...	6	...	...	1	101	1	37	3	159
3. Coolgardie ...	...	1	...	...	...	1	1	...	...	9	...	5	1	14
4. North Coolgardie...	...	...	1	1	...	1	...	...	...	4	...	5	1	11
5. North - East Coolgardie	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6. Broad Arrow ...	...	...	...	3	...	2	...	...	...	1	...	...	...	6
7. Dundas ...	1	2	...	4	1	11	3	...	...	66	...	16	5	99
8. Yilgarn ...	2	...	...	1	2	2	...	...	...	14	1	4	5	21
9. Murchison ...	...	...	3	6	4	7	...	...	2	69	...	25	9	107
10. East Murchison ...	2	2	1	6	1	5	...	3	3	90	...	50	7	156
11. Peak Hill ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12. Yalgoo ...	...	...	...	...	...	2	...	...	...	...	...	...	...	...
13. Northampton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14. Greenbushes ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15. South-West ...	...	2	...	...	...	...	...	...	...	...	...	86	...	88
16. Phillips River ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17. Collie ...	...	...	1	42	...	...	...	...	...	170	...	21	1	233
18. Pilbara ...	...	...	...	...	...	...	...	...	...	1	...	2	...	3
19. West Pilbara ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20. Ashburton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals for 1939 ...	6	13	8	85	9	42	4	3	9	906	3	346	39	1,395
Totals for 1938 ...	1	8	9	82	5	37	...	...	7	987	6	340	28	1,454

WINDING MACHINERY ACCIDENTS.

There were twenty accidents reported during the year involving winding machinery, including three skip derailments, six overwinds and eleven miscellaneous accidents.

Skip Derailments.

Two derailments were caused through the skip striking stones on the rails, but in neither of these was any damage caused.

In the third accident the skip struck the shaft centres, causing a collapse of the timbers and a fall of ground from the back of the shaft. The damage caused suspension of work on the mine for five and a half days. The cause of this accident was not evident.

Overwinds.

All overwinds were fully reported on by the Inspectors of Machinery, or investigated by the Engine Drivers' Board.

Miscellaneous Accidents.

On five occasions cages became jammed in the shaft owing to loose skids or truck doors opening. Only minor damage was caused.

A fractured crank shaft was caused by a flaw in manufacture, and possibly accentuated by an overwind some time previously.

A butterfly safety hook broke and the safety grips failed to act, causing the cage to fall to the bottom of the shaft. The cage was damaged beyond repair.

The breaking of the tension belt of the brake band and a broken clutch were responsible for a runaway cage.

A skip got out of control, went down the shaft and jammed at the spill doors of an ore chute. The rope pulled out of the drum and piled on top of the skip. The drum was cracked and head frame and spill doors damaged. The accident was due to an error of judgment on the part of the driver.

An accident resulting in fatal injuries to one man was due to the rope riding on the flange of the drum, dropping back and jolting the ascending cage. No damage was done to cage, rope or shaft.

The sheave of an underground hoist broke while a kibble of mullock was being hoisted from the bottom of the shaft. The broken portion of the sheave cut the strands of the rope, allowing the full kibble to fall to the bottom of the shaft where men were working. Two men were killed and a third injured.

ADMINISTRATION.

Amendments of Acts.

Mines Regulation Act, 1906.

Regulation 17.—Amendment of Clause 5, Division 2, re Workmen's Inspectors of Mines. Gazetted 14th July, 1939.

Regulation 2A.—New Regulation issued re Safety Helmets. Gazetted 8th December, 1939.

Regulation 3 amended. Gazetted 8th December, 1939.

Regulation 4.—General Rules 4, 15, 16 and 51 amended. Gazetted 8th December, 1939.

Regulation 11.—Rules 9 and 11 amended. Gazetted 8th December, 1939.

Regulation 16 amended. Gazetted 8th December, 1939.

Regulation 17.—Division 2, Rule 4 amended. Gazetted 8th December, 1939.

Mining Development Act.

Regulation 7, para. (a) amended. Gazetted 17th March, 1939.

Regulation 7 deleted and new regulation inserted in lieu. Gazetted 24th November, 1939.

Coal Mines Regulation Act.

Regulation 51, Part IV., re Plans and Surveys of Mines, Clauses (b) and (c) of paragraph (1) deleted and new clauses substituted. Gazetted 8th September, 1939.

Rule 56.—New rule gazetted re Safety Helmets. Gazetted 8th December, 1939.

PROSECUTIONS.

There were thirteen prosecutions undertaken during the year for breaches of the Mines Regulation Act, 1906, and in each case a conviction was recorded and a fine imposed.

A miner was prosecuted under Section 57 for returning to the face before the fumes of firing had dispersed.

A manager was fined for contravention of General Rule 42, Regulation 4, by not having gates fixed on cages when lowering and raising men.

A shift boss was proceeded against under Section 57 and fined for endangering his own safety by travelling on top of a kibble of stone.

A miner was prosecuted under Section 32, Subsection 39, for riding on a skip when the winding engine driver had been informed by signal (one bell) that no person was so riding.

A manager was proceeded against twice under Section 42 for employing men underground who could not readily and intelligibly speak the English language.

A timberman was prosecuted under Section 57 for endangering his own safety by travelling on top of a skip of ore.

A manager was prosecuted for contravention of General Rule 46, Regulation 4, by constructing a rise of more than 10 feet in height without the necessary sanction of the Inspector of Mines.

A manager was prosecuted under Section 29 for interfering with the place where a fatal accident had occurred, before it had been inspected.

A miner was proceeded against for contravention of Regulation 4, General Rule 49, by failing to use a venturi appliance when supplied by the company.

A manager was prosecuted under the same regulation for failing to provide a venturi in a winze.

A machine miner was prosecuted under Section 57 for neglecting to bar down loose ground in a stope, thus endangering his own life.

Two machine miners were prosecuted for contravention of Regulation 4, General Rule 49, by not using the venturi appliances provided for their protection.

UNDERGROUND SUPERVISORS.

The usual examinations were held in May and October by the Board of Examiners for Underground Supervisors' Certificates of Competency. The total number of candidates examined was 105, of whom 62 were successful in gaining certificates.

There were six Certificates of Service issued to applicants who were employed as underground supervisors at the date of the gazettal of Regulation 17A, one reciprocal certificate of competency was issued without examination to the holder of a Mine Manager's Certificate for another State, and one duplicate certificate of competency was approved and issued to a person who had lost the original.

Copies of the papers set in Mining and Mining Law for the examinations are attached to this report. (Appendix No. III.)

EXEMPTIONS.

In accordance with the provisions of section 34, subsection 4, of the Mines Regulation Act, 1906-38, 163 certificates were issued exempting the holders from the operation of subsection 1 (b) of the same section, as compared with 150 during 1938.

SUNDAY LABOUR.

Twenty-one permits to employ men on Sunday were granted during the year. Details are set out hereunder:—

Eighteen men to work for two Sundays shifting a penthouse and winch and installing them at a lower level, thus saving loss of time in subsequent working of the mine.

Eight men to work one Sunday shifting a penthouse to a lower level.

Six men to work four Sundays opening out a new plat and level.

Six men to work one Sunday emptying waste rock from an underground ore bin.

Four men to work one Sunday cleaning out a shaft well hole.

Twenty-four men to work shaft sinking on Sundays for six months on account of excessive water and continuous pumping.

Eighteen men to work on Sunday for a further six weeks on the same job on the same mine.

Four men to work one Sunday sinking a small shaft to obtain means for mullocking stopes.

Twenty-two men to work on Sundays for twelve months shaft sinking and timbering.

Eight men to work one Sunday picking up an underground ore pass.

Eight men to work one Sunday repairing a transfer pass.

Twenty-five men to work one Sunday mullocking stopes.

Thirteen men to work one Sunday repairing lines and altering grizzlies.

Six men to work one Sunday repairing switch points.

Four men to work one Sunday altering chairs in Main Shaft to suit new cages.

Thirty-six men to work one Sunday transferring timber underground.

Twelve men to work one Sunday repairing main mullock transfer pass.

Eight men to work one Sunday repairing mullock pass.

Twelve men to work one Sunday skidding main shaft.

Fifteen men to work one Sunday skidding main shaft.

All the above permits were granted for the purpose of saving time in subsequent working of the mine.

LOANS AND SUBSIDIES.

The following monetary assistance was given to the mining industry:—

	£	s.	d.
Advances towards development work and equipment of mines ..	8,340	10	1
Providing transport and general assistance to prospectors	38,191	3	9
Subsidies paid to privately owned batteries	534	16	3
Miscellaneous expenditure	392	8	3
	<u>£47,458</u>	<u>18</u>	<u>4</u>

The total expenditure was £47,458 18s. 4d., compared with £21,915 17s. 9d. during 1938 and £7,300 7s. 1d. during 1937. (Appendix I.)

No expenditure was incurred during this year on "Advances on Ores."

VENTILATION.

Increasing attention has been paid to the important item of proper ventilation of mines, which is so vital to the health of mine workers. The appointment of an assistant ventilation inspector has made it possible to widen the scope of investigations in this direction.

Inspector Brisbane's report on this phase of the mining operations is quoted in full hereunder.

During this year the work of surveying those mines in which there is a prospect of improved ventilation has been continued. The mines which have been examined in detail are briefly described as follows:—

Central Norseman.

In this mine the connection of No. 16 level has produced a strong flow of air at the bottom of the mine.

Kalgoorlie Enterprise.

The main shaft of this mine is still upcast. Efforts to reverse the natural ventilation current have not been successful. The development programme will soon produce a new connection and the question of improvement of the ventilation will be renewed when this is made.

Great Boulder Proprietary.

Some trouble has been experienced here because the main ore pass was under pressure from the fan. This pass has been closed off from the mine workings at all levels by concrete stoppings.

Hannan's North.

A fan has been installed at No. 11 level. The main shaft is now downcast and there has been a reduction of temperature in the lower levels.

Iron Duke Gold Mine.

Routine inspection of this mine was made. Conditions are satisfactory.

Ivanhoe Gold Mine.

Dust and temperature surveys of this mine have been made. There has been a slight improvement in conditions in the mine but the lower levels are still warm. Provision for a new fan at the 3,100 level has been made. The fan is expected to arrive early in 1940, and its principal use will be in the ventilation of the No. 3 Lode.

Lancefield.

Poor circulation of air in the lower levels of this mine was traced to leaks in the upper levels.

Norseman Gold Mine.

An additional fan has been installed on this mine. Particular interest attaches to this installation as the two fans in parallel circulate more air than could be otherwise obtained. The power used by the two fans is less than that previously used by the single fan.

Northern Star.

This is a small mine and the use of a ventilating fan at this stage of development is unique in Western Australia. The result has been satisfactory.

North Kalgoorlie.

This mine is connected to other mines in a great many places and the natural ventilation is satisfactory.

Sunshine-Reward (Edward's Find).

The ventilation of this mine was much improved by the use of a small air driven fan.

Tindals.

There has been trouble in this mine due to bad clearance of smoke. Fan ventilation is proposed.

Triton.

Mining operations have increased the resistance to air flow. Improvements to the ventilation system are now under consideration.

White Hope.

Bad clearance of smoke caused some trouble in this mine. The position has been improved by the use of stoppings.

Wiluna.

There has been some improvement in the ventilation of this mine. This is apparently due to the filling of old stopes.

Youanmi.

Fan ventilation for the main shaft workings is proposed.

The appointment of Mr. J. E. Lloyd as Assistant Inspector in March of this year has made it possible for mine surveys to be done more quickly. Some dust sampling work has also been done and the results are summarised in the appendix to this report.

Lead poisoning hazard at the Wiluna Smelters was investigated. Fume hoods over tapping holes and slag spouts were employed and reduced the escape of lead fume. Smelting is now confined to small experimental operations. The substitution of hot slag handling for the granulation process has helped to reduce fume.

The escape of sulphur dioxide from roasters has been the cause of complaint at Wiluna and at Youanmi. This trouble is usually associated with overloaded roasters. At Wiluna a cure has been made by the use of auxiliary flues drawing from the tops of furnaces. At Youanmi, additional roaster capacity has been provided.

Through the courtesy of the Perseverance mine, a test of fans for the ventilation of development ends was made. Information regarding the operating cost of air and electric fans was obtained.

There have been two instances of the occurrence of sulphuretted hydrogen in mine workings. In an old mine called the "Black Swan" at Vettensburg, one man was seriously affected. The gas was removed by the use of lime.

In the sump at the bottom of the Horseshoe No. 2 shaft, which had been newly timbered, a concentration of this gas was detected. Lime was used and no trouble was experienced.

Three men were killed by exposure to the fumes of blasting in the "Maybelle" mine at Norseman. Adequate precautions for the ventilation of the place after firing had not been taken.

In the "Lady Luck" mine, near Kalgoorlie, a concentration of carbon dioxide put out a miner's light. A fire bucket in the shaft was used in an effort to disperse this gas. A man who attempted to descend the shaft was killed by falling from the bucket.

One man, after being subjected to fumes was found to be suffering from an injured heart and was compensated for total disability.

For the districts controlled from Kalgoorlie, twenty-three accidents, as a result of fumes, have been reported. None of these cases was "serious."

Dust Sampling.

The results of dust samples taken and counted by Assistant Inspector Lloyd are recorded and a monthly summary is made.

From these records the results have been segregated under four headings, namely, Levels, Development, Stopping and Surface, according to the place in which the sample was taken. The total number of particles in each group has been divided by the number of samples taken to give the "average count" for the month. The weighted average of these figures is given against the total number of spots taken during the year.

Those spots which could not be counted and which were reported as 1000 + p.p.c.e. are included in the averages at 1000. The position is therefore made to appear slightly better. Most spots of 1000 + p.p.c.e. are due to some defect. These conditions are frequently of a temporary nature and the high count is therefore not an index of the average conditions in the place where it is taken.

Many of the spots are purposely taken in places where conditions are considered to be bad. This has an adverse effect on the indication. As an instance, the high average count on levels during the month of July is due to several spots taken in places known to be bad.

The total number of samples taken during the year is 396 and the average of all the samples is 321 p.p.c.e.

DUST SAMPLING.

Summary of Samples taken during 1939.

Month.	Levels.		Development.		Stoping.		Surface.	
	No.	Average Count.	No.	Average Count.	No.	Average Count.	No.	Average Count.
January ... ..	...	...	...	...	...	...	...	...
February ... ..	...	...	...	...	...	...	...	...
March ... ..	...	...	...	...	...	...	...	...
April	21	291	3	433	...	...	9	512
May	18	92	20	431	22	329	...	...
June	15	158	18	377	34	316	...	...
July	11	190	21	479	8	405	...	...
August	23	493	14	262	11	351	...	...
September	12	166	21	479	23	321	...	...
October	9	364	10	415	10	229	...	...
November	26	236	15	209	11	410	...	...
December	8	160	8	290	4	391	...	...
Total	143	254	130	385	123	331	9	512

ELECTRICAL.

A steady increase in electrical equipment is taking place throughout the goldfields. In following the general present trend to discard steam haulage in favour of electricity, two new electric winders have been installed by the North Kalgurli (1912) Gold Mines.

Lake View and Star, Limited, are making preparations for an extension of their power house, and Western Mining Corporation, Limited, have extended their power houses at Norseman, Kalgoorlie and Cox's Find.

The new turbo-generator installed by the Kalgoorlie Power and Lighting Corporation has proved satisfactory, and the company's faith in the future of the goldfield has been shown by orders for the extension of the boiler plant.

GOLD MINING.

The reported gold production from the State again showed an increase over the previous year's total, the figures for 1938 and 1939 being 1,172,950 and 1,188,286 fine ounces, respectively. The value of the year's gold yield in Australian currency was £11,594,221, a new high level record, exceeding that of 1938 by £1,184,293.

This record figure was largely due to the fact that the average price realised for the year was 195.14s. per fine ounce, as against 177.50s. in 1938. A further substantial increase in the average price of gold is anticipated for the ensuing year.

The tonnage of ore treated also constituted a new record for all time, the figure, 4,095,257 tons, exceeding that of the previous year by 335,537 tons.

A new low level record for the average gold content of ore treated was again established, the average yield per ton being 5.80 dwt. Reference to Table D will show that since 1929 this figure has been reduced from 11.84 dwt. per ton.

The average number of men employed in the industry was 15,216, showing a small decrease of 158 on the 1938 figures.

The increase in the total gold yield is pleasing in view of the fact that several of the major producers showed a considerably decreased production. Chief among these were Wiluna Gold Mines, showing a decrease of 15,138 ounces; Big Bell, 10,810 ounces and Moonlight Wiluna 9,164 ounces, as compared with the 1938 figures. Wiluna unfortunately appears to be definitely on the down grade, but Big Bell's diminished production was due to mining considerably lower grade ore than the average of the ore reserves, and it would appear that in the case of the Moonlight Wiluna the decrease is rather apparent than real, due to the non-reporting of the gold content of antimonial ore exported in 1937 and its inclusion in the 1938 figures.

Mines showing substantially increased production over 1938 were Great Boulder Proprietary, with an increase of 13,093 ounces, Central Norseman 17,564 ounces, Paringa 8,945 ounces, Hill 50 2,343 ounces, Kalgoorlie Enterprise 6,682 ounces and Emu 7,198 ounces.

Two new mines in Consolidated Gold Mines of Coolgardie, Limited (Tindals) and Gladiator Gold Mine, Limited, at Laverton, produced respectively 8,764 and 6,760 fine ounces.

It is thought that a classification of the gold output of the State, showing the number and total yield of producers of various ranges, might prove of general interest. This information is shown in Tables E and F. Table E shows this classification for each goldfield and district for the year under consideration, while in Table F the information is given for the whole State for each of the past five years. Table F also shows the total production of each range expressed as a percentage of the grand yearly total.

Table E gives a very good idea of the amount of mining activity in the various centres, and distinctly reveals East Coolgardie to be the principal centre for big mines, while the Yilgarn Goldfield shows up as the most important centre for small mines.

It is rather interesting to note by reference to Table F, that in 1935, 38.3% of the total yield came from two mines, each producing over 100,000 ounces, compared with 23.7% from the two mines in the same category in 1938 and 1939. This indicates a greatly increased activity in the operations of the lesser mines during the intervening period.

In compiling these tables, private and State Battery treatment plants were included as individual producers.

The year passed off without any serious industrial disturbance, and the only stoppages of production were due to floods in Kalgoorlie during the early part of the year, which by interfering with the electrical power production, caused a cessation of work for a few days on some of the mines.

The mining industry generally has maintained its sound position and may be confidently expected to continue to do so.

Table D hereunder shows statistics illustrating the progressive growth of the industry since 1929.

TABLE D.
Gold Production Statistics.

Year.	Tons Treated. (2,240 lbs.)	Total Gold Yield.	Estimated Value of Yield.	Value of Yield per ton.	Number of Men Employed.	Average Value of Gold per oz., Australian Currency.	Average per ton of Ore.
	tons.	fine ozs.	£A.	shillings.		shillings.	dwt.
1929 ...	628,400	372,064	1,580,426	50·30	4,108	84·96	11·84
1930 ...	645,344	419,767	1,874,484	58·09	4,284	89·33	13·01
1931 ...	982,163	518,045	3,042,019	61·94	5,961	117·44	10·55
1932 ...	1,327,021	599,421	4,358,989	65·70	8,695	145·44	9·03
1933 ...	1,588,979	636,928	4,884,112	61·48	9,900	153·36	8·01
1934 ...	1,772,931	639,871	5,461,004	61·60	12,523	170·69	7·22
1935 ...	1,909,832	646,150	5,676,679	59·45	14,708	175·71	6·77
1936 ...	2,492,034	852,422	7,427,687	59·61	15,696	174·27	6·84
1937 ...	3,039,608	1,007,289	8,797,662	57·99	16,174	174·68	6·64
1938 ...	3,759,720	1,172,950	10,409,928	55·38	15,374	177·50	6·24
1939 ...	4,095,257	1,188,286	11,594,221	56·62	15,216	195·14	5·80

TABLE F.
Classification of Gold Output, 1935-1939.

Range of Output.	1935.			1936.			1937.			1938.			1939.		
	No. of Producers.	Pro-duction.	Percentage of Total.	No. of Producers.	Pro-duction.	Percentage of Total.	No. of Producers.	Pro-duction.	Percentage of Total.	No. of Producers.	Pro-duction.	Percentage of Total.	No. of Producers.	Pro-duction.	Percentage of Total.
Fine ozs.		fine ozs.			fine ozs.			fine ozs.			fine ozs.			fine ozs.	
Over 100,000	2	247,316	38·3	2	287,904	33·9	2	280,648	27·9	2	278,010	23·7	2	281,948	23·7
50,000-100,000	1	55,054	8·5	1	72,901	8·6	2	127,676	12·7	3	220,109	18·8	2	149,896	12·6
40,000- 50,000 ... ..	...	...	...	2	90,941	10·6	3	127,969	12·7	2	86,650	7·4	2	95,093	8·0
30,000- 40,000	2	68,438	10·6	2	69,139	8·1	2	65,248	6·5	4	136,508	11·6	6	204,218	17·2
20,000- 30,000	1	29,642	4·6	2	49,251	5·8	3	73,422	7·3	5	128,267	10·9	5	124,818	10·5
10,000- 20,000	4	62,460	9·7	4	54,872	6·4	7	91,354	9·1	5	72,724	6·2	5	80,351	6·8
5,000- 10,000	5	33,855	5·2	7	50,451	5·9	10	66,111	6·6	9	62,797	5·4	8	55,115	4·6
4,000- 5,000 ... ..	...	...	...	...	...	...	2	9,813	1·0	...	...	...	2	8,195	0·7
3,000- 4,000	1	3,934	0·6	1	3,647	0·4	...	...	...	5	17,093	1·5	7	25,450	2·1
2,000- 3,000	3	6,876	1·1	11	25,052	2·9	5	12,497	1·2	7	16,499	1·4	6	14,120	1·2
1,000- 2,000	18	26,240	4·1	25	36,470	4·3	27	35,731	3·5	21	28,195	2·4	20	29,500	2·5
500- 1,000	34	22,780	3·5	37	25,034	2·9	30	20,515	2·0	47	30,176	2·6	33	23,362	2·0
100- 500	173	37,164	5·7	168	36,725	4·3	214	46,649	4·6	202	43,922	3·7	203	46,358	3·9
Under 100	504	15,055	2·3	547	18,157	2·1	459	17,351	1·7	432	18,685	1·6	429	16,954	1·4
Sundry Claims, P.As., etc.	...	37,336	5·8	...	32,233	3·8	...	32,325	3·2	...	33,215	2·8	...	32,908	2·8
Total	748	646,150	100·0	809	852,422	100·0	766	1,007,289	100·0	744	1,172,950	100·0	730	1,188,286	100·0

Note.—Individual producers include private and State Battery treatment plants.

OPERATIONS OF THE PRINCIPAL MINES.

Table G (page 36) shows the names, tonnages treated, output in fine ounces and average yield per ton of ore treated annually for the past five years of mines producing 5,000 fine ounces per annum and upwards.

Lake View and Star, Limited, retained pride of place as the major producer for the year, with an output of 171,623 fine ounces obtained from 604,340 tons of ore. Great Boulder Proprietary, Limited, in producing 110,325 fine ounces has now become the second largest producer, while Wiluna is third with a total of 90,169 ounces. These three mines again were the only ones to produce more gold than the State Batteries.

Riverina Gold Mine, Limited, which for the past two years produced over 5,000 ounces annually, ceased production during the year and its future is problematical. Blue Bird's production, 4,004 ounces, also dropped below the 5,000 ounce mark, but the value of its tailings, purchased by the State Battery, was over 1 oz. per ton and has not been included in the returns.

Two new names, Consolidated Gold Mines of Coolgardie (Tindals) with 8,764 ounces and Gladiator Gold Mine, Limited, with 6,760 ounces, appear on this year's list, bringing the total number of producers of 5,000 ounces and upwards for the year to 31, exclusive of State Batteries and including Blue Bird.

A number of smaller mines, not included in Table G, are operating successfully, among which are the following:—

Wiluna District—

- (1) Florence No. 3, which treated 3,664 tons for 1,317 ounces.
- (2) Linden (W.A.), Gold, N.L., 7,541 tons for 1,867 ounces.

Mt. Magnet District—

- (3) Broken Bond, 3,752 tons for 1,371 ounces.
- (4) Edward Carson, 3,727 tons for 1,978 ounces.
- (5) Black Cat (Metropolitan Mining and Development Co.), 2,647 tons for 1,598 ounces.
- (6) Saturn, 6,084 tons for 1,182 ounces.
- (7) Swan Bitter Gold Mining Co., Ltd., 2,964 tons for 1,092 ounces.
- (8) Moyagee Syndicate, 1,188 tons for 2,367 ounces.

Yalgoo Goldfield—

- (9) Carnation, 2,721 tons for 1,317 ounces.

Mt. Margaret Goldfield (Mt. Morgans District)—

- (10) Coronation (Linden), 146 tons for 1,458 ounces.

North Coolgardie Goldfield—

- (11) New Callion (Davyhurst), 2,588 tons for 889 ounces.
- (12) Two Chinamen (Morley's Find), 362 tons for 1,539 ounces; doliied 2,212 ounces.

Broad Arrow Goldfield—

- (13) Western Mining Corporation, 2,140 tons for 1,713 ounces.

East Coolgardie Goldfield—

- (14) Lake View South, 10,385 tons for 3,520 ounces, treated by Gold Mines of Kalgoorlie, Ltd.
- (15) Consolidated Gold Areas, 14,235 tons for 2,451 ounces.
- (16) Milano (Mt. Monger), 1,253 tons for 3,802 ounces.
- (17) New Hope (Hampton Plains), 8,305 tons for 1,287 ounces.

Coolgardie Goldfield—

- (18) Spargo's Reward, 13,313 tons for 4,191 ounces.
- (19) Goldfields Australian Development (Kintore), 2,451 tons for 2,322 ounces.

Yilgarn Goldfield—

- (20) Mistletoe, 1,484 tons for 1,534 ounces.
- (21) Rising Sun, 6,018 tons for 1,359 ounces.
- (22) Newfield Central (Yellowdine Gold Areas), 394 tons for 628 ounces.
- (23) Evanston, 7,285 tons for 3,894 ounces.
- (24) Great Bingin (Golden Valley), 3,302 tons for 2,322 ounces.
- (25) May Queen, 1,460 tons for 1,433 ounces.
- (26) New Yilgarn, 4,524 tons for 2,195 ounces.
- (27) Sunshine, 3,150 tons for 1,445 ounces.

Dundas Goldfield—

- (28) Norseman Developments, 18,957 tons for 3,570 ounces.

TABLE G.—MINES PRODUCING 5,000 OUNCES AND UPWARDS PER ANNUM FOR THE PAST FIVE YEARS.

Mine.	1935.			1936.			1937.			1938.			1939.		
	Tons.	Ounces Gold.	Dwt. per Ton.	Tons.	Ounces Gold.	Dwt. per Ton.	Tons.	Ounces Gold.	Dwt. per Ton.	Tons.	Ounces Gold.	Dwt. per Ton.	Tons.	Ounces Gold.	Dwt. per Ton.
Lake View and Star, Ltd.	493,265	138,911	5.63	524,998	174,409	6.64	542,330	167,272	6.17	566,749	172,703	6.09	604,340	171,623	5.68
Wiluna Gold Mines, Ltd.	470,205	108,405	4.69	557,099	118,495	4.08	599,567	113,376	3.78	594,739	105,307	3.54	581,245	90,169	3.10
Great Boulder Pty., Ltd.	127,498	55,054	8.64	166,755	72,901	8.74	188,120	72,478	7.71	276,430	97,232	7.04	358,364	110,325	6.16
Big Bell Mines, Ltd. ....	....	....	....	....	....	....	85,958	*10,140	*2.36	400,473	70,537	3.52	447,322	59,727	2.67
State Batteries	108,360	63,298	11.68	102,086	64,619	12.65	102,800	60,033	11.67	108,966	73,253	13.44	101,443	65,803	12.23
Sons of Gwalia, Ltd.	94,513	35,770	7.67	125,260	45,095	7.20	136,522	45,687	6.69	138,203	45,692	6.61	136,114	45,617	6.70
Boulder Perseverance, Ltd.	80,651	29,642	7.35	97,752	34,392	7.04	110,171	42,221	7.66	111,824	40,958	7.32	114,589	37,681	6.58
North Kalgurli (1912), Ltd.	104,945	42,663	6.22	147,197	45,430	6.17	140,468	55,173	7.85	135,135	52,340	7.75	139,205	49,476	7.11
South Kalgurli Consolidated, Ltd.	46,383	16,701	7.20	45,308	14,802	6.53	70,947	21,130	5.96	87,947	25,193	5.73	89,405	24,836	5.56
Norseman Gold Mines, N.L.	37,767	15,422	8.16	67,860	22,440	6.61	76,069	30,771	8.09	79,250	27,692	7.00	123,404	31,046	5.03
Broken Hill Pty., Ltd. (Hannans North)	15,991	6,194	7.75	19,316	8,169	8.46	22,098	10,363	9.38	30,224	12,617	8.35	37,162	17,022	9.16
Ingliston Consols Extended	41,689	7,983	3.83	37,204	7,221	3.88	30,815	5,367	3.48	23,385	3,430	2.94	17,107	3,035	3.55
Lancefield (W.A.) G.M., N.L.	62,045	19,054	6.14	104,355	34,747	6.66	113,342	34,477	6.08	101,176	29,612	5.85	128,343	32,041	4.99
Mt. Magnet Gold Mines, Ltd.	46,547	7,396	3.19	54,760	10,519	3.84	59,580	8,589	2.88	59,671	7,639	2.56	60,019	7,091	2.36
Triton Gold Mines, N.L.	22,307	7,232	6.48	77,757	26,811	6.89	74,388	25,917	6.97	108,878	34,437	6.33	107,201	33,776	6.30
Ora Banda Amalgamated, N.L.	8,278	5,050	12.20	13,193	7,284	11.04	16,495	8,309	10.08	18,730	8,700	9.29	18,955	8,020	8.46
Gold Mines of Kalgoorlie, Ltd. ....	....	....	....	22,520	16,709	14.85	30,432	16,971	11.15	102,615	36,059	7.03	104,052	34,419	6.62
Yellowdine Gold Development, N.L. ....	....	....	....	27,050	12,842	9.49	44,899	36,958	16.46	47,175	30,041	12.74	47,534	23,703	9.98
Cox's Find (Western Mining Corp. Ltd.) ....	....	....	....	6,999	6,412	18.32	16,768	14,042	16.75	17,985	17,872	19.87	17,615	12,657	14.37
Central Norseman Gold Corporation, N.L. ....	....	....	....	20,303	5,840	5.70	48,896	13,785	5.64	71,117	17,691	4.98	88,313	35,255	7.98
Marvel Loch Gold Development, N.L. ....	....	....	....	33,008	5,012	3.03	35,533	5,033	2.83	....	....	....	....	....	....
Moonlight Wiluna, Ltd. ....	....	....	....	....	....	....	95,121	26,375	5.54	132,407	35,972	5.43	95,805	26,816	5.60
Youanmi Gold Mines, Ltd. ....	....	....	....	....	....	....	48,184	11,153	4.63	75,160	20,396	5.43	77,221	20,696	5.36
Paringa Mining and Exploration Co., Ltd. ....	....	....	....	....	....	....	15,305	6,998	9.14	40,939	9,804	4.79	78,676	18,749	4.77
First Hit Gold Mine, N.L. ....	....	....	....	....	....	....	8,377	6,831	16.31	7,794	5,728	14.68	7,949	5,034	12.07
Comet Gold Mines, Ltd. ....	....	....	....	....	....	....	4,790	6,822	28.48	4,996	6,563	26.27	5,872	5,564	18.95
Hill 50 Gold Mine, N.L. ....	....	....	....	....	....	....	23,878	6,689	5.60	24,424	5,569	4.56	24,764	7,912	6.39
Riverina Gold Mines, Ltd. ....	....	....	....	....	....	....	13,822	5,565	8.05	15,812	5,166	6.53	2,424	932	7.69
Celebration-Golden Hope ....	....	....	....	....	....	....	26,988	5,401	4.00	....	....	....	....	....	....
Lady Shenton Gold Mines, N.L. ....	....	....	....	....	....	....	7,623	4,984	13.07	9,295	3,931	8.46	927	664	14.32
Kalgoorlie Enterprise, Ltd. ....	....	....	....	....	....	....	....	....	....	39,594	12,592	6.36	59,336	19,274	6.49
Emu Gold Mines, Ltd. ....	....	....	....	....	....	....	....	....	....	48,370	11,952	4.94	48,542	12,649	5.21
Edna May Amalgamated G.Ms., N.L. ....	....	....	....	....	....	....	....	....	....	14,450	5,451	7.54	15,822	5,970	7.55
Blue Bird ....	....	....	....	....	....	....	....	....	....	1,185	†8,277	†139.70	1,169	†4,004	†68.50
Consolidated Gold Mines of Coolgardie Ltd. (Tindals) ....	....	....	....	....	....	....	....	....	....	....	....	....	43,106	8,764	4.07
Gladiator Gold Mine, Ltd. ....	....	....	....	....	....	....	....	....	....	....	....	....	24,169	6,760	5.49
Total	1,760,444	548,775	6.23	2,250,780	729,149	6.48	2,781,907	872,079	6.27	3,493,913	1,032,131	5.91	3,806,345	1,033,106	5.43
All others	149,388	97,375	13.04	241,254	123,293	10.22	257,701	135,210	10.49	265,807	140,819	10.60	288,912	155,180	10.74
GRAND TOTAL	1,909,832	646,150	6.77	2,492,034	852,422	6.84	3,039,608	1,007,289	6.64	3,759,720	1,172,950	6.24	4,095,257	1,188,286	5.80

* This figure does not represent the full value of the ore treated, as it neglects the gold absorbed by a new plant and also a considerable quantity of gold in the course of treatment at the end of the year.
† Blue Bird output is included in State Battery figures and has not been included in the total. The yield shown from this mine is by amalgamation only.

Table II hereunder shows the development footages reported for the year by the principal gold mines of the State.

TABLE H.

Development Footages reported by Principal Mines for 1939.

Mine.	Shaft Sinking.	Driving.	Cross-cutting.	Rising and Winzing.	Diamond Drilling.	Total.
PILBARA GOLDFIELD—						
Comet Gold Mines, Limited	feet. 332	feet. 590	feet. 342	feet. 445	feet. ...	feet. 1,709
EAST MURCHISON GOLDFIELD—						
Wiluna Gold Mines, Limited	1,194	8,480		1,244	13,634	24,552
Moonlight Wiluna, Limited	106	5,630	463	1,988	6,049	14,236
Youanmi Gold Mines, Limited	579	3,055	1,106	2,378	3,008	10,126
Emu Gold Mines, Limited	50	1,201	309	991	...	2,551
MURCHISON GOLDFIELD—						
Big Bell Mines, Ltd.	92	1,809	3,140	999	...	6,040
Triton Gold Mines, N.L.	360	1,720	341	2,254	1,826	6,501
Triton Gold Mines, N.L. (prospecting)	260	145	75	...	5,244	5,724
Mt. Magnet Gold Mines, Limited	119	1,230	267	583	...	2,199
Hill 50 Gold Mine, N.L.	114	365	412	166	1,741	2,798
MT. MARGARET GOLDFIELD—						
The Sons of Gwalia, Limited	208	1,096	973	1,487	3,379	7,143
Lancefield (W.A.), N.L.	93	5,514	303	3,370	474	9,754
Gladiator Gold Mine, Limited	82	721	23	96	...	922
Cox's Find Gold Mine	191	553	576	307	2,267	3,894
Hill End Gold Mine	180	150	95	35	...	460
NORTH COOLGARDIE GOLDFIELD—						
Riverina Gold Mines, Limited	35	196	40	88	830	1,189
First Hit Gold Mine, N.L.	30	1,012	306	444	...	1,792
Mt. Ida Gold Mines, Limited ... ..	...	75	26	93	...	194
Yilgarn Queen Gold Mine	90	100	...	...	...	190
BROAD ARROW GOLDFIELD—						
Lochinvar Gold Mine, Limited	92	98	261	...	...	451
Ora Banda Amalgamated, Limited	334	533	387	286	462	2,002
EAST COOLGARDIE GOLDFIELD—						
Lake View and Star, Limited	593	24,342	7,470	9,141	19,413	60,959
Great Boulder Proprietary, Limited ... ..	...	14,260	2,920	6,143	18,938	42,261
Boulder Perseverance, Limited ... ..	...	4,397	319	2,083	8,537	15,336
Kalgoorlie Enterprise Mines, Limited	292	1,382	1,396	383	2,890	6,343
Gold Mines of Kalgoorlie, Limited ... ..	...	4,280	1,122	879	11,781	18,062
North Kalgurli (1912), Limited ... ..	...	7,058	2,563	3,221	3,996	16,838
Paringa Mining and Exploration Company, Limited ... ..	...	3,668	1,107	934	1,291	7,000
South Kalgurli Consolidated, Limited ... ..	...	3,369	1,336	832	5,956	11,493
Broken Hill Proprietary, Limited (Hannan's North)	158	2,267	273	1,167	212	4,077
Consolidated Gold Areas, N.L.	15	64	...	64	...	143
North Kalgurli United, Limited ... ..	...	...	100	...	2,742	2,842
COOLGARDIE GOLDFIELD—						
Consolidated Gold Mines of Coolgardie Ltd. ... ..	...	154	83	245	201	683
Phoenix Gold Mines, Limited	316	339	435	155	...	1,245
Spargo's Reward Gold Mine	2	181	65	144	...	392
YILGARN GOLDFIELD—						
Yellowdine Gold Development, Limited	237	806	425	457	5,688	7,613
Edna May (W.A.) Amalgamated, N.L.	461	215	263	302	...	1,241
DUNDAS GOLDFIELD—						
Central Norseman Gold Corporation, N.L.	1,687	6,117	202	6,329	10,036	24,371
Norseman Gold Mines, N.L.	296	2,737	174	2,507	6,521	12,235
Norseman Developments, N.L.	75	1,099	32	1,341	175	2,722
Norseman Associated, N.L.	188	724	23	419	4,312	5,666

EAST COOLGARDIE GOLDFIELD.

The East Coolgardie Goldfield easily retained pride of place as the major field of gold production for the State.

The gold yield for the year was 533,235 fine ounces, equivalent to 44.9 per cent. of the total production, while the tonnage treated amounted to 1,639,597 tons, or 40 per cent of the State total.

The average number of men employed in this centre was 4,470, compared with the State total of 15,216.

In spite of the large tonnages of ore mined and treated, ore reserves in sight appear to be larger than ever, showing that an energetic and systematic development policy is being followed throughout.

Every effort is being made to take advantage of the higher price of gold, as evidenced in the general

fall in the grade of ore treated. The average recovery per ton of ore treated for the year was 6.5 dwt. per ton as against 7.3 dwt. during the previous year. (These figures are somewhat exaggerated as they include gold won from retreatment of sands.)

It may be said generally that the prospects of this field were never brighter and a long period of profitable activity can be confidently anticipated.

Lake View and Star Limited treated a record tonnage of 604,340 tons for a recovery of 171,623 fine ounces of gold, the average yield from ore treated being 5.68 dwt. per ton.

Development for the year comprised 593 feet shaft sinking, 24,342 feet driving, 7,420 feet crosscutting, 9,141 feet rising and winzings and 19,413 feet diamond drilling.

Ore reserves were estimated at 30th June, 1939, as 3,665,000 tons, approximately six years' mill supply, valued at an average of 5.56 dwt. per ton. Reserves are being increased yearly.

On the surface a new 7,000 ton fine ore storage bin was constructed as a standby for week-ends, holidays and emergencies.

A new 20ft. diameter bowl classifier has been added to treat flotation tails, the coarse product of which is re-ground in a tube mill and returned to the cells. Two new thickeners, 50 and 85ft. diameter respectively thicken the slimes, which are pumped away.

In the roaster section, the furnaces are now charged by constant weight drag feeders scraping the feed off a belt conveyor, which replaces the old push plate conveyor. A new fan has been installed in the dust recovery section and numerous other improvements have been accomplished. The fume nuisance in this section appears to have been overcome.

The following is a brief resume of underground activities on this group:—

Western Group.

Horseshoe Chaffers Section.

No. 4 Lode.—On the No. 37 level, 700 feet of development was carried out in average grade ore of good width. Crosscutting west is in progress. The sinking of the new internal shaft will be undertaken from this level, commencing at a point between Nos. 2 and 4 Lodes. A winder will be installed and ore pockets constructed. Ore will pass on to a conveyor belt and will be taken to the Chaffers Shaft main ore bin.

No. 3 Lode.—No development took place on this lode for the year. Some stoping was carried out from the 500 to the 3,000ft. level in Ivanhoe ground, the bulk of the work being between the 2,200ft. and the 3,000ft. levels. On some of these levels the ore has been worked 12 feet wide over a length of 2,000 feet.

No. 2. Lode is being stoped and developed from the 1,500ft. level in the Ivanhoe section and the 3,100ft. level in the Horseshoe Chaffers Section. The average length opened out is about 3,500 feet. Development is confined in the north end to the ground between the 2,000ft. and 3,300ft. levels. The 3,300ft. level is opened up for a length of 600 feet with ore at both ends. On the south end, developments from the

1,000ft. to the 1,700ft. level opened up good grade ore over fair widths. On the 1,700ft. level 700 feet of driving was completed. The Chaffers end is being prepared south of the Main Shaft between the 1,400ft. and 2,400ft. levels. A new level is being driven on the Chaffers at 2,180 feet to handle the ore from higher levels.

The *New Lode* is being developed and stoped in the Ivanhoe and Horseshoe from the 1,200ft. to the 2,700ft. level for an average length of about 1,400 feet. At the 2,500ft. level, a distance of 800 feet was driven with both ends showing ore. Values are about 5 dwt. Driving is in progress at the 2,700ft. level and crosscutting from the 2,800ft. level at the Ivanhoe. Stoping is in progress from the 1,200ft. to the 2,100ft. level. The Chaffers East Lode is being stoped between the 800ft. and 1,000ft. levels in good grade ore.

On the *Hannan's Star Section* the main lode was developed on the 600, 700, 800 and 1,000ft. levels. Above the 800ft. level high grade ore is showing over a width of six feet. A programme has been laid out involving development to the 1,200ft. level. At the 600ft. horizon a long level is being driven south, one of the objects of which is the probable development of the Aberdare and Imperial lodes to the eastward. This will also be a convenient level for future diamond drilling.

At the *Morrison West Lode* the internal shaft is now down to the 2,400ft. horizon, which will be the main haulage level to the Chaffers Shaft. Crosscuts are out at the 1,800ft., 2,000ft. and 2,180ft. levels and driving is in progress at the 2,180ft. horizon. Stoping operations are being carried out from the 1,200ft. to the 1,700ft. level on fair grade ore over widths up to 20 feet.

A new pulsometer pump of 9,000 gallons per hour capacity has been installed at the 1,300ft. level at Horseshoe No. 2 Shaft.

New skips are being designed for the Ivanhoe Shaft.

Eastern Group.

At the *Lake View* section the new haulage way on the 1,900ft. level is connected through to the Associated workings and an electric pump at this shaft handles the water from both mines. Ore passes have been put in at the 1,200, 1,400, 1,600, 1,800, and 1,900ft. levels. Good developments have been encountered on the Perseverance lode at the 500ft. level. Most of the stoping for the year was done on the Central West Boulder lode, between the 100ft. and 1,000ft. levels, where the ore body exhibited good length, width and value.

At the *Associated* section shaft repairing is in progress below the 1,700ft. level. The chief developments for the period have been on Tetley's cross lode, where good values and widths exist. The mine is looking well and 10,000 tons of ore are broken monthly and 7,000 tons hauled.

Sands Retreatment.

A new sluicing plant was installed on the old Kalgurli dump consisting of a vortex mixer and slimes pump. About 14,000 tons monthly is pumped to the Associated plant.

The retreatment of the Associated dump is nearly completed and a sluicing plant, consisting of three centrifugal two stage slimes pumps and two vortex mixers, is being installed to pump the South Kalgurli slimes at Trafalgar to the Associated plant.

Preparations are in hand for the erection of a complete Oliver filter plant to treat the Chaffers dump, which consists of slimes and flotation tails. The treatment of 60,000 tons monthly is aimed at.

A new air conditioned survey office has been built, special attention having been given to the lighting. The main offices have been re-conditioned and painted and air conditioning installed throughout.

Old structures and rubbish are being gradually cleared away and dust allayed as much as possible with a view to improving conditions as regards health, cleanliness and comfort.

Great Boulder Proprietary Gold Mines, Limited, having brought their plant into full operation, treated 358,364 tons for an output of 110,325 fine ounces of gold, the average recovery being 6.16 dwt. per ton. This group is now second only to Lake View and Star in gold production, and has practically doubled its gold output in the past five years, at the same time reducing the grade of ore treated by nearly 30 per cent.

Development work carried out for the year was as follows:—14,260 feet driving, 2,920 feet crosscutting, 6,143 feet rising and winzing and 18,938 feet diamond drilling.

All sections of the plant worked smoothly and no major additions were made.

A new change room to accommodate 300 men is being completed for surface workers.

Electric traction is in use underground. Two-ton Granby trucks are used and mechanical shovels are employed where suitable. The use of electric head lamps is becoming general.

The mine is looking well and the maintenance of the present tonnage appears to present no difficulty.

Brief details of work carried out for the year are given hereunder.

At the Main Shaft workings development and stoping operations were carried out from the 400ft. to the 2,600ft. levels and good developments eventuated on practically every level. On the 700ft. level good ore was proved on the New Lode East branch, east of Conroy's lode. On the 1,800ft. level the West vein near the Ivanhoe boundary was driven 450 feet in ore worth 8.3 dwt. over a width of six feet. This section was also developed on the 1,600ft. level and is blocked out to the 1,900ft. level in payable values. A winze below the 1,900ft. level shows low values and the lode appears to be running into the big dyke.

On Edward's and Lane's Shafts a considerable amount of work has been done in the oxidized zone above the 200ft. level.

The main development consisted of working minor veins in the Eastern Lode formation. Developments east of the 2,500 and 2,600ft. levels did not disclose much of value, but much work is still necessary in this quarter.

On Lane's Shaft, Lane's Lode was picked up below the 500ft. horizon at the 700ft., 800ft., and 900ft. levels and proved over a length of 500 feet worth 6 dwt. This area is in course of being blocked out. The lode appears to be getting weaker below the 900ft. level.

It is probable that electric haulage will be installed to shift the ore from the south end to the underground ore bins at Edward's Shaft.

At the Hamilton Shaft workings the principal development took place between the 1,200ft. and 1,600ft. levels.

On the 1,950ft. level the workings are connected with the Main Shaft workings and some ore from these will be hauled up the Hamilton Shaft.

Workings below the 1,950ft. horizon are all off No. 2 Winze (Internal Shaft), and levels have been opened up at 2,070ft., 2,190ft., 2,290ft., 2,400ft., 2,530ft. and 2,600ft. At 2,070ft. little development was done. At 2,190ft. 243 feet of 5 dwt. ore was exposed. At 2,290ft. the drives were in faulted zones and the lodes proved erratic. At 2,400ft. 112 feet of 4.7 dwt. ore was exposed, while at 2,530ft. two short lengths of ore were encountered, little work being done. At 2,600ft. a connection was put through to the Main Shaft workings.

Some development has been done on new lodes and on the continuation of the upper lodes, but the system has not been definitely connected up.

No. 2 Winze is sunk to 38 feet below the 2,800ft. level. The plat has been cut and the face of the cross-cut is in ore.

Work was dislocated for part of the year owing to a mishap to the winder drum shaft. A new 12in. shaft had to be procured from the Eastern States and was fitted by the mine engineering staff.

Gold Mines of Kalgoorlie, Limited.—The production of this group for 1939 totalled 34,419 fine ounces from the treatment of 104,052 tons of ore, the average yield being 6.62 dwt. per ton. Production was slightly lower than that of the previous year owing to the treatment of ore of somewhat lower grade.

Development work completed for the year comprised 4,280 feet of driving, 1,122 feet of crosscutting, 879 feet rising and winzing and 11,781 feet of diamond drilling.

New units have been added to the mill, which will raise its capacity from 8,000 to 12,000 tons per month.

A new alternator set has been installed in the power plant of 410 K.W., 3,300 V. and 50 cycle, made by Belliss and Morcombe. Another new installation was a 250,000 gallon capacity oil storage tank.

On the Iron Duke section developments carried out from No. 2 to No. 13 levels proved good milling ore.

On the No. 12 level a drive in the Hinchcliffe Lode area exposed ore for a length of 44 feet worth 14 dwt. per ton over a width of 6 feet, and has still 50 feet to go to intersect a drill hole which exposed high values.

On the No. 13 level ore was exposed near the Western boundary which would appear to be an offshoot of the N.E.D. Lode in the Kalgurli Mine.

In several of the old stopes which have been reconditioned some patches of rich telluride ore were found. At the 300ft. level some new work was done on the old Brownhill Lode, which is connected with the Iron Duke Lode. This work is in the far northern sections and there is a possibility that considerable ore reserves may be opened up in this end of the mine.

In the Australia East section ore is being extracted from the open cutting of ground made available by the retreatment of the old Australia dump after considerable development and special work to facilitate handling on the No. 3 level.

On the Blue Gap leases the hanging wall lodes were explored by crosscuts and drives on Nos. 3 and 6 levels, but no payable results were disclosed.

Development on Nos. 6, 7, 11 and 13 levels proved good milling ore.

In addition to the tonnage quoted above, this Company mined and milled 10,385 tons on behalf of Lake View South, Limited.

Ore reserves at 31st March, 1939, were reported to be 670,000 tons at an estimated value of 5.2 dwt. per ton.

Paringa Mining and Exploration Company, Limited, treated 78,676 tons of ore for a return of 18,749 fine ounces, an average yield of 4.77 dwt. per ton. Head values were reported at 5.4 dwt., giving a recovery of 88.3 per cent. The monthly tonnage has risen from 5,000 to 7,000 tons and it is expected, with slight alterations to the plant to further raise this figure to 9,000 tons.

Development for the year included 3,668 feet driving, 1,107 feet crosscutting, 934 feet rising and winz- ing and 1,291 feet diamond drilling.

Ore was obtained from No. 3 to No. 8 levels and some from development work at the Paringa South Lease.

During the year new areas have been acquired ad- joining the main leases on the north and include North Kalgurli Central and Block 45 mines, both of which contain partially developed ore shoots and on which a considerable amount of useful development has been carried out.

Developments have been satisfactory and payable ore has been exposed on levels from the 200ft. to the 640ft. horizon. On the Croesus, Paringa Extended and Block 45, development work is proving payable ore bodies down to the 400ft. level, which is the low- est horizon explored.

Costs for the year were 24s. 7d. per ton and 180 men were employed.

On the Paringa Extended new headgear, ore bin, winder and electrical air compressor have been in- stalled at the Federal Shaft.

Ore reserves are reported as 263,600 tons of an average value of 5.37 dwt., made up as follows:—

Paringa	240,840 tons at 5.42 dwt.
North Kalgurli Central	12,800 tons at 3.83 dwt.
Paringa Extended ..	8,160 tons at 6.12 dwt.
Block 45	1,800 tons at 6.00 dwt.

North Kalgurli (1912), Limited, mined and milled 139,205 tons for 49,476 fine ounces of gold, an average extraction of 7.11 dwt. per ton. Tonnage was up slightly on the previous year and gold pro- duction down about 3,000 ounces, due to a lower grade of ore being treated.

Development footages reported for the year were 7,058 feet driving, 2,563 feet crosscutting, 3,221 feet rising and winz- ing and 3,996 feet diamond drilling.

On the Croesus Proprietary this Company has been carrying out an energetic development programme with such signal success that a new plant has been justified. The head frame has been strengthened and a new 1,000 ton steel primary ore bin and 800 ton fine ore bin erected.

A new electric winder with 7ft. drum and 280 H.P. motor has been installed. The engine is similar to the one on the North Kalgurli Shaft.

The treatment plant is in course of construction, but the date of its completion is uncertain, depend- ing largely on the transport of material. The treat- ment will follow the usual practice and the capacity of the plant will be 6,000-7,000 tons per month.

A new surface change room and general office are completed and a new tool sharpening shop is under construction.

Underground the No. 10 level has been driven 666 feet south with milling ore in sections. The Main North Drive is in for a distance of 561 feet, the last section being in low grade ore. A crosscut west at 410 feet north shows 11 feet of 8.7 dwt. ore, while the east crosscut opposite shows 11 feet of 4.0 dwt. ore.

On No. 9 level, East Crosscut 478 feet north proved 37 feet of ore worth 3.3 dwt. Good milling ore exists both north and south over big widths.

On No. 7 level, East Crosscut 670 feet north shows 38 feet of ore assaying 5.3 dwt. and the next 8 feet worth 2.8 dwt.

At No. 5 level, East Crosscut 426 feet south re- vealed 10 feet of 5.7 dwt. ore, and East Crosscut 520 feet south, 11 feet worth 6.8 dwt.

The Main Shaft is down to the 1,200ft. horizon, but no work is being done at present below the No. 10 level. All levels show excellent ore bodies and on the No. 7 level in particular there are sections where the lode is 40 feet wide assaying 8 dwt.

The country rock is calc schist and the geological structure has to be studied as a guide to development work. A series of vertical faults occurs by which the footwall sections have been dropped in places a dis- tance of 40 feet, while in other places very little dis- placement has occurred. Values occur where earth movements have caused the physical conditions neces- sary for mineral deposition.

On the North Kalgurli section the principal work was the Main North Drive, and developing and stop- ing on Nos. 5, 6, 7 and 9 levels.

On the No. 6 level the ore at 1,200 feet north is 12 feet wide and worth 11½ dwt. to the ton. The lode strikes the calc schist at 600 feet north, which forms one wall of the lode, the other wall being green- stone. At 820 feet north an east crosscut was put

out 100 feet, which picked up the Union Jack Lode. This was driven on 1,150 feet north in ore 12 feet wide worth $9\frac{1}{2}$ dwt., all in calc schist. These developments prove that the calc schists are worthy of exploration.

Some driving north was done off the Main East Crosscut in order to explore the Paringa Lode. Exposures were low grade.

On the 962ft. level the Union Jack Lode was opened up over a length of 800 feet.

New steel poppet legs, a 450-ton bin and electric winder were installed on this shaft.

At the Union Jack Shaft the year's work has consisted mainly of stoping at the 400ft. and 500ft. levels. Good widths and values exist in this section.

At the Kalgurli Shaft stoping and development have been carried out on the N.E.D. Lode on Nos. 4 and 5 levels. All sections of the mine are being worked and ore exposures are good.

All ore raised from North Kalgurli, Union Jack and Kalgurli Shafts is treated at the Kalgoorlie ore treatment plant. A few hundred tons were drawn from development work on the Croesus.

Boulder Perseverance, Limited, treated 114,589 tons for a return of 37,681 fine ounces, the average yield per ton being 6.58 dwt.

Development footages were 4,397 feet driving, 319 feet crosscutting, 2,083 feet winzings and rising and 8,537 feet diamond drilling.

Some interesting developments were met with on the East Boundary Lode, south of the Main Shaft. Eight hundred and ninety feet of driving and winzings proved good ore.

On the 2,200ft. level, a crosscut into the Australia East Lode cut good values on which driving is in progress. From the 1,900ft. level this lode is in calc schist. Normal values have been obtained from stoping this ore.

Reserves of broken and unbroken ore have been somewhat increased.

The care exercised by the management and others in safety precautions on this mine appears to be meeting with encouraging results. Carefully kept statistics show a decrease in accident rates and time lost. The monthly accident figures are prominently displayed on a special notice board.

Double-deck cages are to be installed at the Main Shaft. The electric winder is giving satisfaction and shows a definite saving in haulage costs.

A large and modern new store has been built and laid out in such a manner that articles are easily found and stocks may be ascertained with a minimum of trouble.

The leases have been cleared of rubbish and old plant rejects, bitumen roads laid down and gravel laid on dusty surfaces.

Kalgoorlie Enterprise Mines, Limited, working under the same management as Boulder Perseverance, Limited, maintained a steady throughput of 5,000

tons per month, mining and treating 59,336 tons for 12,649 fine ounces, the average yield being 6.49 dwt. per ton.

Development work for the year consisted of 292 feet shaft sinking, 1,382 feet driving, 1,396 feet crosscutting, 383 feet rising and winzings and 2,890 feet diamond drilling.

The sinking of the Victoria Shaft was continued, the depth being now 1,600 feet.

The Golden Pike Shaft (1,000 feet deep) was examined and unwatering operations commenced.

The crosscut from the Boulder Perseverance, Limited, workings on the 2,050ft. level into the Enterprise lease, passing through a portion of the South Kalgurli Consolidated lease by permission of that company, was continued and is now 750 feet north of the south boundary of the Enterprise lease.

Development of the Greenhill Shoot on No. 11 level was completed, and development on Nos. 12, 13 and 15 levels started.

The accident rate has shown a reduction on the previous year, lost time per 1,000 shifts worked from this cause being 2.18 as against 2.54 for 1938.

A subsidiary store working in conjunction with Boulder Perseverance, Limited, is in course of construction.

Transport of ore from the Victoria Shaft to the Kalgoorlie Ore Treatment Company's plant is by Diesel truck.

Broken Hill Proprietary, Limited, at Hannan's North, in treating 37,162 tons for a yield of 17,022 fine ounces, increased their throughput by 7,000 tons and gold output by 4,405 fine ounces as compared with 1938. The average extraction was 9.16 dwt., being .81 dwt. higher than that of the previous year.

Development figures were 158 feet shaft sinking, 2,267 feet driving, 273 feet crosscutting, 1,167 feet rising and winzings and 212 feet diamond drilling.

A new steel headgear and electric winder were installed during the year and additions to the plant have been completed. This work is reflected in the increased production for the year.

The Main Shaft was sunk to 1,350 feet and a plat is in course of excavation at that horizon. This level will be driven before further sinking is undertaken.

At the 1,150ft. level a fan has been installed to keep the shaft downcasting. Fair values were opened up both north and south on this level, and stoping is in progress.

Stopes are also being worked at the 600ft., 800ft., and 950ft. levels.

Some 4,000 tons is broken monthly and out of this amount about 1,000 tons of mullock is sorted through the ore sorting plant. The skip tips the ore over the grizzly and the rough portions roll over the sorting tables, where three to four men pick out the waste.

The mine is generally looking very promising.

South Kalgurli Consolidated, Limited, mined and treated 89,405 tons for 24,836 fine ounces of gold, an average yield of 5.56 dwt. per ton.

Development consisted of 3,369 feet driving, 1,336 feet crosseutting, 832 feet rising and winzing, and 5,956 feet of diamond drilling.

There is little of note to report on this mine, which is well managed and keeps up its tonnage and gold production and ore reserves by routine methods. Conditions underground are good.

The Western Mining Corporation, Limited, is carrying out some drilling and exploratory work about the leases north of the Croesus Proprietary. The Oratava Shaft has been equipped with headgear and electric winder. Indications are that this mine may develop satisfactorily.

It is intended to do some diamond drilling on the obscured areas in the vicinity of the State Battery and Trotting Grounds, where geological plans indicate areas of favourable country.

Mt. Charlotte Leases.—The development of these leases is unfortunately held up by litigation. This is to be regretted, as exploratory work has practically proved the presence of a very large tonnage of payable ore.

Hampton Plains Area.

Consolidated Gold Areas, N.L., during the year commenced treatment operations on White Hope ore, having acquired the Celebration treatment plant. The ore is carted from White Hope to Celebration for treatment, a distance of about four miles.

During the year 14,235 tons were put through the mill for a return of 2,451 fine ounces, an average yield of 3.45 dwt. per ton.

There was little development done for the period, the figures being 15 feet shaft sinking, 64 feet driving and 64 feet rising and winzing.

The latest estimate of ore reserves to hand at the time of writing is 48,600 tons valued at 5.1 dwt. per ton.

New Hope.—The only other producer at Hampton Plains is the New Hope, which continues to successfully treat low-grade ore from its Celebration property by Huntington mill. Gold obtained for the year totalled 1,287 fine ounces from the treatment of 8,305 tons, the average yield being 3.10 dwt. per ton.

Mount Monger District.

Milano Gold Mine.—This rich small mine, which has been a regular producer of substantial quantities of gold for a number of years, has been taken under option by a company who are busily engaged in development work at the 300 ft. level.

Although the reef is small, this mine would appear to have a rather promising future. The total production to date, exclusive of somewhat high sands values has been 9,705 fine ounces from 3,291 tons of ore.

Production for the past four years from amalgamation only has been as follows:—

Year.	Tons	Fine Ozs.
1936	712	988
1937	383	1,058
1938	600	2,473
1939	1,253	3,802

A five-head mill was installed during the year.

Several other small mines in the district are working steadily and producing rich stone.

Messrs. Cunneen and party have erected a crushing plant consisting of a 5 ft. Huntington mill driven by a 15 h.p. McDonald oil engine, also a cyanide plant of four 20-ton vats. Public crushings are undertaken at 10s. 6d. per ton and sands paid for at State Battery rates. This plant has been in operation for about six months and has crushed 1,000 tons for an average overall recovery of 15 dwt. per ton.

This district generally is a very interesting one and should produce a lot of gold.

COOLGARDIE GOLDFIELD.

Consolidated Gold Mines of Coolgardie, Limited (Tindals), came into production during the first half of the year, and, with a throughput of some 5,000 tons per month, mined and treated 43,106 tons for a return of 8,764 fine ounces, an average recovery of 4.07 dwt. per ton.

Development consisted of 154 feet driving, 83 feet cross-cutting, 245 feet rising and winzing and 201 feet diamond drilling.

The commencement of operations on this mine is of great importance to the district, which has been without a major producer for many years. Ore reserves are well ahead of production, and the output of the mine could easily be doubled. It was on account of restricted finance that a mill of twice the capacity was not erected in the first place, but indications are that additional capacity will be budgeted for in the not too remote future.

Phoenix Gold Mines, Limited, have not yet reached the stage of production and the year's work consisted of further development and stope preparation, and the erection of the treatment plant from the Southern Cross United Mines. It is anticipated that treatment operations will be commenced during the current year.

Development work carried out during the year consisted of 316 feet shaft sinking, 339 feet driving, 435 feet crosseutting, and 155 feet of winzing and rising.

Spargo's Reward treated 13,313 tons of ore and 14,619 tons of accumulated residues for a return of 4,191 fine ounces of gold.

Development consisted of two feet shaft sinking, 181 feet driving, 65 feet crosseutting and 144 feet rising and winzing.

Work has proceeded steadily and there appears to be a satisfactory reserve tonnage.

Progress has been hampered somewhat by the fact that the main shaft has not yet been completed to the 300ft. level, and until this necessary development is carried out, the position cannot be regarded as entirely satisfactory.

Prospecting and small mining operations generally on the Coolgardie Goldfield have been active, 13,327 ounces of gold having been produced, excluding that from the larger producers enumerated above.

YILGARN GOLDFIELD.

The mining industry on this goldfield appears once more to be in a very prosperous condition. Although only two mines, Yellowdine Gold Development, Limited, and Edna May Amalgamated, N.L., produced more than 5,000 ounces individually, yet reference to Table E (page 33) shows that 31 small producers contributed between 100 and 500 ounces, seven from 500 to 1,000 ounces, six from 1,000 to 2,000 ounces, two from 2,000 to 3,000 ounces and one between 3,000 and 4,000 ounces. The total produced by prospectors and small mines amounted in all to 33,267 fine ounces.

Although there are no State Batteries on this goldfield, a surprisingly large number of small mines have installed treatment plants, most of which are available for public crushings for neighbouring prospectors.

Yellowdine Gold Development, Limited, the major producer of the Yilgarn Goldfield, milled 47,534 tons for a recovery of 23,703 fine ounces, the average yield being 9.98 dwt. per ton. In the previous year the gold output was 6,338 ounces higher, but lower grade ore was mined in 1939. The 1938 average yield was 12.74 dwt. per ton.

Development comprised 237 feet shaft sinking, 806 feet driving, 425 feet crosscutting, 457 feet winzings and rising and 5,688 feet diamond drilling.

The extent to which open cutting operations can be carried has been nearly reached. The East lode has opened up better than anticipated and will increase the life of the mine.

On No. 5 Level (400ft.) the East lode is being developed by driving and winzings. There is still a considerable quantity of ore to be mined in the Main Lode and the new lode from the 100 ft. level.

No recent reports of estimated ore reserves have been received.

Edna May Amalgamated, N.L., mined and treated 15,822 tons for a return of 5,970 fine ounces, the average yield being 7.55 dwt. per ton, practically identical with the previous year's grade.

Development footages include 451 feet shaft sinking, 215 feet driving, 263 feet crosscutting and 302 feet rising and winzings.

The new main shaft, sunk to a depth of 461 feet and connected with the old workings, has made a great difference with regard to economy and convenience of working and ventilation.

Ore exposures continue to be satisfactory and on present indications the future of the mine appears to be assured for some years to come. The large inflow of water is well under control.

Evanston District.

This comparatively new district shows some promise of permanency, but requires more development. A serious drawback is the lack of an adequate water supply.

The Evanston Gold Mine is the main producer and in 1939 treated 7,285 tons for a return of 3,894 fine ounces, an average yield of 10.69 dwt. per ton. Tailings are said to average about 1½ dwt.

The plant includes a coarse ore bin, 25 tons capacity, 14in. x 7in. jaw crusher, 12in. belt conveyor to 60-ton battery bin and 5 head of stamps and copper amalgamating plates. Two 5ft. grinding pans grind the battery tailings for cyanide treatment. The full capacity of the plant is 1,000 tons per month.

A considerable amount of development was done during the year and the mine is opening up satisfactorily. Blocked out ore reserves are estimated at 5,000 tons, while the estimate of probable ore is put down at 10,000 tons. Some high grade ore has been developed and in the lower workings some heavy sulphide ore has been encountered.

The treatment plant is running satisfactorily and 5,000 tons of tailings have been treated for a return of approximately 800 ounces of fine gold.

Thirty men are employed on this mine.

Several adjoining leases are under option and little work is being done on them.

The general opinion locally is that another battery on the field is warranted, as cartage costs to Marda and Southern Cross are too high for the grade of ore available.

Mayfield District.

The Newfield Central Gold Mine (Yellowdine Gold Areas, N.L.), in several trial crushings obtained 628 fine ounces from 394 tons, by amalgamation.

A 5-head mill was acquired and erected at a well three miles north of the mine. Construction was almost completed at the end of the year.

The estimated tonnage of ore available for crushing is 6,000 tons. The grade of the ore is high and, although there is a possibility that this is merely a salvage proposition, a substantial profit is in sight from the visible reserves.

Twenty men are employed.

Bullfinch District.

Marie's Find is progressing satisfactorily. Twenty-five men are employed and the tonnage crushed is 300 tons per month.

Winzes sunk below the 150ft. level have disclosed values and the sinking of the shaft another 100 feet lift is contemplated.

Stoping has been carried out in the oxidised zone north of the shaft and values are reported to have been good.

The Mistletoe Mine, which is being worked by the Western Mining Corporation, mined and treated 1,484 tons for the year for a return of 1,534 fine ounces. It is thought that this mine will be worked out early in the current year, although a diamond drilling programme is mooted, which may extend its life.

Copperhead.—Parties of tributers are working this mine and are doing reasonably well. On account of crushing in of the main shaft, a new shaft is being sunk to the 300ft. level.

Southern Cross District.

Three Boys Gold Mine has been reopened under new management and satisfactory progress is being

made. Ore is being mined at the 100ft. level, West Lode, over a width of 15 feet, values being 2.15 dwt. over the plates and 3 dwt. in the sands.

The Golden Pig Shaft has been unwatered and a long drive, put in forty years ago, sampled. Sampling so far has revealed payable values over a length of several hundred feet, four feet wide.

Some parties of tributers on the mine and public crushings keep the battery working full time.

The plant is a good one and is running well. The mine and plant are competently supervised.

Marvel Loch District.

May Queen Gold Mine treated 1,460 tons for 1,433 fine ounces. It has been closed down for some time pending the arrival of a pumping plant to cope with extra water struck between the 400ft. and 500ft. levels.

Marvel Loch Leases.—A 10-head battery is in course of construction and it is proposed to work the No. 1 Main Shaft of the late Marvel Loch Gold Development.

A number of other small mines are working in this district and apparently progressing satisfactorily.

Burbridge Gold Mining Company, N.L., is a new company formed to mine and treat the laterite deposits at the Great Victoria. A plant designed to treat 2,500 tons per month is in the course of erection. The plant will be powered by a 282 h.p. Ruston gas engine (wood gas).

The flow sheet is roughly as follows:—Open cut; primary ore bin; cracker to 2in.; belt conveyor to 600-ton ore bin; conveyor to No. 8 Krupp mill; push conveyor into leaching plant of 16-40 ton vats. This plant was designed after exhaustive tests and is expected to be in operation during the first half of the current year.

Kurrajong Mine.—This mine is situated east of the Nevoria leases and is equipped with a 5-head mill and cyanide treatment plant. Eight men are employed and the plant has treated up to 300 tons per month of 8 dwt. ore. Width of ore body is up to 16 feet.

The New Yilgarn Mine treated 4,524 tons for a return of 2,195 fine ounces, and then closed down. The cyanide plant is still working on accumulated sands.

DUNDAS GOLDFIELD.

This goldfield has been the scene of much activity during the past year and gold production has shown a considerable increase. Prospecting is being systematically prosecuted and indications point to a successful future.

Central Norseman Gold Corporation, N.L., treated 88,313 tons for a return of 35,255 fine ounces, an average yield of 7.98 dwt. per ton. This is an increase of 17,000 tons and nearly 18,000 ounces over the previous year's figures, while the average yield increased by 3 dwt. per ton. This brings this mine to the position of ninth on the list of the State's producers, whereas in 1938 it held the eighteenth position.

It is anticipated that a further increase in gold production will take place in the current year.

Development carried out for the year comprised 1,687 feet of shaft sinking, 6,117 feet driving, 202 feet crosscutting, 6,329 feet rising and winzing and 10,036 feet of diamond drilling. Lake View and Star, Great Boulder and Wiluna were the only three mines which exceeded these figures.

A new vertical shaft, known as the Ajax Shaft, was begun in January. It is situated at a point 2,250 feet south of the Phoenix Shaft and it is expected that it will intersect the Mararoa reef at a vertical depth of 2,200 feet. The purpose of the shaft is to develop the southern extension of the Norseman and Mararoa reefs.

The outside dimensions of the shaft are 21ft. 0in. by 8ft., and 19ft. 6in. by 6ft. 6in. inside the timbers. There are four compartments, two skip compartments, one servicing compartment and one pump, pipe and ladder compartment.

The main winding hoist is an electric hoist of 300 h.p. When pulling dirt it operates at 800 feet per minute and 1,100 feet per minute when lowering.

The service winch is a 60 h.p. electric hoist which operates at a maximum speed of 500 feet per minute. Two one-ton kibbles are used for mucking.

The sinking crew consists of 16 miners and one tool carrier. Each shift is in charge of a boss miner and the whole crew is controlled by a party leader. Three shifts per day are worked, each of 7 1/5th hours, and are usually one boring shift and two mucking shifts. The type of ground traversed has been very hard greenstone, difficult to bore, but good shooting ground. A special timber crew is employed over week ends to do all the shaft timbering.

Excellent progress has been made with this sinking, 1,153 feet having been completed during the year. Plats were cut at the 200ft., 500ft. and 1,050ft. horizons.

A rather remarkable feature was that only one lost time accident was recorded in this shaft.

The future development programme includes connecting the Phoenix and Ajax Shafts at the No. 22 Level by driving on the reef from both shafts. This will necessitate approximately 600 feet of crosscutting from the Ajax Shaft to cut the reef.

At the north end, winze 3,860 feet north will be carried down to connect with a rise from No. 14 Level. This winze will prospect the ground between Nos. 10 and 14 Levels and will provide a ventilation opening between Nos. 8 and 16 Levels for the section north of winze 3,050 feet north.

The sinking of All Nations Shaft to connect with winze 4,400 feet north is also contemplated. This would improve mine ventilation and provide servicing facilities for the north end of the mine.

At the Princess Royal a surface drilling programme is under way, with the object of locating the southern extension or reconnection of the Princess Royal reef. To date a total distance of 1,022 feet has been drilled in two holes without locating anything of importance.

All precautions are taken for the safety of the men and full stocks of safety equipment are available at the mine store. These include miners' safety boots, helmets, gloves, eye shields and goggles and shin guards, all of which are being brought into general use throughout the mine.

Stimsonite reflectors are being fitted at all rail points, chutes and electrical equipment underground, the colours used being orange for chutes, green for rail points and red for electrical equipment. Reflectors are fitted one on each side of chutes, rail points, etc., to act as warning to train crews moving in either direction.

Carbide lamps have been completely replaced by electrical hat lamps, which are giving excellent results, even when used under adverse conditions.

Production.—The grade of ore mined increased during the latter half of the year to nearly 10 dwt. recovery, and the result of development, particularly at the north end of the mine, has been such that the present tonnage and grade can be maintained for some considerable time. When the present programme, involving the connection of the Ajax and Phoenix Shafts is nearing completion, consideration will be given to further plant extensions.

Norseman Gold Mines, N.L., treated 123,404 tons for a return of 31,046 fine ounces, the average yield per ton being 5.03 dwt.

Development consisted of 296 feet shaft sinking, 2,737 feet driving, 174 feet crosscutting, 2,507 feet winzings and driving, and 6,521 feet diamond drilling.

The total number of men employed by this and associated companies was approximately as follows:

<i>Norseman Gold Mines, N.L.—</i>			
Norseman Mine	..	..	390
Iron King	..	..	13
			—
			403
<i>Norseman Developments, N.L.—</i>			
Northern Star Mine	..	..	44
<i>Norseman Associated Gold Mines, N.L.—</i>			
Mt. Barker Mine	..	..	38
Higginsville Scheelite Mine			15
			—
			53
			—
			500
			—

Norseman Mine.

Treatment plant additions completed during February included a new crushing station and duplication of the milling and cyanide plant, increasing the capacity from 7,500 to 15,000 short tons monthly. Further additions now in hand, including a third ball mill, will further raise the monthly capacity to over 18,000 tons.

This tonnage will be derived from the various properties approximately as follows:—

Norseman	..	..	..	10,000	tons.
Iron King	..	..	..	5,000	"
Northern Star	..	..	..	1,500	"
Mt. Barker	..	..	..	1,500	"
				—	
Total	..	..	..	18,000	"
				—	

Power Plant.

Transmission lines have been erected from Norseman Mine power station to Iron King, Northern Star and Mt. Barker mines. Current is transmitted at 6,600 volts.

Additional power is provided by a 450 H.P. Diesel alternator set completed in February, and a further similar set is on order.

Transport.

In co-operation with the Dundas Road Board, good roads have been constructed to the Iron King, Northern Star and Mt. Barker mines. Two Diesel trucks were purchased and are handling ore from external sources very economically.

Underground.

The most important work undertaken during the year was the driving of No. 8 level (950 feet on the underlay), as a main haulage road and the installation of an electric train there. This drive now extends to 1,750 feet south of the Main Shaft and the face is still in ore. Three winzes put down to 200 feet below this level indicate the persistence of the ore body in depth.

The sinking of the Main Shaft was recommenced in September and the inclined depth at the end of the year was 1,053 feet, at which horizon No. 9 Plat has been cut. Sinking will shortly be resumed and continued to an inclined depth of 1,400 feet and No. 10 level opened out at 1,350 feet.

A new air shaft was sunk about 2,000 feet south of the Main Shaft and an additional ventilation fan installed.

At the Iron King Mine the first 40 h.p. scraper unit, operated electrically on power from the Norseman Mine, has been operating satisfactorily since about April. A second unit is on order and, when installed, will enable the production to be increased to 5,000 tons monthly. At present the quantity extracted from the two large open cuts is about 2,000 tons monthly and the average grade for 1939 was approximately 2¼ dwt.

Exploratory work is carried out by sinking holes with a percussion boring plant. During the year over 3,000 feet of boring by this method was completed in holes ranging from 30 feet to 150 feet in depth. Three diamond drill holes were also bored, their aggregate depth being 525 feet.

Norseman Developments, N.L.—On the Northern Star Mine the equipment includes a steel head frame and ore bin, electrically driven winder and compressor and various buildings. This was completed in February, when production commenced. The tonnage treated for the year totalled 18,957 tons for a return of 3,570 fine ounces, averaging 3.76 dwt. extraction per ton.

Development consisted of 75 feet shaft sinking, 1,099 feet driving, 32 feet crosscutting, 1,341 feet rising and winzings and 175 feet diamond drilling. The main shaft was continued from 476 feet to 551 feet, and driving was carried out on the No. 4 level (inclined depth 368 feet) and the No. 5 level (inclined depth 490 feet).

Norseman Associated Gold Mines, N.L.—The Mt. Barker Mine is equipped with steel head frame, electric winder, compressor and various buildings.

Production was commenced in September and about 1,000 short tons per month is sent to the Norseman Gold Mine for treatment.

Development comprised 188 feet of shaft sinking, 724 feet of driving, 23 feet crosscutting, 419 feet rising and winzing and 4,312 feet diamond drilling.

The main shaft was sunk to 299 feet and is being continued to 450 feet. The principal underground work was on the No. 1 level (inclined depth 119 feet). No. 2 level has been opened up at 219 feet. Five surface holes were diamond drilled.

Norseman Extended Leases.—Four surface diamond drill holes, aggregating 1,824 feet were sunk with the object of locating extensions of the Viking and Valkyrie reefs. No payable ore was intersected.

Copeland Mines, N.L.—After holding an option for twelve months over G.M.Ls. 1524 and 1528, Copeland Mines, N.L., purchased the leases for £6,000.

G.M.L. 1528 was let under option to Australian Developments, N.L., while the purchasers have confined operations to G.M.L. 1524. During the year three crushings were put through the Norseman State Battery for a return of 186 ounces, the average value of the sands being 4½ dwt. per ton.

During October the erection of a treatment plant was started and crushing operations were commenced on the 20th November. The plant consists of a five-head battery (1,250 lb. stamps) followed by corduroy strakes. Power is supplied by a 104 h.p. Crossley Diesel engine, which also drives a 250 cubic feet Kelly and Lewis air compressor and a 15 k.w. generator.

Up to the end of December this battery crushed 353 tons for a return of approximately 162 fine ounces of gold.

Development for the year consisted of 280 feet driving, 120 feet crosscutting and 90 feet of winzing and rising.

Two shifts are worked underground and the treatment plant is operated continuously. The total number of men employed is 34, of whom 19 are underground.

Blue Bird Gold Mine, N.L., treated 1,169 tons of ore at the Norseman State Battery for a return of 4,004 fine ounces by amalgamation only. The average yield was 68.50 dwt. The average content of tailings was 20.71 dwt., bringing the total head value of ore treated to 89.21 dwt.

At a point 193 feet south of the Empress boundary, a new vertical shaft of three compartments, 12 feet by 4 feet in the clear was sunk to a depth of 210 feet, and the eastern side is being opened out at that depth for a plat.

A steel head frame, 50 feet high, has been erected and a Ronaldson Tippett winch, driven by a 22 h.p. National engine has been installed. A V belt drive from this engine drives a 220 volt, 7 k.w., D.C. generator from which is obtained the current for lighting the whole plant.

A new store and change house with hot and cold showers have been erected. The compressor room houses an Ingersoll Rand 440 cubic feet compressor, direct coupled to a crude oil engine of 113 h.p. In addition a Bromwade 220 cubic feet compressor is also installed, driven by a 38 h.p. Lister crude oil engine. These two units are coupled to a 6ft. x 3ft. air receiver.

At No. 4 Shaft, in the old workings, an Ingersoll air hoist is used for haulage, a similar unit being used for hauling from the winze.

Treatment Plant.

An order has been placed for a 10 head battery (1,250 lb. stamps), with ore bins, Fraser and Chalmers 9in. x 4in. rock breaker, Ross feeder, elevator from cracker to battery storage bins and two grinding pans, the whole plant to be driven by a 70-77 Blackstone horizontal four cycle, single cylinder Diesel engine.

BROAD ARROW GOLDFIELD.

Ora Banda Amalgamated, N.L., was again the only mine of note on this goldfield, and treated 18,955 tons for a return of 8,020 fine ounces, showing an average recovery of 8.46 dwt. per ton, as against 9.29 dwt. the previous year.

Development for the year included 334 feet of shaft sinking, 533 feet driving, 387 feet crosscutting, 286 feet rising and winzing, and 462 feet diamond drilling.

A new main shaft sunk during the year has greatly facilitated both haulage and development.

Developments have been satisfactory and ore reserves are well ahead of the mill.

Prospecting has been active on this field and the Ora Banda State Battery has been kept working continuously, but there is otherwise little of consequence to report.

NORTH COOLGARDIE GOLDFIELD.

Yerilla District.

This district was generally quiet, although there was some activity in prospecting south of the Paget Gold Mines at Edjudina, which have been under exemption for the whole of the year.

It is reported that the Chateau Tanunda Leases at Porphyry have been taken over by a company which will shortly begin operations there.

The Yilgangie Queen has changed hands and work was recommenced at a lower level than was reached in previous operations. The ore body appears to be widening and becoming stronger. Good results are anticipated.

Niagara District.

There was some prospecting activity in this district and towards the end of the year the Grafter Battery was reconditioned and put into operation. As a result an increased number of prospectors is coming to the centre and it is probable that some old low grade mines will be reopened and worked on a small scale.

Ularring District.

Riverina Gold Mines, Limited, continued full scale operations until the middle of April, when the plant closed down. Underground development was continued until the end of September, and diamond drilling from the surface is still being continued.

The year's gold production was 932 fine ounces from 2,424 tons of ore treated, an average yield of 7.69 dwt.

Development comprised 35 feet shaft sinking, 196 feet of driving, 40 feet of crosscutting, 88 feet rising and winzing and 830 feet of diamond drilling. Developments were encouraging, but the plant is obsolete.

With the expenditure of some capital this mine might still become a consistent producer.

At Morley's Find the Two Chinamen produced 1,539 fine ounces from the treatment of 362 tons of ore and 2,212 ounces from dollied and specimen stone. This mine was under option to the Western Mining Corporation, who abandoned the option after carrying out certain development work.

Five men are still employed there.

From thirty to forty other men were working around this field, but there were no other returns of importance reported.

The New Callion Mine at Davyhurst, employing 18 men on an average, treated 2,588 tons for a return of 889 fine ounces.

A new grinding pan, Wilfley pump and a corduroy table were added to the plant, and additional buildings included a change room, assay office and general office.

Numerous stoppages during the year were due to breakages and alterations to the treatment plant.

It is rather regrettable that a five-head mill was not installed on this mine in the first place instead of the Krupp mill, which has been a constant source of trouble. The mine should be a good one with a strong ore body containing consistent values over a good length and width.

Menzies District.

The Lady Shenton Gold Mine, N.L., treated 927 tons for a return of 664 fine ounces. Some exploratory work was carried out and the mine finally closed down during the latter half of the year. An option was then taken over a neighbouring lease, but proved unsatisfactory.

The First Hit Gold Mine, N.L., continued operations on much the same scale as during recent years, mining and treating 7,949 tons for a return of 5,034 fine ounces. The yield, 12.67 dwt. per ton, was somewhat lower than previously.

Development consisted of 30 feet shaft sinking, 1,012 feet driving, 306 feet crosscutting and 444 feet rising and winzing.

Ore reserves decreased slightly, but a new lens is being opened up on the 366ft. level.

A new internal haulage system is being installed, to cope with the pitch of the ore bodies at lower levels.

The average number of men employed is 41. Only one shift is worked.

Timoni Gold Mine closed down during the year, but in October an option was taken by Goldfields Australian Development, Limited, and 25 men are employed in development.

No. 2 level is being pushed southwards and two winzes are being sunk below this horizon. A shaft further south is being picked up.

Development consisted of 75 feet driving, 26 feet crosscutting and 93 feet winzing.

It is understood that developments are satisfactory.

Prospecting was active around Mt. Ida and Copperfield, and the district appears brighter.

MOUNT MARGARET GOLDFIELD.

Mt. Malcolm District.

The Sons of Gvalia, Limited, mined and treated 136,114 tons of ore for a return of 45,617 fine ounces of gold, the average extraction being 6.70 dwt. per ton.

Development included 208 feet shaft sinking, 1,096 feet driving, 973 feet crosscutting, 1,487 feet rising and winzing and 3,379 feet diamond drilling.

Operations were continuous throughout the year with the exception of one week's hold-up as the result of a shaft mishap.

Ventilation has had careful attention and a new downcast air system has been completed, which feeds the main workings with large quantities of fresh air.

Development has been advanced rapidly and the No. 30 level is being opened up from the Main Shaft and from winzes. Driving and crosscutting have been carried out at Nos. 28, 29 and 30 levels in preparation for the proposed internal shaft from No. 30 level.

The number of men directly employed by the mine averaged 380, exclusive of men employed on the wood-line.

New plant installed includes:—

- (a) Composite alternator compressor set.
- (b) Extensions to switchboard.
- (c) Gas producer.
- (d) Cooling towers.
- (e) Compressed air after-cooler.
- (f) Large Macson lathe.
- (g) Power hacksaw and sundry workshop tools.
- (h) 10in. air main on surface.
- (i) Surface change room (incomplete).
- (j) Completion of workshops.
- (k) Water spray and motor for dust prevention at rock breaker station.

Rapid changes are being carried out on the wood-line, where a new and shorter track is being laid to the new reserves.

Leonora Central Mine was re-opened by Messrs. Powell and Sons in August. A five-head battery and cyanide plant were erected and six men employed.

Ore crushed was broken from both walls of the old workings. The quantity of ore treated up till the end of the year was 650 tons for a return of 51 ounces of fine gold, while 1,020 tons of sands were cyanided for 62 ounces.

The ore body appears to be very wide, but values are erratic. Working costs are low.

The Reefer Battery at Leonora during the year treated 4,166 tons of prospectors' ore.

Prospecting has been fairly active throughout the year, treatment facilities being provided by nine private crushing plants in the district.

Mt. Margaret District.

The Lancefield (W.A.) Gold Mine, N.L., was the major producer of the district, treating 128,343 tons for 32,041 fine ounces of gold, the average yield being 4.99 dwt. per ton.

Development consisted of 93 feet shaft sinking, 5,514 feet driving, 303 feet crosscutting, 3,370 feet rising and winzing and 474 feet diamond drilling.

The internal inclined tunnel was driven a further 93 feet and the No. 15 level driven. Development on this level revealed a considerably decreased length of ore body, and only a short block of ore is available for stoping.

A strong fault traverses the north end of the mine, north of which values have not been proved to persist on the lower levels.

A northerly extension of the ore body was located on No. 13 level. After driving through approximately 70 feet of low-grade material, a body of between 200 feet and 300 feet in length was located in payable values. This was picked up at Nos. 12 and 14 levels, but values were unfortunately disappointing.

Work has been commenced at Nos. 4 and 5 levels to work out a large block of ore left there.

In the inclined tunnel the conveyor belt has been extended to the bin below the No. 15 level and is operating very efficiently.

The pressure on the hanging wall of the expansive open stopes has caused some movement and a few small rock bursts, mainly on the upper levels where the spacing between pillars was greater than is the present practice.

Retreatment of tailings has been abandoned owing to the hard nature of the dump.

Owing to the shortening of the length of the ore body on the bottom levels of this mine, the future is somewhat obscure.

Ore reserves were increased by 143,700 short tons, and the average number of men employed was 268.

At *Cox's Find* the Western Mining Corporation continued successful operations by treating 17,615 tons for a return of 12,657 fine ounces of gold. The grade of ore treated was considerably lower than the previous year, being 14.37 dwt. per ton, compared with 19.87 dwt. in 1938.

Development comprised 191 feet shaft sinking, 553 feet driving, 576 feet crosscutting, 307 feet rising and winzng and 2,267 feet diamond drilling.

Ore reserves remained practically unchanged at 25,000 tons.

The shaft has been extended to the horizon of the No. 6 level, which has been driven on. The nature of the ore body at this level has not yet been determined, but the country has become more settled.

Owing to the nature of both ore body and hanging wall country, mining costs are still high.

Plant installed during the year includes:—

- (a) One 16in. x 9½in. double toggle Ruwolt crusher.
- (b) One 150 h.p. Crossley crude oil engine, driving a Kelly and Lewis 500 cubic feet compressor set, and extensions to the power house to accommodate this extra machinery.
- (c) Pumping plant to supply domestic water.
- (d) Tempering steel furnace.
- (e) Two clarifying tanks.

Diamond drilling is in progress to test the ore body at depth below the present workings.

The Gladiator Gold Mine, Limited, employing an average of 92 men, operated throughout the year, mining and treating 24,169 tons for 6,760 fine ounces of gold, an average yield of 5.49 dwt.

Development work carried out consisted of 82 feet shaft sinking, 721 feet driving, 23 feet crosscutting and 96 feet rising and winzng.

A new 500 cubic feet compressor was installed to assist in better ventilation underground and to provide more air for the machines.

A programme of development was laid out involving proposals for an internal shaft from the No. 5 level. Water will be stored and pumps operated at the No. 6 level, where a concrete dam will be built.

Small mines running five-head mills are the Mary Mac Beria Main Lode in the Laverton area, and the Famous Blue and Mulga Queen in the Duketon district.

Prospecting in the district generally was active. Several new finds were reported, but none proved to be of any importance.

Mt. Morgans District.

Sands Retreatment, Limited, at Morgans, had a profitable year and 3,878 fine ounces were recovered. This plant employs 25 men and works three shifts.

A new classifier was installed during the year, resulting in the treatment of an increased tonnage.

Hill End at Murrin operated throughout the year, employing five men, the battery also crushing for prospectors.

Ore mined and treated amounted to 650 tons, which yielded 177 ounces of bullion, while the cyanidation of 3,500 tons of sands returned 563 ounces of bullion.

A new ore body has been opened up underground and the future of this small mine looks bright.

The Coronation Mine at Linden reported 1,438 fine ounces from the treatment of 146 tons of ore.

There was increased prospecting activity throughout the district and a number of good crushings were recorded.

EAST MURCHISON GOLDFIELD.

Wiluna District.

Wiluna Gold Mines, Limited.—The results of the intensive exploratory campaign that has been carried out on this important property for the past two years have been disappointing, and the undertaking is now being treated as a salvage proposition. While it is hoped that the position is not so serious as recent reports would indicate, it would appear that the end of this prolific producer of the past ten years is more or less definitely in sight.

Development for the year comprised 1,194 feet of shaft sinking, 8,480 feet of driving and crosscutting, 1,244 feet of winzng and rising and 13,634 feet of diamond drilling. No major ore bodies were exposed.

During the year 581,245 tons were treated for a return of 90,169 ounces of fine gold, a falling off of 13,494 tons in ore treated and 15,138 ounces of gold. The average yield was 3.10 dwt. per ton, or .44 dwt. less than the figure for 1938. The reduced tonnage may practically all be accounted for by a five days stoppage in October due to a strike.

Continuous smelting operations were suspended at the end of March and modified low temperature roasting adopted.

Additions to the plant were:—Water cooling equipment for the power house; two agitators for the cyanide section; two flotation machines for the treatment of complex antimonial ore.

The Bulletin section is being treated as a salvage proposition and no further exploratory work is contemplated at present.

The Happy Jack was opened to 1,400 feet and stoping will be done in this area during 1940.

Moonlight Wiluna Gold Mines, Limited, treated for the year a total of 95,805 tons for a return of 26,816 ounces. These figures show a falling off of 36,602 tons and 9,156 fine ounces on the previous year's production, while the average recovery per ton of ore treated remained approximately the same at 5.36 dwt. The discrepancy between the outputs for 1938 and 1939 is more apparent than real. Prior to 1938, the tonnage of antimonial concentrates shipped abroad for treatment had not been reported as tonnage treated, nor had the gold content of this material been reported. These figures were adjusted in 1938, thus raising the reported output for that year to a considerably higher figure.

Development for the year consisted of 106 feet shaft sinking, 5,630 feet driving, 463 feet crosscutting, 1,988 feet rising and winzing and 6,049 feet diamond drilling.

On the Starlight lease some little prospecting and diamond drilling was done and the property was purchased by the company.

No new machinery was installed and treatment operations were carried out at the plant of Wiluna Gold Mines, Limited.

The shipping of antimonial concentrates has been practically discontinued since the outbreak of war.

The Coolgardie Brilliant, N.L., took over the Wiluna East Mine and, at the beginning of the year erected a five-head mill on the property. A further five-head was added at the end of the year and is now in operation.

A cyanide plant is also in operation, and all machinery is driven electrically with power purchased from the Wiluna Gold Mines.

The ore body is a quartz reef some 4 feet in width and has opened up reasonably well, and prospects look bright.

The year's gold production amounted to 1,317 fine ounces from the treatment of 3,664 tons of ore.

Linden (W.A.) Gold, N.L., is another regular producer, and turned out 1,867 fine ounces during the year, the ore crushed amounting to 7,541 tons.

Lawlers District.

The Emu Gold Mines, Limited, was the only prominent producer for the year in this district. The year's work resulted in a yield of 12,649 fine ounces of gold from 48,542 tons of ore, while the ore reserves were increased by about 17,000 tons.

Development for the year comprised 50 feet of shaft sinking, 1,201 feet of driving, 309 feet of crosscutting and 991 feet of rising and winzing.

A new shaft was commenced, but, owing to the international situation, it was decided that the expense was not justified and work was stopped after

completing 50 feet of sinking. The old main shaft has been close timbered from the surface to the No. 2 level and preparatory work was commenced for the deepening of this shaft.

A new 165 h.p. National Diesel engine and two 500 cubic feet compressors were installed.

The future of this mine appears to be assured for a period of years.

The only other producer in the district worthy of note is the Vanguard at Mt. Sir Samuel, which employs 10 men and produced 549 ounces of fine gold from 2,490 tons of ore.

In addition, 1,428 tons of prospectors' ore was treated for 809 ounces of bullion.

Black Range District.

The Youanmi Gold Mines, Limited, the major producer of the district, obtained 20,696 fine ounces of gold from the treatment of 77,221 tons of ore, an average of 5.36 dwt. per ton.

Development work for the year included 579 feet of shaft sinking, 3,055 feet of driving, 1,106 feet of crosscutting, 2,378 feet of winzing and rising and 3,008 feet of diamond drilling. In addition, 769 feet of driving, crosscutting, rising and winzing was carried out in stope preparation.

Additions to the plant were:—1 Belliss and Morcombe compressor, 1,980 c.f.m.; 8 Denver cells in the flotation section; 1 60 rabble Edwards roasting furnace; 1 Cyclone dust arrester and fan.

With the completion of the sulphide treatment plant, the rate of treatment is now over 7,000 tons per month.

Ore reserves were reported at the end of November as 170,000 tons, including 112,000 tons of proved ore, estimated at 8 dwt. per ton.

MURCHISON GOLDFIELD.

Meekatharra District.

The Ingleton Consols Extended was again the chief producer of this district and carried out routine work. The tonnage treated for the year totalled 17,107 tons for a return of 3,035 fine ounces, approximately 6,000 tons and 400 ounces respectively less than the previous year. The yield per ton was 3.55 dwt., or .6 dwt. higher than in 1938.

Prospecting was active in the district and there were four producers of between 500 and 1,000 ounces and eleven others each producing from 100 to 500 ounces for the year.

Cue District.

Big Bell Mines, Ltd., continued their successful operations, their output for the year being 447,322 tons for a yield of 59,727 fine ounces of gold. It will be noted that the average recovery per ton was only 2.67 dwt. compared with 3.52 dwt. in 1938. The treatment of lower grade ore is, it is understood, deliberate, and will add to the life of the mine by increasing the ore reserves.

The bulk of the ore mined came from the glory holes. Two new holes were opened up at the south end and mined during the year.

A dragline excavator and Diesel shovel were put into commission to remove overburden from the hanging wall, and 175,000 tons of this material was removed.

The No. 3 level was opened up at 430 feet and pumps and fans installed.

Development work carried out during the year totalled 92 feet of shaft sinking, 1,809 feet of driving, 3,140 feet of crosscutting and 1,009 feet of winz-ing and rising:—

The following additions were made to plant and buildings:—

- (a) A steel waste bin of 100 tons capacity at the shaft.
- (b) Another fine ore bin 30ft. diameter x 57ft. high, with 5 belt conveyors for filling the bin and distributing feed to ball mills.
- (c) Two weightometers to weigh primary mill feed.
- (d) New lime emulsifying plant consisting of bin, crusher, elevator, emulsifying tank, motors, pumps and weighing machine.
- (e) New 2,900 ton fuel tank with filling and distributing pipes.
- (f) Two new wells were sunk and equipped with pumps and pipes.
- (g) One new dragline excavator.
- (h) Ten new workmen's homes.
- (i) One air conditioned dormitory for the use of night shift men in the summer, containing fifty beds.
- (j) Concrete swimming pool 165 feet x 40 feet.
- (k) Main roads on the lease were macadamised with the help of the road board.
- (l) All single men's huts were covered with weatherboard in place of hessian.

It will be observed from the above list that the company continues to make the comfort and well-being of its employees a first consideration.

The mine has completed a prosperous year and there is every indication that this state of things will continue.

An average of about 400 men is employed.

Triton Gold Mines, N.L., in treating 107,201 tons for a return of 33,776 fine ounces, an average of 6.30 dwt. per ton, practically repeated the previous year's output.

Development work at the main mine consisted of 360 feet of shaft sinking, 1,720 feet of driving, 341 feet of crosscutting, 2,254 feet of rising and winz-ing and 1,826 feet of diamond drilling. In addition the following work was carried out at the Rand section, north of the main mine:—Shaft sinking 230 feet, driving 145 feet, crosscutting 75 feet and diamond drilling 5,244 feet.

From the diamond drill results, prospects on this section looked promising, but subsequent development did not bear out this promise.

On the Perseus section 6,500 feet south of the main workings, a prospecting shaft was sunk to a depth of 89 feet and a crosscut put in for a distance of 29 feet. The results of this work are encouraging and it is being continued.

Towards the end of the year the installation was commenced of a service hoist on the main shaft. Skips are interchangeable with cages on two compartments and the lack of a service cage while the skips are running is a severe handicap.

The prospects of this mine are good and its future seems assured.

Apart from these two important mines, activity in this centre is confined to small scale syndicate work and prospecting. A few good patches have been struck, but nothing of outstanding interest has been reported.

Mt. Magnet District.

Hill 50 Gold Mine, N.L., treated 24,764 tons for an output of 7,912 fine ounces, the average yield being 6.39 dwt. per ton. The gold output is more than 2,300 ounces in excess of that of the previous year, when practically the same tonnage was treated for an average yield of 4.56 dwt. per ton.

Development reported for the year was 114 feet shaft sinking, 365 feet driving, 412 feet crosscutting, 166 feet rising and winz-ing and 1,741 feet diamond drilling.

Development was very successful and two new lenses of ore were located by diamond drilling, which have added substantially to the ore reserves, both in quantity and value, and greatly enhanced the prospects of the mine.

Operations were handicapped early in the year by shortage of compressed air, but this deficiency has been overcome by the installation of a 375 h.p. Diesel engine coupled to a compressor.

Mt. Magnet Gold Mines, Limited, in treating 60,019 tons of ore for a return of 7,091 fine ounces, once again had the doubtful distinction of treating the lowest grade ore mined in the State. The average yield was 2.36 dwt. per ton, compared with 2.56 dwt. in 1938.

Development figures for the year are 119 feet shaft sinking, 1,230 feet driving, 267 feet crosscutting, and 583 feet rising and winz-ing.

The main shaft has been sunk to 400 feet and development is being carried out at that horizon.

A new compressor, powered by a 375 h.p. Diesel-driven engine was installed during the year.

Since 1936 the average gold yield has become progressively lower, being 3.84 dwt. in 1936, 2.88 dwt. in 1937, 2.56 dwt. in 1938 and 2.36 dwt. in 1939. In spite of this low extraction, working profits have been reported each year until 1939, when a loss was recorded, and this effort reflects great credit on the management. It is considered that if relief from the gold tax could be obtained, a profit might still be made on the present extraction.

The latest advices to hand estimate the ore reserves at 316,550 tons at an average value of 3.75 dwt. per short ton, and the difference between the value of reserves and ore mined is put down to the fact that some of the richer ground mined cannot be extracted until additional plant is available.

The immediate future of this mine seems obscure unless some alleviation is forthcoming in the way of extra capital, remission of gold tax or treatment of higher grade ore.

There are a number of successfully operating small mines working in this area which is a very promising one for prospectors and minor operators particularly.

Of the lesser mines the following are worthy of special mention:—

1. Moyagee Syndicate, which obtained 2,367 fine ounces from 1,188 tons.
2. Edward Carson, treating 3,727 tons for 1,978 fine ounces.
3. Black Cat Mine, worked by the Metropolitan Mining and Development Company, Limited, which treated 2,647 tons for 1,598 fine ounces.
4. Broken Bond, 3,752 tons for 1,371 fine ounces.
5. Saturn, 6,084 tons for 1,182 fine ounces.
6. Swan Bitter, which treated 2,964 tons for 1,092 fine ounces.

Altogether prospectors and small producers were responsible for the production of 15,812 fine ounces from this district for the year.

The Murchison Goldfield generally has had a prosperous year, and apart from the major producers, which have been discussed individually, is equalled only by the Yilgarn Goldfield in the productive activities of its minor producers.

YALGOO GOLDFIELD.

At Payne's Find, a number of syndicates are working with varying success. A series of intrusive bars occurring in the mines hampers operations considerably owing to the difficulty of picking up the values when they are lost.

The Carnation Mine had a good year, mining and treating 2,721 tons for a return of 1,317 fine ounces.

At Field's Find an English company commenced operations with the object of reopening an old mine. Twelve men are employed, and operations at the end of the year consisted of bailing and cleaning up the levels. Some plant is in course of erection.

Between Field's Find and Warriedar the Western Mining Corporation are carrying out some boring work.

At Gnow's Nest Mine a five-head battery has been erected, which is now in operation.

Rothsay Gold Mines closed down and dismantled and removed the plant.

PILBARA GOLDFIELD.

Prospecting in this goldfield was again active and the total production for the year was 15,249 fine ounces.

Comet Gold Mines, Limited.—The major producer was again the Comet Gold Mines, which produced 5,564 fine ounces of gold from 5,872 tons of ore treated. The average extraction was, therefore, 18.95 dwt. per ton.

Development for the year included 332 feet of shaft sinking, 590 feet of driving, 342 feet of cross-cutting and 445 feet of winzing. For the provision of a water supply, 215 feet of well sinking was also carried out. High values are reported to continue.

Operations were concentrated on the erection of the new sulphide treatment plant, while a few men were employed breaking oxidised ore from the open cut for treatment at the five-head mill.

The erection of the new plant was completed, but a number of modifications were found necessary, which delayed the commencement of treatment of the sulphide ore.

During the year McKinnon's, a mine to the south of the Comet property, was purchased by the latter company. Satisfactory values are also reported on this mine.

Ora Banda South Mines, N.L., exercised the option held on the Tassy Queen mine, and to the end of the year treated 1,464 tons for a return of 985 fine ounces. This company has installed a five-head mill and cyanide plant on the mine and developments are reported to be satisfactory.

Prospecting and small mine operations generally have been active throughout this goldfield for the year, as is evidenced by the fact that four mines produced between 500 and 1,000 ounces and thirteen more produced from 100 to 500 ounces. The total production for the year from the field was 500 ounces in excess of that of the previous year, in spite of the fact that the output of the Comet Mine, due to construction operations, decreased by 1,000 ounces.

In the Nullagine District, the Blue Spee Mine is worthy of special mention. This mine has been acquired by the Consolidated Gold Areas, N.L., and a considerable amount of satisfactory development is reported. Operations have again been hampered by lack of water. In the previous year a bore was put down at a distance of about half a mile from the mine and tests indicated that a fairly satisfactory flow was available. On sinking a well, however, the flow diminished considerably and was found insufficient for plant requirements. The ore paddock was full and development was held up. Towards the end of the year, a further water supply was located at a distance of some three miles from the mine and a pumping test indicated a flow of 15,000 gallons per 24 hours. The operators now consider that the water difficulty is over.

This company will be in a position and has the intention to treat ore for prospectors, and the successful outcome of this venture is of the first importance to the district generally.

PEAK HILL GOLDFIELD.

Activity is generally confined to prospecting, crushing of low-grade dumps and sands retreatment. The total production from the field for the year was 2,536 ounces.

The only mine to produce more than 500 ounces was the Pegasus, with an output of 771 fine ounces.

COAL MINING.

As compared with 1938 there was a slight falling off in tonnage of coal produced, value and number of men employed.

The production totalled 557,535 tons of coal valued at £362,811. This shows a decrease on the previous year's figures of 47,257 tons and £12,272.

The average number of men employed decreased from 737 to 700, of whom 140 were employed on the surface and 560 underground.

The individual outputs of the various mines working and their values are tabulated hereunder:—

Mine.	Tons.	Value. £
Proprietary	180,775	123,407
Co-operative	97,032	62,769
Cardiff	97,291	58,078
Stockton	102,769	65,769
Griffin	79,668	52,788
Total	557,535	£362,811

A continuous programme of hand boring has been continuously carried out during the year, principally on the Stockton and Cardiff leases. Results have been eminently satisfactory and have proved the existence of coal ahead of the present workings, which increases the known life of these mines for many years.

Development work underground has been carried out satisfactorily, and, at the end of the year, the position of the mines with regard to the production of coal was very favourable.

At the *Proprietary Mine* the number of places available for working at the end of the period under consideration was 123, excluding Nos. 10 and 12 Sections, which can be brought into operation at short notice. A pair of rise headings is being driven through these sections from No. 17 district, by means of which the coal won from Nos. 10 and 12 districts may be transported to the proposed haulage road to be installed in No. 19 Gannon Bord.

Nos. 10 and 12 Districts.—There is room for 32 working places in these two districts. In No. 12 the bords are being set away on the bearing obtaining in Nos. 17 and 19 Districts, while in No. 10 District, the roads are already laid into all the bords, which are standing ready cut for coal production.

In Nos. 19, 21 and 22 districts new faults were encountered which cut off working places. Prospecting is in progress to locate the seam in No. 21 district and a prospecting drive is up 30 feet. Although the seam has not been entirely lost, its position and height have not yet been accurately determined.

In No. 11 district there were 17 working places available at the end of the year which were not being worked. All necessary working plant remains in the district and can be put into operation at short notice if required.

In Nos. 18 and 20 districts development has been pushed ahead rapidly and it is estimated that there is twelve years' work ahead of the present line of working faces.

On the right hand side of the mine, which includes Nos. 10, 12, 17, 19 and 21 districts there is a considerable area to be worked ahead of the present faces before encountering the main fault at the bottom of the mine, although minor faults may be met with similar to those on the left hand side of the mine.

The yardage of development during the year, excluding cut throughs and breaking away of new bords is tabulated hereunder:—

No. 20 District:		
No. 1 Heading	222 $\frac{1}{2}$	yards.
No. 2 Heading	220 $\frac{1}{2}$	yards.
No. 18 Level	300 $\frac{1}{2}$	yards.
No. 19 Level	307 $\frac{1}{2}$	yards.
No. 11 District:		
No. 1 Heading	87 $\frac{3}{4}$	yards.
No. 2 Heading	94	yards.
No. 19 District:		
No. 1 Heading	56 $\frac{3}{4}$	yards.
No. 2 Heading	57	yards.
No. 4 Heading	61 $\frac{3}{4}$	yards.
No. 5 Heading	61 $\frac{1}{2}$	yards.
Total	1,468$\frac{3}{4}$	yards

The number of working places lost in this mine through faulting was:—

No. 11 District	12	places.
No. 19 District	3	places.
No. 20 District	7	places.
No. 21 District	9	places.
No. 22 District	6	places.
Total	37	places.

The *Co-operative Mine* has 71 working places and sufficient area developed for a further 13 places. No places were lost during the year through faulting, but the main development headings are close to a major fault, the effect of which is problematical.

There is ample coal ahead to keep up supplies at the present rate for some years to come, and suggested future development includes working eastward from the present workings and junctioning with a continuation of the Main Dip headings, while at the same time prospecting for the hinge of the fault which cuts off the workings at the bottom of the district known as 5 Right Dips.

The *Cardiff Mine* has 60 working places available, while 7 bords have been stopped in No. 7 district owing to the steepness of the gradient. It is proposed to work this coal from the district below when it is sufficiently advanced.

Preparations are now in hand to open up a new district to the dip on the right hand side of the main haulage road, where it is proposed to extract the coal revealed in boring from the surface on this side of the mine.

The *Stockton Mine* has 75 working places available, including 10 spare places. There were 12 places lost by faulting during the year.

Extensive hand boring has proved the coal to continue towards the Proprietary workings and new headings have been put out in this direction. The places opened up in this new area will be permanent to the boundary of the area as proved to date. It is estimated that the coal proved by boring will give the colliery a life of twenty years at the present output.

Development is still being carried on the No. 4 Left headings, but the thickness of the coal is only about 5 feet, and it is doubtful whether the life of the mine in this direction is very great. There appears to be a split in the seam with a thick stone band intruding. Faulting also narrows the sphere of operations at this point.

It would appear from all indications that the future of this mine lies in the new area disclosed by recent boring and a further possible extension towards the Proprietary workings.

At the *Griffin Mine* the rate of development has not been entirely satisfactory, although steps were taken during the latter part of the year to remedy this deficiency.

The most important development is the pushing forward of a stone drive through a fault to explore and open up an area on the downthrow side. With this work successfully completed, a large area of coal which cannot be worked from above owing to the steepness of its inclination, will become available.

This mine has 49 working places, exclusive of cut throughs and specials, and employs 20 pairs of miners, allowing a fair margin of working places.

The position generally on the field may be regarded as fairly satisfactory as regards development. The hand boring programme is continuing and widening the knowledge of the field, and substantially increasing the known reserves of coal.

MINERALS OTHER THAN GOLD AND COAL.

There was a falling off in the total value of minerals produced other than gold and coal of £34,983, the figure for 1939 being £156,177.

Antimony concentrates were again produced only at the Wiluna Gold Mines plant as a by-product of the treatment of antimonial gold ore. The production reported was 364 tons, the value being £3,234. The increase in tonnage over 1938 production was 25 tons, while the value increased by £625. Exports were valued at £26,425, including the value of the gold content.

Arsenic, also wholly produced by Wiluna Gold Mines, Limited, totalled 1,416 tons valued at £25,488. This showed a big decrease on the previous year's production, of 2,583 tons and £46,494. The value of exports for the year was £59,163, which included a large carry-over from the previous year.

Asbestos.—Production of this mineral was reported from the Marble Bar and Nullagine Districts of the Pilbara Goldfield, from Bulong in the East Coolgardie Goldfield (low grade material only), and from the Hamersley Range crocidolite deposits.

Many inquiries were received during the year regarding Western Australian deposits of this useful mineral, and it would appear that, if its exploitation could be placed on a proper basis, a valuable industry might be formed.

So far as the chrysotile variety is concerned, a number of high grade deposits have been opened up from time to time, and easily mined long fibre extracted, but it has not yet been proved whether any of these deposits are of sufficient extent to warrant large scale operations.

A small treatment plant was working during the year on the crocidolite deposits in the Hamersley Range, but it is understood that, to date, no system-

atic mining has been attempted, operations being confined to gouging out visible supplies at the outcrops. There is a big opportunity for large scale operations on this field.

Beryl.—At Balingup 7 tons of beryl was produced, valued at £60. To mine this quantity it was found necessary to break 300 tons of waste rock. This hardly seems a commercial proposition.

Bismuth.—The production of bismuth ore to the value of £138 was reported from the Gascoyne district.

Felspar.—The felspar quarries in the Coolgardie area worked steadily throughout the year, employing 12 men and producing 3,542 tons, valued at £7,084. A further 250 tons worth £500 was produced elsewhere.

Iron.—Investigations at Yampi Sound were continued during the year with the object of ascertaining the extent and value of the haematite deposits there. The work of tunnelling and boring was still in progress at the end of the year, and results to date have been very satisfactory.

Glauconite.—The reported production for the year was 142 tons, valued at £710. This quantity was 41 tons less than the 1938 production and the value was decreased by £205.

Gypsum production was reported as 14,340 tons valued at £13,492, an increase of 911 tons and £1,083 in value over the previous year.

Mica production to the extent of 444 lbs. valued at £196 was reported, which originated principally at Mullalyup and Yinnietharra. It is understood that the majority of the output has been disposed of locally, and that any mica shipped overseas was in the nature of small trial parcels only.

There are deposits of good quality mica distributed about the State, but difficulties of mining and preparation for the market together with uninviting prices offered by Australian dealers do not tend to make their exploitation a tempting proposition.

Red Oxide has been mined in the Nullagine district of the Pilbara Goldfield, the quantity reported being 142 tons valued at £1,398.

Scheelite was produced at Comet Vale in the North Coolgardie Goldfield, 10 tons being reported valued at £28. Very little work was done, but towards the end of the year an Eastern States syndicate was becoming interested.

The Norseman Gold Mines, Limited, purchased some scheelite leases at Higginsville. A portable compressor, drills and winch were put to work and driving is being carried out at the 70ft. level.

A pilot plant designed to treat 20 tons per day has been constructed at the Norseman Gold Mine.

Silver.—The quantity of silver exported, which was entirely produced as a by-product of gold refining, amounted to 287,439 fine ounces valued at £32,890. The quantity produced was 16,093 ounces more than in 1938, while the value increased by £4,038.

Tantalite.—The reported production of tantalite for the year, all from Tantalite, Limited, of Wodgina, was 8 tons valued at £12,073, while the export figures are 14 tons worth £19,969. The production is 12 tons behind the total for 1938 while the value decreased by £15,484. The price for this mineral is rising, but, rather paradoxically, the demand appears to be decreasing.

British Tantalite, Limited, holds two mineral leases on the Coolgardie Goldfield, each of 24 acres, and also a Water Right of 5 acres, while a dam has been constructed by the company. An option has been taken on a third lease.

The mine is situated on the Londonderry Road, 14 miles from Coolgardie. A private road has been constructed on the property.

The main lode, some 60 feet wide, is being developed. It is a typical pegmatite intrusion into the older greenstones. Large nodules of biotite and well defined beryl crystals are conspicuous. The tantalite is found in needle-shaped crystals finely disseminated through the ore.

The erection of a small pilot plant was begun in July and the machinery was running in November. Plant adjustment and running prevented regular shift work in December, but it is anticipated that full time work will be undertaken early in the current year. At 31st December eight bags of concentrate were ready for shipment.

All plant water is chemically treated, settled and clarified, about 25,000 gallons per hour being constantly in circulation. Apart from a Technical Director, 14 men are employed.

Vermiculite.—Great interest has been shown in this mineral, and during the year 30 tons were produced from the Bulong deposits, valued at £250.

Good deposits have also been discovered in the Young River district, between Ravensthorpe and Esperance, and several mineral claims have been pegged out.

CONCLUDING REMARKS.

The continued expansion of the gold mining industry is most gratifying and new records have been established.

During the year under review the tonnage treated reached the new record total of 4,095,257 tons, last year's total of 3,757,720 tons being the previous highest tonnage.

The value of the gold won was £11,842,964, which is also a new record.

The record price of gold of 195.14s. permitted lower grade ore to be mined, with the result that the average grade of ore mined was only 5.80 dwt. per ton.

The tonnage of ore mined per man employed in the gold mining industry was 269, which is the highest yet recorded. The previous best figures were 244 in 1938 and 238 in 1915.

Amongst the items of major importance for the year, the following may be mentioned:—

Lake View and Star Mine was again the principal producer, followed by the Great Boulder Gold Mine, whose output this year exceeded the 100,000 ounce mark. The names of the Consolidated Gold Mines of Coolgardie and the Gladiator Gold Mine were added to the list of those producing over 5,000 ounces. The Central Norseman Gold Mine, the Paringa Gold Mine and the Kalgoorlie Enterprise all materially increased their outputs.

The comparative importance of the gold mining industry in the export trade of the State is made clear from the following figures:—

	1938.	1939.
	Value in	Value in
	Australian	Australian
	Currency.	Currency.
	£	£
Gold exported ..	10,363,023	11,842,964
Wheat exported ..	4,890,039	4,492,004
Wool exported ..	3,333,549	2,962,860

I wish again to express my appreciation of the co-operation and high standard of the work performed by the Assistant State Mining Engineer and all Inspectors of Mines.

The Assistant State Mining Engineer was again largely responsible for the compilation of this report and the Inspectors of Mines for supplying much of the information contained in it.

I wish also to express my thanks for the help kindly given by all other officers of the Department.

RICHARD C. WILSON,
State Mining Engineer.

APPENDIX No. I.

MINING DEVELOPMENT EXPENDITURE.

	£	s. d.
Loans Authorised prior to 1939	249,565	4 5
Loans Authorised during 1939	21,993	9 1
Total Amount Authorised	£271,558	13 6

To Advances—	£	s. d.	£	s. d.	By Advances Repaid—	£	s. d.	£	s. d.
Prior to 1939	225,372	2 3			Prior to 1939	54,866	4 9		
During 1939	11,435	14 0			During 1939	3,399	2 11		
Total Advances			236,807	16 3				58,265	7 8
					„ Advances Written Off—				
					Prior to 1939	151,603	1 6		
					During 1939 (Credit)	23	14 3		
								151,579	7 3
					„ Advances Outstanding			26,963	1 4
								£236,807	16 3

	£	s. d.
Advances Outstanding	26,963	1 4
Interest Outstanding	6,710	7 1
Total Outstanding	£33,673	8 5
Interest Paid prior to 1939	27,111	9 0
Interest Paid during 1939	185	11 0
Total Interest Paid	£27,297	0 0

APPENDIX No. II.

Coal Mines Regulation Act, 1902-1926.

ANNUAL REPORT OF THE BOARD OF EXAMINERS FOR MINE MANAGERS, UNDER-MANAGERS AND OVERMEN.

Office of the State Mining Engineer,
Mines Department,
Perth, 15th April, 1940.

The Under Secretary for Mines:

Sir,

We submit herewith, for the information of the Hon. Minister for Mines, the Annual Report of the Board of Examiners for the year 1939.

*Examinations for Certificates.**April Examination:*

Three candidates submitted themselves for examination in April, one taking the First Class and the others the Second Class Examination. At the meeting of the Board on the 14th April, it was decided that the First Class papers warranted a First Class Certificate of Competency being issued to this candidate, but that the Second Class candidates had failed to obtain the requisite number of marks to enable the Board to grant certificates.

October Examination:

No applications were received for the October examination, and no meeting of the Board was held in that month.

Copies of the papers set for examinations during the year are attached to this report. These papers were exchanged with kindred Boards in England and the Eastern States.

We have the honour, etc.

RICHARD C. WILSON,
State Mining Engineer (Chairman).
H. A. ELLIS,
Acting Government Geologist (Member).
JAS. McVEE,
Inspector of Mines, Collie (Member).

The Coal Mines Regulation Act, 1902-1926.
EXAMINATION OF FIRST CLASS CERTIFICATE
OF COMPETENCY.

Subject: ARITHMETIC.

Tuesday, 4th April, 1939: 9 a.m. to 11 a.m.

(1) A reduction of $7\frac{1}{2}$ per cent. is made on the basic rate of 4 $\frac{1}{2}$ d. for machine cutting, and later an increase of 5 per cent. is given. The fortnightly output is 17,350 tons. What is the difference in the amount of money paid between the basic and the last rate?

(Possible Marks, 17.)

(2) A, B and C are the joint owners of a mine in which £200,200 is invested. A's shares are valued at £25,025, B's share of the remainder is $\frac{1}{35}$ th more than C's. What is C's fractional amount of the share capital?

(Possible Marks, 16.)

(3) When making a stone drive 13 feet wide and 8 feet high 18 lbs. of explosive are used per lineal yard of cutting. The specific gravity of the rock was 2.3. How many pounds of explosive were used for each ton of excavated material?

(Possible Marks, 17.)

(4) If 55 per cent. of coal came out of bords and headings and $17\frac{1}{2}$ per cent. of the pillar coal is lost during extraction, how many tons have been got from the whole and from the broken respectively out of a total area of 250 acres with a 6 foot seam? (A cubic foot of coal weighs 82 lbs.)

(Possible Marks, 16.)

(5) Calculate the proportion of concrete required for a shaft 18 feet finished diameter and 800 feet deep with 9-inch concrete. Assume the proportions are four of rubble, two of sand and one of cement and that 7 cubic feet of dry mixture are equal to $4\frac{1}{2}$ cubic feet of concrete.

(Possible Marks, 17.)

(6) In a heading 12 feet wide where the seam is 8 feet thick and a loader is used, 2,150 tons of coal are got out in three weeks. How many yards are driven per week, specific gravity of the coal being 1.28?

(Possible Marks, 17.)

Subject: GEOLOGY.

Tuesday, 4th April, 1939: 11 a.m. to 1 p.m.

(1) What types of rocks would you expect to find associated with coal measures? Give a list of the essential constituents of the following rocks:—Conglomerate, sandstone, shale, carbonaceous shale.

(Possible Marks, 20.)

(2) Illustrate by means of sketches the various irregularities met with in working coal seams. Give a brief account of how you think these have been brought about.

(Possible Marks, 20.)

(3) Give a brief outline of two theories by which coal seams are thought to have been formed and quote evidence which substantiates these theories.

(Possible Marks, 20.)

(4) Outline the geological history of any Australian coalfield with which you are familiar and name the characteristic fossil remains found in the coal measures.

(Possible Marks, 20.)

(5) Write a brief account of faulting of coal seams and illustrate with diagrams. What are the usual types of faults encountered in the workings of the Collie coalfield?

(Possible Marks, 20.)

Subject: MACHINERY.

Tuesday, 4th April, 1939: 3 p.m. to 5 p.m.

(1) What tests would you apply to a transformer to ascertain that it was in good and correct working order.

(Possible Marks, 16.)

(2) What is the importance in earthing in connection with electrical plants? In an electrical power plant comprising alternating switch gear, transformers and motors, what parts would be earthed, and how would you ensure a good earth?

(Possible Marks, 17.)

(3) What are double helical teeth? The speed of an electrical motor is 720 revolutions per minute, and on the motor shaft there is a pinion having 30 double

helical teeth, the pitch being 10 inches diameter. The motor is to drive a countershaft running at 240 revolutions per minute. State the number of teeth and the diameter of the pitch circle of the toothed wheel required for the countershaft. (Possible Marks, 17.)

(4) How would you arrange the gears of an endless rope haulage, the electric motor of which develops 100 horse-power at 960 revolutions per minute, whilst the C wheel turns at 12 revolutions per minute?

(Possible Marks, 17.)

(5) Describe the operation of putting a winding rope on a drum and say what you would specially guard against.

(Possible Marks, 17.)

(6) How may water be fed into a steam boiler under pressure? Describe a complete installation for feeding a boiler.

(Possible Marks, 16.)

Subject: MINING OF COAL.

Wednesday, 5th April, 1939: 10 a.m. to 1 p.m.

(1) Describe the panel system of working for a mine liable to spontaneous combustion. The seam is 18 feet thick, the depth from the surface is 800 feet, and the seam is dipping 1 in 18. Fire-damp is given off freely. Give details of how the panels should be formed and why they should be so formed.

(Possible Marks, 25.)

(2) In driving a pair of branch headings a very hard dyke is encountered 20 chains from the main haulage way, at which are situated a main pump, lodgment and the main delivery pipes. A branch endless rope haulage runs to within 30 yards of the dyke. You have reason to anticipate the dyke being of considerable thickness and water is making at the dyke at the rate of 3,000 gallons per hour. State and illustrate by sketches the provisions you would make for—

(a) Preventing water interfering with the work on the dyke.

(b) Economically and speedily driving through the dyke in both headings.

(c) Dealing with the water.

The headings are dipping 1 in 20 from the main haulage and electric current (three-phase A.C.) at 415 volts is available at the main haulage road.

(Possible Marks, 25.)

(3) You have worked 7 feet of a 13-foot seam and are now taking the remaining 6 feet as tops. The roof is fairly heavy, requiring 9-foot slabs being set 2 feet apart after the tops have been taken down. What method would you adopt in setting the slabs so as not to interfere with the filling and wheeling of the skips?

(Possible Marks 25.)

(4) In a faulty heading where the sides are showing signs of weight and the roof is bad at the face, how would you timber to hold the side squeeze and make the work safe at the face? Give sketches to illustrate your answers.

(Possible Marks, 25.)

(5) You are using undercutting machines in a mine where the coal sits down on the cutter bar as soon as it is cut. It is essential to have machine-cut coal. What alterations would you make and what would you expect as a result?

(Possible Marks, 25.)

(6) Sketch a district worked on the bord and pillar system and show by a large scale sketch the method of extracting one of the pillars. (Possible Marks, 25.)

(7) Show by sketches various methods of supporting underground roadways which are subject to severe crushing pressures. Under what circumstances would you adopt each particular method?

(Possible Marks, 25.)

(8) It has been decided to drive two headings off a main return which is 18 yards from and parallel to the main intake haulage. Cuts through are 40 yards apart. State and indicate clearly by sketches how you would lay this work out for ventilating and for haulage of coal to main haulage. (Possible Marks, 25.)

Subject: SURVEYING.

Wednesday, 5th April, 1939: 2 p.m. to 4 p.m.

(1) Assume that you are about to make an underground survey of a colliery and that you have to use a transit theodolite which is not new and which you have not used before. Give a list of the adjustments you would have to check before starting work. Do not give details of each adjustment.

Give a detailed description of the collimation adjustment for any level with which you are familiar. State the maker's name. (Possible Marks, 30.)

(2) Calculate the bearing and distance of the line joining Stations 4 and 1 in the following traverse:—

Station.	Bearing.	Horizontal Distance.
1—2	90°—00'	235 feet
2—3	47°—35'	300 "
3—4	340°—20'	179 "

Station 4 is 220 feet above Station 1. Calculate the angle of depression between Station 4 and Station 1. (Possible Points, 25.)

Back.	Inter.	For.	Rise.	Fall.	Reduced Level.	Distance.	Remarks.
10·12	6·41 9·12 3·21				120 ft.	0 ch. 1 ch. 2 ch. 3 ch.	Bench Mark.
8·12	9·21 6·76 3·37 5·00	8·19 9·76				4 ch. 5 ch. 6 ch. 7 ch. 8 ch. 9 ch.	Change.

Plot the longitudinal section and calculate the gradient of the line joining the first and last stations. State what scales are used. (Possible Marks, 20.)

(6) Surveying instruments depending on the use of the magnetic needle are sometimes used in underground surveying. State what precautions you would take when doing underground surveying with these instruments. (Possible Marks, 20.)

Subject: VENTILATION AND DANGEROUS GASES.

Thursday, 6th April, 1939: 10 a.m. to 1 p.m.

(1) A fan produces 300,000 cubic feet of air per minute at a mine with a 4-inch water gauge. Calculate the horse-power of ventilation and state the power you would instal to ensure the fan giving this quantity. If the quantity is required to be increased to 400,000 cubic feet in the same mine, what would be the new horse-power and water gauge? (Possible Marks, 25.)

(2) In connection with mine gases, explain what is meant by a chemical combination and by a mechanical mixture. Give instances of each from gases met with in mines. (Possible Marks, 25.)

(3) How would you conduct a ventilation survey of a mine? What are the principal difficulties encountered in obtaining a high order of accuracy in the results? (Possible Marks, 25.)

(4) In driving cross measure drifts in strata containing a proportion of silica, state what arrangements you would adopt as to ventilation, and give an account of any special apparatus you would instal to prevent the dust getting into the air. (Possible Marks 25.)

(5) It is proposed to make a permanent air crossing not far from the bottom of the shaft. Sketch in plan and sectional elevation the type you would construct, giving the principal dimensions. (Possible Marks, 25.)

(6) A sample of air taken from behind a stopping is analysed and found to contain—

	%
Methane	8.36
Oxygen	10.14
Nitrogen	72.43
Carbon Dioxide	9.07
	100.00

(3) It is desired to prolong for a distance of about 3 miles, the straight line joining two Stations, A and B, situated 15 chains apart. Detail the method you would employ, using a transit theodolite.

Show by a sketch how you would continue this line beyond, say, a large building which lay in the centre of the line of sight. Show the angles and distances used. (Possible Marks, 25.)

(4) A, B and C are the sites of three bore-holes, the reduced levels of the collars of which are 400, 300 and 200 feet, respectively, above datum. The bearing from A to B is 70° and the distance 200 feet; the bearing from B to C is 120° and the distance 300 feet. The depth to the top of the same coal seam in bore-holes A, B and C is 350, 280 and 140 feet, respectively. Show graphically how to determine the direction and degree of dip of the coal seam. State the scale used. (Possible Marks, 30.)

(5) Complete and check the necessary data in the following reproduction of a level book page to enable a longitudinal section of the centre line traverse to be plotted:—

Find the percentage of fire-damp, normal air, and black-damp contained in the mixture. (Possible Marks, 25.)

(7) Narrow bords are being driven in advance to the full rise of 1 in 20. Headings are being driven from the narrow bords on the strike, and from the headings bords are being broken away to the full rise. A little CH₄ is being given off. You have the choice of making the narrow bords either the first or the last places on the split. State which you prefer and give your reasons. (Possible Marks, 25.)

(8) At a colliery where the shafts are 700 feet deep, the steam-driven fan is badly damaged by an explosion and the return airways are heavily charged with fire-damp. What means would you adopt as a temporary expedient to restore the ventilation to allow exploration and repair work to go on until such time as the fan is repaired? (Possible Marks, 25.)

Subject: COAL MINES REGULATION ACT, 1902-1926.

Thursday, 6th April, 1939: 2 p.m. to 4 p.m.

(1) What are the provisions of the Act with regard to mine plans? (Possible Marks, 21.)

(2) What does the Act require as to the division of the mine into parts? (Possible Marks, 21.)

(3) What places of refuge on underground planes are required by the Act? (Possible Marks, 21.)

(4) What occurrences require to be reported to an Inspector under the Act? (Possible Marks, 22.)

(5) What steps must be taken on the abandonment of a mine? (Possible Marks, 21.)

(6) What does the Act require with regard to—
(a) Reporting of accidents?
(b) Prohibition of single shafts, tunnels or outlets. (Possible Marks, 22.)

(7) State in substance what the Coal Mines Regulation Act requires in regard to the use of explosives in the coal mines of this State. (Possible Marks, 22.)

The Coal Mines Regulation Act, 1902-1926.
 EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER MANAGER OR OVERMAN.

Subject: ARITHMETIC.

Tuesday, 4th April, 1939: 9 a.m. to 11 a.m.

(1) The capacity of a sinking bucket is 1.5 cubic yards. How many buckets of debris would have to be raised in sinking through 60 feet of rock in a shaft whose finished diameter is 18 feet and is lined with brickwork 14 inches in thickness? (Possible Marks, 17.)

(2) The driving wheels of a locomotive are 5 feet in diameter and turn $\frac{2}{3}$ of the remainder to another. Find what distance was lost owing to the wheels slipping on the rails. (Possible Marks, 16.)

(3) A mine owner sold $\frac{1}{3}$ rd of $\frac{21}{64}$ ths of his mine to one person and $\frac{2}{3}$ of the remainder to another, receiving £31,500 as the total amount of both sales. What is the value of the part he still possesses? (Possible Marks, 16.)

(4) A lodgment is 4 chains long, 12 feet wide and 7 feet high. Water is flowing into the lodgment at the rate of 150 gallons per minute, and the pump has a capacity of 250 gallons per minute. Find how long the pump would take to empty the lodgment which was full when the pump was started. (Possible Marks, 17.)

(5) The analysis of coal from a mine is—

Moisture .. .. .	.9%
Ash	9.10%
Hydro-Carbons	38.34%
Carbon	51.66%

What is the total weight of each in a heap of coal from the mine weighing 25 cwt.? (Possible Marks, 17.)

(6) A coal heap has a rectangular base and a rectangular top. The base measures 100 feet by 30 feet, the top 90 feet by 20 feet, and the height 12 feet. Allowing 45 cubic feet per ton of coal, find how many tons are in the heap. (Possible Marks, 17.)

Subject: COAL MINES REGULATION ACT,
 1902-1926.

Tuesday, 4th April, 1939: 11 a.m. to 1 p.m.

(1) State the requirements of the Act relative to timbering working faces. (Possible Marks, 25.)

(2) What are the duties of an examining deputy making an inspection before the commencement of work? (Possible Marks, 25.)

(3) State the requirements of the Act relative to the appointment of persons in charge of machinery. (Possible Marks, 25.)

(4) Withdrawal of workmen in case of danger—
 Name all the dangers possible to occur in a coal mine to which this rule is applicable. (Possible Marks, 25.)

(5) What does the Act require in regard to—
 (a) Firing of shots on dry and dusty haulage roads?

(b) Firing of shots in a dry and dusty working place? (Possible Marks, 25.)

(6) What precautions are required by the Act and Special Rules in—

(a) Approaching old workings?

(b) Fencing places not in actual course of working or extension?

(c) The use of safety lamps?

(d) The provision of places of refuge? (Possible Marks, 25.)

Subject: ROADWAYS.

Tuesday, 4th April, 1939: 2 p.m. to 5 p.m.

(1) It has been decided to enlarge a main haulage road. To do this explosives have to be used. State fully the precautions necessary to comply with the Coal Mines Regulation Act. (Possible Marks, 25.)

(2) Mechanical haulage is to replace horses to the main haulage rope. Give some practical remarks thereon, more particularly as to face haulage where the grade is 1 in 7 against the load. (Possible Marks, 25.)

(3) As Under Manager of a Colliery you have decided to relay one of your main roads during the week end. Explain fully how you would undertake the work so that the fullest efficiency will be obtained from the men engaged. (Possible Marks, 25.)

(4) What precaution should be taken to prolong the life of a haulage rope, and if it became necessary to change the rope end for end, how would you proceed to carry out this work? (Possible Marks, 25.)

(5) Sketch and describe how you would grade a "Tommy Dodd" curve on an endless rope haulage, and how you would place and secure the "Tommy Dodd" rollers. (Possible Marks, 25.)

(6) What points would you consider before adopting one of the following methods of haulage:—

(a) Endless Rope?

(b) Main and tail?

(c) Direct or single rope? (Possible Marks, 25.)

Subject: MINING OF COAL.

Wednesday, 5th April, 1939: 10 a.m. to 1 p.m.

(1) One of your Deputies in a mine requiring the use of safety lamps, and where shot firing is necessary, informs you that a blower of gas has been struck in the middle of a ventilating district. You cannot get any more air on the blower, and the gas is diluted within two yards of where it is issuing. What would you do regarding shot firing in the district? (Possible Marks, 28.)

(2) A coal seam is 22 feet thick. A band of shale 5 feet thick occurs 11 feet from the floor and the remainder of the seam is clean. The roof is mud stone. Sketch and describe how you would work this seam. (Possible Marks, 28.)

(3) It has been decided to re-open an old district for the extraction of pillars. The haulage roads are very dusty and the dust contains a high percentage of coal dust. Give a brief description of the dangers of coal dust and state what you would do under the conditions set out in this question. (Possible Marks, 29.)

(4) In driving a winning place 14 feet wide by 9 feet high a soft dyke 30 feet thick is met with. Describe in detail how you would drive through this dyke and secure the road permanently. (Possible Marks, 29.)

(5) What are the dangers of shooting off the solid in dry and dusty mines, and what precautions would you take to prevent accidents? Describe and illustrate by a dimensioned sketch a well-prepared shot in a bord 14 feet wide and 7 feet high. (Possible Marks, 29.)

(6) Sketch a hand got long wall district to produce 150 tons of coal per shift from a seam 5 feet thick with good roof and floor. Sketch in detail one working place showing wheeling road and timbering. Give approximate dimensions. (Possible Marks, 29.)

(7) When extracting pillars, describe the operations of drawing timber from a finished "lift" and say what precautions you would take in order that the work may be done as safely as possible. (Possible Marks, 28.)

Subject: VENTILATION AND DANGEROUS GASES.

Wednesday, 5th April, 1939: 2 p.m. to 5 p.m.

(1) What methods are adopted for measuring the quantity of air passing any given place? State fully the method you employ and what precautions you take so as to reduce the chance of error. (Possible Marks, 25.)

(2) State fully how you would ventilate a single heading, expected to reach an ultimate length of 200 yards in a fiery mine. Give particulars of all the appliances required, and describe how you would fix and use them. (Possible Marks, 25.)

(3) How is the presence of fire-damp detected and the proportion present ascertained; State fully how you would proceed to test a place with this object in view. (Possible Marks, 25.)

(4) Sketch a water gauge as used in connection with ventilation, showing a 3-inch water gauge reading, and state what pressure in lbs. this represents per square foot. (Possible Marks, 25.)

(5) What are the advantages of splitting the air in a mine? Can splitting the air be carried too far? If so, give your reasons. (Possible Marks, 25.)

(6) Shot firing is in use in an area where the goaf edge is clear of fire-damp, but experience makes you believe that gas is present in the interior of the goaf. What special precautions would you take to ensure safe working in this district? (Possible Marks, 25.)

(7) In a drive 7 feet 6 inches by 6 feet 8 inches the air travels 40 yards in 12 seconds. What quantity of air is circulating per minute, and if the W.G. is 2.5 what would be the horse-power? (Possible Marks, 25.)

(8) An airway 2,000 yards in length and 6 feet high by 9 feet wide is brushed and widened to 8 feet high by 10 feet wide. If the W.G. in the first case is 1.4 inches find the W.G. in the second case. (Possible Marks, 25.)

APPENDIX No. III.

Mines Regulation Act, 1906.

(Regulation 17A.)

EXAMINATION FOR CERTIFICATE OF COMPETENCY AS UNDERGROUND SUPERVISOR.

Subject: MINING.

23rd May, 1939.

Time allowed: Three hours.

Eight questions only to be answered.

All questions are of equal value.

Candidates should illustrate with sketches, where possible.

1. A winze is down 70 feet and machine drilling is used. Describe clearly:—

(a) How to rig and place the gear and appliances needed, giving strict attention to safe working and health of workmen.

(b) A man descends the winze and is overcome with fumes. How would you rescue him with the least danger to yourself?

2. A drive is in 50 feet from a crosscut. How would you proceed to continue the drive, showing placement of machine, pipes, valves and ventilation layout? Give diagram of holes bored for different cuts. How far would you expect to bore with each steel?

3. Show as fully as you can how and where you would construct a penthouse below the 2,000 ft. level to enable the shaft to be sunk another lift. Give the size of the timbers used.

4. How would you take out a block of ore 6 feet in width by underhand stope and keep the place safe to work in?

5. Write what you know about explosives, the necessary precautions for safe handling, where they are used, and how to charge and blast with them.

6. Describe the timbering of a section of level with stalls and with sets, showing passes and manways. Give the sizes of timber used.

7. Describe the different methods of stoping with which you are acquainted and under what conditions you would use any particular method.

8. How would you support level sets whilst taking the ore out immediately under them, leaving the level in good order for trucking, etc.?

9. Describe fully how you would open out for a plat at the 500ft. level, crosscut in 50 feet and drive in both directions, providing good ventilation. How would you get rid of the fumes and dust after firing?

10. Write what you know about the duties and responsibilities of a shift boss.

Subject: MINING LAW.

23rd May, 1939.

Time allowed: One and a-half hours.

All questions are to be answered.

All questions are of equal value.

1. What safety precautions are laid down by the Mines Regulation Act, 1906:—

(a) In the case of men working alone?

(b) In the use of cyanide tailings for stope filling?

(c) For the prevention of dust underground?

(d) In the method of firing charges?

2. What examinations must be made regularly into the condition of winding ropes and their attachments, guides, rope structure and winding engine?

3. What is the prescribed burning rate of safety fuse? How is the burning rate determined?

4. What action must be taken when a pass or shoot is jammed or "hung-up"?

5. What does the Mines Regulation Act say about Winding Engine-drivers?

6. For what purposes and under what conditions may men be employed underground on a Sunday?

Subject: MINING.

10th October, 1939.

Time allowed: Three hours.

ALL questions to be answered. All questions are of equal value.

Note.—Candidate should illustrate with sketches, where possible.

1. An internal shaft is being sunk from the 1,600ft. level and is down 450 feet. At 400 feet a plat is cut where the sinking winch is placed. One compartment is used for the cage which operates to the 400 plat. The broken rock is hauled from the sink with the winch and transferred to the cage which takes it to the 1,600ft. level.

Show how you would lay out the work for safe operating.

2. If a shoveller was overcome with fumes in the shaft in question No. 1, how would you set about rescuing him.

3. An old prospecting shaft 5ft. x 3ft. and 150ft. deep is to be examined. How would you go about this, and what precautions would you take?

4. How would you safely work a wide stope in fairly heavy ground which requires filling? Show how you would ventilate it, and how you would keep your passes safe. Give a short description of all the operations.

5. State what you know about wire ropes, what sizes are used for different jobs, how to shoe, examine, and keep them in good safe working condition.

6. If you were a shift boss, how would you examine the rig up and the general working of a winze and crosscut for the safety of the men employed?

7. State what you know about ventilation, the suppression of dust and how to keep a mine free from dust and fumes whilst the men are employed.

8. How would you work, on a large scale, open cuts or glory holes, quarries, and rill stopes and keep them safe for the men working there?

Subject: MINING LAW.

10th October, 1939.

Time allowed—One and a half hours.

All questions are to be answered. All questions are of equal value.

1. Describe the different types of main magazines allowed by the Mines Regulation Act, 1906. What quantity of explosives may be stored in a main magazine? Where may a distributing magazine be situated and what quantity of explosives may be stored therein?

2. How should ladders be placed in a shaft? Illustrate by means of a sketch.

3. What exceptions are provided in connection with the regulation that men may not be employed on a mine on Sunday?

4. What sanitary provisions must be made on a mine, both on the surface and underground?

5. What provisions are laid down in the Mines Regulation Act, 1906, regarding:—

- (a) Time for blasting;
- (b) Clearing passes and shoots;
- (c) Crib places;
- (d) Temperatures in underground working places?

6. When must change houses be provided and what provisions must apply to them?

APPENDIX No. IV.

A METHOD OF THE RESCUE OF PERSONS BURIED IN A RILL OF BROKEN ORE.

By J. H. Verran, M.Aust.Inst.M.M.
Inspector of Mines, Kalgoorlie.

In the working of shrink stopes it sometimes happens that cavities are formed in the mass of broken ore lying in the stope. These cavities are covered by a bridge of broken ore which is apparently solid. In some cases persons have been thrown into such cavities by the collapse of the bridge, and have been buried by broken ore. Serious and even fatal accidents have

occurred where men have ventured on to the top of old shrink stopes without taking adequate precautions for their safety.

Rescue operations in such cases may be hampered by the fact that broken ore is standing at an angle steeper than the normal angle of rest and running down on to the place of the accident.

The following measures are designed for safe working in such a situation:—

1. At some little distance below the top of the rill a bearer is wedged from wall to wall, and boards are rested upon this. Their ends are forced into the rill to hold up any stone which may move above this point.
2. A few feet lower down another bearer is wedged across the stope close to the rill and long pieces of steel are driven into the rill above it. The steel is driven in a horizontal position as far as the difficulty of getting it between large stones permits.
3. Ore is worked away from below the steel and stacked clear of the buried man.
4. When this operation has been carried as far as possible another bearer is placed lower down the rill and another set of steel driven in. The process is repeated until the injured man is reached.

The following equipment is likely to be required:— 4 dozen wedges, 3 striking hammers, 1 dozen stout bearers of suitable size, 3 hand saws, 6 picks, 6 shovels, 50 pieces of steel about 1 inch diameter and 5 feet to 7 feet long, and 2 small bottle jacks.

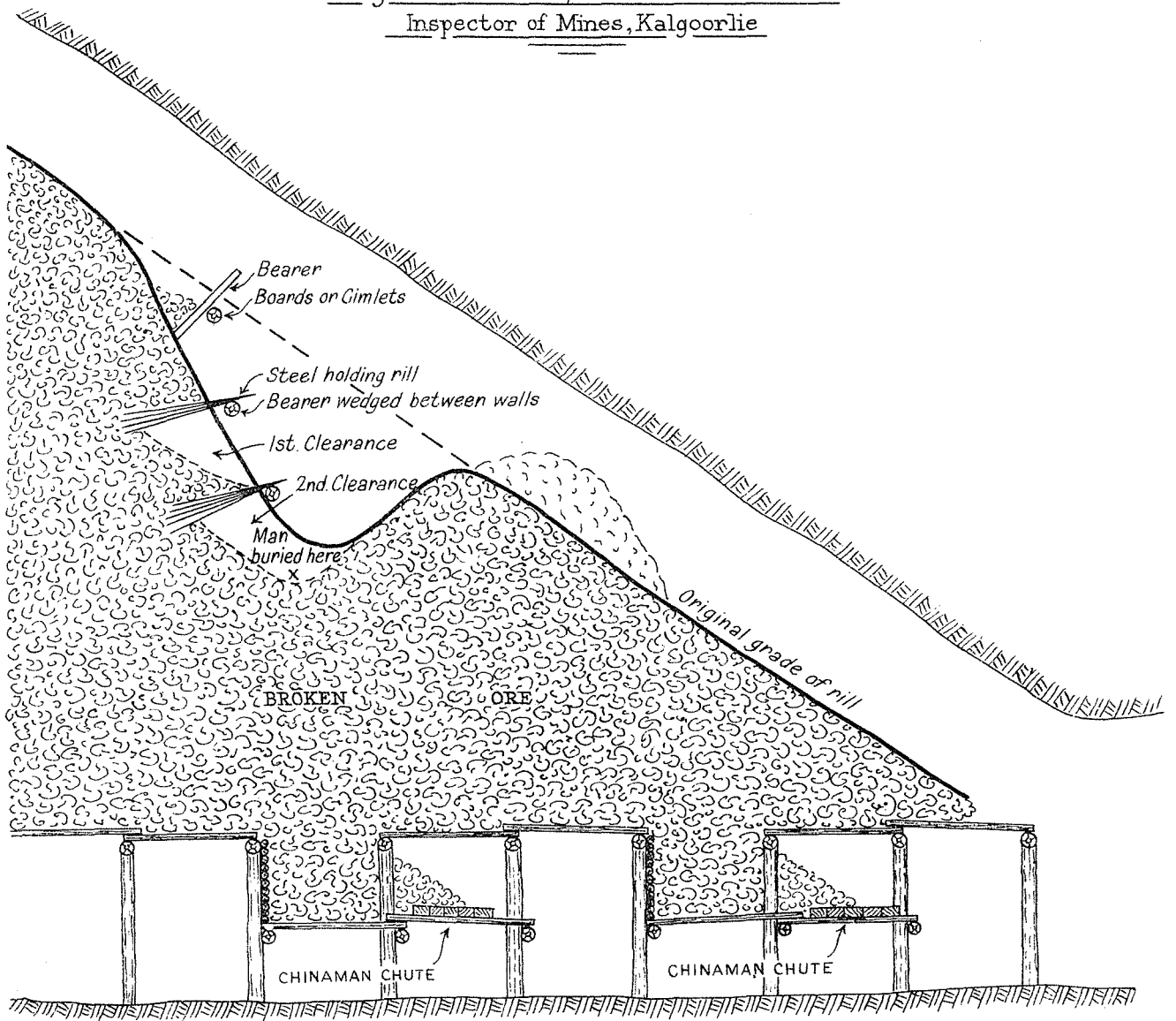
This rescue method is illustrated in the accompanying sketch.

MINES DEPARTMENT, W.A.

PROPOSED METHOD OF RESCUE OPERATIONS
IN SHRINK STOPE WITH MOVING RILL

By J H. Verran, M. Aust. Inst. M.M.

Inspector of Mines, Kalgoorlie



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Division III.

Report of the Superintendent of State Batteries.

The Under Secretary for Mines.

I have the honour to submit, for the information of the Hon. Minister, my report on the operations of State Batteries for the year ended December 31st, 1939.

Cyclonic rainstorms in January, experienced in most of the districts in which our plants are situated, interrupted operations both at the producing shows and our plants and, apart from considerable material damage, resulted in reduced ore supplies for some weeks.

The tonnage crushed did not reach the record figure for the preceding year, due in some measure to the dislocation mentioned above, and the fact that Boogardie and Marble Bar batteries were hung up for some months whilst new plants were erected.

Tailing treatment fell slightly in proportion to the tonnage crushed.

A comparison of the tonnages crushed and cyanided for the last two years and the low yield year of 1928 is as follows:—

	1928.	1938.	1939.
Tons Milled ..	16,271	108,966	101,443.75
Tons Cyanided ..	15,474	103,175	95,056.00
	31,745	212,141	196,499.75

The following are detailed figures for production since inception:—

Production at Par:

	£
By Amalgamation	6,862,642.31
By Sands	1,379,774.33
By Slimes	265,266.11
By Residues	10,051.29
Total at par	£8,517,734.04

Gold Premium:

By Amalgamation	1,618,986.94
By Sands	522,253.42
By Residues	728.41

Total Australian Currency £10,659,702.81

Tons of Tin Ore Milled:

Production:	
By Black Tin	93,833.96
By Residues	572.20
	£10,754,108.97

VALUE OF PRODUCTION.

Two thousand two hundred and fourteen parcels were treated, an average of 45.82 tons per parcel for 53,141.17 ounces of bullion recovered by amalgamation estimated to contain 44,995 ounces of fine gold, worth £427,966(A).

Tailing plants produced 14,587.77 fine ounces, worth £142,372(A), bringing the total value of bullion recovered to £572,373.

The estimated production in fine ounces from all treatment was 59,882 fine ounces. The State Battery System has kept its place as fourth in the order of gold output. The only larger producers were the Lake View and Star Group, Great Boulder Pty., and Wiluna Gold Mines.

VALUE OF ORE PER TON TREATED.

The 101,443.75 tons crushed yielded 44,995 fine ounces or 8 dwts. 20.9 grains per ton. The average value of tailing produced was 4 dwts. 2.4 grains, bringing the average value of the ore treated to 12 dwts. 23.1 grains per ton.

The average head value in 1938 was 13 dwts. 10 grains per ton and in 1937, 12 dwts. 20 grains per ton.

Districts producing the highest averages were Norseman, which crushed 5,157 tons averaging 27 dwts. 9 grains, due to the high yields of the Blue Bird, and Boogardie with 6,228.75 tons worth 20 dwts. 1 grain per ton.

ESTIMATED PERCENTAGE RECOVERY.

The whole of the tailing was not treated and approximately 4.68% was untreatable, but applying the average extraction of 77.6% obtained at all batteries to the average value of tailing, the estimated percentage of recovery at our plants was as follows:—

Head Value—12 dwts. 23.1 grains.	
Recovery by Amalgamation .. 8 dwts. 20.9 grs. =	68.43%
Recovery by Tailing Treatment . 3 dwts. 4.27 grs. =	24.51%
Total Extraction	92.94%

RECEIPTS AND EXPENDITURE.

Receipts from all sources were £121,104 17s. 6d. as against £124,179 11s. 11d. in 1938. Expenditure amounted to £110,690 3s. 11d. as against £112,557 0s. 9d. the previous year.

A comparative synopsis shown later in this report gives the details of receipts and expenditure under the respective headings.

It will be noticed that the cost of crushing has increased by fourpence per ton and the receipts increased by approximately threepence. Tailing treatment costs have increased by ninepence per ton. This increase was offset by a rise in receipts of 1s. 1d. per ton. Receipts exceeded our working expenditure by £10,414 13s. 8d.

MILLING.

Excluding Mt. Sir Samuel, Linden and Darlot (leased batteries) one 20-stamp, eight 10-stamp and ten 5-stamp mills, totalling 135 stamps, were available for public crushing.

Two thousand two hundred and fourteen parcels were treated aggregating 101,443.75 tons, averaging 45.82 tons per parcel.

The tonnage is down 7,523 tons on 1938 when the tonnage crushed and average parcel size was 108,966 tons and 47.86 tons respectively.

Batteries crushing 5,000 tons, tonnages shown in parentheses, are Kalgoorlie (19,118), Coolgardie (8,747), Ora Banda (8,323), Marble Bar (7,493), Cue (6,778), Meekatharra (6,495), Peak Hill (5,640), Payne's Find (5,215), and Norseman (5,157).

Kalgoorlie was some 1,200 tons below 1938 figures but approximately 4,000 tons up on 1937 results.

Marble Bar with a larger new battery operating most of the year showed the greatest increase in tonnage crushed, the increase being 2,368 tons.

STAMP DUTY.

The duty per stamp was 4.57 tons per 24 hours against 4.72 tons in the previous year.

COST PER TON.

The milling cost increased from 12s. 10.9d. in 1938 (the lowest since 1929) to 13s. 2.8d.

This increase was to be expected with the increase in the basic wage of 8s. per week, which operated for the last half of 1938, applying for the whole of the year under review, and a general increase in fuel, stores, etc.

A comparison in detail of the expenditure per ton for 1939 and 1938 are as follows:—

	1939		1938	
	s.	d.	s.	d.
Wages	6	11.6	6	8.22
Fuel	0	10.3	0	9.30
Water	0	10.6	1	0.34
Stores	1	6.1	1	7.77
Motor Car	0	1.6	0	2.19
Repairs and Renewals ..	1	3.4	1	1.88
Sundry Expenses ..	1	7.2	1	5.10
	13	2.8	12	10.80

A slight economy in wages has been effected as the increase shown does not reflect the rise in the basic wage. The same can be said about the cost of stores which was lower despite an increase in many items.

Sundry expenses include Head Office Expenditure and insurance premiums under the Workers' Compensation Act. Details are shown later under Administration.

Kalgoorlie State Battery had the lowest milling cost of 9s. 9.4d. and incidentally the lowest revenue, viz., 8s. 0.8d., owing to the high stamp duty and owners crushing by time.

I am pleased to report a considerable drop in the cost of crushing at our North-West Batteries. The costs at Marble Bar, where a new 10-head plant was installed, dropped from 15s. 6d. to 13s. 4d., and at Bamboo Creek from 20s. 5.8d. to 16s. 10.7d.

Revenue per Ton.

The revenue per ton was 9s. 4.7d., an increase of 2.8d. per ton on the 1938 figure.

The total loss on milling was £20,618 0s. 1d., or 3s. 10d. per ton, against 3s. 9d. in 1938.

TAILING TREATMENT.

Nineteen plants treated 95,056 tons of tailing as against 103,175 tons in 1938. The reduction is a reflection of the smaller tonnage milled.

The average head value was 4.067 dwts., just above the 1938 figure. Continued high tonnages and values from the Blue Bird Mine at Norseman, the Metropolitan Development Company's Black Cat Lease at Boogardie, and an increased tonnage of high-grade tailing at Marble Bar, are greatly responsible for this comparatively high average.

Comparative figures are as follows:—

Year.	Tons Treated.	Head Value.	Residue Value.	Theoretical Extraction.	Call at 8½s. 11½d. per oz.	Recovery.	Value.
		dwts.	dwts.	%	£	£	£A.
1939	95,056	4.067	0.908	77.67	63,943	63,759	140,275
1938	103,175	4.03	0.96	76.17	67,477	67,533	142,372

There was an increase of 1.5 per cent in extraction over the previous year and average residue of 0.908 dwts. can be considered satisfactory.

It will be noticed that the recovery is again very close to the call, which speaks well of the work done and the excellent sampling.

Segregation of Tailing Produced.

Schedule 5 attached shows the tonnage of tailing above the purchaseable value of 2 dwts. 8 grs., that below this figure and of the refractory tailing.

Most of this last mentioned contains too much copper, but some will pay to treat and owners will be paid on the extraction obtained.

Approximately 50 per cent. of the refractory tailing was produced at Marble Bar, but it is interesting to note that of the 6,762.25 tons of tailing produced, only 2,093.75 tons were segregated to the copper dam.

Totals are as follows:—

	Tons.	Head	Value	Per
		Dwts.	Dwts. Grs.	cent.
Over 2 dwts. 8 grs. per ton ..	48,272	6	7	52.82
Under 2 dwts. 8 grs.	38,855.5	1	10	42.50
Refractory ..	4,279	3	23	4.68

The percentage figures are almost identical with those of the preceding year and values are also close, except that the value of refractory tailing segregated dropped from 4 dwts. 20 grains to 3 dwts. 23 grains per ton.

Revenue and Cost per Ton.

The revenue increased from 14s. 4.7d. to 15s. 5.5d. due to the higher value of tailing, increased extraction and the rise in gold values.

The cost per ton at 8s. 11.1d. was 9d. per ton greater than in 1938, and the following are comparative details with the 1938 figures, and the increases are mainly due to heavy replacements of vats and equipment originally charged to capital as recon-

struction, a gradual increase in the price of stores and dislocation due to storms early in the year.

	1939		1938	
	s.	d.	s.	d.
Salaries and Wages ..	4	4.42	4	6.34
Cyanide	0	9.31	0	9.99
Lime	0	2.97	0	3.02
Water	0	7.54	0	3.16
Oil	0	0.39	0	0.67
Motor Car	0	0.76	0	0.47
Repairs and Renewals ..	0	5.22	0	3.04
Stores, Administration and general expenses ..	2	4.50	1	11.48
	8	11.11	8	2.17

On account of the very high price of gold, extra care has been given to the preparation of tailing, making additional horses and drays necessary. More supervision is exercised over the contractors and the results have fully justified this course, as is shown by the increased extraction. Kalgoorlie State Battery practice is taken as a basis for fixing the price of emptying and filling vats, the district allowance being added for the respective centres.

Wages per ton for Kalgoorlie for the year were 2s. 11d., and the average at all batteries 3s. 5d. These figures do not include insurance, which is charged to Head Office.

COMPARATIVE SYNOPSIS OF RESULTS AT STATE BATTERIES FOR TWELVE MONTHS ENDED 31st DECEMBER, 1938 AND 1939.

	1938.			1939.		
	Tonnage.	Expenditure per Ton.	Revenue per Ton.	Tonnage.	Expenditure per Ton.	Revenue per Ton.
Milling	108,966	s. d. 12 10·9	s. d. 9 1·9	101,443·75	s. d. 13 2·8	s. d. 9 4·7
Tailing Treatment ...	103,175	8 2·1	14 4·7	95,056·00	8 11·1	15 5·5

RECEIPTS AND EXPENDITURE.

	Tonnage.	Expenditure.	Revenue.	Profit.	Loss.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Milling	101,443·75	68,221 19 1	47,631 7 4	...	20,590 11 9
Tailing	95,056·00	42,437 16 6	73,470 10 2	31,032 13 8	...
Tim Treatment ... ..	...	30 8 4	3 0 0	...	27 8 4
	...	110,690 3 11	121,104 17 6	31,032 13 8	20,618 0 1
Less Loss ... ..	...	...	...	20,618 0 1	...
Net Profit ... ..	...	...	...	10,414 13 7	...

CARTAGE SUBSIDIES.

Comparative figures for the last three years are as follows:—

Year.	Tons Crushed.	State Batteries.			Private Batteries.		Total.
		Tons Claiming Subsidy.	Percentage of Ore Crushed.	Amount Paid.	Tons Claiming Subsidy.	Amount Paid.	
1937	102,800·00	30,625	% 29·8	£ s. d. 11,202 16 0	8,786	£ s. d. 2,900 8 6	£ s. d. 14,103 4 6
1938	108,966·00	29,599	26·2	12,481 7 7	6,745	2,593 12 7	15,075 0 2
1939	101,443·75	26,965	26·44	10,797 12 6	5,524	1,817 13 2	12,615 5 8

It will be noticed that the reduction in ore crushed is just about reflected in the decreased subsidy paid to State Battery customers.

The proportional decrease in the amount paid to customers of privately owned plants is slightly greater.

ERECTION AND RECONSTRUCTION.

Work during the past year was undertaken at the following Batteries.

Marble Bar was reconstructed and the plant enlarged from 5 to 10 stamps, which included the installation of a new 57 h.p. Ruston-Hornsby Single Cylinder Fuel Oil Engine, together with a complete new six-vat (19ft. 2in. x 4ft.) tailing plant. A Bedford truck was also supplied.

The assay office was improved by the installation of a Braun Pulveriser.

The water supply was increased by installing an electric motor on the Homeward Bound Water Shaft in addition to providing machinery for the equipping of the Viking water supply should this be necessary.

Coolgardie.—New mortar boxes and guides to standard 10in. centres were installed and the standards rebedded, whilst a completely new nine-vat (18ft. 6in. x 4ft.) tailing plant was installed.

Boogardie.—This plant was reconstructed and enlarged from 5 to 10 stamps, including the installation of a reconditioned 15ft. x 9ft. Hadfield Rock Breaker, Elevator and Ore Bins.

Warriedar.—Owing to the heavy summer rains the water shaft was badly damaged, which necessitated a considerable and costly amount of retimbering.

Peak Hill.—It was also found necessary to retimber this water shaft, a dangerous and very costly business. The pump was also removed from the shaft and reconditioned.

An analysis of the expenditure is as follows:—

General Loan Fund:	£	s.	d.
Wages	4,245	6	7
Public Utilities	3,328	9	11
Other	3,653	15	5
Total	£11,227	11	11

STAFF.

A considerable amount of leave due to Managers was taken during the past year, their movements being as under.

Coolgardie.—Ed. Wann taking his biennial leave was relieved by Thos. Prosser, who had been on sick leave.

Meekatharra.—Ed. Speering had his accumulated annual leave, Thos. Prosser acting as his relief until he had a bad accident, when he also was relieved by L. A. Thompson.

Sandstone.—E. G. McKenzie took his accumulated leave, the relieving Manager being L. A. Thompson.

Marble Bar.—J. Duval, whose term in the North-West had expired, took his accumulated annual and long service leave, F. J. Breustedt being appointed as Manager of this Battery.

Yalgoo-Warriedar.—L. A. Thompson had his accumulated leave early in the year, being relieved by Geo. Macfarlane, who, after a couple of months was relieved by H. Bassford, who is still in charge of this circuit.

Payne's Find.—L. A. Thompson was appointed to the Battery thus replacing P. F. Hogg, who was transferred to Yarri, and it is with the deepest regret that I have to record that the late Mr. Thompson was killed in an accident whilst motoring from Payne's Find to Yalgoo, J. Duval then being appointed in his place.

Laverton-Yarri.—P. F. Hogg is now in charge of this circuit having replaced F. J. Breustedt.

Peak Hill.—Bain Hogg, whose engagement at this Battery expired during the first half of the year was replaced by H. Bell, who is now at this plant which is under the supervision of Ed. Speering, Manager of Meekatharra.

Ora Banda.—Owing to A. Hepworth's illness this plant was operated by the staff under the supervision of C. E. Kennedy Smith of Kalgoorlie.

It is to be regretted that during the past year, owing to illness and accident, the Department lost the services of two esteemed Managers, namely Mr. T. E. Prosser, whose connection with the State Batteries dates from 1903 to 1916 and from 1923 to 1939, and the late Mr. L. A. Thompson, whose sad death on the Payne's Find-Mt. Magnet Road in September terminated a service which commenced in 1934.

ADMINISTRATION.

	£	s.	d.
Salaries	2,817	17	8
Inspection (including salary of Inspector)	879	3	7
Workers' Compensation	2,250	3	2
Postage	76	6	3
Printing	68	17	7
Sundry Fares, etc.	221	9	6
Total	£6,313	17	9

In future the amount shown under Workers' Compensation will be charged under wages against the different batteries.

The total amount charged for the year under Administration shows a decrease of £494 18s. over the previous year.

FUEL SUPPLIES AND POWER ECONOMY.

The possibility of a long war and the difficulty that may arise in obtaining adequate fuel oil supplies has to be seriously considered by all users of imported fuel. Sixteen of the 20 State Batteries are equipped with wood gas producer engines as prime movers. Four plants, Yalgoo, Meekatharra, Bamboo Creek and Marble Bar have Diesel engines and oil is taken from the State Steamers' bunkers and railed in bulk

to the respective plants. At the four above-mentioned plants wood is very scarce or, in the case of Marble Bar and Bamboo Creek, practically unobtainable.

The charcoal producer plant which was superseded by a Diesel engine some years ago at Marble Bar used charcoal burnt on the Murchison and costing £10 10s. per ton. The fuel cost was 1.25 pence per B.H.P. as against the present cost of 0.5 pence with fuel oil. We have almost eliminated the use of petrol, kerosene and Diesel engines for solution pumping on our tailing plants and water supplies, some of which are at a considerable distance from our plants. These pumps are now motor driven, the electric current being derived from generators driven off the main engines. The 44-hour week worked by our Batteries results in a long hang up at the week end and solution pumping has to be done by smaller engines.

At some centres tailing treatment has to be carried on when the mill is idle and again we have to have recourse to small pumping engines using imported fuel. To obviate this as much as possible it is proposed to install small charcoal producers to drive these engines. We have just built a small producer of more or less conventional lines to drive a 10 H.P. National Kerosene Engine. This engine was purchased in 1920, was damaged in a fire in 1933, overhauled and found unsatisfactory for kerosene and scrapped.

The charcoal producer was made with a furnace 18in. high and 9in. diameter, lined with firebrick and with air preheater and a simple type easily replaceable vaporiser. Although a scrubber was made for working trials at the State Engineering Works it is proposed to connect these small producers to our main power plant scrubber system, which will make their installation inexpensive.

By introducing a plate between the T end of the connecting rod and the big end brass the compression was raised from 80 to 100 lbs. per square inch. Gas pipes and ports were increased in size to assist the flow of gas to the cylinder. The engine developed and maintained 7 H.P. in test with white gum charcoal.

It is proposed to increase the speed slightly when at least 9 H.P. can be obtained.

The experiments were carried out under the direction of the Engineer for State Batteries, Mr. R. J. Sinclair, and it is proposed to use charcoal from our wood producers which we use for smithy purposes and partly in our assay work. Firewood is used for calcining our cyanide sludge and coke for smelting.

Firewood is gradually increasing in price, as the distance of the source increases and in sympathy with the rise in wages, etc. Forestry restrictions and royalties, no doubt considered necessary, also influence the price.

METHOD OF TREATMENT.

It has been suggested that the present method of treatment should be superseded by that employed by most mines, i.e., fine grinding and continuous treatment. In 1915 the Government erected such a plant at Wiluna to deal with large quantities of oxidised ore from the Wiluna Gold Mines, then under option.

This ore produced little or no gold by amalgamation. The cost of additions to the then existing plant was £12,524, but despite the fact that the results were

considerably better than those obtained by the old company neither the cost of treatment nor extraction showed any improvement on our present methods.

51,671 tons were treated on this plant and when the options were exercised the ore supplies became intermittent and the Department reverted to the present system.

The experience here and at other batteries where different slime presses and filters had been used showed that none of these filters was very efficient when treating oxidised aluminous slime, which is now produced by a large proportion of the ore crushed at State batteries.

If a reasonably large monthly tonnage could be guaranteed the working cost with such a plant would be less at the present moment on account of the increased cost of wages, but at very few of our batteries could such a guarantee be given and under the circumstances the saving in wages would not justify the large capital expenditure.

In 1939 the estimated extraction obtained at State Batteries was 92.9 per cent. on some two thousand different parcels, many of them difficult to treat.

The average head value was 12 dwts. 23 grs. and the residue 0.90 dwts.

There are occasional parcels which would yield considerably higher extraction if treated by fine grinding, etc., but the tonnage of such at any one battery would not warrant the cost of the extra and costly plant required. The South Kalgurli mine, which crushes large monthly tonnages of its own ore and is equipped with an expensive sampling plant can give better terms than the Department for ores which show a low recovery by amalgamation, but on average ore and that showing a higher than average return by amalgamation the State Battery charges are more advantageous to the prospector, notwithstanding the fact that our charges are based on the cost at all batteries and not on Kalgoorlie costs only.

CHARGES.

No alteration was effected but the increased payment from 80s. to 84s. 11½d. per ounce for gold produced from tailing introduced in the last half of 1938 was felt for the full year.

Charges collected on 101,443.75 tons crushed, including tailing treatment, amounted to 23s. 11d. per ton. As the total production was estimated at £572,373 owners, after paying Departmental charges, collected 89s. per ton.

GENERAL REMARKS.

At the time of writing it would appear that ore supplies for 1940 would be up to last year's figures but we must face the inevitable drift of men from the fields to the A.I.F. and war industries.

The difficulty in obtaining capital has resulted in a number of companies patronising our batteries in preference to erecting their own plants, especially during the development periods and this has been the means of keeping several plants fully occupied. Large customers under this category are the Metropolitan Development Company's Black Cat Mine at Boogardie, the Blue Bird and Groundlark mines at Norseman and the Carbine Mine at Ora Banda.

The ore from these mines is high grade and has resulted in keeping up the high average of recent years. The gross value of the ore at S4s. 11½d. per ounce showed increases at ten plants, six being but slight and a fall at nine centres; the average head value was 12 dwts. 23 grs. per ton as against 13 dwts. 10 grs. in 1938 and 12 dwts. 20 grs. in 1937.

The season was an exceptionally good one on the Pilbara as far as rain was concerned, and prospectors have been able to get about this extensive belt; but the rains damaged the roads considerably and made transport almost impossible to some centres for a time.

On the Murchison and Eastern Goldfields the season was patchy, but with good roads and motor transport, conditions for prospecting and transport of ore were excellent, except for a few weeks early in the year, following severe storms.

Transport charges remained stationary and at very cheap rates in most centres. With the substantial increase in gold prices producers have had every encouragement. This is evidenced by the increase in crushing during the last quarter of the year when just under 30,000 tons were crushed at State Batteries.

CONCLUSION.

Once again I have to thank the Goldfields and Head Office staff for their good work and loyal co-operation. Military training has interrupted our office routine very considerably and many alterations had to be made. Both customers and outback staff have been understanding and complaints have been few.

I must especially thank the Government Analyst and those of his staff who have undertaken increased work on our behalf. Beside check and umpire samples for gold a very large number of copper determinations were necessary in order to segregate properly tailing containing too much copper to handle.

In districts like Laverton, Marble Bar, Mt. Ida, Yalgoo and Warriedar where copper is widely distributed the copper content of all parcels treated is ascertained.

A good deal of work has been done by the State Batteries Branch on water treatment for engine circulating water as a prevention of scale and to offset the corroding of the circulating tanks, and water analyses have been done by the Government Laboratory.

D. F. BROWNE,
Superintendent of State Batteries.

24th May, 1940.

SCHEDULE No. 1.

Return showing Tons Crushed, Gold Yield by Amalgamation, Average Per Ton in Shillings, and Total Value without Premium for Year ended 31st December, 1939.

Battery.	Tons Crushed.	Gold Yield Bullion.	Value per Ton in Shillings and Pence.	Total Value without Premium.
		oz.	s. d.	£
Bamboo Creek	3,276·25	1,784·31	39 2·6	6,423·52
Boogardie	6,228·75	4,499·70	52 0	16,195·92
Coolgardie	8,747·75	3,959·90	32 7·1	14,255·64
Cue	6,778·00	4,759·30	50 6·6	17,133·48
Kalgoorlie	19,118·75	6,359·55	23 11·4	22,894·38
Laverton	2,822·25	2,548·85	63 8·9	8,995·86
Marble Bar	7,493·00	3,024·45	29 0·7	10,888·02
Meekatharra	6,495·75	4,236·70	46 11·5	15,252·12
Mt. Ida	2,523·25	1,670·15	47 7·8	6,012·54
Norseman	5,157·00	6,055·05	84 6·4	21,798·18
Ora Banda	8,323·75	4,802·75	41 6·5	17,289·90
Payne's Find	5,215·25	2,801·85	38 8·1	10,086·66
Peak Hill	5,640·50	1,142·01	14 6·9	4,111·24
Sandstone	4,112·25	1,232·45	21 6·9	4,436·82
Warriedar	1,538·00	554·45	25 11·4	1,996·02
Wiluna	2,751·50	1,096·70	28 8·3	3,948·12
Yalgoo	2,222·50	1,190·60	38 6·8	4,286·16
Yarri	2,766·25	1,345·85	35 0·3	4,845·06
Youanmi	233·00	76·55	23 7·9	275·58
	101,443·75	53,141·17	34 3·6	191,125·22

SCHEDULE No. 2.

Return showing Tailings Payable and Unpayable and Gross Contents for Year ended 31st December, 1939.

Battery.	Tailings Payable.		Tailings Unpayable.		Refractory Tailings.		Totals.	
	tons.	ozs. dwts.	tons.	ozs. dwts.	tons.	ozs. dwts.	tons.	ozs. dwts.
Bamboo Creek	1,941·75	690 19	1,006·75	80 6	...	...	2,948·50	771 5
Boogardie	4,771·50	2,122 5	846·00	61 6	...	...	5,617·50	2,183 11
Coolgardie	4,038·50	1,073 16	3,577·25	244 16	339·25	95 16	7,955·00	1,414 8
Cue	3,907·50	1,101 15	2,125·00	162 0	40·00	19 16	6,072·50	1,283 11
Kalgoorlie	8,427·50	2,177 12	8,805·50	631 13	...	...	17,233·00	2,809 5
Laverton	1,769·50	410 12	792·25	68 12	...	...	2,561·75	479 4
Marble Bar	4,158·00	2,239 18	510·50	43 19	2,093·75	218 1	6,762·25	2,501 18
Meekatharra	3,885·00	1,012 4	1,824·50	131 0	199·25	14 4	5,908·75	1,157 8
Mt. Ida	1,843·50	463 2	346·50	31 5	90·00	17 10	2,280·00	511 17
Norseman	3,263·50	1,613 0	1,451·00	117 10	...	...	4,714·50	1,730 10
Ora Banda	3,825·50	834 5	3,587·25	227 2	...	...	7,412·75	1,061 7
Payne's Find	440·00	72 1	4,247·25	313 14	6·50	2 11	4,693·75	388 6
Peak Hill	626·00	163 18	4,297·50	228 7	...	...	4,923·50	392 5
Sandstone	1,385·00	313 13	1,618·75	123 10	697·00	129 6	3,700·75	566 9
Warriedar	312·25	110 14	465·50	26 7	606·50	299 12	1,384·25	436 13
Wiluna	2,397·50	374 12	131·25	11 10	...	...	2,528·75	386 2
Yalgoo	337·75	95 3	1,455·75	96 15	206·75	56 4	2,000·25	248 2
Yarri	753·00	183 14	1,745·75	129 5	...	...	2,498·75	312 19
Youanmi	188·75	90 15	21·25	1 7	...	...	210·00	92 2
Totals	48,272·00	15,143 18	38,855·50	2,730 4	4,279·00	853 0	91,406·50	18,727 2

SCHEDULE No. 3.

Number of Parcels treated, Tons crushed, and Head Value for the Year ended the 31st December, 1939.

No. of Parcels Treated.	Battery.	Tons Crushed.	Yield by Amalgamation, Bullion.	Yield by Amalgamation, Fine Gold.	Gross Contents of Tailings on 100 % (including Refractory).	Total Contents of Ore, Fine Gold.	Average per ton, Fine Gold.	Gross Value per ton, at £4 4s. 11d. per oz.
			ozs. dwts.	ozs. dwts.	ozs. dwts.	ozs. dwts.	dwts. grs.	£ s. d.
65	Bamboo Creek	3,276·25	1,784 6	1,512 4	856 19	2,369 3	14 11	3 1 5
146	Boogardie	6,228·75	4,499 14	3,812 17	2,426 3	6,239 0	20 1	4 5 1
241	Coolgardie	8,747·75	3,959 18	3,356 3	1,571 11	4,927 14	11 6	2 7 9
160	Cue	6,778·00	4,759 6	4,033 12	1,426 3	5,459 15	16 3	3 8 6
453	Kalgoorlie	19,118·75	6,359 11	5,389 16	3,121 8	8,511 4	8 22	1 17 10
123	Laverton	2,822·25	2,548 17	2,117 10	532 9	2,650 5	18 19	3 19 10
165	Marble Bar	7,493·00	3,024 9	2,563 5	2,779 18	5,343 3	14 6	3 0 6
84	Meekatharra	6,495·75	4,236 14	3,590 14	1,286 1	4,876 15	15 0	3 3 9
74	Mt. Ida	2,523·25	1,670 3	1,415 11	568 14	1,984 5	15 17	3 6 9
122	Norseman	5,157·00	6,055 1	5,131 15	1,922 15	7,054 10	27 9	5 16 3
167	Ora Banda	8,323·75	4,802 15	4,070 8	1,179 6	5,249 14	12 15	2 13 7
61	Payne's Find	5,215·25	2,801 17	2,374 13	431 9	2,806 2	10 18	2 5 8
39	Peak Hill	5,640·50	1,142 0	967 17	435 16	1,403 13	5 0	1 14 6
80	Sandstone	4,112·25	1,232 9	1,044 11	629 8	1,673 19	8 3	2 12 9
26	Warriedar	1,538·00	554 9	469 18	485 3	955 1	12 10	2 1 11
40	Wiluna	2,751·50	1,096 14	929 9	429 1	1,358 10	9 21	2 9 0
83	Yalgoo	2,222·50	1,190 12	1,009 2	275 13	1,284 15	11 13	2 5 8
79	Yarri	2,766·25	1,345 17	1,140 12	347 14	1,488 6	10 18	2 5 8
6	Youanmi	233·00	76 11	64 17	102 7	107 4	14 8	3 0 11
2,214		101,443·75	53,141 3	44,995 0	20,807 18	65,802 18	12 23	2 15 0

Average tons per parcel 45·82.
 Average yield by amalgamation per ton (fine gold) 8 dwts. 20·9 grains.
 Average value by amalgamation per ton £1 17s. 8d.
 Average head value of tailings per ton (fine gold) 4 dwts. 2·4 grains.
 Average value of tailings per ton 17s. 4d.

SCHEDULE No. 4.

Direct Purchase of Tailings.

Battery.	Tons Purchased.	Amount Paid for Tailings.	Amount Paid A/c. Premium.
		£ s. d.	£ s. d.
Bamboo Creek	2,252	1,541 17 2	1,432 18 8
Boogardie	4,891½	5,173 11 1	5,421 6 9
Coolgardie	3,998½	1,839 13 10	2,088 19 9
Cue	3,649½	1,927 5 1	3,333 17 9
Kalgoorlie	9,006	4,200 17 9	5,687 1 5
Laverton	1,878½	723 14 10	919 4 9
Marble Bar	3,623	4,541 18 7	5,902 1 9
Meekatharra	3,721½	1,782 5 4	2,380 0 5
Mt. Ida	2,006½	739 15 10	824 8 1
Norseman	3,333½	4,481 14 1	4,925 11 4
Ora Banda	3,798½	1,080 16 9	2,347 14 0
Payne's Find	387½	58 14 11	46 16 5
Peak Hill	1,092½	317 8 10	576 17 9
Sandstone	1,222½	456 1 3	562 15 5
St. Ives	...	...	7 7 3
Wiluna	3,407½	1,999 9 3	1,257 17 2
Warriedar	496	314 15 3	5 0 0
Yalgoo	328½	236 8 6	240 3 7
Yarri	746	276 12 2	695 18 11
Youanmi	188	218 18 11	337 2 8
Totals	50,027½	£31,911 19 5	£38,993 3 10

SCHEDULE No. 5.

Tailings Treatment for 1939.

Battery.	Tonnage.	Yield.	Value.	Premium.	Total.
	tons.	fine ozs.	£	£	£
Bamboo Creek	3,192	691·00	2,944·861	3,718·207	6,663·068
Boogardie	5,572	1,701·94	7,228·864	9,169·560	16,398·424
Coolgardie	7,666	891·19	3,784·951	4,772·423	8,557·374
Cue	7,168	1,248·68	5,187·380	6,441·689	11,629·069
Kalgoorlie	18,280	2,428·33	10,313·198	12,873·490	23,186·688
Laverton	3,190	470·18	1,996·454	2,472·760	4,469·214
Marble Bar	4,220	1,481·27	6,290·828	8,214·280	14,505·108
Meekatharra	7,180	1,080·82	4,590·652	5,745·601	10,336·253
Mt. Ida	2,480	389·94	1,656·223	2,074·218	3,730·441
Norseman	4,290	1,525·96	6,489·964	8,067·598	14,557·562
Ora Banda	10,932	1,130·90	4,803·023	5,998·922	10,801·945
Payne's Find	4,564	243·40	1,033·787	1,310·365	2,344·152
Peak Hill	5,352	288·92	1,225·630	1,514·372	2,740·002
Sandstone	2,862	336·86	1,430·602	1,763·623	3,194·225
Warriedar	180	24·48	104·000	138·000	242·000
Wiluna	2,688	431·58	1,832·928	2,156·926	3,989·854
Yalgoo	1,320	96·76	410·958	504·279	915·237
Yarri	3,300	325·78	1,384·707	1,678·273	3,062·980
Youanmi	620	99·78	423·771	625·087	1,048·858
Totals	95,056	14,887·77	63,132·781	79,239·673	142,372·454

SCHEDULE No. 6—MILLING AND TIN.

Statement of Receipts and Expenditure for the Year ended 31st December, 1939.

Battery.	Tonnage Crushed.	Expenditure.									Receipts.		Profit.	Loss.
		Management.	Wages.	Stores.	Total Working Expenditure.	Cost per Ton.	Renewals and Repairs.	Sundries.	Gross Expenditure.	Cost per Ton.	Receipts.	Receipts per Ton.		
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	3,276.25	231 4 10	1,562 1 10	556 3 11	2,349 10 7	14 4.0	171 7 10	246 12 8	2,767 11 1	16 10.7	1,586 5 6	9 8.2	....	1,181 5 7
Boogardie	6,228.75	306 12 0	1,722 5 1	593 1 9	2,621 18 10	8 5.0	374 16 6	486 19 1	3,483 14 5	11 2.2	3,010 8 4	9 7.9	....	473 6 1
Coolgardie	8,747.75	495 8 3	2,262 18 8	1,595 4 2	4,353 11 1	9 11.4	694 2 3	604 14 2	5,652 7 6	12 11.0	4,589 0 6	10 5.9	....	1,063 7 0
Cue	6,778.00	243 15 0	1,474 13 10	1,169 13 10	2,888 2 8	8 6.3	365 3 2	529 9 1	3,782 14 11	11 1.9	3,501 3 11	10 3.9	....	281 11 0
Darlot	....	....	....	....	....	....	....	....	....	....	17 19 9	....	17 19 9	....
Jimblebah	....	....	4 17 1	....	4 17 1	....	....	1 6 0	6 3 1	....	40 5 0	....	34 1 11	....
Kalgoorlie	19,118.75	779 15 5	3,060 3 11	3,382 14 10	7,222 14 2	7 6.7	654 3 7	1,556 13 7	9,433 11 4	9 9.4	7,718 14 8	8 0.8	....	1,714 16 8
Laverton	2,822.25	191 10 5	780 15 7	373 18 4	1,346 4 4	9 6.5	169 17 5	296 0 2	1,812 1 11	12 10.1	1,422 14 0	10 0.9	....	389 7 11
Marble Bar	7,493.00	667 0 0	2,204 11 11	1,102 13 3	3,974 5 2	10 7.3	287 4 11	734 8 2	4,995 18 3	13 4.0	3,602 12 10	9 7.4	....	1,393 5 5
Meekatharra	6,495.75	466 0 11	2,120 5 6	1,404 1 0	3,990 7 5	12 3.4	70 4 2	452 1 8	4,512 13 3	13 10.7	2,970 10 6	9 1.7	....	1,542 2 9
Mt. Ida	2,523.25	171 0 0	1,266 1 0	774 19 11	2,212 0 11	17 6.4	468 1 10	178 2 1	2,858 4 10	22 7.8	1,320 14 1	10 5.6	....	1,537 10 9
Mt. Sir Samuel	....	....	....	....	....	....	....	....	....	....	50 15 6	....	50 15 6	....
Mulline	....	....	....	....	....	....	....	....	....	....	89 2 6	....	89 2 6	....
Mulwarrie	....	....	....	....	....	....	....	....	....	....	15 0 0	....	15 0 0	....
Norseman	5,157.00	345 11 3	2,026 5 5	1,084 0 3	3,455 16 11	13 4.8	87 16 2	406 16 11	3,950 10 0	15 4.0	2,744 1 9	10 7.7	....	1,206 8 3
Ora Banda	8,323.75	489 12 1	2,171 12 0	1,595 15 6	4,256 19 7	10 2.7	297 1 8	587 1 8	5,141 2 11	12 4.2	3,590 3 8	8 7.5	....	1,550 19 3
Payne's Find	5,215.25	401 18 1	1,855 15 5	743 19 5	3,001 12 11	11 6.1	546 18 6	403 16 5	3,952 7 10	15 1.9	2,441 2 7	9 4.3	....	1,511 5 3
Peak Hill	5,640.50	211 8 5	1,688 8 6	594 8 7	2,494 5 6	8 10.1	748 2 9	327 18 9	3,570 7 0	12 7.9	1,909 3 3	6 9.2	....	1,661 3 9
Pingin	....	....	....	....	....	....	....	....	....	....	20 0 0	....	20 0 0	....
Sandstone	4,112.25	418 0 0	1,488 15 4	596 8 2	2,503 3 6	12 2.0	389 11 0	393 17 8	3,286 12 2	15 11.8	1,975 12 5	9 7.3	....	1,310 19 9
St. Ives	....	....	29 19 8	....	29 19 8	....	....	1 17 6	31 17 2	....	....	....	....	31 17 2
Warriedar	1,538.00	123 5 3	679 6 3	279 11 8	1,082 3 2	14 0.9	502 5 2	120 10 0	1,704 18 4	22 2.0	750 1 5	9 9.0	....	954 16 11
Wiluna	2,751.50	182 11 6	633 9 6	264 12 7	1,080 13 7	7 10.3	127 1 6	265 18 6	1,473 13 7	10 8.5	1,412 18 1	10 3.2	....	60 15 6
Yalgoo	2,222.50	112 16 9	839 10 2	379 2 11	1,331 9 10	11 11.8	123 5 4	200 13 6	1,655 8 8	14 10.7	1,075 13 5	9 8.1	....	579 15 3
Yarri	2,766.25	289 14 4	1,235 16 4	610 8 4	2,135 19 0	15 5.3	360 12 3	272 10 6	2,769 1 9	20 0.2	1,569 0 1	11 4.1	....	1,200 1 8
Youanmi	....	....	....	....	....	....	....	....	....	....	120 5 7	10 3.9	....	190 9 8
Linden	233.00	36 12 11	102 9 1	21 13 4	160 15 4	13 9.6	84 15 1	65 4 10	310 15 3	26 8.1	90 18 0	....	90 18 0	....
Tin Plant, Greenbushes	101,443.75	6,163 17 5	29,210 2 1	17,122 11 9	52,496 11 3	10 4.2	6,522 11 1	8,132 12 11	67,151 15 3	13 2.8	47,634 7 4	9 4.7	317 17 8	19,835 5 7
	....	30 8 4	....	....	30 8 4	....	....	....	30 8 4	....	3 0 0	....	....	27 8 4
Erection from Revenue	101,443.75	6,194 5 9	29,210 2 1	17,122 11 9	52,526 19 7	....	6,522 11 1	8,132 12 11	67,182 3 7	....	47,637 7 4	....	317 17 8	19,862 13 11
	....	....	....	....	....	....	....	....	1,070 3 10	....	....	....	....	1,070 3 10
Total	101,443.75	6,194 5 9	29,210 2 1	17,122 11 9	52,526 19 7	....	6,522 11 1	8,132 12 11	68,252 7 5	....	47,637 7 4	....	317 17 8	20,932 17 9
Total Loss	....	....	....	....	....	....	....	....	....	....	....	....	....	317 17 8
	....	....	....	....	....	....	....	....	....	....	....	....	....	20,615 0 1

SCHEDULE No. 7—TAILING TREATMENT.

Statement of Receipts and Expenditure for the Year ended 31st December, 1939.

Battery.	Tonnage Treated.	Expenditure.										Receipts.		Profit	Loss.
		Management.	Wages.	Assays.	Stores.	Total Working Expenditure.	Cost per Ton.	Repairs and Renewals.	Sundries.	Gross Expenditure.	Cost per Ton.	Receipts.	Receipts per Ton.		
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	3,192	231 4 10	845 15 8	117 6 3	412 16 8	1,607 3 5	10 0·8	53 4 2	137 17 0	1,798 4 7	11 3·2	3,278 7 5	20 6·5	1,480 2 10	.....
Boogardie	5,572	284 12 5	353 14 7	352 7 3	764 8 7	2,255 2 10	8 1·1	81 13 8	277 1 2	2,613 17 8	9 4·5	6,511 18 9	23 4·4	3,897 19 1	.....
Coolgardie	7,666	300 8 9	1,275 14 6	244 5 10	1,098 2 10	2,918 11 11	7 7·4	287 3 6	304 8 9	3,510 4 2	9 1·9	4,579 8 6	11 11·3	1,069 4 4	.....
Cue	7,168	206 12 7	1,213 15 3	168 4 1	1,254 3 7	2,842 15 6	7 11·2	194 19 10	288 7 8	3,326 3 0	9 3·4	5,977 0 9	16 8·1	2,650 17 9	.....
Kalgoorlie	18,280	272 10 0	2,686 7 0	397 4 2	2,107 17 8	5,463 18 10	5 11·7	21 10 8	882 14 4	6,368 3 10	6 11·6	13,910 1 10	15 2·6	7,541 18 0	.....
Laverton	3,190	60 1 7	584 18 9	174 17 5	492 2 0	1,311 19 9	8 2·7	288 8 1	139 6 1	1,739 13 11	10 10·9	2,631 15 2	16 6·0	892 1 3	.....
Marble Bar	4,220	211 0 1	928 19 7	173 6 6	545 4 10	1,858 11 0	8 9·7	26 2 1	141 17 5	2,026 10 6	9 7·3	4,366 10 8	20 8·3	2,340 0 2	.....
Meekatharra	7,180	279 12 3	1,146 0 8	171 4 7	959 17 10	2,556 15 4	7 1·5	304 4 3	388 8 1	3,249 7 8	9 0·6	5,646 14 4	15 8·7	2,397 6 8	.....
Mt. Ida	2,480	161 12 8	478 11 8	198 14 7	392 9 7	1,231 8 6	9 11·2	32 15 9	103 3 10	1,367 8 1	11 0·3	2,311 2 3	18 7·6	943 14 2	.....
Norseman	4,290	270 15 6	800 19 9	127 1 8	612 16 9	1,811 13 8	8 5·3	229 4 10	226 8 2	2,267 6 8	10 6·8	5,647 9 5	26 3·9	3,380 2 9	.....
Ora Banda	10,932	298 9 9	2,013 19 11	155 4 4	1,575 3 1	4,042 17 1	7 4·8	70 19 11	538 0 0	4,651 17 0	8 6·1	7,125 2 9	13 0·4	2,473 5 9	.....
Payne's Find	4,564	190 12 10	632 15 7	116 16 7	646 6 6	1,586 11 6	6 11·4	7 17 7	223 3 10	1,817 12 11	7 11·6	2,256 10 0	9 10·6	438 17 1	.....
Peak Hill	5,352	201 2 6	760 17 2	72 14 5	548 8 1	1,583 2 2	5 10·9	86 9 6	219 5 4	1,888 17 0	7 0·7	2,084 16 4	7 9·4	195 19 4	.....
Sandstone	2,862	161 7 10	569 16 3	158 12 2	487 7 5	1,377 3 8	9 7·5	28 11 11	176 9 6	1,582 5 1	11 0·6	2,136 5 8	14 11·1	554 0 7	.....
Warriedar	180	7 9 0	109 9 2	8 0 7	72 8 8	197 7 5	21 11·1	277 17 9	4 19 3	480 4 5	53 4·3	70 0 0	7 9·3	.....	410 4 5
Wiluna	2,688	126 5 2	466 9 10	96 18 9	215 7 4	905 1 1	6 8·8	19 16 9	157 19 8	1,082 17 6	8 0·7	1,643 6 4	12 2·7	560 8 10	.....
Yalgoo	1,320	104 7 2	310 16 7	92 0 9	242 12 7	749 17 1	11 4·3	14 7 0	145 1 4	909 5 5	13 9·3	664 18 0	10 0·9	.....	244 7 5
Yarri	3,300	54 0 8	525 2 3	174 1 3	588 13 0	1,341 17 2	8 1·6	11 10 7	147 15 11	1,501 3 8	9 1·1	2,213 2 8	13 4·9	711 19 0	.....
Yunanmi	620	2 3 10	103 5 6	3 17 8	96 13 0	206 0 0	6 7·7	33 6 5	17 7 0	256 13 5	8 3·3	416 1 4	13 5·0	159 7 11	.....
Total	95,056	3,424 9 5	16,307 9 8	3,002 18 10	13,113 0 0	35,847 17 11	7 6·5	2,070 4 3	4,519 14 4	42,437 16 6	8 11·1	73,470 10 2	15 5·5	31,687 5 6 654 11 10	654 11 10
Total Profit	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	31,032 13 8	.....

N.B.—Warriedar—£277 17s. 9d. Renewals and Repairs includes £223 4s. 5d. Erection from Revenue.

SCHEDULE No. 8.

State Battery Statistics from Inception to 31st December, 1910, and from 1st January, 1930, to 31st December, 1939.

Year.	Milling.				Sand and Tailing Treatment.				Slime Treatment.				Tin Treatment.				Gross Profit. ‡
	Tons.	Expenditure per ton.	Revenue per ton.	Loss.	Tons.	Expenditure per ton.	Revenue per ton.	Profit.	Tons.	Expenditure per ton.	Revenue per ton.	Loss.	Tons.	Expenditure per ton.	Revenue per ton.	Loss.	
1899	18,806	s. d.	s. d.	£	...	s. d.	s. d.	£	...	s. d.	s. d.	£	...	s. d.	s. d.	£	£
1900	22,675	22 10.1	17 4.5	7,611	...	...	...	...	...	...	...	...	...	...	...	...	2,827†
1901	26,775	18 0.0	16 6.0	1,983	9,534	16 9	...	1,337	...	...	...	...	...	...	...	...	7,611†
1902	39,516	14 8.6	14 8.2	169	9,721	22 3	...	724	...	...	...	...	1,170	12 2	...	...	646†
1903	49,233	13 6.8	12 10.6	1,250	33,369	7 7	...	1,442	...	...	...	...	2,009	8 2	...	...	269
1904	71,616	14 4.4	12 6.5	6,423	43,251	7 10	...	1,448	...	...	...	...	2,337	8 2	...	...	153
1905	85,018	12 4.0	12 2.5	957	54,420	7 3	9 8.5	6,689	7,028	12 1	...	410	3,697	5 8	5 0.3	324	5,141†
1906	95,831	12 2.0	11 3.8	4,076	65,159	7 4	9 2.1	5,549	4,737	11 8	12 1.1	2,254*	11,428	4 2	4 3.3	156*	3,342
1907	95,280	12 6.0	11 4.8	8,724	64,514	6 8.7	9 2.8	6,474	8,220	8 7.6	13 5.5	1,983*	10,496	4 4.4	4 8.8	191*	2,880
1908	95,628	12 1.9	9 3.6	13,669	62,272	6 4.7	8 11.0	8,017	5,818	12 0.9	11 8.0	120	5,573	4 5.2	3 6.3	254	1,688†
1909	94,218	11 1.7	9 6.6	7,568	61,032	6 5.8	8 9.7	7,096	16,848	10 0.7	9 6.7	423	5,043	4 8.2	3 7.5	267	7,278†
1910	89,278	11 3.3	9 6.6	7,709	43,391	6 2.9	8 6.1	4,903	28,600	8 9.1	9 11.5	1,723*	3,769	5 5.5	3 4.1	401	1,965†
1930	29,285.75	15 3.41	9 2.58	6,420	20,344	7 11.16	10 2.3	2,300	...	...	...	...	159	14 5.16	3 4.24	88	6,420†
1931	63,428.5	12 8.2	9 7.9	9,677	37,315	6 9.8	11 2.8	8,256	...	...	...	...	...	...	...	16*	1,361†
1932	79,745.75	12 6.3	9 9.04	11,068	66,216	6 11.0	14 6.6	25,249	...	...	...	...	...	...	...	26	14,155
1933	91,616	11 6.7	9 6.5	9,068	84,151	6 7.3	15 9.7	38,468	...	...	...	...	...	...	...	24	29,375
1934	97,454	13 7.3	9 6.3	20,219	94,616	6 9.3	14 2	35,442	...	...	...	...	...	...	...	26	15,197
1935	108,360	13 9.3	9 6.8	22,739	102,037	7 1	13 5.9	32,676	...	...	...	...	...	...	...	26	9,912
1936	102,086.25	14 0.2	9 5.1	23,411	110,543	7 9.1	14 11.8	39,919	...	...	...	...	...	...	...	26	16,482
1937	102,800	13 5.7	9 2.2	22,032	110,263	7 9.7	13 5.8	31,258	...	...	...	...	...	...	...	24	9,202
1938	108,966	12 10.9	9 1.9	20,397	103,175	8 2.1	14 4.7	32,039	...	...	...	...	...	...	...	19	11,612
1939	101,443	13 2.8	9 4.7	20,591	95,056	8 11.1	15 5.5	31,033	...	...	...	...	...	...	...	27	10,415

* Profit. † Loss. ‡ Details of Ore Dressing and Residue Treatment not shown, but financial result included in the figure of this column.

STATE BATTERY SYSTEM.

Balance Sheet as at 31st December, 1939.

LIABILITIES.				ASSETS.				
	£	s. d.	£	s. d.	£	s. d.	£	s. d.
<i>Capital Expenditure—</i>								
General Loan Fund	401,335	14 1			127,658	5 11		
Revenue	93,051	5 6			2,912	8 2		
	494,386	19 7					124,745	17 9
Assistance to Gold Mining Industry	28,621	13 5						
Commonwealth Assistance	13,786	8 0	536,795	1 0				
<i>Sundry Creditors—</i>								
Cash Orders	3,249	11 2					10,639	16 0
Other	*1,361	14 7					12,927	3 10
			4,611	5 9			1,187	13 5
Treasury Account			94,260	16 1			1,169,277	6 4
Interest Outstanding	555,154	0 0						
Sinking Fund	127,947	14 6						
			683,101	14 6				
			£1,318,777	17 4			£1,318,777	17 4
Purchase of Tailings Advance Account	10,000	0 0						
Plus Receipts	3,869	15 7			10,479	7 3		
			13,869	15 7				
Sundry Creditors for Tailings Payments	2,786	4 9			2,786	4 9		
Sundry Creditors for Premium Payments (estimated)	13,623	3 3					13,265	12 0
			16,409	8 0				
			£1,349,057	0 11			13,623	3 3
							3,390	8 4
							£1,349,057	0 11

* These figures not complete.

STATE BATTERIES.

General Working Account for the Year ended 31st December, 1939.

	Milling.	Cyaniding.	Total.		Milling.	Cyaniding.	Total.
	£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.
To Wages	40,358 9 9	24,202 12 6	64,561 2 3	By Revenue	47,637 7 4	73,470 10 2	121,107 17 6
„ Stores	14,740 10 4	12,349 1 4	27,089 11 8	„ Loss carried down	16,309 1 11	.....	16,309 1 11
„ Battery Spares	2,243 5 8	.....	2,243 5 8				
„ Water	4,511 6 8	1,368 8 4	5,879 15 0				
„ General Expenses	2,092 16 10	1,429 4 10	3,522 1 8				
„ Profit carried down	.....	34,121 3 2	34,121 3 2				
	£63,946 9 3	£73,470 10 2	£137,416 19 5		£63,946 9 3	£73,470 10 2	£137,416 19 5

Profit and Loss Account.

	Milling.	Cyaniding.	Total.		Milling.	Cyaniding.	Total.
	£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.
To Loss brought down	16,309 1 11	.....	16,309 1 11	By Profit brought down	.....	34,121 3 2	34,121 3 2
„ Administration	3,235 14 4	3,085 9 6	6,324 3 10	„ Gross Loss carried down	19,544 16 3	.....	19,544 16 3
„ Gross Profit carried down	.....	31,032 13 8	31,032 13 8				
	£19,544 16 3	£34,121 3 2	£53,665 19 5		£19,544 16 3	£34,121 3 2	£53,665 19 5

General Profit and Loss Account.

	£	s.	d.		£	s.	d.	£	s.	d.
To Interest	19,890	0	0	By Gross Profit Cyaniding	31,032	13	8			
„ Sinking Fund Unpaid	999	0	0	Less Gross Loss Milling	19,544	16	3			
„ Depreciation	2,912	8	2	„ Net Loss carried down				11,487	17	5
								12,313	10	9
								£23,801	8	2
				„ Balance carried down				1,160,277	6	4
„ Balance brought forward	1,156,963	15	7					£1,160,277	6	4
„ Balance brought down	12,313	10	9							
	£1,169,277	6	4							

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Division IV.

Annual Progress Report of the Geological Survey of Western Australia for the Year ended 31st December, 1939.

The Under Secretary for Mines.

I have the honour to submit, for the information of the Hon. Minister for Mines, my report on the operations of the Geological Survey for the year 1939.

STAFF.

During the year I continued to hold a Commonwealth Fund Service Fellowship under which I studied at Harvard University, Cambridge, Massachusetts, U.S.A., and visited a number of leading metal mining districts in the United States of America and Canada.

Mr. H. A. Ellis continued to occupy the position of Acting Government Geologist until my return to the State on the 12th December.

No other changes in the staff took place. The staff throughout the year consisted of the Acting Government Geologist, three field geologists, a senior typist, a junior clerk, and a messenger.

H. A. Ellis, Acting Government Geologist:—A considerable portion of Mr. Ellis's time both in the field and the office was taken up by work on the Yampi Sound iron deposits, and alluvial boring operations and bucket dredging which were being carried out by Greenbushes Tin, Limited, at Greenbushes.

In January, Mr. Ellis attended, as a member, a meeting of the Executive Committee of the Aerial, Geological and Geophysical Survey of Northern Australia which was held in Melbourne. In the same month, he made two visits to the Collie Coalfield, during which the main collieries were inspected in connection with the formulation of a development programme.

In March Mr. Ellis inspected the iron ore deposits at Yampi Sound and the development of the work in progress on the main lode at Koolan Island.

In April he inspected a bismuth deposit at Yin-nietharra Station, Gascoyne River District, and in May, accompanied by the late Dr. E. S. Simpson, he investigated the possibilities of a kyanite deposit situated 10 miles southwest of Bridgetown.

During June and July Mr. Ellis visited the field parties working in the Mount Margaret and Yilgarn Goldfields, and accompanied a representative of an English mining company on a tour of inspection of some alluvial gold areas in the Murchison Goldfield.

In August he inspected a number of mineral claims at Greenbushes with the object of deciding the best means of prospecting them and assessing their possible economic value.

In October Mr. Ellis again visited Koolan Island in company with the State Mining Engineer, the Commonwealth Geological Adviser, and the Consulting Mining Engineer of the Yampi Sound Mining Company.

The remainder of Mr. Ellis's time was fully occupied by administrative duties at Head Office and in consultations with and tendering of advice to numerous prospectors and others interested in the various mineral resources and geology of the State.

R. A. Hobson, Geologist:—During January and portion of February Mr. Hobson prepared a progress report on the work in the Laverton District to the end of July, 1938, and an interim report on the iron deposits at Koolyanobbing, Yilgarn Goldfield.

For the remainder of February and until May Mr. Hobson was engaged mainly in completing the maps of the Koolyanobbing iron deposits, and in making preparations for commencing a survey of West Australian iron deposits. During this period Mr. Hobson also made a brief inspection of Boya Quarry at the request of the Plant Engineer, and attended to routine duties at Head Office in the absence of the Acting Government Geologist.

In May, the iron ore survey having been postponed, Mr. Hobson returned to the Laverton District to resume control of the field work in that area. This work was continued until the end of November, when the field party returned to Perth. For the remainder of the year he was engaged on office work in connection with the Laverton survey.

Mr. R. S. Matheson, Geologist:—From January to the middle of March, Mr. Matheson was engaged in compiling information necessary for the conduct of the resurvey of the northern portion of the Yilgarn Goldfield, proof-reading Bulletin 97, and carrying out miscellaneous office work. Towards the end of January he also made a geological examination of the proposed Stirling Reservoir, at Harvey, and the proposed Samson's Brook Reservoir, at Waroona.

Mr. Matheson left Perth for the Yilgarn Goldfield at the end of March, and from April to October made geological examinations of the following min-

ing groups:—Corinthian, Babylonian, Rutherford's Find, Mornington, Reynold's Find, Wither's Find, Day's Find, Rowan's Find, Radio, Marie's Find, Colreavy, Eenuin and Mayfield.

During this time Mr. Matheson also visited Mayfield to select bore sites for mine water supply and made an inspection of the Leviathan Mine at Kennyville with a view to advising the management on future prospecting.

Geological mapping of the strip of country from Day's Find to the Radio Mine and north to Lake Deborah was also carried out during this period, besides a reconnaissance trip through the Jackson area and proof-reading Bulletin 98.

In November Mr. Matheson moved his camp to Westonia and made a geological examination of the country and mines at that centre. The late Comstock and Colossus mining groups at Boddalin were also visited.

During the last week in November Mr. Matheson visited the "Cricket" lease at Edward's Find to assist the lessees with a faulting problem.

On completion of the examination at Edward's Find, Mr. Matheson returned to Perth and, for the remainder of the year, was engaged in writing reports on mines examined during the 1939 field season.

K. R. Miles, Geologist:—From the beginning of the year until the latter end of March, Mr. Miles was engaged at Head Office writing up outstanding reports, drafting maps and plans to illustrate his field work during the 1938 field season, the compilation of base maps and the collection of other survey data for the continuance of the re-survey of the Mt. Margaret Goldfield.

Mr. Miles left Perth on 22nd March to take charge of the field work in the Mt. Margaret Goldfield, was engaged continuously on this work until the end of November, and was in charge of the work until Mr. Hobson took over at the beginning of June.

During December Mr. Miles was engaged at Head Office in the preparation of plans and reports on his field work, petrological investigations, and other miscellaneous office work.

PUBLIC INQUIRIES.

Mr. Ellis reports that throughout the year inquiries by prospectors, the representatives of mining companies and others interested in the geology and mineral resources of the State were particularly numerous, questions on the non-metallic minerals, base metals and water supply in particular being unusually frequent. Satisfactory replies to questions regarding non-metallics and base metals were difficult to make owing to the absence of recent field investigations. With the present small field staff and lack of adequate funds, all the field work of this branch has of necessity been concentrated on work in the goldfields, and our information on other subjects is almost completely out of date.

AERIAL, GEOLOGICAL AND GEOPHYSICAL SURVEY OF NORTHERN AUSTRALIA.

Mr. K. J. Finucane, who was in charge of the field work of the Western Australian section of this survey finalised his reports at the end of June, and at that time the Government Geologist's membership on the Executive Committee of the Survey ceased.

I wish to record my appreciation of the pleasant relations which existed between all members of the Executive Committee throughout my association with the survey, and the enthusiastic and very efficient manner in which the actual field work was carried out by Mr. Finucane and his staff.

IRON ORE SURVEY.

In last year's report mention was made of the intended structural and genetic survey of the principal iron deposits of the State. This survey was to be actively conducted during the year with the financial assistance of the Commonwealth Government. Unfortunately, the financial arrangements were not finalised and except for work at Yampi Sound and Koolyanobbing, the survey has been indefinitely postponed.

FIELD TRANSPORT.

The same difficulties exist in regard to motor transport as were mentioned by Mr. Ellis in last year's report. Lack of full transport facilities absolutely prohibits the field work being planned or carried out with the most efficient use of the technical staff available. The time is fast approaching when even the existing motor vehicles will require replacement, it being a distinct compliment to the careful personal attention and interest of the field officers using the two utility trucks, that they are at present in good mechanical order.

PUBLICATIONS.

During the year the following publications were issued by this branch:—

Annual Progress Report of the Geological Survey for the year 1938.

Geological Survey Bulletin 97:

The Geology of the Yilgarn Goldfield South of the Great Eastern Railway, by H. A. Ellis, B.Sc., A.O.S.M., with an appendix by Dorothy Carroll, Ph.D., D.I.C., on Sand-plain Soils from the Yilgarn Goldfield.

The following Bulletins are now in the press and will be issued as early as possible in 1940:—

Bulletin 98:

The Mining Groups of the Yilgarn Goldfield South of the Great Eastern Railway, Part I, from Southern Cross Southwards to Marvel Loch, by R. S. Matheson, B.Sc., and R. A. Hobson, B.Sc. (Hons.).

Bulletin 99:

The Mining Groups of the Yilgarn Goldfield South of the Great Eastern Railway, Part II, South of Marvel Loch, by R. A. Hobson, B.Sc. (Hons.), and R. S. Matheson, B.Sc.

Reports of investigations follow, except where such were made for purely departmental purposes.

I wish to record my appreciation of the manner in which Mr. H. A. Ellis carried out his duties as Acting Government Geologist during the whole period of my absence, and the loyal support and willing co-operation which he received from all members of the field and office staff.

F. G. FORMAN,
Government Geologist.

REPORT ON MINERAL CLAIMS Nos. 34, 36, 37,
38, 39, 40, GREENBUSHES TINFIELD.

(H. A. Ellis, B.Sc., A.O.S.M.)

LOCALITY.

These claims can be grouped into three separate areas situated in the central portion of the Greenbushes Tinfield and located as follows:—

(a) The Northern Area—

	Area.
M.C. 36 = old M.C. 24	15a. 0r. 0p.
M.C. 37 = old M.C. 23	27a. 1r. 6p.
M.C. 38 = old M.C. 7	85a. 0r. 0p.
Total area	127a. 1r. 6p.

This group of three claims extends from just south of the Greenbushes Railway Station, south-easterly to just north of the northern boundary of the Greenbushes Townsite, and embraces amongst others, the old "Mt. Bischoff" and "Little Wonder" claims.

(b) The Central Area—

	Area.
M.C. 39 = old M.C. 22	21a. 1r. 28p.
M.C. 40 = old M.C. 5	77a. 3r. 29p.
Total Area	99a. 1r. 17p.

This group of 2 claims extends along the eastern and southern boundaries of the Greenbushes Townsite and embraces the old "Dixie," "Cornwall" and "South Cornwall" claims.

(c) Southern Area—

	Area.
M.C. 34	108a. 3r. 16p.

This claim is situated $1\frac{1}{4}$ miles S.E. of Greenbushes Townsite about half a mile east of the Greenbushes-Bridgetown Road and includes the old "Tairua" claim and Fox's Lode Area.

All three areas occupy flat to undulating country near the crest of the old peneplain and have an average altitude of 1,000 feet above sea level. They are covered by a widespread mantle of ferruginous laterite which develops on both alluvial and "lode" country completely obscuring the nature of the underlying rocks. In addition, the areas are moderately heavily timbered with jarrah and redgum forest from which the millable timber has been cut many years ago.

All three areas have been variously worked in the past for lode, eluvial, and alluvial tin-oxide.

GEOLOGY.

The Northern Area (Mineral Claims 36, 37, 38,
Area 127a. 1r. 6p.)

The existing openings reveal the presence of three types of cassiterite concentration:—

- (1) Alluvial deposits in existing drainage channels.
- (2) Older alluvial deposits, laterite capped, which have no relation to existing drainage channels.
- (3) Lode deposits consisting of a stockwork of highly decomposed albite pegmatite dykes in zones of granitised amphibolite-biotite

schists and normal amphibolite-biotite schists also highly decomposed. These lode formations occur in the basal rocks of the region, and are believed to be of Pre-Cambrian age, and are the source from which the cassiterite of the alluvial deposits has been derived.

The deposits of types (1) and (2) above have been extensively worked in their richer parts in the past, but those of type (3), which have also yielded small patches of eluvial cassiterite have not been extensively worked. The area over which lode material has been shown to occur is comparatively small as revealed by the existing openings, but this area may well be more extensive on account of the masking effect of the covering laterite.

The Central Area (Mineral Claims 39 and 40,
Area 99a. 1r. 17p.)

The existing openings reveal the presence of two types of cassiterite concentration:—

- (1) Eluvial deposits adjacent to the lode deposits.
- (2) Lode deposits consisting of a remarkably strong stockwork of highly decomposed albite pegmatite dykes in zones of granitised and amphibolite-biotite schists and normal amphibolite-biotite schists also highly decomposed.

These lodes are similar in nature and origin to those of the Northern Area, and have been the source of the alluvial cassiterite won from the alluvial deposits of the central portion of the Greenbushes Tinfield.

The existing openings show that these lodes have been worked to shallow depths at intervals extending practically over the length and breadth of this Central Area. The average depth of the zone of decomposition which has affected both lode and country rock appears to be about 50 feet, but this must be determined by boring.

On this area a large number of individual cassiterite bearing lodes have been located from surface indications, that is, from the obvious presence in the laterite blanket of tourmaline, mica, or cassiterite. The normal manner of occurrence of cassiterite-bearing pegmatite dykes and mineralised granitised zones, suggest that there are many more concentrations of cassiterite which have not outcropped, and indeed, this can be seen to be the case in several of the accessible opencuts on the old Cornwall Lease.

The Southern Area (Mineral Claim 34. Area
108a. 3r. 16p.)

The deposits on this area are of a similar nature to those on the Central Area, but in this instance are of a very much more limited extent. The evidence available from the existing openings shows that the degree of alteration and weathering of the lodes and country rock as well as the distribution of the cassiterite-bearing dykes is comparatively limited.

It would appear that this area is somewhat outside (east of) the strongly marked zone of regionally granitised and highly altered and decomposed mineralised rocks which have been proved to extend in a north-westerly direction from the scene of operations of Vulcan Minerals, Limited, on Mineral Claim 4 in Westralian Gully, to the Greenbushes Railway Station, a distance of some $3\frac{1}{2}$ miles.

THE POSSIBLE ECONOMIC VALUE OF THE AREAS.

(a) *The Northern Area.*

The potential mineral wealth in this area lies in the cassiterite content of the unworked portions of the alluvial deposits and in the cassiterite and tantalite concentrations in the unworked portion of the lode system.

The extent of these potential sources does not appear from surface inspection to be great, but the area is of sufficient value to justify a scout-boring campaign on both the alluvial and lode deposits.

Before this could be undertaken it would be necessary to make a detailed feature survey of the area, as a result of which all old workings, both alluvial and lode, would be able to be put on a large scale plan (say 200 feet to one inch).

The valuing of the alluvial ground, providing it were shown to have a sufficient extent by the scout drilling, is a straightforward matter, but the lode areas present greater difficulty. The presence of these formations can only be detected by working away from the known occurrences, and this can first be done with closely spaced (20 feet intervals) hand bores set at right angles to the general trend of the distribution of the lodes as would be revealed by detailed mapping.

Provided a sufficient area of lode bearing ground can be shown to exist by this means, and that some values are revealed, a proper drilling campaign should be undertaken to value the lode system to the downward limit of the decomposed material. In this campaign cased holes would be essential and values would need to be determined on a basis of metallic tin content.

Until this preliminary surveying and scout-drilling programme is carried out, the economic value of this area remains totally unknown, and all that can be said for it is that it possesses sufficient surface evidence to warrant preliminary prospecting.

(b) *The Central Area.*

Unlike the Northern Area, the potential mineral wealth of the Central Area lies in deposits of only one kind, namely, the lodes. It is abundantly evident that many short rich shoots of cassiterite have been mined on the old "Dixie," "Cornwall" and "South Cornwall" claims which are embodied in this area.

A preliminary search of Mines Department records reveals that about 155 tons of lode and alluvial cassiterite have been won from the area. The actual quantity is probably more.

There is an extensive area over which lode material can be seen to have occurred, and it is almost certain that there are many flatly or obliquely disposed ore concentrations underlying the laterite which have not yet been located.

This area possesses excellent prospects of containing large quantities of cassiterite-bearing ground, and is one which is well worthy of thorough prospecting.

An accurate feature survey of the area is desirable from which a plan (scale 200 feet = 1 inch) showing all existing workings and lode formations can be constructed. From such a plan the distribution of the known lodes can be ascertained and a boring campaign can be laid out.

In this area it will be necessary to ascertain by closely spaced bores the extent and value of the decomposed rock containing vertical, steeply inclined,

obliquely inclined, or horizontal cassiterite-impregnated pegmatite dykes or country rock. The possibilities of successfully working the area depend on:—

- (1) the existence of a sufficient area and depth of payable decomposed lode country.
- (2) the establishing of a process whereby the highly kaolinised decomposed lode matter and enclosing country rock can be successfully treated on a large scale.

WATER SUPPLIES.

In any big scale attempt to work the deposits on this area in the event of a successful boring campaign, adequate provision would need to be made for water supplies.

An excellent dam site exists on Norilup Brook about 30 chains upstream from the junction of West Gully, about three miles West of the central portion of Mineral Claim 40. An earth dam has at one time been erected across the gully in this locality, but the stream is now (August 1939) flowing through the western end of the embankment.

(c) *The Southern Area.*

The prospects of obtaining large workable quantities of cassiterite-bearing ground on this area are very poor, and are hardly sufficient to justify a prospecting campaign.

CONCLUSIONS AND RECOMMENDATIONS.

The relative prospective mineral potentialities of the three areas under consideration can be placed as follows:—

- First:—The Central Area,
- Second:—The Northern Area,
- Third:—The Southern Area.

Evidence available from existing openings reveals that on the Central Area cassiterite-bearing lode formations are widespread, sufficiently widespread in fact, to lead to the conclusion that many more similar occurrences as yet uncovered may possibly exist in the decomposed rocks below the laterite blanket.

The lode formations on the northern area appear to be much less widespread, and to be very restricted in the Southern Area.

The alluvial ground of the Northern Area may prove by scout drilling to be extensive.

From an economic point of view the Southern Area can be regarded as of low value and hardly worthy of further prospecting.

An intensive prospecting campaign by hand bores and ultimately by cased bores, can be confidently recommended for the investigation of the intricate lode system of the Central Area.

It must be fully realised, however, that the highly clayey nature of the deposit is likely to present serious treatment difficulties, but the topographic situation of the ground is favourable, and the water supply problem is certainly acute, but not insuperable.

The minerals of chief economic importance likely to be found in the areas are cassiterite, tantalite and columbite.

In any prospecting campaign by boring, all values should be determined by assay results on carefully weighed concentrates obtained from cased bore-holes in which the casing-shoe has been kept in advance of the drilling bit.

REPORT ON A KYANITE DEPOSIT, 10 MILES
S.W. OF BRIDGETOWN.

(Lands Dept. Litho 439/80.)

(H. A. Ellis, B.Sc., A.O.S.M.)

LOCALITY.

The deposit is situated on an area about 10 chains long by 2 chains wide, the central portion of which would be about 3 chains east of the north-eastern corner of Nelson Agricultural Location 1369. Location 1369 is situated approximately 10 miles south-west from the Bridgetown Post Office in the flat to gently undulating heavily timbered country at the head of a small tributary of the west branch of the Donnelly River.

ACCESS.

The locality can be reached in 14 miles by road from Bridgetown which is 173 miles by rail from Perth. The road is in good condition for the greater part of its length, with a few short rough sections near the south-western end.

HISTORY OF THE FIND.

Attention was drawn to this deposit of kyanite by the recent sale to The Newbold Silica Fire Brick Company, Limited, Sydney, of a parcel of approximately 50 tons of pure kyanite in the form of waterworn boulders. The material was sufficiently attractive in its refractory properties to cause a further demand for it to be made by this company, and the inspection on which this report is based was made on May 17th, 1939, with the object of determining the manner of occurrence of the deposit, and its possibilities of providing further commercial supplies.

TOPOGRAPHY AND GENERAL GEOLOGY.

The country for some distance in all directions from the locality of the deposit is devoid of rock outcrops, being flat to gently undulating and heavily timbered with jarrah forest and undergrowth. Ferruginous duricrust (laterite) is extensively developed and outcrops frequently on the gentle rises and soil covered flats. Although this part of the State is deeply dissected by the Blackwood and Donnelly Rivers, there is a considerable area of high level, peneplaned country in the watersheds, over which no bed-rock outcrops, and on which occurs an extensive development of ferruginous duricrust (laterite).

There was no evidence available by which the nature of the underlying rocks could be determined, but these can be reasonably inferred to be schists, quartzites, gneisses and possibly granite of the Pre-Cambrian complex, by virtue of the fact that similar rocks can be seen to occur in the vicinity of Bridgetown and westwards from that centre for some distance.

The locality in which the kyanite deposit was found is on flat to gently undulating laterite-covered country which is flanked to the west by gently rising ground for at least one mile. The country rises gently to the east and north, and falls very gently southwards. The drainage is southwards into a tributary of the west branch of the Donnelly River, and the deposit occurs practically on the old peneplaned surface, in a slight topographic basin very near the divide between the Blackwood and Donnelly Rivers in this locality.

MANNER OF OCCURRENCE OF THE DEPOSIT.

The material comprising the parcel of 50 tons sold to the Newbold Silica Fire Brick Company, Ltd., is reported by the buyer's agent and the person who loaded the kyanite on to the motor truck to have consisted of waterworn boulders and smooth semi-angular blocks of pure kyanite of from 2½ cwt. to a few ounces in weight. They state that the material was all waterworn, irrespective of its size, and that it was picked up from the surface of the ground or was lying partially buried in the soil.

A careful examination of the locality showed numerous holes in the soil of a rounded and sub-angular shape, from which the material had been removed. Several large pieces of pure kyanite were found during the course of the inspection, one of which was well rounded with one soled surface and weighed about 60lbs.

There are numerous outcrops of the ferruginous duricrust (laterite) on the area where the boulders of kyanite were found, and some of these large boulders were seen to be liberally studded with waterworn boulders of kyanite of varying sizes.

The area over which the material was obtained has a width of about 2 chains, and a maximum length of about 10 chains, extending in a north and south direction between the north-eastern corner of Location 1369 and the south-eastern corner of Location 1395.

The noteworthy features about this deposit are:—

- (a) the waterworn nature of the hard resistant kyanite boulders set in an aluminous—and ferruginous—cemented laterite containing much small angular glassy quartz,
- (b) the occurrence in close proximity of boulders weighing up to 1 cwt. and small pebbles of from one to two ounces in weight only,
- (c) the common occurrence of one or more flattened sides to the boulders,
- (d) the restricted area over which the deposit occurs,
- (e) the almost complete absence of boulders composed of any other material than kyanite (only two waterworn boulders of quartzite could be found).

Several explanations can be given to account for this remarkable occurrence, but none can be convincingly proved.

From an economic point of view it is important to be able to decide whether these boulders of kyanite have been transported from a long distance or whether they have a source in the immediate vicinity of where they were found.

Their extremely well worn appearance suggests that they have been subjected to the action of running water, but their great diversity in size indicates that they have not been sorted by this agency.

Samples of the ferruginous laterite collected 10 chains away from any laterite containing boulders of kyanite were found to contain extremely small grains of kyanite, staurolite (a mineral allied to kyanite), zircon, tourmaline and ilmenite, a feature which suggests that the laterite has been formed on a surface of metamorphic schists. Kyanite occurs in lenses in rocks of this nature in the Chittering Valley north of Perth, hence it is a reasonable conclusion that the

rocks which originally contained the kyanite *in situ* are not very far away from the site of the present boulder deposit.

The highly waterworn nature of the boulders has to be accounted for, and it is likely that when all the circumstances enumerated above are considered, it is possible that the boulder deposit represents a boulder-beach deposit of an ancient shore line.

If this hypothesis is not acceptable, then probably the best alternative is that the deposit is a residual accumulation produced from the weathering of a lens or lenses of kyanite in schists. It is difficult, however, to reconcile the rounded nature of the kyanite boulders with this latter conception.*

Practically all of the visible kyanite has been obtained from this deposit, and the 50 tons obtained was all found on the surface. Further supplies would most likely be found in the form of boulders buried in the soil and encased in the laterite, over the area from which the first material was gathered.

There is sufficient doubt about the mode of origin of the deposit to warrant the cutting of a series of trenches in an east-west direction through the laterite and soil into the underlying rock in an endeavour to locate the source of the bouldery kyanite.

The question arises as to whether the deposit is worthy of prospecting in view of the fact that, notwithstanding the great ease with which the material was obtained, the price paid for it would not permit of any mining operations being carried out in the course of production unless the deposit proved to be extremely large. The vendors state that the margin of profit on the 50-ton parcel sold was very small.

The present position (May, 1939) with regard to the possibilities of this deposit being able to supply an immediate demand for even small supplies of kyanite, is that there is no ore developed and that the probable ore is a most uncertain factor. Further, much exploratory work is necessary in order to locate the possible source of the material *in situ*, and from the experience gained in the production and sale of the 50-ton parcel it appears that the deposit will not stand exploration or mining treatment.

It will thus be seen that the deposit cannot be regarded as an immediate source of commercial kyanite, and that the future development of it depends on the success of locating the material *in situ*, the size of the deposit when located, and the price obtainable for the material when found.

SUMMARY AND CONCLUSIONS.

A deposit of waterworn boulders of high-grade kyanite recently found about 10 miles south-west of Bridgetown occurred as loose boulders embedded in and resting on the soil in association with ferruginous laterite over an area of about 20 square chains.

A parcel of 50 tons of these boulders was sold to a firm in the Eastern States at a price which the vendors state left only a small margin of profit.

*Since compiling this report it has occurred to the writer that a lens of massive, jointed kyanite, may weather *in situ* in a manner similar to that seen in the case of some epidiorite dykes of the Darling Ranges, where many rounded and smooth semi-angular boulders of epidiorite can be seen associated with dyke outcrops.

The manner of occurrence of the material cannot be definitely determined without further prospecting involving extensive trenching down to bed-rock, and there are no further commercial supplies of kyanite immediately available, while the probable ore is a very uncertain factor.

The deposit in its present condition cannot be regarded as a source of commercial quantities of kyanite, and its future possibilities depend on the locating of the original source of the material and the size of the ore body when found, together with the market price available.

The situation of the deposit, the destination of the material (Sydney), and the price of the product, make it appear that only the most easily obtainable material (such as loose boulders found on the surface) can be profitably handled at present, and this source of supply no longer exists.

A sufficiently attractive price would need to be offered for the kyanite to encourage further prospecting, and it is problematical whether this price would not exceed the price of the material at present being imported from India.

It is possible for deposits of a similar nature to this one to be found in the district and an intensive search among the laterite outcrops for pieces of contained kyanite would be the best means of conducting this search.

KYANITE DEPOSIT AT SMITHFIELD.

(By E. S. Simpson, D.Sc., B.E., F.A.C.I.,
Government Mineralogist and Analyst.)

The Acting Government Geologist and myself inspected the kyanite deposit at Smithfield to the south-west of Bridgetown on 17th May, 1939, and the former has already reported fully on the field occurrence. There is very little that I can add to his notes in this respect.

Briefly, the deposit occurs in gently undulating forest country in the south-eastern corner of Loc. 1395, extending southwards over the border of that block. Over an area of 10 x 2 chains large and small boulders of kyanite from a few ounces to two hundredweight in weight, and all worn smooth on the surface, have been found loose in the soil, and to a less extent embedded in primary laterite. Fifty tons of boulders were collected this year in a few days and sold to the Newbold Silica Firebrick Co., of N.S.W., and used in their factory at Waratah in the manufacture of super-refractory bricks. This parcel seems to have almost exhausted the visible supply of mineral, not more than half a ton more being seen by us on our visit. By burning off the scrub and ploughing the outcrop a few more tons could possibly be obtained. No boulders were to be seen beyond the area of 10 x 2 chains defined by Mr. Ellis. Microscopic grains of kyanite were however detected in a concentrate from a stream about $\frac{3}{4}$ mile east of this area, and in primary laterite samples collected within that area and up to half a mile to the north and south of it. No kyanite has yet been detected in its original rock matrix, that known up to the present being found in alluvial or eluvial material. In similar material small fragments have been found at Bunbury, Greenbushes, Fly Brook, Pemberton, and Jasper Lake in this district.

To my mind there is a strong probability that the mineral is derived from lenses in the Chittering Series of metamorphic sediments, which extend for several hundreds of miles along the western portion of the Darling Range. In the Chittering Valley itself, kyanite is extremely plentiful in this series, both in lenses of almost pure mineral, and in small crystals scattered freely through certain beds of rock, which I feel certain will ultimately be concentrated by oil flotation for a yield of commercial kyanite. In the Chittering Valley staurolite is often associated with kyanite, and it is important to note that I found this mineral associated in granules with kyanite at various spots at Smithfield.

Owing to the extensive beds of laterite and great depth of soil in the district no outcrops of bedrock are visible anywhere near the Smithfield deposit. This will make prospecting for further supplies of the mineral very difficult. I would suggest as a preliminary step that from carefully marked spots within a radius of 2 miles of the outcrop concentrates should be obtained from creek beds, beds of swamps and surface soils for examination in the Government Laboratory. At the same time samples of laterite should be collected for detailed mineralogical examination. This may lead to the location of concentrations of granular kyanite, where prospecting could be carried a further step by costeaning or sinking. At the same time a look out should be kept for further surface pebbles along a north and south line through the present known outcrop.

The demand for kyanite in Australia and abroad is likely to increase owing to its suitability for the manufacture of super-refractories for use in the steel and other industries employing high temperatures. The Smithfield mineral is of good commercial quality for such a purpose, being well over 95 per cent. pure.

REPORT ON LATERITE SPECIMENS FROM KYANITE LOCALITY, SOUTH-WEST OF BRIDGETOWN.

(Litho. 439/80, Loc. 1395.)

(By Dr. Dorothy Carroll, Department of Geology,
University of Western Australia.)

List of specimens examined.

1. Laterite surrounding the kyanite pebbles.
2. Laterite 5 ch. north of kyanite pebbles.
3. Laterite 10 ch. north of kyanite pebbles.
4. Laterite boulders near kyanite occurrences with no free kyanite visible.
5. Breccia with angular quartz fragments and rounded pebbles of kyanite.

Method of examination.

With the exception of specimen 5 the laterites were crushed to pass an 85 B.S. sieve (approx. 70 I.M.M.) and decanted to remove the bulk of the clay. The residue was then boiled in concentrated HCl to remove the red colouring matter. The cleaned material was then separated in bromoform to obtain the heavy minerals, i.e., those above S.G. 2.9. In each specimen this heavy fraction was quite large in amount, but this was further reduced in bulk

by separation with a small electro-magnet. The remaining material was mounted in clove oil for examination under the microscope. Specimen No. 5 was not crushed but the individual grains were freed from the clayey and ferruginous cement by boiling in KOH and various acids. The grains were then sieved and the finest material separated in bromoform to obtain the heavy minerals as above.

The following heavy minerals were identified:—Magnetite, ilmenite, limonite, leucoxene, zircon, staurolite, kyanite, tourmaline, rutile, sillimanite, and pale green spinel (? gahnite).

Of these minerals, magnetite, ilmenite, limonite and staurolite were the most abundant. Zircon is scarce in these residues, and spinel extremely rare. Kyanite is moderately abundant. Nearly all the grains are angular and unworn, thus signifying little transport. Staurolite grains show many crystal faces, and the tourmaline is prismatic. Zircon alone shows signs of abrasion. The general appearance suggests some source near at hand for these heavy minerals.

The light fraction is made up of clay material and quartz. The grains are angular to sub-angular in shape, but there are also a few rounded ones, and a number with regrowth rims. Specimen 5 has extremely angular and "chippy" grains showing no wear; but here, too, a couple of rounded grains were noticed.

The following is a tabulation of the heavy mineral assemblages:—

Sample No.	...	1.	2.	3.	4.	5.
Magnetite	...	A	A	A+	+	+
Ilmenite	...	+	A	A	+	+
Limonite	...	A+	A+	A+	A+	A
Leucoxene	...	+	+	+	+	+
Zircon	...	S	+	+	S	S
Staurolite	...	A	A	+	+	+
Kyanite	...	+	+	+	+	+
Tourmaline	...	+	+	+	+	+
Rutile	...	+	+	+	+	...
Sillimanite	...	...	...	S	...	...
Spinel	...	...	...	S	...	...

A+ = very abundant; A = abundant; + = present in fair amount, but not abundant; S = scarce, one or two grains only. (These refer to the heavy residue only, and *not* to the total sample.)

NOTES ON THE OCCURRENCE OF KYANITE IN COMMERCIAL QUANTITIES IN INDIA.

(By Dr. Dorothy Carroll, Department of
Geology, University of W.A.)

Rec. Geol. Survey India, LXIII., p. 114, 1930.

"Dr. Dunn's suggestion is that these highly aluminous rocks do not owe their formation to the alteration of once less aluminous schists, but represent original bauxitic or other highly aluminous clays occurring interstratified in the succession of sediments from which the series of schists has been derived."

Rec. Geol. Survey India, LXIV., p. 403, 1930,
J. A. Dunn.

"At Lapsa Buru the kyanite-quartz rock is found in enormous beds, the massive kyanite apparently occurring as segregations in the more acid rock.

Some large deposits are, however, entirely of kyanite rock. The pure kyanite-rock is massive, never cleaved; it is usually medium to coarse-grained, and even in those rocks which, in the hand-specimen, appear to be fine-grained, are found to consist under the microscope of quite coarse crystals full of fine inclusions. Kyanite is almost the sole constituent. It is often of the radiating columnar variety, and blades of crystals over 12 inches long may be seen sometimes in the large boulders. Such coarse kyanite indicates the action of at least a certain amount of metamorphic migration. Usually the only other constituent is rutile, which is often plentiful; fine corundum is present occasionally. Other places at which massive kyanite occurs in workable amounts in Singhbhum are Ghagidih, Rakha Mines, Badia-Bakra, and Kanyaluka. The minimum quantities of these present, calculated to a depth of one yard, are:—

	tons.
Lapsa Buru	214,000
Ghagidih	20,000
Badia-Bakra	10,000
Kanyaluka	8,000

Analyses of typical specimens of these rocks are:—

	Lapsa Buru.	Ghagidih.
	%	%
SiO ₂	30.2	36.0
Al ₂ O ₃	65.35	60.7
Fe ₂ O ₃	3.19	2.3
TiO ₂	0.76	1.2
CaO	Tr.	0.8
MgO	1.37	0.4
H ₂ O	0.61	0.9
	<hr/>	<hr/>
	100.78	102.3

Rec. Geol. Survey India LXV, part 2, pp. 285-305, 1931.

On certain rocks bearing kyanite and sillimanite in the Bhandara district by S. K. Chatterjee.

This paper gives an account of the schistose rocks of the district and method of formation of these schists by metamorphism. The kyanite here also occurs in a massive form. "The rocks carrying kyanite and sillimanite are distributed sporadically. The outcrops are small and discontinuous, give rise to slightly elevated features, and are disposed in parallel belts with a roughly north-south trend." "The thickness of the formations is variable and irregular. At Sonekhari it is about five feet; at Miregaon and Ganglewara about 15 feet; and at Sarathi about 30 feet. At the two hills at Pohra the maximum thicknesses are 50 feet and 125 feet, respectively. At Magra the thickness ranges up to 100 feet; whilst at Girola it is from 250 to 400 feet."

"... a consideration of all the outcrops reveals the following three salient features:—

1. Chlorite-muscovite-schist is invariably associated. In certain instances . . . a gradation between chlorite-muscovite-schist and the kyanitic or the sillimanitic rocks . . . could be recognised.
2. Although these rocks are restricted to the zone of chlorite-muscovite-schist, there is apparently no definite stratigraphic

horizon at which they occur. At Girola there seem to be two bands at different horizons.

3. Each of the outcrops is intersected by myriads of quartz-veins, carrying among other accessory ingredients tourmaline, rutile, and occasionally roscoelite mica. Granite is found to emerge out of the alluvial mantle at a distance, but pegmatites are occasionally seen quite close to these rocks" (not a commercial occurrence, as the kyanite is mixed with other minerals).

REPORT ON A BISMUTH CARBONATE DEPOSIT IN A PEGMATITE DYKE, M.C. 173H, YINNIETHARRA STATION (GASCOYNE RIVER).

(Lands Dept. Litho. 78/300, S.W. Quadrant.)

(H. A. Ellis, B.Sc., A.O.S.M.)

LOCALITY.

The deposit is situated on M.C. 173H in a very coarsely grained pegmatite dyke forming a low rise in which two quartz reefs ("blows") are prominent about 10 chains west from the western bank of Nardoo Creek and about seven miles on a bearing of 285 degrees from Morrissey Hill. M.C. 173H is situated in approximate latitude 24° 31' S. and approximate longitude 116° 03' E.

Nardoo Creek is a southerly trending dry water-course, tributary to the Gascoyne River, and joins the river near the most northerly point of the big bend convex to the north some eight miles a little south of east from the Lockier Range. (See Plate I.)

ACCESS.

The locality can be reached from Carnarvon by a road which passes through Gascoyne Junction, Dairy Creek, Mooloo Downs and Yinnietharra, or from Perth by travelling in a northerly direction, via Mullewa, Byro Station and Dairy Creek. The latter is the most direct from places south of Mullewa. The distance to Carnarvon, the nearest port, would be about 250 miles by road.

HISTORY.

The deposit was discovered in October, 1938, by a prospector named Thompson, and the inspection on which this report is based was made on 20th and 21st April, 1939.

GENERAL GEOLOGY.

The area in which the deposit is situated is shown on the most recent geological map of the State (1933) as being composed of granite, but which actually consists of a gneiss and mica schist complex liberally invaded by very coarsely crystalline pegmatite dykes composed of quartz, microcline felspar and muscovite mica.

The regional strike of this area of gneiss and schist, at least as far south as latitude 25° 15' S., is about 15 degrees west of north, and the same direction of regional strike prevails as far east as longitude 117° 50' E. in these outcrops noted in a traverse from Dairy Creek to the Egerton gold mining centre, in the valley of the Gascoyne River.

The belt of country in which the bismuth deposit occurs, is a continuation along the strike in a westerly direction of the gneiss and mica schist in which the mica mines were once worked at Morrissey Hill. A feature of the pegmatites of this area is a strong tendency for the various constituents (quartz, muscovite mica, and felspar) to segregate and form unimineral deposits. It was noted that in the case of the quartz constituent there was a tendency for the reefs, or "blows," as these quartz concentrations are known by prospectors, to occur more or less centrally in a pegmatite mass.

Very large crystals of beryl (Beryllium aluminium silicate) sometimes up to 6 inches across, and occasionally possessing a distinct basal termination with prismatic faces as the only other faces developed, occur in the pegmatite dykes. These beryl crystals were chiefly seen lying on the surface in the vicinity of quartz concentrations, but several were observed occurring in the solid quartz, and one was found in a matrix consisting of microcline felspar, muscovite mica, and quartz.

THE BISMUTH CARBONATE DEPOSIT.

Samples of a soft, heavy, greyish coloured mineral found in the eluvial material on the slopes of a low quartz hill on M.C. 173H (see Locality) were submitted by the prospector to Dr. Simpson, Government Mineralogist and Analyst, and proved on examination to be bismuth carbonate. This mineral is known under the name of Bismutite, and is a basic carbonate of bismuth, whose composition is given by Dana as perhaps $\text{Bi}_2\text{O}_3 \cdot \text{CO}_2 \cdot \text{H}_2\text{O}$.

An examination of a considerable number of specimens of the eluvial bismutite showed that besides a number of pieces consisting of pure bismuth carbonate, many of the lumps had quartz fragments adhering to and penetrating them, while others had microcline felspar, muscovite mica and hard limonite attached to them.

Up to the time of inspection, approximately 800 lbs. of eluvial bismutite had been obtained from the slopes of the hill, not all of which, however, could be regarded as pure ore. The size of the eluvial bismutite varied from pieces as big as a grain of wheat to pieces weighing three or four pounds, and one piece weighing about 17 lbs. was obtained. The only bismutite *in situ* was found in a very small vein in solid quartz, and yielded about 30 lbs. of ore impregnated with quartz.

MODE OF OCCURRENCE OF THE BISMUTITE.

The pegmatite dyke with which the bismutite is associated forms a gently rounded ridge about 10 chains long running in a general direction of N. 50° E. At each end of the ridge is a low quartz hill, that at the north-eastern end being about 60 feet high above the general level of the surrounding flat country, while the hill at the south-western end is about 80 feet high.

The country immediately to the north of the pegmatite dyke is a complex of pegmatite dykes, gneiss and heavily tourmalinised biotite schist, with varying strikes, and forms a flat to gently undulating area with numerous small rounded hillocks of quartz. It was on this ground that a considerable quantity

of detrital columbite was found, though the columbite has not yet been found *in situ*. There are numerous small excavations made by mica prospectors on small mica concentrations distributed sporadically over this area, and although a careful search has been made for eluvial bismutite on it, none has yet been found.

The eluvial bismutite occurs on the quartz strewn south-eastern slopes of the pegmatite ridge, and is confined to the slopes immediately below the quartz concentrations. At the north-eastern end of the ridge, the quartz reef, situated roughly in the centre of the pegmatite dyke, is about 2 chains long and is very irregular in width, being as much as 20 feet wide in places. The walls of the pegmatite are not visible, but the dyke is at least 70 feet wide here, and may be considerably wider. The area over which eluvial bismutite has been found in this vicinity is about 1½ chains long by 1 chain wide to a depth of about 1 foot.

The only definite occurrence of the bismutite *in situ* was found as a small vein about 2 feet 6 inches long by 2 inches thick by 2 feet deep in the centre of the quartz reef at the north-eastern end of the ridge. This vein dipped steeply to the south-east, and had solid quartz on the hanging wall, and what appeared to be an iron-oxide-cemented, decomposed, medium grained pegmatite of small dimensions on the footwall.

The lateral limits of the formation could be plainly seen to be defined by quartz, and since the date of inspection, information has been received that the deposit terminated at a very shallow depth (perhaps 3 feet) in quartz, yielding only 30 lbs. of medium grade ore.

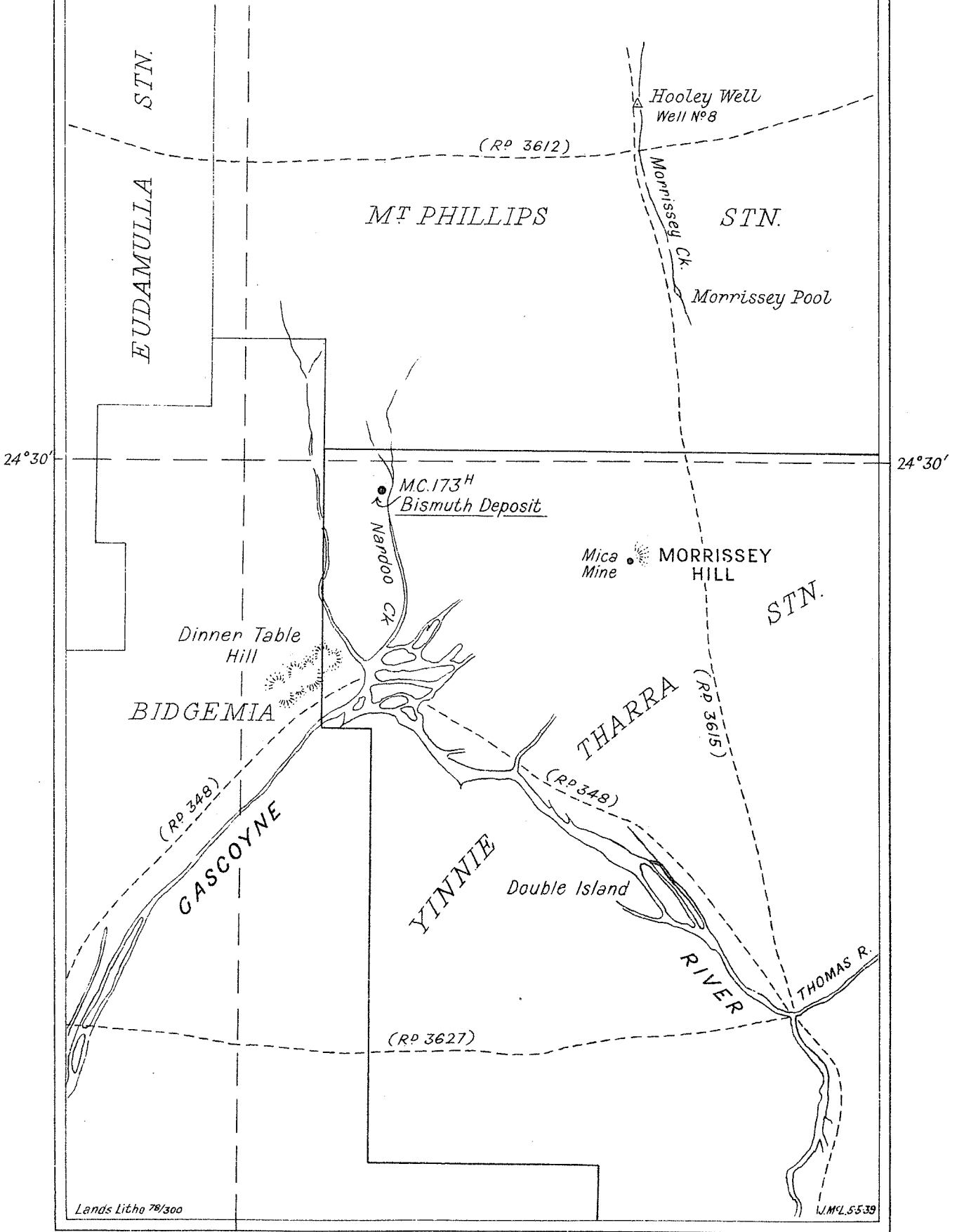
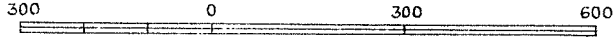
A considerable number of shallow holes had been made in pegmatite on the south-eastern slope of the hill, below spots on which large pieces of bismutite were found, but up to 21st April, no deposit *in situ* had been located in any spot other than in the solid quartz on top of the ridge.

At the south-western end of the pegmatite ridge, the quartz reef is of slightly larger dimensions, and is separated from the quartz reef at the north-eastern end by a low saddle of pegmatite about 5 chains long in which no quartz reefs occur. It is significant that no eluvial bismutite has been found in this intervening space, and points to the conclusion that the bismutite deposit is associated only with the quartz concentrations of the pegmatite dyke. The occurrence of the eluvial bismutite mainly on the south-eastern slopes of the hill also suggests that the main concentration of the mineral occurred near the south-eastern side of the quartz reefs.

The quartz reef at the south-western end of the ridge is about 3 chains long, and varies in width from a few feet up to 50 feet. It is surrounded by coarse grained pegmatite in which small concentrations of muscovite mica in "book" form occur. A costean some 50 feet long and 8 feet deep in the deepest part was cut across the eastern end of this hill, and passed through typical coarse pegmatite with concentrations of felspar and quartz. The boundaries of the quartz concentration are very irregular here, and although there is quartz on both sides of the costean at the surface, very little solid quartz was encountered in the cut.

PLAN SHOWING.
LOCALITY OF BISMUTH DEPOSIT
YINNIE THARRA STATION

Scale 300 chains to an inch



116°0'

A specimen of bismutite with fresh feldspar adhering to it and which was reported to have been obtained from the pegmatite near the south-eastern end of the costean, close to the quartz outcrop, was examined, and from the nature of the material in the wall of the cut immediately below the spot indicated as being the original position of the bismutite, the latter was definitely associated with a concentration of microcline feldspar and beryl in the pegmatite near the south-eastern side of the main quartz reef. No other occurrence of bismutite *in situ* had been found in this quartz reef or adjoining pegmatite at the time of inspection. A considerable area of quartz is exposed here, and examination of the outcrop is easy, but there is no indication at all in the quartz of the occurrence of bismutite in it.

The area over which eluvial bismutite has been found on the south-eastern slope of this hill is comparatively small, being about one square chain only.

The manner of occurrence of the two small patches of bismutite which had been located *in situ* up to the time of inspection, showed that the mineral occurred in isolated small concentrations, both in the solid quartz of the pegmatite dyke, and in association with feldspar and mica in the pegmatite, adjoining the quartz reef on the south-eastern side. This is a typical manner of occurrence of the metallic mineral constituents of a pegmatite dyke, and on the evidence available from this bismutite deposit, the conclusion is justified that the eluvial bismutite is a concentration from the breaking up under natural agencies of a considerable volume of quartz reef and pegmatite, which has contained small concentrations of the bismuth ore. There is no evidence which suggests that the bismutite has been shed from a relatively large deposit of bismutite having the form of a reef or lode.

Much of the eluvial bismutite, and some of that obtained from the small deposit found *in situ* in the quartz is intimately intergrown with quartz. Some of the quartz has many of its crystal faces developed on it, and is embedded in bismutite, showing the bismutite to be of later age of crystallisation than the quartz.

Mineral deposits in pegmatite dykes are notoriously difficult to systematically prospect by mining methods, although in some cases the metallic constituents are confined to some particular portion of the dyke, being confined to one wall in some cases or to the quartz concentrations or feldspar aggregates in others.

The evidence which could be used to guide a prospecting programme on this deposit of bismutite is not sufficiently convincing to enable one to have faith in the success of a programme laid out in accordance with it. The extremely irregular manner of mineral deposition in pegmatite dykes, coupled with the frequent total absence of indications as to where to search for a repetition of the deposit once it is lost in mining, makes systematic prospecting by, say, trenching, a very hazardous undertaking.

In the present case, a programme of trenching in the pegmatite adjacent to and following the wall of the quartz reef along the length of the eluvial shed of both outcrops, was suggested to the owners. It was also suggested that the pegmatite and quartz

should be explored laterally from the trench by short trenches or drill holes at right angles to the main trench. A further excavation across the quartz reef at the site of the only small deposit found in the hill at the north-eastern end of the ridge, may reveal some useful evidence, or further small concentrations of ore.

SUMMARY AND CONCLUSIONS.

The deposit of bismuth carbonate (bismutite) found occurring in association with the major quartz concentrations of a pegmatite dyke on M. C. 173H had yielded about 800 lbs. of impure eluvial bismuth carbonate, the impurities being mainly adhering quartz and feldspar, up to the time of inspection (21st April, 1939).

The only occurrence of the mineral *in situ* was seen in the quartz reef at the north-eastern end of the dyke, and yielded about 30 lbs. of impure bismutite before the deposit terminated in quartz.

No defined reef or lode formation, to which the mineral could be seen to be confined, was seen in the pegmatite dyke, and the evidence points to the occurrence of the bismutite as a series of small concentrations in the quartz and pegmatite possibly confined to the area in the vicinity of the south-eastern wall of the quartz reefs.

The area over which eluvial bismuth occurs is small, being about 3½ sq. chains, and at the time of inspection had not been completely worked out.

The price obtainable for clean bismuth carbonate is about 6s. per lb., but one parcel of 3 cwt. sold from this claim realised a much lower price than this on account of impurities (quartz, feldspar, etc.).

The relatively large area of quartz exposed in which only one small vein of bismutite has been found is easily prospected, and despite this ease of prospecting, no other deposit can be found in it. This indicates the widely disseminated manner of occurrence of the bismutite as far as the quartz is concerned, and the adjoining pegmatite had not been shown to be definitely carrying bismutite concentrations, though it may well do so.

The failure to locate *in situ* any workable concentration of bismutite up to the time of inspection, coupled with the natural irregular manner of occurrence of this material in pegmatite dykes, makes it extremely unlikely that this deposit has any commercial prospects even on a small scale.

Some of the eluvial bismutite showed very small bright soft specks of metallic bismuth, and it is possible that metallic bismuth would be found in association with the bismuth carbonate should any deposit be found living to a moderate depth.

There are many quartz reefs associated with pegmatite dykes in this part of Yinnietharra Station, and bismutite may well occur in association with any of them.

ASSOCIATED MINERALS.

Besides the obvious minerals, quartz, microcline feldspar, muscovite mica, beryl and bismutite which constituted the pegmatite, some other minerals were collected and submitted to Dr. Simpson, Government Mineralogist and Analyst.

Dr. Simpson reports as follows on these specimens:—

Lab. No. 1820. "No. 1 Brown Microcline."—This is a mixture of microcline, quartz, limonite and a hydrous ferric phosphate. The microcline is brown throughout, due to the presence of this film of limonite and the hydrous ferric phosphate in the cleavages.

Acid soluble Phosphoric oxide P_2O_5 , 0.74 per cent.

Lab. No. 1821. "No. 2 Brown Microcline."—Microcline with a little muscovite and veins of kaolinised felspar. The brown colour of the felspar is due to films of limonite and a hydrous ferric phosphate.

Lab. No. 1822. "No. 3 Brown Microcline with Mammillated Crusts."—Brown microcline with white patches of chalcedony and kaolin. The brown staining throughout the microcline and the black mammillated crusts consist of limonite and a hydrous ferric phosphate.

Lab. No. 1823. "No. 4 Beryl."—Beryl with a surface staining of limonite and a hydrous ferric phosphate.

Lab. No. 1824. "No. 5 Columbite."—Manganocolumbite.

Specific Gravity	.. ..	6.54
Tantalie oxide, Ta_2O_5	.. ..	51 per cent.
Niobic oxide, Nb_2O_5	.. ..	32 " "

The presence of small quantities of iron phosphate in all the ironstained specimens is interesting as pointing to the presence in the vein of masses of zwiesselite (Fe_2FPO_4) or triphylite ($LiFePO_4$).

PROGRESS REPORT ON THE GEOLOGY OF PORTION OF THE MT. MARGARET GOLD-FIELD.

(R. A. Hobson, B.Sc., (Hons).)

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Broad Geological Structure	87
Results of the Survey	88
Prospecting Recommendations	89

INTRODUCTION.

The work done during the 1939 field season is a continuation of that already carried out during the field seasons of 1937 and 1938, and reported upon in the Annual Report for 1938.¹ Mapping has now been extended northward to include the whole of the Erlistoun-Duketon-Mulga Queen auriferous belt, southward to include Yundamindera and Wilga (E 40), and eastward to include Burtville. In all, approximately 5,000 square miles have been mapped. Field work this year was commenced by Mr. K. R. Miles on 22nd March. At that time the writer had been withdrawn from the Mt. Margaret Survey to carry out the proposed survey of Western Australian iron

deposits. It was later decided not to go ahead with this work, and the writer returned to the Mt. Margaret Goldfield early in June. By the end of November the field party had returned to Perth.

Mr. Miles is responsible for the regional mapping in the vicinity of Wilga, Burtville and Yundamindera and the southern end of the Erlistoun-Duketon auriferous belt. He has also examined the following mining groups:—Victory Group, New Erlistoun Group, Midas Group, Baneygo Group, The Patch, Connemara Group, Famous Blue Group, Mulga Queen Group, Hutani Group, Escreet's new find between Erlistoun and Duketon, Kelly's new find north of Duketon, and briefly inspected many abandoned workings. Reports on the mining groups are to be found elsewhere in this report (p. 114).

Within the area examined this year there is very little prospecting activity, and no prospecting workings of any extent. Except for the New Erlistoun Gold Mine² at Cox's Find there are no larger mines now working. Consequently information as to the nature of the gold deposits is somewhat meagre. Most of the ore bodies are small, but frequently quite rich. The abandoned workings however, show that in the past larger ore bodies have been worked. Throughout the area ground water is shallow—rarely exceeding 100 feet in depth and more usually of the order of 50 feet. This has, in all probability, accounted for the closing down of many of the smaller mines operated by prospectors.

GENERAL GEOLOGY.

In last year's progress report³ it was stated that country with a yellow to reddish brown sandy soil and a spinifex and mallee vegetation was being mapped as soil covered, because it was considered that this sandy soil had been transported by wind action to its present position. This type of country has now been seen in many places to overlie granite or gneiss, which is frequently exposed in breakaways forming the edge of the spinifex and mallee country. That some of the sandy soil is transported is shown by the occurrence of sand dunes and the piling of sand against ridges. Some of the soil so transported overlies greenstone. It is now believed however that, except in a few relatively small areas, the spinifex and mallee country overlies granite or gneiss.

In addition to extensive areas of alluvium associated with well defined drainage channels, smaller areas of alluvium have been found fringing the generally hilly greenstone complex country. This alluvium is deposited by a series of small and not very well defined drainage channels.

Glacial erratics have been recorded at many places between Erlistoun and Duketon, where they are generally found as scattered patches of boulders. In the south bank of Mallee Creek (23 miles north of Beria, on the Beria-Erlistoun Road) they occur in a white matrix, overlying unconformably rocks of the Greenstone Complex. The exposures are not very complete, and no examination has yet been made of the matrix for fossils. So far the glacial erratics have been found only on the "New Plateau." Further evidence of the age of the glacial erratics may be expected from the examination of conglomerate and greywacke pebbles

¹Hobson, R. A., Progress Report on the geology of an area in the vicinity of Laverton and Morgans—Mt. Margaret Goldfield, Annual Progress Report of the Geological Survey for the year 1938, p. 15.

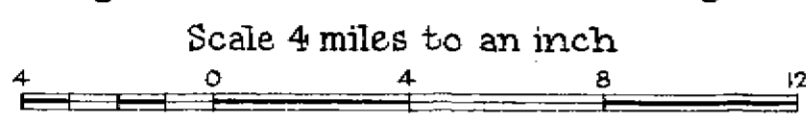
²Miles, K. R., Gladiator Gold Mine, The Mary Mac Gold Mine, Notes on the geological structure of portion of the Mt. Margaret Goldfield, Notes on the banded jaspilites of the Mt. Morgans-Mt. Margaret District, Annual Progress Report of the Geological Survey for the year 1938, pp. 27, 28, 29, 31.

³Matheson, R. S., Erlistoun Gold Mine, Cox's Find, Annual Progress Report of the Geological Survey for the year 1938, p. 24.

⁴Hobson, R. A., op. cit., p. 16.

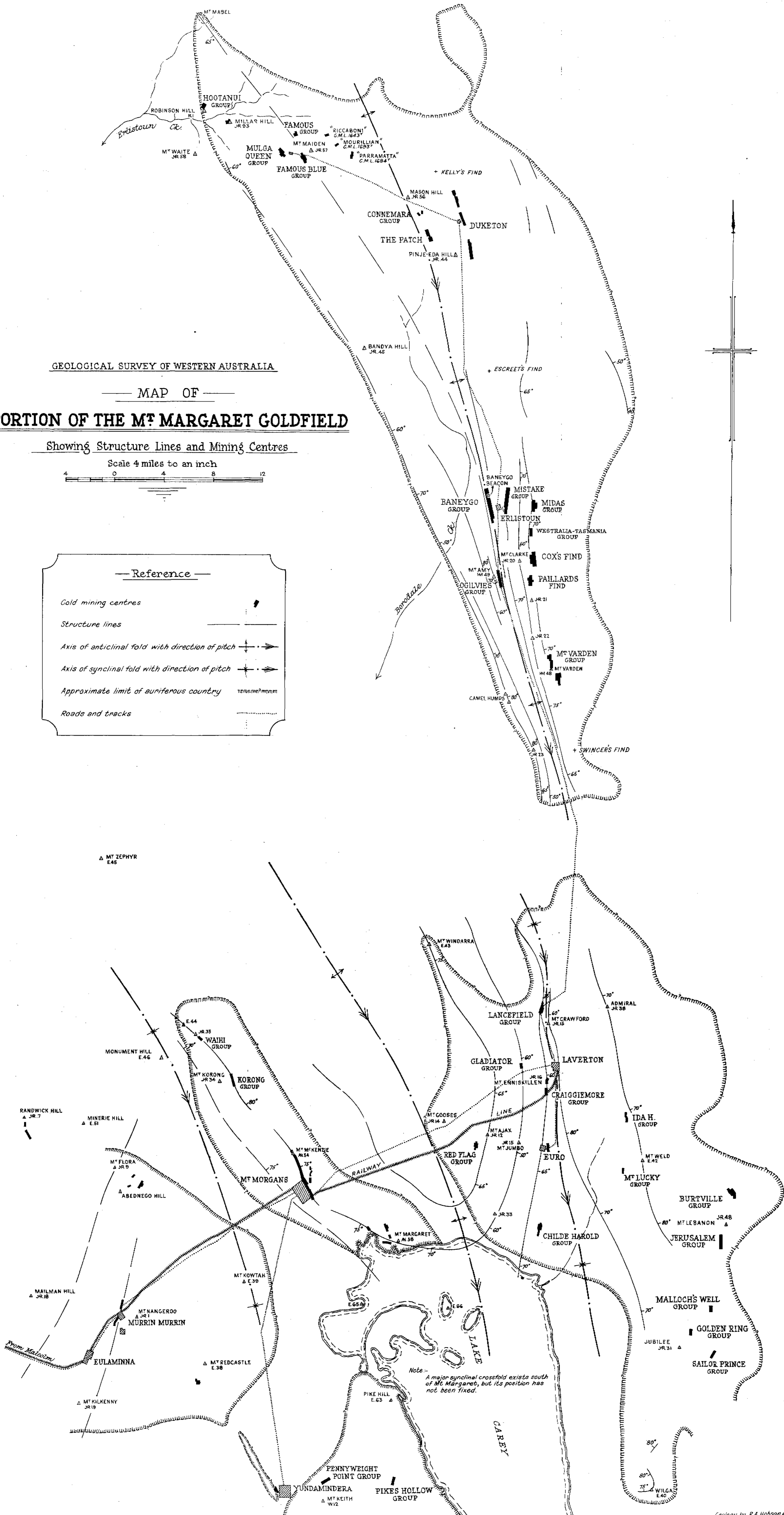
GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
MAP OF
PORTION OF THE MT MARGARET GOLDFIELD

Showing Structure Lines and Mining Centres



Reference

- Cold mining centres
- Structure lines
- Axis of anticlinal fold with direction of pitch
- Axis of synclinal fold with direction of pitch
- Approximate limit of auriferous country
- Roads and tracks



found amongst the boulders. Many of the boulders could be derived from rocks of the Greenstone Complex. The conglomerate referred to above, however, shows no signs of dynamic metamorphism, strikingly seen in the elongated pebbles of the conglomerate beds of the Greenstone Complex and it may therefore be younger than Pre-Cambrian in age.

Additional information has now been obtained about the medium and coarse grained greenstones exposed in various places. At a point approximately six miles E.S.E. from J-R 23 (S.E. portion of Lands Department Litho 172/80) a medium to coarse grained greenstone is seen to have intruded a schistose basic lava and a gneissic granite. A conglomerate bed, forming portion of the Greenstone Complex, contains pebbles of a medium grained massive greenstone. Further the old workings on "Hutanui," G.M.L. 1679, are in a coarse grained greenstone, while 13 miles north of Duketon there has been some prospecting activity in a similar rock. At this last locality the coarse grained greenstone is somewhat sheared. It can therefore be stated that there are at least two periods at which coarse grained greenstones were formed—one pre-folding and the other post-folding and post granite.

At four localities west of the Beria-Duketon road conglomerates, forming portions of the Greenstone Complex, have been noted. Two and possibly three of these occurrences appear to be portions of the same horizon, while the fourth is a slightly lower horizon. The pebbles at all outcrops are generally elongated and consist predominantly of quartzites. At two localities pebbles of lava, medium grained greenstone, jaspilite and granite have been recognised. A collection of pebbles has been made for future examination. The main granite of the area is considered to have been intruded towards the end of the period of folding, and there is no evidence, other than the occurrence of granite pebbles in the conglomerate, of any older granite.

In the Erlistoun-Duketon belt of country, metamorphosed graphitic sediments are more abundant than in the Laverton-Mt. Morgans belt. West of Mt. Amy (H.M. 49) there are particularly good exposures of graphitic shales and schists. Generally, metamorphic minerals are absent from these. In the vicinity of Duketon there are good exposures of what are probably metamorphosed sediments. Typically these consist of white much weathered rocks with rounded to semi-rounded pebbles of quartz, up to $\frac{1}{2}$ in. in diameter, in a white sericitic groundmass. They have a strongly developed schistosity, and break into characteristic elongated fragments. They have also a well marked jointing at right angles to the schistosity. The exact stratigraphic position of these rocks cannot be fixed, but it can be said they are low in the rock succession, and well below the main jaspilite horizons. They are also lower than the main auriferous horizons, but do themselves contain ore bodies, associated at The Patch* and Connemara Group† with basic dykes.

As a result of this year's field work the rock classification table previously published⁴ needs some amendments, and the following table is put forward:—

RECENT.

Soil, alluvium, siliceous and ferruginous laterite.

* p. 120.

† p. 120.

⁴Hobson, R. A., op. cit., p. 16.

AGE UNKNOWN.

Glacial erratics.

POST GRANITE AND POST FOLDING.

Dolerite dykes, medium grained massive greenstone.

PRE-CAMBRIAN.

Granitic Series:—Granite, gneiss, pegmatite and aplite dykes, porphyry dykes of various types, barren and auriferous quartz reefs.

Greenstone Complex:—lavas, tuffs, agglomerates, medium and coarse grained greenstones generally massive, ultra basic rock, erosion sediments including conglomerate beds and jaspilites.

A noticeable feature of the area under examination is that the regional metamorphism is low in grade, and almost completely confined to dynamic or stress effects. These are to be seen in the elongation of pebbles in conglomerate beds, and in the development of schistosity and fracture cleavage in other rock types. This schistosity has been so slight however, that in most beds of sedimentary origin it seldom masks the original bedding. Despite the relatively abundant development of sedimentary beds of a type which is usually fairly sensitive to changes in temperature and pressure conditions, the only metamorphic minerals so far located in these beds are andalusite, chiastolite, staurolite and possibly corundum, in several small isolated occurrences, which are each clearly due to the contact heating effects of local intrusions. A garnetiferous amphibolite has been recognised from the dump on "Hutanui," G.M.L. 1679, but garnets are absent from the amphibolite elsewhere in the vicinity. Minerals such as kyanite and sillimanite are absent, as are also mica schists. The mild regional metamorphism has resulted in the breaking down of the amphiboles of the basic lavas with the production of urallite and chlorite, and in extreme cases of the development of chloritic schists. Actinolite, a moderately high grade stress material, which is commonly found in basic schists in other parts of the State is generally absent from this area. One or two specimens, however, collected towards the end of the field season, may be found to contain actinolite.

BROAD GEOLOGICAL STRUCTURE.

The country in the vicinity of Wilga (E 40) and Burtville yielded very little structural information. At Wilga there are outcrops of jaspilite, with very intricate local folding and with local reversals of pitch. Unfortunately however these jaspilites could not be traced northward sufficiently far to enable them to be fitted into the structure already known to exist there.

The structure of Erlistoun-Duketon-Mulga Queen Belt is shown on Plate II. This belt of country is believed to be an overturned anticlinal fold pitching southward at a moderate angle. The pitch of the smaller dragfolds rarely exceeds 40 degrees, is quite frequently 20 degrees to 30 degrees and may be less than 20 degrees. Horizontal dragfolds have also been observed. The amount of pitch of the dragfolds in this area contrasts with the amount of pitch of the dragfolds in the Laverton-Morgans-Mt. Margaret

area. In this latter area the pitch usually exceeds 40 degrees, while less than 30 degrees is quite rare. The shape of the folds is also quite different.

As far north as Eristoun the jaspilites form conspicuous and continuous outcrops and the structure lines are therefore well defined. North of Eristoun, however, the outcrops of the jaspilites are generally less conspicuous and also much less continuous. This is especially true west of the anticlinal axis, where only scattered outcrops of jaspilite have been found. West of the axis, i.e., on the overturned limb, the structure lines are broadly straight, but with a slight convexity facing east. East of the axis the structure lines have a general north north-west trend as far as Mt. Clarke. North of there as far as a point east of Duketon the general trend is northward, and beyond this point the indications are that the general trend is again north north-west. Thus it will be seen that north of the vicinity of Mt. Clarke the rate of divergence of the structure lines increases, and there are indications that it decreases in the vicinity of Duketon. There is no noticeable change in the dip of the beds, which might account for this fact. It is therefore interpreted to mean that, in the vicinity of Mt. Clarke, the degree of pitch of the fold increases, and that, in the vicinity of Duketon, the degree of pitch decreases. Some doubt is thrown on this interpretation since no confirmation is obtained from inspection of the pitches of the dragfolds recorded during mapping. If however this interpretation is correct, then the mining groups in the vicinity of Eristoun and Duketon are associated with changes in pitch of the main axis. It must be recorded however, that there is a group of mining leases in the vicinity of King of Creation Gold Mine 10 miles south of Mt. Clarke, that gold has recently been found between Eristoun and Duketon, and also that there are mining leases or prospecting areas (in vicinity of Eristoun Creek) 15 miles north north-west from a line at right angles to the axis and passing through Duketon. Outcrops are not sufficiently good to indicate more than the broad structure in the Duketon-Mulga Queen Area.

Considering briefly now the Laverton-Mt. Morgans Area already reported upon in a previous Annual Report⁵ in the light of information obtained during the present field season. It is now considered that there is no major reversal in pitch north of Laverton, and that the folds continue to pitch to the south as far north as the mapping has been carried. The anticlinal crossfold shown between Mt. Windarra and Mt. Zephyr⁶ is no longer believed to exist. This possibility was fully appreciated by my colleague, Mr K. R. Miles, when preparing Plate VIII.

Unfortunately no additional evidence as to exact position of the major synclinal crossfold, previously shown[†] as passing through Pike Hill, has been obtained. That this crossfold exists is certain, but its position cannot be fixed. It was hoped that the jaspilites at Wilga would help to fix the position of this crossfold, but as already pointed out they do not.

RELATIONSHIP BETWEEN BROAD GEOLOGICAL STRUCTURE AND GOLD DEPOSITION.

Inspection of Plate II. shows that the mining groups are distributed, broadly, along "gold lines," which trend, in different portions of the area, in

directions varying from north-north-eastward to north-westward. It is at once apparent that these "gold lines" are parallel to the structure lines, and variation in trend is at once explained. Plate II. also reveals that there is a tendency for mining groups to be arranged in lines trending generally in an east north-easterly direction. Considering the general nature of the folding this latter arrangement of mining groups is very suggestive of some control by crossfolding. So far however the existence of only one major crossfold has been recognised and the position of this is still uncertain. It would appear likely however that the mining groups in the vicinity of Yundamindera and Jubilee (J.R. 31) may be associated with this crossfold. It is also apparent that the larger mining groups such as occur at Laverton (including Beria), Mt. Morgans, Murrin Murrin, etc., are not associated with major crossfolding.

The mapping has indicated the complete absence of strong minor crossfolding. In the vicinity of Mt. Clarke and Duketon there is evidence of change in the degree of pitch of the fold but not of a change in direction of pitch. The mining groups in these two vicinities appear to be associated with this change in the degree of pitch. Elsewhere minor crossfolds have not been recognised with any degree of certainty.

The production from the Laverton-Mt. Morgans area is considerably more than that from the Eristoun-Duketon-Mulga Queen area. This suggests that the more steeply pitching and more open fold of the former area was more favourable for gold deposition than closer and far more gently pitching fold of the latter area.

RESULTS OF THE SURVEY.

Most of this report deals with the area, which was examined during the 1939 field season. It is thought advisable, however, to summarise below the results of the work in the Mt. Margaret Goldfield during the past three field seasons.

(1) The Greenstone Complex consists predominantly of once horizontal lavas, agglomerates and sediments, which have reached their present position as a result of folding. Two major anticlinal folds, having a width between limbs of approximately 25 miles, and two major synclinal folds of about the same order of size have been recognised. The pitch of all these folds is southward. Broadly the rock types now recognised are similar to those recognised during earlier surveys.

(2) The present survey fully confirms the view, now generally held, that the Western Australian jaspilites are metamorphosed sediments. During the course of the survey all jaspilite outcrops have been examined and mapped, generally using a plane table and telescopic alidade, but also with a tachometer and with a compass and chain.

(3) Rocks previously mapped as sheared porphyries are now believed to be metamorphosed sediments. Specimens have been collected for laboratory examination, but this has not yet been carried out. Generally it can be said that the proportion of sediments in the Greenstone Complex is much higher than

⁵Miles, K. R., op. cit., G.S.W.A. Annual Report for 1938, p. 29.

⁶Plate VIII., Annual Progress Report of the Geological Survey for the year 1938.

[†]Plate VIII., Annual Progress Report of the Geological Survey for the year 1938.

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. 114).

(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.)

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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 Boodarooekin and Warrachupp on the Bullfinch-Wyalkatchem railway. The nearest railway station however is Carrabin, which is about $5\frac{1}{2}$ 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 re-crystallised 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 hornblende 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 hornblende 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 re-

placement 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.

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.

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

placement 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.

ADDENDUM.

Page 92, *Conclusions and Recommendations*, line 21—to follow on from foliation:—These expected changes may not, however, occur within the limits of depth of economic mining.

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 re-

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

placed zone, as suggested concerning the reefs 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,

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, ultra-basic 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 foot-wall 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 occurred 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 (hydrated 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 approxi-

mately 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 platy 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. 108.

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 be-

lieved to consist mainly of basic sediments, and it is in the broad synclinal crossfold, which occurs between Marie's Find and the Eenuin Group.

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 platy 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.

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

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 iron-stained 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. SPP.

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 platy 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. SPP, 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, platy 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 reef 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 Red-wing 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.

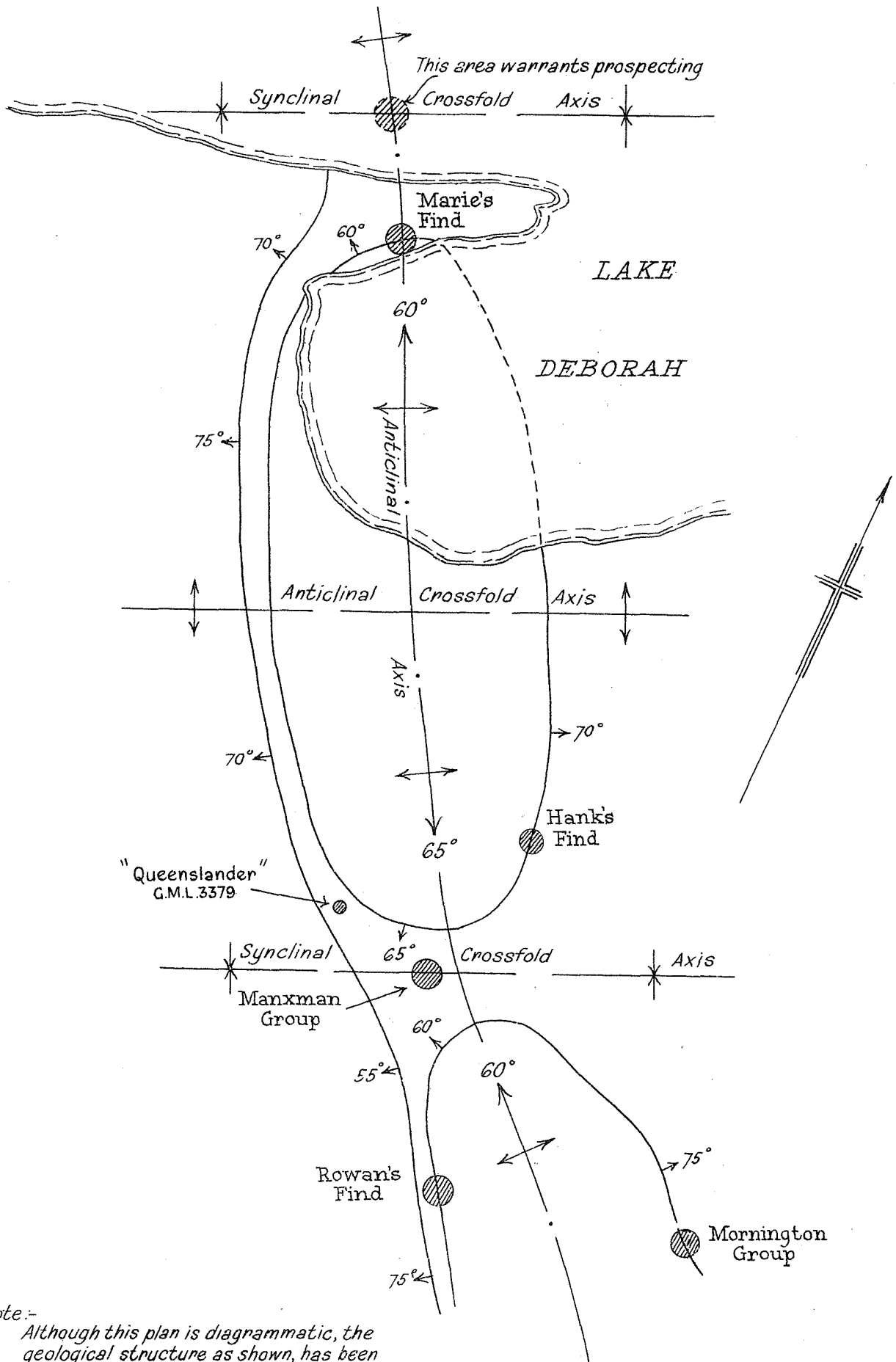
At the time of inspection the tailings from the company's battery were being stacked for treatment at some later date. It was reported (October, 1939) that there were 2,400 tons of accumulated sands averaging 1.9 dwts. per long ton.

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

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

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, platy 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. N113. (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.]

Field No. N128. (Lab. No. 4081.)

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

[Quartz and sericite.]

Field No. N129. (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 foot-wall 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" antiline, 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-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.).

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INTRODUCTION.

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

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

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

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

BROCKOFF'S FIND, MALLOCH'S WELL.

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

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

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

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

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

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

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

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

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

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

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

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

VICTORY GROUP, PAILLARD'S FIND.

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

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

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

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

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

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

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

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

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

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

* Dollied gold.

MIDAS GROUP, RUSSELL'S FIND.

This find is located at approximately $4\frac{1}{2}$ miles north of Cox's Find and 46 miles north of Laverton. It comprises the four G.M.L.s. 2350T, 2352T, 2362T and 2402T, of which the last is the only one in which any degree of mining has been carried on, and which was at the time of inspection (September, 1939) the only lease being actively worked.

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

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

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

Two parallel reefs have been located on this lease. Their outcrops can only be traced over a length of a few chains by means of floaters. They both strike at approximately N. 10-15° W. and are about 20 to 25 feet apart. The western or main reef is the one at present being mined. This consists of an ore body of fairly dense white quartz striking N. 15° W. and underlying steadily to the eastward at from 42 to 45 degrees. This reef has been opened up to a depth of 100 feet (underlay depth) and for a length of 95 feet. It varies in width from 1 foot up to $5\frac{1}{2}$ feet but averages about 3 feet wide. An inclined shaft has been sunk on the reef to a depth of 100 feet (underlay depth) and levels have been driven at 40 feet and 100 feet.

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

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

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

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

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

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

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

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

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

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

BANEYGO GROUP, ERLISTOUN.

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

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

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

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

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

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

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

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

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

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

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

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

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

* Approximately.

† Dollied.

RECENT FINDS, ERLISTOUN-DUKETON

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

THE PATCH, DUKETON.

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

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

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

THE CONNEMARA GROUP, DUKETON.

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

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

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

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

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

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

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

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

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

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

KELLY'S FIND, DUKETON.

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

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

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

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

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

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

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

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

FAMOUS BLUE GROUP, MULGA QUEEN.

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

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

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

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

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

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

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

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

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

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

* Dollied.

MULGA QUEEN GROUP, MULGA QUEEN.

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

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

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

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

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

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

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

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

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

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

* Dotted.

SOME ABANDONED MINING GROUPS—MULGA QUEEN DISTRICT.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Name and Number of Lease.	Year.	Ore Crushed.	Gold Therefrom.	Grade.
		tons.	fine ozs.	dwts. per ton.
Famous—				
G.M.L. 1508r	1904-7	659	550·46	16·70
G.M.L. 1843r	1910	8	2·10	5·34
Total ... ..	...	667	552·56	16·56
Stockwhip and Blanket—				
G.M.L. 1708r	1906-7	12	16·83	28·04
Riccaboni—				
G.M.L. 1643r	1905-7	845	655·81	15·52
G.M.L. 1801r	1909-10	563	293·51	10·42
Total ... ..	...	1,408	949·32	13·48
Mourillian—				
G.M.L. 1693r	1906-7	96	117·54	24·48
Parramatta—				
G.M.L. 1684r	1905-7	279·5	182·71	13·07

HUTANUI GROUP, ERLISTOUN CREEK.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Division V.

Annual Report of the Director of the Schools of Mines of W.A. for the Year 1939.

The Under Secretary for Mines.

I forward hereunder my report on the School of Mines for the year 1939. At the commencement of the year the Kalgoorlie School and a branch at Wiluna were in existence. On 18th September, a new branch was opened at Norseman, and although the enrolments were not as great as was expected, it is anticipated that these will be increased in 1940 and succeeding years. As at Wiluna, the managements of the Norseman mines have generously assisted the department by making available their plants and staffs. This assistance is of material advantage as it gives the department the opportunity to try out the demand without any great initial expenditure. This action by the mining companies is much appreciated by the students and the department.

The numbers enrolled at the three schools are as follows:—

Centre.	Total Individual Students.	Average Class En- rolments.
Kalgoorlie	563	885
Wiluna	150	181
Norseman	93	163
Totals	806	1,229

In addition, there were 74 enrolments in the Correspondence Classes.

At Kalgoorlie there was a decrease of 54 in the average enrolments compared with the enrolments of 1938, and at Wiluna there was an increase of 43 enrolments.

The classes have been of great advantage and benefit to students in all parts of the State. Students have also enrolled in the Correspondence Classes from other States of the Commonwealth and from New Guinea, Fiji and Malaya.

Fees received from students, exclusive of Metallurgical Laboratory fees and Correspondence Classes, were as follows:—

Kalgoorlie	£980
Wiluna	£233
Norseman	£57

Staff.—At Kalgoorlie there is a full-time staff, but at Wiluna and Norseman only part-time instructors are employed. The value of the work of the small schools would be greatly increased if it were possible to appoint full-time officers. At the present time shift workers at Wiluna and Norseman miss one-

half or one-third of the classwork owing to the incidence of shift work. One full-time lecturer should be appointed at Wiluna, who would carry out the duties of several of the part-time instructors now employed.

Advisory Committees.—The Advisory Committee at Wiluna was reorganised early in the year and a new committee was formed at Norseman. The gentlemen who give their services to assist the department in the conduct of these classes deserve the best thanks of the townspeople and the students in the centres named.

KALGOORLIE.

Enrolments.—The individual enrolment, exclusive of Correspondence Class and Wiluna and Norseman students, reached a maximum of 563, as compared with 606 during 1938. Statistics are furnished hereafter, showing the individual and class enrolments for each term.

Correspondence Classes.—Correspondence classes in Metallurgy I., Mining I., Assaying I., Mine Sampling, Mining II., and Ore Dressing, have been continued, and new classes in Surveying I. and Fitting and Turning I., have been formed.

The enrolments during the year in these classes were as follows:—

Metallurgy I.	8
Mining I.	24
Assaying I.	13
Mine Sampling	3
Mining II.	5
Ore Dressing	13
Surveying I.	2
Fitting and Turning I.	6
	74

Some of these students sat for the ordinary annual examinations of the school, while others have been given special examinations.

Revenue.—The revenue for the school year, not including Correspondence Class fees or Metallurgical Laboratory fees, has been £980.

The revenue from investigations conducted in the Metallurgical Laboratory amounted to £201, which has been paid into the Metallurgical Laboratory Trust Fund to meet maintenance and incidental expenditure in connection with the laboratory.

Staff.—The services of Mr. G. S. Compton, Lecturer in Geology and Mining, were made available to Spargo's Reward Gold Mine until the end of 1939. Mr. Compton will return to his position on the staff of the school on the 1st January, 1940.

Mr. K. A. Beatson has continued to carry out satisfactorily the duties of this officer during his absence on loan.

Mr. G. G. Lutz, Science Assistant, resigned during the year to accept an appointment with an engineering company in Perth, and his position has been filled by the appointment of Mr. D. A. Sivyler, a highly qualified student of the school, who has had good chemical and metallurgical experience on mines on the Golden Mile.

Mr. W. G. Stead, trade instructor, also resigned during the year to accept a more lucrative position as engineer with a manufacturing company in Kalgoorlie. This position has been filled by the appointment of Mr. S. C. Parker, a former student of the school, who has had extended engineering and power plant experience in Western Australia and New South Wales.

Mr. H. J. Jessup, who has held the position of caretaker and laboratory assistant at the School of Mines since its foundation at Coolgardie in 1902, will retire at the end of January, 1940. Mr. Jessup gave efficient and enthusiastic service to the school during his long period and his retirement is greatly regretted by the staff and the students of the school.

All members of the staff have carried out their duties conscientiously and I have pleasure in expressing my appreciation of their services and of the assistance they have given me at all times.

Public Assay Department.—The number of free assays and mineral determinations carried out for prospectors during the year was as follows:—

Assays for gold and other metals	720
Mineral determinations	81

This work has been carried out by the staff of the school and every effort has been made to assist prospectors with advice and information regarding their mining and treatment problems.

The Gold Stealing Detection Staff of the Criminal Investigation Branch has ceased to make use of the facilities of the school in connection with assays and determinations.

Metallurgical Laboratory.—During the year 30 applications for investigations into the metallurgical treatment of ores and mill products were received, 29 of which were completed and reports were issued on all completed investigations.

In connection with this work 1,017 assays for gold and silver have been carried out, as well as 250 chemical analyses, not including routine tests on cyanide solutions, etc.

The total revenue received in the form of fees for investigations amounted to £201, which has been paid into the Metallurgical Laboratory Trust Fund.

Heavy calls have been made upon this fund for the purchase of new equipment, notably Haultain superpanner, Haultain infrasizer, Fagergren flotation machine, Ingersoll-Rand compressor and Denver conditioner and agitator.

Extension of the laboratory is urgently necessary in order to provide a special dry-crushing section, accommodation for special equipment such as the superpanner and infrasizer, and office facilities for the staff.

The joint control of the laboratory by the Mines Department of W.A. and the Commonwealth Council for Scientific and Industrial Research has continued, but the period and the Commonwealth Vote will probably expire in 1940, when it is hoped that the joint scheme will be renewed for a further five-year period and a similar vote will be made available.

During the year the laboratory lost the services of the Assistant Research Officer, Mr. G. H. Payne, who was appointed by the Commonwealth at the commencement of the joint scheme of control and who has been appointed to a position with the Council for Scientific and Industrial Research in Melbourne.

With the approval of the Council, Mr. R. W. Wilson, assayer to the laboratory, has been promoted to the vacant position and Mr. J. S. Meharry, a student of the school, has been appointed assistant.

The calls on the staff of the laboratory by prospectors and mill operators for advice and assistance in solving problems and clearing up difficulties in treatment have been numerous and although it has been possible in only a few cases to visit the plants, every effort has been made to give full assistance in this direction. The numerous requests of this kind for assistance point to the necessity and advisability of the appointment by the Mines Department of a highly qualified adviser whose duty would consist of visiting mill operators who are in difficulties and assisting them on the spot in correcting their treatment methods and clearing up their difficulties and problems. As these plants are scattered all over the State it is obviously impossible for a member of the staff of the laboratory to visit the plants to find out at first hand what the difficulties are.

Buildings.—The new drawing office, engineering lecture room and staff offices were completed early in the year, and have relieved the congestion that previously existed, and have also been of great value for examination purposes.

Painting of the interior of the old buildings, i.e., classrooms and laboratories, which has been asked for on several occasions, has not yet been carried out nor has the reorganisation of the lighting of the school been completed. These two urgent needs, the carrying out of which would greatly increase the efficiency of the work of the school, would enable students to work under more modern and congenial conditions. The interior walls of all classrooms and laboratories should be painted white to minimise absorption of light and so permit the effective use of the lighting of the rooms.

Attendances, 1939.

	1st Term.	2nd Term.	3rd Term.	Average.
Total Class Enrolments, 1939 ...	1,097	866	691	885
Total Class Enrolments, 1938 ...	1,265	873	678	939
Decrease 1939 (Average Enrolments) ...	...	...	...	54
Individual Students, 1939 ...	492	490	403	462
Individual Students, 1938 ...	523	516	401	480
Decrease 1939 (Average Individual Students) ...	...	...	...	18
Total number individual students enrolled during 1939 ...	...	...	...	563
Total number individual students enrolled during 1938 ...	...	...	...	606
Decrease ...	...	...	...	43

Wiluna.—The new buildings described in my report for 1938 were opened in February by the Hon. the Minister. The buildings consist of a science laboratory, drawing room, engine room and the necessary offices and store-rooms. The lecture work is still held in the adjoining State School, and the fitting and turning work in the workshops of the Wiluna Gold Mines. The new building has been of great value in carrying out the work of the School during the year.

Enrolments.

Individual Students.		Class Enrolments.	
1st term ...	132	1st term ...	200
2nd term ...	118	2nd term ...	180
3rd term ...	113	3rd term ...	164
Average ...	117	Average ...	181

The average enrolment in 1938 was 139. The increase in 1939 being thus 42.

The fees received amounted to £233.

Classes were held in the following subjects:—Mathematics, mining, geology, chemistry, physics, assaying, metallurgy, surveying, internal combustion engines,

mechanical drawing and fitting and turning, and many of the students successfully passed the annual School of Mines examinations in November.

Staff.—The staff is a part time one drawn mainly from the Wiluna Gold Mines. The secretarial work has been carried out very satisfactorily by the Mining Registrar, Mr. Bruce, but he has now been transferred from the district. Death unfortunately claimed a most enthusiastic and esteemed lecturer early in the year when Mr. Haszard, Lecturer in Geology, passed away suddenly after an operation. He was an excellent lecturer and a well qualified and efficient member of the staff.

Norseman.—This branch of the School of Mines began classwork on September 18th, 1939, when classes were held in elementary mathematics, preparatory mathematics, preparatory physics, fitting and turning, surveying I, internal combustion engines, engine driving, mining I, preparatory chemistry and preparatory mechanical drawing.

The initial difficulties of securing accommodation were overcome by the generosity and the enthusiasm of the mining companies, the Dundas Road Board and various public and semi-public bodies of the district. The State School, the Road Board Office, the St. John's Ambulance Brigade and the Fire Brigade Halls, the laboratories, machine shops and engine rooms at the mines provided the necessary buildings for the initial term.

Epidemics of measles and mumps reduced enrolments below expectations, but 93 individuals making 163 class enrolments, registered, contributing in fees fifty-seven pounds.

The shift system which is in operation on the mines in this district increases the difficulties of many of the students and affects detrimentally the average attendances of the classes.

In spite of the unsettled conditions resulting from the war, much increased enrolment is expected in 1940 in each of the classes already established and it is expected that the demand for classwork in mining, geology and assaying will necessitate instruction being provided in these subjects.

J. F. LYNCH,
Director, School of Mines.

Division VI.

Annual Report of the Inspection of Machinery Branch of the Mines Department for the Year 1939.

OPERATIONS UNDER THE INSPECTION OF MACHINERY ACT, 1921, ANNUAL REPORT OF THE CHIEF INSPECTOR OF MACHINERY AND CHAIRMAN OF THE BOARD OF EXAMINERS FOR ENGINE-DRIVERS, FOR THE YEAR ENDED 31st DECEMBER, 1939, WITH STATISTICS.

The Under Secretary for Mines:

For the information of the Hon. Minister for Mines, I submit the report of the Deputy Chief Inspector of Machinery on the administration of the Inspection of Machinery Act, 1921, for the year ended 31st December, 1939.

Although there was a small decrease in the number of certificates issued, there was an increase in the number of inspections of both boilers and groups of machinery carried out during the year 1939. The number of serious accidents reported was five less, and of fatal accidents one more than for the previous year; one fatal accident was caused by an oil engine which was not subject to the provisions of the Act as it did not exceed six horsepower and was used by an agriculturist; six of the accidents recorded, one of which proved fatal, occurred on mines, and are also included in my report on the mining industry.

The financial result of the year's work was again good, the credit balance being £1,228 6s. 7d.

Reference is made in Section VII. of the report to the fact that a Bill to amend the Machinery Act was introduced during the year but was defeated at the second reading in the Legislative Council. The two principal objects of the Bill were, firstly, to see that certificated engineers only were in charge of specified machinery and, secondly, to ensure greater control by this Department in the installation of refrigerating machinery and to require persons in charge of such refrigerating machinery to hold the required certificate.

RICHARD C. WILSON,
Chief Inspector of Machinery.

SECTION I.

Inspection of Boilers, New Construction, Maintenance, etc.

The total number of registered boilers (including various types of unfired pressure vessels, such as steam-jacketed pans, sterilisers, digesters, vulcanisers,

air and gas receivers, montejus, etc.) which, according to records, were fit for use on 31st December, 1939, was 4,572, compared with 4,401 on 31st December, 1938, an increase of 171.

The total number of boilers added to the register during 1939 was 193, including 2 boilers previously condemned which had been reconditioned, 1 second-hand boiler imported from another State, 1 transferred from another authority in this State, and 189 new registrations. Of the new registrations, 16 were imported from the United Kingdom, 2 from the United States of America, 1 from Italy, 46 from the Eastern States, 13 of unknown origin, and 111 made in this State. The boilers built in this State comprised 58.7 per cent. of the new registrations, compared with 64 per cent. in 1938, 37 per cent. in 1937, 38 per cent. in 1936, 41 per cent. in 1935, 33 per cent. in 1934 and 14 per cent. in 1933. The types built in this State were return multitubular stationary underfired 8, locomotive 1, Cornish 4, water tube (small) 21, vertical multitubular stationary 2, vertical patent tubular 12, air receiver 28, steriliser 7, steam jacketed vessel 6, hot plate 3, vulcaniser 4, digester 15.

The number of boilers removed from the register during 1939 was 22. Of these, 4 are now used for purposes which exempt them from the provisions of the Act, 16 have been permanently condemned, and 2 have been transferred out of this State.

The number of thorough inspections decreased by 7, or 0.366 per cent. compared with 1938, but the increase compared with 1929 was 342 or nearly 22 per cent. in ten years.

Inspections made under steam, for which separate reports were submitted, numbered 172, being 96 more than in 1938.

There were 19 fewer boiler certificates, and 86 fewer repair notices issued than in 1938.

Return No. 1.—Showing Classification of Types of New Boiler Registrations for the Year ended 31st December, 1939.

Types.	Total.
Vertical Stationary	2
Vertical Multitubular Stationary	4
Vertical Patent Tubular	13
Return Multitubular Stationary Underfired	9
Locomotive	1
Cornish	4
Water Tube	29
Digester	16
Saddle Back	19
Air Receiver	47
Vulcaniser	10
Steam Jacketed Vessel	11
Underfired Plain Drum	1
Underfired Return Lancashire	1
Steriliser	15
Hot Plate	3
Ideal	1
Autoclave	2
Disinfector	1
	<hr/>
	189
Imported from United Kingdom	16
Imported from United States of America	2
Imported from Italy	1
Imported from Eastern States	46
Imported from Unknown Sources	13
Made in the State of W.A. (itemised hereunder).	111
	<hr/>
	189

Return Multitubular Stationary Underfired	8
Locomotive	1
Cornish	4
Water Tube	21
Vertical Multitubular Stationary	2
Vertical Patent Tubular	12
Air Receiver	28
Steriliser	7
Steam Jacketed Vessel	6
Hot Plate	3
Vulcaniser	4
Digester	15
	<hr/>
	111

Return No. 2.—Showing Classification of Various Types of Useful Boilers in Proclaimed Districts on 31st December, 1939.

Types of Boilers.	Districts worked from Perth.	Districts worked from Kal-goorlie.	Unpro-claimed Areas.	Totals.	
				1939.	1938.
Lancashire	38	60	...	98	97
Cornish	106	493	...	599	602
Semi-Cornish	10	37	...	47	47
Vert. Stat.	292	356	...	648	654
" Port.	66	15	...	81	82
" Mult. Stat.	45	25	...	70	66
" " Port.	23	3	...	26	26
" Pat. Tubular	49	...	...	49	38
Loco. Rect. Firebox Stat.	80	64	...	144	144
" " Port.	245	70	...	315	317
" Circ. " "	140	8	...	148	149
Locomotive	74	44	...	118	119
Water Tube	181	126	...	307	278
Return Mult. Underfired Stat.	141	65	...	206	192
Return Mult. Underfired Port. ... ..	...	8	...	8	8
Return Mult. Int. Fired Stat.	30	13	...	52	51
Return Mult. Int. Fired Port.	2	...	...	2	2
Egg ended and other types not elsewhere specified	97	17	49	163	118
Digesters	105	6	...	111	96
Air Receivers	434	410	...	844	801
Gas Receivers	5	...	...	5	4
Vulcanisers	260	11	...	271	261
Steam Jacketed Vessels	251	9	...	260	249
Total Registrations useful Boilers	2,683	1,840	49	4,572	4,401
Total Boilers out of use, 31st December, 1939	1,256	1,362	...	2,617	2,435

Return No. 3.—Showing Operations in Proclaimed Districts during Year ended 31st December, 1939.

	Districts worked from Perth.	Districts worked from Kal-goorlie.	Unpro-claimed Areas.	Totals.	
				1939.	1938.
Total number of useful boilers registered	2,683	1,840	49	4,572	4,401
New boilers registered during year	166	23	...	189	220
Boilers reinstated	2	...	...	2	1
" converted ... ..	...	4	...	4	5
Boilers Inspected—					
Thorough	1,430	475	...	1,905	1,912
Working	166	6	...	172	76
Boilers condemned during year—					
Temporarily	31	...	...	31	29
Permanently	15	1	...	16	12
Boilers sent to other States during year	2	...	...	2	2
Boilers sent from other States during year	1	...	...	1	4
Transferred to other Departments ... ..	...	...	...	...	1
Transferred from other Departments	1	...	...	1	3
Number of Notices for Repairs issued during year	560	18	...	578	664
No. of Certificates issued, including those issued under Section 30 during year	1,427	478	...	1,905	1,924

New Construction.

When a new steam jacketed autoclave, having an outer shell of 3/16in. copper and an inner shell of 1/4in. copper, which was built in New South Wales, was tested by hydraulic pressure after its arrival in this State, it leaked badly when the pressure had been raised to only the working pressure of 20 lbs. per sq. in. It was found that a slab of solder about 10in. x 6in. x 7/16in. thick had been run over portion of the back end seam, apparently in an attempt to stop the leaks. Owing to defective riveting, it was necessary to remove the back end plate, the flange of which fitted in between the inner and outer shells, so as to form a distance ring. Both the inner and outer shells were a very slack fit on this flange, and had to be respectively stretched and reduced by a local firm to make a good fit before re-riveting. This vessel was tested again after reconstruction and found to be drop tight. A licensed boiler inspector had issued to the manufacturer a test certificate, which stated inter alia that he had subjected the vessel to both a hydraulic and a steam test, and that both were satisfactory.

Of the 16 boilers imported from the United Kingdom, 2 were double drum Babcock & Wilcox boilers, 12 air receivers, 1 sectional boiler, and 1 disinfector, and with the exception of 1 Cornish and the Locomotive, the steam boilers built locally were mostly small boilers for use in the dairying industry.

Alterations and Repairs.

The three sections of the flue at the front end of a Cornish Boiler were condemned by an inspector. When the face plate and the defective flue sections were removed, it was decided to convert the boiler into a Semi-Cornish, by attaching the three remaining sections, which were in good order, to the front plate to form the firebox, and fitting a tube plate to the back flange of the third section and also to the back end plate; 73 tubes of 3in. outside diameter were fitted. The flue was 1/2in. thick by 3ft. 6in. diameter, with Adamson joints between the sections. The alteration increased the efficiency of the boiler appreciably.

From time to time many Cornish and a few Lancashire Boilers have been converted for use as air receivers, and the usual practice was to remove the

flue tubes to increase the capacity. This involved removing and replacing one end plate, blanking the flue openings in each end plate by riveted cover plates, and fitting longitudinal stays to support the cover plates and the portions of the end plates not stayed by the original gusset stays. Last year three Cornish boilers were converted into receivers, but without removing the flue tube. Blanks were fitted inside the flue tube near each end, and secured by fillet welding to the flue tube, gusset stays were fitted to support these blanks and were attached to the plates and the flue tube by fillet welding. To allow access to the flue in order to carry out the welding, and to facilitate cleaning after the receiver has been in use, openings were cut in the top and bottom of the flue tube. This method of conversion is very much cheaper than the old method and gives practically the same capacity.

Both flue tubes in each of two Lancashire boilers were so extensively grooved both at the top and bottom of the heel of the flange to the front end plate that it was considered necessary to order new front sections to be fitted, but as the owner intended to convert the plant to electric drive in the near future, he requested that some modification be made which would cost less than fitting new front sections, involving removal of the end plate of each boiler. The method shown in the sketch reproduced at the end of this report, which was evolved by the officers of this branch, was adopted. This has proved quite satisfactory and obviated the removal of the end plate, thereby considerably reducing the cost of the repair.

Maintenance.

A vertical boiler used on an excavator in a clayhole, which was first used in June, 1934, was found on inspection in February, 1939, to be so badly wasted that it was not worth the cost of the necessary repairs. This boiler was mentioned in the 1938 report on account of the corrosion in the steam space. The feed water for this boiler was obtained from the clayhole as being the most convenient source. The following chemical analysis was made in 1936, and the owner was strongly advised not to use this water any longer, but he would not go to the expense of either carting the water or laying a pipe line from the water main.

	Grains per Gallon.	
	Feed Water.	Boiler Water.
Alkaline Chlorides	55.5	738.3
Magnesium Chloride	9.81	144.4
Sulphate	1.83	12.26
Carbonate	1.84	1.76
Calcium Sulphate	3.33	51.0
Iron Oxide and Alumina	T	T
Silica	T	T
Total Solids	75.0	950.0
Total Hardness	16.5	201.8
Temporary Hardness	2.19	2.1

SECTION II.

Explosions, Interesting Defects, etc.

An air receiver of less than five cubic feet capacity burst in a motor garage shortly after it had been closed for the night. This receiver was 48in. x 15in. x 3/16in. M.S. plate. The ends were 1/4in. thick and were dished to a radius approximately equal to the shell diameter; the longitudinal seam was lapped and fillet welded on the outside only, the end plates were not flanged, but fitted inside the shell which overlapped slightly. The end was then welded

to the shell plate on the outside only; the top end was concave and the bottom end convex to the pressure.

The owner stated that the safety valve always started to lift at 150 lbs. pressure, and that when the garage was closed shortly before the receiver burst, the pressure was not more than 130 lbs. From the appearance of the plates after the explosion, it seems that the top end was blown through the roof, and at the same time the longitudinal seam weld failed from end to end and the shell tore away from the bottom end. The shell was turned inside out and was folded flat when it hit the brick wall, from which it apparently rebounded and considerably damaged a motor car which was pushed sideways a distance of four feet.

The shell and ends were not wasted, and were not torn, but all the welded seams failed. This receiver being less than five cubic feet capacity, was not subject to inspection under the Act.

A cast iron calorifier was lined with stainless steel plate approximately 1/16in. thick, which was flanged at each end over the flange of the cast iron shell; cast iron covers were bolted to each end. After about 12 months' use the stainless steel lining was found to have corroded through in several places at the heel of the top flange, showing that stainless steel is not proof against stress corrosion.

A semi-Cornish boiler built in 1905, for a working pressure of 90 lbs., and which had been working for a number of years at 70 lbs. working pressure, was moved to a new site, and in consequence of removal the boiler was subjected to a hydraulic test. When the hydraulic pressure had been raised to 135 lbs., three rivets in the manhole compensating ring failed with a loud report, and one end of the ring lifted 1/2in. from the shell of the boiler. For about two years before the boiler was moved, it had been used at atmospheric pressure for evaporating water for a condensing plant, and it is assumed that the corrosion which had occurred between the compensating ring and the shell took place then. This is one of the cases where defects which were not otherwise apparent were disclosed by a hydraulic test. Owing to this and other defects, the boiler was discarded.

A steam jacketed copper pan, with an inside hemispherical shell of 15in. radius riveted to the outer shell round the top, turned inside out while in use. When the pan was dismantled, it was found that the inner shell was 1/8in. thick at the top, 3/32in. about midway and only 1/16in. at the bottom, and as this pan had not, as far as could be ascertained, been subjected to thinning either by erosion or corrosion, it is assumed that the plate was thinned in the course of manufacture by working the centre of the plate, instead of working up the edge to form the hemisphere. A new inner vessel was made out of 8-gauge copper sheet, which was carefully worked so as to avoid any reduction of the original thickness, and as an additional precaution a substantial stay was fitted in the extreme bottom.

Another copper steam jacketed pan, 41in. dia. x 12in. deep at the centre, dished to 23 1/2in. radius, cracked round the top flange for about 16in. after it had been distorted on one side by being bulged upwards about 2in. close to the ring supporting the

flange, and when dismantled, surface cracks were found for over three-quarters of the circumference. The reducing valve was found to be out of order, and the safety valve on the low pressure pipe line did not prevent an accumulation of pressure. The failure took place about 15 minutes after the steam had been turned on to the pan.

SECTION III.

Inspection of Machinery.

The number of useful groups of machinery on the register was 555 more than at the end of 1938, and 8,036 more than at the end of 1929, an increase of nearly 105% in ten years.

It is somewhat strange to note that the number of gas engines has again decreased, in spite of the fact that a considerable amount of interest has been shown by vehicle and tractor owners in the conversion of petrol engines to the use of suction gas. The owners of power plants had, as far as is known, taken no steps in this direction up to the end of 1939. Evidently they do not fear either a shortage of supplies of fuel oil or a marked increase in its price.

The number of groups of machinery inspected during 1939 was 386 greater than in 1938, and 5,810 more than in 1929, being an increase of just under 100% in ten years.

The number of notices which were issued to owners dealing with the guarding or repair of machinery increased by 48.

Return No. 4.—Showing Classification according to Motive Power of Groups of Machinery in use or likely to be used in Proclaimed Districts and which were on the Register during the Year ended 31st December, 1939.

Classification.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals.	
			1939.	1938.
No. of Groups driven by steam engines	555	529	1,084	1,094
No. of Groups driven by oil engines	1,808	764	2,572	2,508
No. of Groups driven by gas engines	75	181	256	261
No. of Groups driven by compressed air	3	57	60	55
No. of Groups driven by electric motors	8,491	3,242	11,733	11,234
No. of Groups driven by hydraulic pressure	6	....	6	4
	10,938	4,773	15,711	15,156

Return No. 5.—Showing Operations in Proclaimed Districts during Year ended 31st December, 1939.

(MACHINERY ONLY.)

	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals.	
			1939.	1938.
Total registrations useful machinery	10,938	4,773	15,711	15,156
Total inspections made	8,534	3,097	11,631	11,245
Certificates (bearing fees)	3,605	612	4,217	4,204
Certificates (Steam without fees)	65	11	76	113
No. of extension certificates issued under Section 42 of Act .....	....	....	....	....
Notices issued (Machinery Dangerous)	443	13	456	408

The number of passenger lifts increased by 9, but the number of goods lifts remained unaltered. The number of passenger lifts has increased by 72 since 1929, making an increase of 64.3 per cent. in ten years. During the year, 8 permits were issued for the erection of passenger lifts.

Only one accident in connection with lifts was reported. In this case, the driver of the lift, who has had considerable experience, sustained a fracture of the big toe on the left foot, owing to the toe of his boot becoming caught between the floor of the car and the wall of the lift well. This accident was due to want of ordinary care on the part of the injured person.

Return No. 6.—Showing Classification of Lifts on 31st December, 1939.

Type.	How Driven.	Totals.	
		1939.	1938.
Passenger	Electrically driven	184	175
	Hydraulically driven	1	1
Goods	Electrically driven	105	105
	Hydraulically driven	3	3
	Belt driven	4	4
		297	288

SECTION IV.

Prosecutions under the Act.

There were no prosecutions for breaches of the provisions of the Act, other than action taken to recover fees due for inspections made.

SECTION V.

Accidents to Persons.

The return No. 7 below includes only accidents which caused the death of the injured person and those which caused the injured person to be incapacitated for a period of two weeks or more. Those accidents which were caused by machinery used in timber mills or on timber holdings, which are subject to the provisions of the Timber Industry Regulation Act of 1926 are not included.

The total number of persons injured by accidents during 1939 was 5 less than during 1938, but the number which proved fatal increased by 1. All the accidents recorded in the districts controlled from Kalgoorlie office occurred on mines and therefore are also included in the report of the State Mining Engineer on the mining industry.

The owner of a four horsepower oil engine was fatally injured as a result of his overcoat catching in the keyway in the projecting end of the crank shaft, where the handle supplied for starting the engine is applied. He was thrown violently against the foundation of the engine and sustained a fractured skull. He died the following day without having regained consciousness. Owing to floods, considerable difficulty was experienced in bringing him to the nearest hospital, which was some nineteen miles from his home. At one stage he had to be carried on a stretcher

over a bridge, the approaches on either side of which had been washed away. The engine which caused this accident is exempt from inspection, because all oil or petrol engines not exceeding six horsepower which are used by an agriculturist or pastoralist, are exempt from the provisions of the Inspection of Machinery Act.

A butcher aged 61 had his left hand severed just below the wrist by the feed worm of a mincing machine, which he was operating and unfortunately he developed "pemphigus acutus" or "butcher's pemphigus," so called because it is almost invariably confined to persons who habitually handle dead animals. This condition, although it is rarely contracted, usually has fatal results, and in this case the injured man died eight days after the accident. In some of the other Australian States and in New Zealand, the sale of open type mincing machines is not permitted, but in this State the Inspectors have power only to order safeguards to be fitted to the machine, but it is difficult to prevent the machines being used with the safety device removed.

The danger of removing a manhole cover before the boiler has cooled sufficiently to condense the water vapour was exemplified when an engine-driver who was preparing a boiler for cleaning, received such extensive scalds that he died ten days later. There was no witness of the accident, and the boiler was not examined until about two or three hours later. The deceased called the mine manager at 4 a.m. and informed him that he had been scalded. He was given first aid and driven 15 miles to hospital. When the boiler (a Cornish 15ft. x 5ft.) was examined, the blow-off cock was open, the lever safety valve had been propped open, and all the bolts had been removed from the manhole cover which was partially displaced. The accident occurred nearly four hours after the boiler ceased working, so that probably all the water was out of the boiler. The deceased told the doctor that he had dropped his lamp and had tripped over a steel bar (this was found alongside the manhole), but he was not clear what had happened. All the scalding was on his back and sides, from his neck to his knees, so that it would appear that he fell backwards in a sitting position over the partially opened manhole.

One man was injured fatally, three seriously and one slightly by liquid ammonia, through the accidental breaking of a branch pipe, which had been disconnected at a flange joint from a condenser coil which was to be removed from the cooling tower. There was a horizontal length of $\frac{3}{4}$ in. ammonia pipe about 2ft. 7in. long screwed into a right angle valve which was attached to the liquid ammonia main by flanged joint and a piece of $\frac{3}{4}$ in. pipe about 3in. long. A pipe fitter fixed a pipe wrench on the horizontal pipe to unscrew it from the right angle valve. No one is clear what happened after that, but the short length of pipe broke just below the flange carrying the valve, and liquid ammonia at about 120 lbs. pressure escaped. Four of the men escaped from the tower within a short time, but the fifth was

not found until about twenty minutes later, when he was seen on the roof. It is thought that he must have climbed into the upper part of the tower where he was overcome by the fumes which were still escaping although the compressors had been stopped. This man was so badly injured that he died the next day.

About two months later, at the same works at which the above accident happened, an engine-driver was injured by oil impregnated with ammonia, which splashed into his face while he was drawing off accumulated oil from the delivery side of the refrigerator system. His eyesight has been permanently injured. He was an experienced man and had drawn off the trapped oil almost daily from similar plants for several years without mishap.

In addition to the foregoing, there were three accidents causing amputation of an arm, one amputation of a hand, and ten injuries to a hand necessitating, in the majority of cases, the amputation of a thumb or fingers. Most of these accidents could have been avoided by the injured person's exercising ordinary care.

Return No. 7.—Showing Persons Killed or Injured by Boiler and Machinery Accidents in Proclaimed Districts during the Year ended 31st December, 1939.

Numbers within brackets denote fatal accidents.

Class of Machinery.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Total.
Metal Working—			
Emery Wheel	1	1	1
Wire Drawing	1	1	1
Sawmilling and Woodworking—			
Circular Saw	2	1	2
General—			
Belting	1	2	3
Guillotine	2	1	2
Mincing Machine	1 (1)	1	1 (1)
Conveyor	1	1	2
Chaffcutter	1 (1)	1	1 (1)
Agitator Driving Wheels	1	1	1
Ammonia Compressor	5 (1)	1	5 (1)
Scalding (Boiler)	1	1 (1)	1 (1)
Dough Mixer	1	1	1
Stamping Machine	1	1	1
Passenger Lift	1	1	1
Printing Machine	1	1	1
	18 (3)	6 (1)	24 (4)

Section VI.

Engine-drivers' Examinations, etc.

The total number of certificates granted during 1939 was 78 less than for the previous year, making the fourth consecutive year showing a decrease in the number of certificates granted, but the number granted was 60% greater than the total for 1929, which was equal to the average for the preceding five years. Three hundred applications for certificates were received and dealt with by the board.

Examinations were held as follows:—Perth, 4; Kalgoorlie, 4; Leonora, 2; Cue, 1; Meekatharra, 1; Mt. Magnet, 2; and Bunbury, 2. Examinations were held at all advertised centres except Geraldton.

The board was engaged for 15 days conducting examinations, 25 days in travelling and 33 correcting examination papers, dealing with applications and other matters in connection with engine-drivers' certificates.

The personnel of the board remained unchanged.

Return No. 8.—Showing Total Number of Engine Drivers' and Boiler Attendants' Certificates (all Classes) Granted in 1939, compared with 1938.

	Number Granted.	
	1939.	1938.
Winding Competency, including certificates issued under Regulation 40 and Section 60 of the Act	27	37
First Class Competency, including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act	8	9
Second Class Competency, including certificates issued under Regulation 40 and Section 60 of the Act	28	43
Third Class Competency, including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act	54	45
Locomotive Competency, including certificates issued under Regulation 40 and Section 60 of the Act	5	5
Traction Competency, including certificates issued under Regulation 40 and Section 60 of the Act ....	....	4
Internal Combustion Competency, including certificates issued under Regulation 40 and Section 60 of the Act	80	89
Crane and Hoist Competency, including certificates issued under Regulation 40 and Section 60 of the Act	10	8
Boiler Attendant Competency, including Certificates issued under Regulation 40 and Section 60 of the Act	71	115
Interim	1	....
Copies	2	8
Transfer	1	2
Totals	287	365

SECTION VII.

General, Staff, Revenue and Expenditure, Mileage, etc.

General.—As I mentioned in my report for the year 1934, there is no provision for the periodical inspection of electrical equipment after it has been tested and passed by the supply authority before connection to the supply mains, with the exception of electrical equipment on mines. During the year the attention of an inspector was drawn to the dangerous condition of the electric wiring, etc., in a butchering and cold storage establishment, when enquiring into the cause of two cases of electric shock. Luckily in this case the supply authority had cut off the current, and the owner was using a generator driven by a suction gas engine which was, of course, subject to the provisions of the Act. Therefore it was possible, without exceeding the strict letter of the Act, to order the complete re-wiring of the premises to comply with the Standards Association of Australia Wiring Code. The saving of current due to the elimination of leakage should pay for the cost of re-wiring in a comparatively short time.

Staff.—One inspector luckily escaped with a few bruises when the light sedan model car, in which he was travelling across a street intersection, was struck on the left side about 18 inches from the rear bumper by a loaded truck. The truck and its driver were uninjured, but the car made a complete somersault and came to rest on its right side, and at right angles to the direction in which it had been travelling.

When war was declared, one inspector who was an officer of the Royal Australian Naval Volunteer Reserve, was called up for duty; also another inspector commenced his long service leave on 21st November. There were no other changes in the personnel of the staff during the year.

Revenue and Expenditure.—The revenue for 1939 was £55 10s. 7d. greater than for 1938, but the expenditure also increased by £365 15s. 5d., so that the profit was £310 4s. 10d. less. The increase of expenditure under the heading of salaries was due to grade increases received by officers who had not reached the maximum of their classification.

Return No. 9.—Showing Revenue and Expenditure for Year ended 31st December, 1939.

REVENUE.				
	1939.		1938.	
	£	s. d.	£	s. d.
Fees for Boiler Inspections	2,737	13 6	2,809	14 5
Fees for Machinery Inspections	5,516	10 4	5,322	19 8
Engine Drivers' Fees	402	19 0	501	13 0
Incidentals	105	1 1	72	6 3
(Increase—£55 10s. 7d.)	8,762	3 11	8,706	13 4

EXPENDITURE.				
	1939.		1938.	
	£	s. d.	£	s. d.
Salaries	5,967	11 7	5,606	1 11
Incidentals	1,465	17 10	1,358	14 4
Engine Drivers	100	7 11	203	5 8
(Increase—£365 15s. 5d.)	7,533	17 4	7,168	1 11

Profit—£1,228 6s. 7d.

Mileage.—Return No. 10, page 138 of this report, shows that the total mileage travelled was 3,201 miles less than in 1938. There were no journeys made by air, and Wyndham was not visited during 1939, which accounts for the decrease in the miles travelled by water. There was a marked increase in the miles travelled by rail, which was due to special journeys to enquire into accidents and attend inquests at Albany, also special inspections.

Amendments to the Act.—A Bill to amend the Inspection of Machinery Act, 1921, was introduced during the year, but was defeated on the second reading in the Legislative Council.

I wish sincerely to thank all those who helped in achieving the satisfactory results attained during the year. Valuable assistance was freely given by officers in other departments in this State, also by officers of the Commonwealth and other States, and in the preparation of the Amending Bill, by the representatives of various associations of employers and of employees.

In particular I desire to thank all the officers of this branch and other branches of the Mines Department for their courtesy and assistance.

G. MOORE,
Deputy Chief Inspector of Machinery.

Return No. 10.—Showing Distances Travelled, Number of Inspections made and Average Miles Travelled per Inspection for Year ended 31st December, 1939.

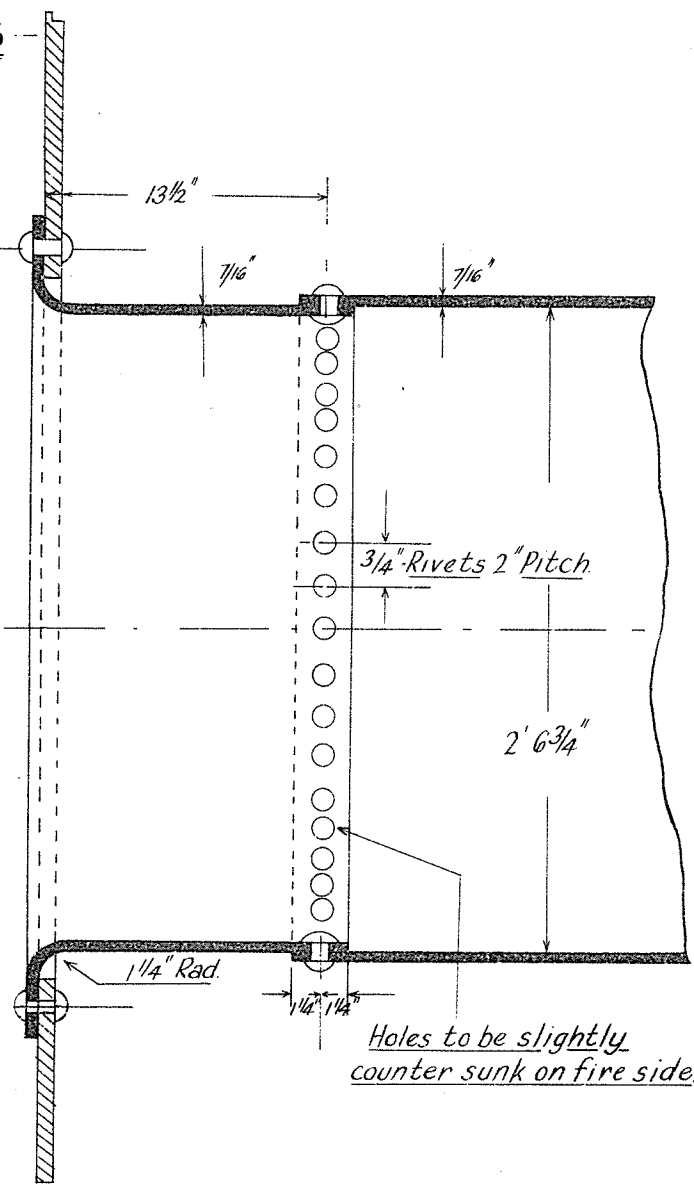
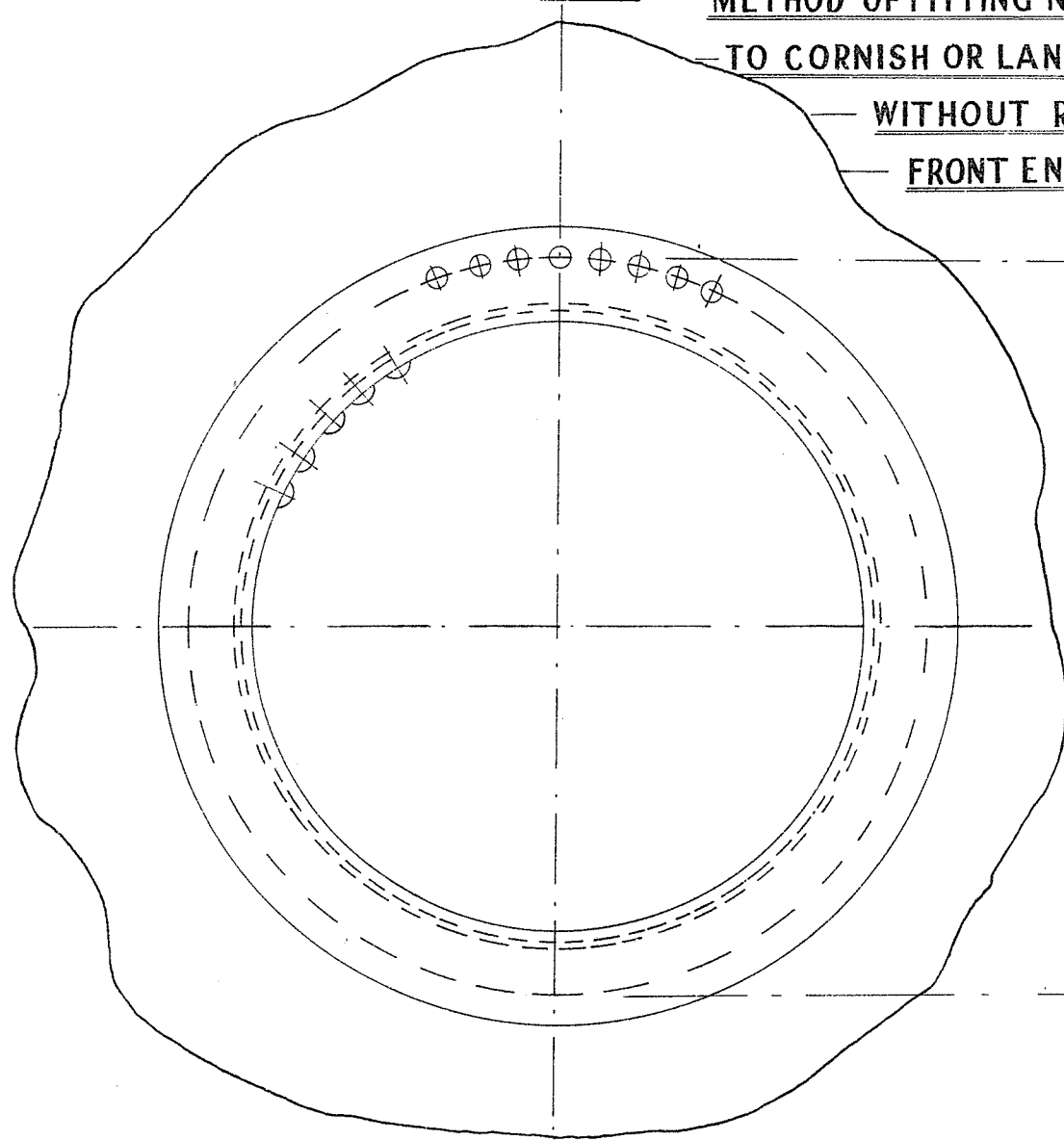
Areas Traversed.	Air Miles.			Rail Miles.			Road Miles.			Water Miles.			Total Miles.			Total Number of Inspections.			Average Miles per Inspection.		
	1939.	As compared with 1938.		1939.	As compared with 1938.		1939.	As compared with 1938.		1939.	As compared with 1938.		1939.	As compared with 1938.		1939.	As compared with 1938.		1939.	As compared with 1938.	
		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.			
Districts worked from Perth	1,000	2,607	2,178	...	47,347	...	1,490	20	...	4,406	49,974	...	4,718	10,130	309	...	4.93	...	.64
Districts worked from Kalgoorlie	22,789	1,517	...	...	...	...	22,789	1,517	...	3,578	166	...	6.36	.13	...
Totals	1,000	2,607	2,178	...	70,136	1,517	1,490	20	...	4,406	72,763	1,517	4,718	13,708	475	...	5.30 5.74	= Average all Districts, 1939. = Average all Districts, 1938.	
Increases or Decreases	...	Decrease, 1,000		...	Increase, 2,178		...	Increase, 27		...	Decrease, 4,406		...	Decrease, 3,201		...	Increase, 475		...	= Average Decrease .44 miles per inspection.	

METHOD OF FITTING NEW HALF SECTION

TO CORNISH OR LANCASHIRE BOILERS

WITHOUT REMOVING

FRONT END PLATE



Division VII.

Annual Report of the Chemical Branch, Mines Department, for the Year 1939.

The Under Secretary for Mines.

I have the honour to present, for the information of the Hon. the Minister for Mines, my report for the year.

Staff.—It is with deep sorrow I have to record the death of Edward Sydney Simpson, D.Sc., B.E., F.A.C.I., who passed away suddenly on 30th August, 1939, just three weeks before he was due to commence long service leave prior to his retirement in March, 1940.

Dr. Simpson joined the service of this State in 1897 as Mineralogist and Assayer to the Geological Survey Branch Department. In this position he acted as Chief Chemist to the Mines Department. In 1922 he was appointed Government Mineralogist and Analyst, having control of the combined Health, Mines and Agricultural Laboratories, and occupied this position up to the time of his death.

He was a man of high scientific attainments and possessed administrative ability of high order.

During his 42 years association with the Government, he published over 100 papers on scientific subjects and during recent years was engaged in the preparation of a book on "The Minerals of Western Australia" incorporating the results of his many years official and private work on local minerals. This book was more than half completed at the time of his death.

He made, during his association with the Geological Survey Branch, an unobtrusive and yet fundamental contribution to the knowledge of the rocks which carry our chief gold deposits and there is no doubt that it was his pioneering work in this matter which laid the foundation of our present knowledge of the highly metamorphic rocks of the Golden Mile and other similar districts.

Dr. Simpson took a special interest in the mineral distribution of this State and within a few weeks of his death delivered his presidential address to the Royal Society entitled "Mineral Provinces and Metallogenic Epochs in Western Australia."

By his passing, this State lost a man of great intellectual powers with a record of outstanding service to this State.

After occupying the position of Government Mineralogist and Analyst in an acting capacity for one month, I was permanently appointed to the position on 1st October, 1939.

There has been no other change in the permanent staff. The temporary professional staff was increased during the year by the appointment of Mr. N. R. Houghton, B.Sc., A.A.C.I., to carry out the investi-

gations required by the Forests Department, and Messrs. G. A. Greaves, B.Sc., A.A.C.I., and J. D. Hayton, B.Sc., for chemical work in connection with the Iron Ore Survey. Mr. A. V. Hamilton was appointed as laboratory technician to assist in the Iron Ore Survey investigations.

Mr. G. E. M. Dean was seconded to the State A.R.P. Committee early in September and he was engaged solely on its work from that date until the end of the year.

Early in May I spent a week in the Coolgardie District inspecting a number of interesting mineral occurrences. Particular attention was paid to the mineral associates of the pegmatite in the felspar quarry on M.L. 80 Londonderry.

Mr. B. L. Southern represented this Branch at the Winter School of Soil Science held at the Waite Research Institute in Adelaide during August.

Mr. H. P. Rowledge went to Coolgardie in October to test an assay balance, at the Coolgardie State Battery, kindly offered on loan to us by the Superintendent of State Batteries. During his stay at Coolgardie he visited the felspar and tantalite workings at Londonderry.

Accommodation and Equipment.—The work of the Laboratory is hampered to a great degree by the cramped and unsatisfactory conditions under which the chemical staff is now required to work, whilst the health of the staff is seriously impaired by the absence of a suitable system of ventilation for removing the highly toxic gases associated with this class of work.

The efficiency of the Branch still continues to be seriously affected by the vibrations throughout the building caused by the adjacent hospital plant. These vibrations render it difficult to perform any delicate operation and have made it impossible to carry out any fine weighings until after that plant has shut down at 4 p.m. each day. The almost constant rattling has had a very serious effect on our delicate apparatus and was responsible for affecting the accuracy of a fine assay balance to such an extent that it was only possible, until a new balance was obtained, to report the gold contents of a tailings sample to an accuracy of ± 6 grains per ton of ore. One chemical balance was so badly affected as to render it useless whilst several others are now showing distinct signs of deterioration and will have to be replaced before long.

I must therefore emphasise the necessity of proceeding with the erection of the proposed new laboratories at the earliest possible moment.

Functions of the Branch.

The Government Chemical Laboratory was established in 1922 to perform all the chemical work required by the Government with the exception of that required by the Railway Department and when not unduly interfering with the official work, to examine any Western Australian raw or manufactured product either free of cost or on the payment of a prescribed fee.

In recent years there has been steady expansion of the work performed, and during the latter end of this year it materially increased by the demands made by the Department of Industrial Development for technical advice.

Although the amount of routine chemical and mineralogical work performed for the Industries Department was not great during this year, it is anticipated in the future that this Department, in its desire to assist in the establishment of local industries, will provide a large amount of work for this Branch.

Equipment.—An ultra violet lamp was installed during the year. This was the only special equipment installed, although the Department is in urgent need of several that are essential to deal with the many new types of investigations we are called upon to perform.

Chemicals, Apparatus and Books Vote.—When submitting the estimate of expenditure for the 1939-40 financial year, it was pointed out that some provision would have to be made for cost of replacing the apparatus ruined by the vibrations emanating from the adjacent hospital machinery.

The amount provided for this financial year was the same as that for the previous financial year, viz., £750.

The purchase of two new balances to replace some of those damaged and the added cost of apparatus and chemicals, brought about by war conditions, made such a demand on this vote that it was impossible to keep within the limits of the amount granted; in fact, the estimated cost of orders issued for the six months ending 31st December exceeded the total amount granted for the financial year, although the utmost economy was exercised.

Departmental Committees.—Meetings of the following committees were regularly attended:—

Advisory Committee, Foods and Drugs.

Advisory Committee, Metropolitan Water Supply and Sewerage.

Technical Advisory Committee on Industrial Development.

Oils Committee of the Government Tender Board.

Foods and Drugs Advisory Committee.—The following matters were dealt with:

1. Consideration was given to the forming of a new clause under regulation 36 to provide for a chocolate sweetmeat for consumption by persons suffering from diabetes. It was recommended that it shall consist of cocoa paste, as defined by clause 2, regulation 36, mixed with d-sorbital, with or without addition of cocoa fat, and with or without spices or other flavouring substances harmless to diabetics.

It shall contain not less than five parts per centum of combined starch, sucrose, glucose and glucose producing substances, nor more than eight grains of saccharine per pound.

2. It was recommended that under regulation 71 provision be made for the use of maize oil in preparations solely for external application.

3. Under regulation 80 (permitted colouring matter) approval was given to the inclusion of Brilliant Blue F.G.F. and Ponceau SX and the deletion of 680 methyl violet.

Industrial Development.—A technical committee consisting of the Conservator of Forests; the Mechanical Engineer, the Economic Adviser and the Government Mineralogist and Analyst was appointed under the Hon. the Minister for Industrial Development to assist the Industries and Works Promotion Engineer in the examination of problems associated with local industrial development.

This committee has been particularly active and in the short period of its existence has been able to do some very useful work.

Association with this committee has not only been responsible for making considerable calls on my time but has also created a demand for a larger amount of investigatory laboratory work.

The successful establishment of an industry depends, to some extent, on a knowledge of the composition and properties of the available raw materials. In this regard it has been necessary to commence a number of systematic detailed surveys of these materials. Although it has not been possible to cover a very wide field, owing to limitation of staff and suitable laboratory facilities, some work of a very useful nature was commenced during the year.

In this Department's desire to assist the jam making industry, an investigation was started in conjunction with the Department of Agriculture, into the composition of fruits produced in the vicinity of the metropolitan area that are likely to be suitable for jam manufacture. Information to be of any value must provide for varying conditions of climate, etc., and it is proposed to continue this work over a period of years on samples taken from the same sources.

Other work having a bearing on industrial development performed in this laboratory included an examination of fruit juice cordials. With the assistance of the Department of Public Health, samples of a number of the local and imported products exposed for sale in some of the city stores were obtained. The results obtained on these samples will be studied in conjunction with those to be obtained later for the composition of the juices of those fruits used in the manufacture of the cordials.

The amount of work involved in investigating problems of the above nature is considerable and if it is the Government's desire to utilise the services of this Branch in that direction some extra provision will have to be made for it.

Nature of Work Done.—The total number of samples registered for investigation during the year was 6,569, which is an increase of approximately 1,000 over the 1934 figures.

The number of individual determinations made far exceed this number, as a large proportion of the samples registered require the estimation of two or more constituents. The nature of the work undertaken involves qualitative and quantitative determinations of all degrees of difficulty and exactitude. In many cases extensive chemical, physical and optical examinations are necessary, whilst the ever-increasing developments in the field of chemistry and mineralogy call for constant research and study.

The samples received are classified in the accompanying table:—

Table showing Source and Allocation of Samples for 1939.

Source, Department, etc.	Section 1. Foods, Drugs and Toxicology.	Section 2. Mineralogy and Geo- chemistry.	Section 3. Agriculture and Water Supply.
Mines—			
Under Secretary	2	15	3
Chemical Laboratory	61	57	18
State Mining Engineer .....	...	23	3
State Batteries	7	1,244	25
Geological Survey .....	...	190	...
Explosives Branch	1	...	...
Health—			
Commissioner of Public Health	217	...	13
Hospitals	72	...	...
Treasury—			
Government Stores	89	...	13
Chief Secretary's—			
Mental Hospital	1	...	...
Comptroller of Prisons .....	...	...	2
Police—			
Criminal Investigation Branch	20	1	...
Coroner's Inquests, etc.	75	...	...
Police Magistrates	1	...	...
Liquor Inspection Branch	31	...	...
State Saw Mills	45	...	1
State Hotels	1	...	2
State Insurance	16	...	...
Agriculture	100	3	408
Industrial Development	4	6	30
Works and Labour	4	3	2,499
Metropolitan Water Supply .....	...	...	...
Premier's	2	...	397
Forests	1	...	...
Railways	10	...	...
Local Governing Bodies	19	...	...
Dairy Products Marketing Board	4	...	...
Iron Ore Survey .....	...	2	...
North Australian Survey .....	...	1	...
Fremantle Harbour Trust	1	...	2
Watheroo Observatory .....	...	...	1
Commonwealth—			
Works Department	2	...	24
Defence Department	2	...	4
Council for Scientific and Industrial Research	4	...	...
Public Pay	24	113	169
Public Free	8	409	4
Total	824	2,067	3,678
Grand Total		6,569	

Mines Department:—1,649 Samples:

Twelve hundred and seventy-six (1,276) samples, entered under this heading, were submitted by the State Batteries Branch, including 1,027 tailings samples for check assay, 188 umpire assays of tailings, 23 assay riders for comparison with National Physical Laboratory Standards and 28 burnt limes used in cyaniding battery tailings. The Geological Survey Branch was responsible for 190 samples, amongst which were 108 tin ores, 52 miscellaneous minerals and 14 rocks.

Only twenty-six (26) samples were received from the State Mining Engineer, made up of 18 gold ores, four iron ores, one tungsten ore and three waters. The Explosives Branch submitted one sample only, whilst the Under Secretary was responsible for 20, including a gas mask, for report as to its suitability for use in mines.

TABLE SHOWING WORK PERFORMED.

	Under Secretary.	State Batteries.	State Mining Engineer.	Geological Survey.	Explosives.
Gold ores	2	5	18	4	...
Gold tailings .....	...	1,215	...	4	...
Minerals	1	1	...	52	...
Iron ores	9	...	4	1	...
Tin ores .....	...	...	...	108	...
Lead ores	1	...	...	...	...
Copper ores .....	...	...	...	1	...
Tungsten ores .....	...	...	1	...	...
Tantalum ores .....	...	...	...	1	...
Phosphatic ores .....	...	...	...	4	...
Rocks .....	...	...	...	14	...
Miscellaneous	2	1	...	...	...
Asbestos .....	...	...	...	1	...
Assay riders .....	...	23	...	...	...
Waters	3	2	3	...	...
Burnt limes .....	...	28	...	...	...
Gas mask	1	...	...	...	...
Mineral oil	1	...	...	...	...
Explosive .....	...	...	...	...	1
Boiler scale .....	...	1	...	...	...

In addition to the above, a further 136 samples, including 47 minerals, nine gold ores, 23 fruits and 10 beers, were entered for examination by this branch.

Department of Public Health:—230 Samples:

Ten (10) samples, including five cows milk, were examined for compliance with the food regulations. This department submitted for analysis on behalf of Infant Health Clinics 27 samples of human milk. Nine (9) specimens of human hair, 10 of nail clippings and 67 urine samples were received for lead and/or arsenic determinations. Ether samples tested for compliance with the requirements of the British Pharmacopoeia totalled 17. In all, 37 samples of drugs and pharmaceutical preparations were examined. Twenty-five (25) of the samples submitted were local or imported cordials. This department was also responsible for forwarding 10 sewerage effluents for examination.

Hospitals:—72 Samples:

Hospitals were responsible for 51 samples of ether to be tested for the presence of peroxides and compliance with the B.P. Standard, in addition to six specimens of human hair, six of nail clippings and five urine samples for arsenic and/or lead content. A number of samples of disinfectants and deodorants and drugs were also received from this source.

Department of Agriculture:—511 Samples:

One hundred and fifty-four (154) fodders were received for analysis. Of these, 33 were for the determination of the minor elements. Mechanical and chemical analyses were made of 69 soils, some of which were examined for cation exchange value also. Of the 78 samples of wheat submitted, 72 were competition wheats for analysis and pelshenke value, the balance being f.a.q. wheats. Analyses were made of nine flours, one of which was required for export purposes. The inspectors appointed under the Fertiliser Act submitted 32 official samples taken under the Act for checking purposes, whilst the fertilising constituents of 18 other samples were determined for departmental information. The minor elements were determined in 23 samples of apple leaves. Twenty (20) specimens taken in connection with animal poisoning cases and disease were submitted for examination. Spectrographic and chemical examination of the minor elements in 31 samples, representing 10 vine leaves, eight pastures, eight

potatoes and five wheat plants, were carried out. The arsenic content was determined in 30 samples of cattle dip. Fourteen waters, three brans, three pollards, four insecticides and two stock medicines were also submitted for examination.

Forests Department:—398 Samples:

Three hundred and ninety-seven (397) soil samples were submitted for mechanical and chemical analysis.

With the exception of one sample of matches submitted for examination in regard to their fire hazard, the material forwarded by this department consisted of soils from pine plantations.

Premier's Department:—Two Samples:

One sample of milk for chemical analysis and one exhibit in connection with the death of an animal for toxicological examination were all that were submitted by this department.

Police Department—128 Samples:

Viscera, poisons and various articles connected with murder, suicide, suspected poisons and unknown causes of death, accounted for 75 specimens submitted for toxicological examination, whilst 18 further samples were received in connection with general criminal cases. The Liquor Inspection Branch forwarded 25 samples of wines, spirits and beers to be examined for their compliance with the regulations. Six spirit measures were examined as to the likelihood of metallic contamination of spirits, etc.

Government Stores Department:—89 Samples:

The work submitted by this department consisted mainly of samples of the various foodstuffs and other products purchased for use in Government Institutions.

The following is a detailed list of the work:—

Baking powder	..	..	..	1
Cocoa	..	..	..	3
Essences	..	..	..	1
Flour	..	..	..	2
Honey	..	..	..	4
Jam	..	..	..	18
Jelly crystals	..	..	..	3
Mustard	..	..	..	1
Pickles	..	..	..	2
Sauces	..	..	..	4
Vinegar	..	..	..	6
Pest destroyers	..	..	..	8
Oils and greases	..	..	..	17
Clothing	..	..	..	1
Phenyle	..	..	..	3
Polishes	..	..	..	4
Soap	..	..	..	10
Sputum dish	..	..	..	1

Railways Department: 10 samples:

This Department submitted ten (10) samples of urine for toxicological examination.

Works and Labour Department:—97 samples:

Waters representing country supplies accounted for most of the samples submitted, and in all 92 waters were analysed for this Department. Other materials examined were metallurgical products (3), cotton waste (1), and oil (1).

Metropolitan Water Supply, Sewerage, and Drainage Department:—2,499 samples:

The number of control samples taken at the Metropolitan Sewerage Treatment Works totalled two thousand one hundred and sixty-five (2,165). One hundred and sixty-nine (169) determinations of the hydrogen sulphide content of sewerage were carried out. In all one hundred and thirty-four (134) waters were analysed including 48 ocean waters and 42 ground waters. Grading tests were made on 12 sands used for construction purposes. Other materials examined were caustic limes (2), soils (2) and (1) trade waste.

Department of Industrial Development:—10 samples:

Three (3) charcoals, three minerals and four lacquers were registered for examination from this Department.

State Saw Mills:—46 samples:

Forty-five (45) of the samples received were preserved timber borings for determination of their arsenic content.

State Hotels:—Three samples:

One (1) hydrometer and two samples of water were tested under this heading.

State Insurance Department:—16 samples:

Claims made under the Workers' Compensation Act were responsible for this Department forwarding 14 urine, one human hair and one nail clipping samples for the determination of the arsenic and/or lead contents.

Fremantle Harbour Trust:—Three samples:

One (1) sample of paint and two samples of sewerage effluent were received from this source.

Local Governing Bodies:—23 samples:

Thirteen (13) cows' milk and four samples of margarine were analysed for compliance with the Food Regulations. Six (6) waters were tested for poisons.

Commonwealth Departments:—36 samples:

The samples examined were 20 waters, 4 sewage effluents and two paints for the Commonwealth Department of Works. Four (4) waters, one sample of air and one sample for toxicological examination were received from the Commonwealth Defence Department. The Council for Scientific and Industrial Research submitted four (4) soils for spectrographic examination.

Public Pay:—306 samples:

The following is a list of the samples received:—

Essence	..	..	1	Lead ores	..	..	2
Drugs	..	..	2	Copper ores	..	..	3
Viscera, etc.	..	..	3	Asbestos	..	..	1
Urine	..	..	7	Bismuth ore	..	..	1
Pest destroyers	..	..	3	Antimony ore	..	..	1
Waters	..	..	157	Metallurgical pro-			
Soil	..	..	10	duet	..	..	1
Pollard	..	..	2	Rock	..	..	1
Stock food	..	..	2	Clothing	..	..	1
Gold ores	..	..	64	Milk, human	..	..	1
Gold tailings	..	..	31	Paint	..	..	3
Manganese ore	..	..	1	Mineral oil	..	..	1
Tantalum ores	..	..	7				

Public Free:—421 samples:

The samples examined under the free assay regulations are shown hereunder:—

Gold ores	165	Titanium ores ..	7
Ochres	10	Miscellaneous ..	8
Coal	1	Felspars	4
Minerals	116	Abrasives	2
Iron ore	32	Lithium ores ..	2
Manganese ores ..	4	Limestones	2
Magnesite	2	Gypsum	1
Alunite	1	Talc	6
Mica	3	Metallurgical pro-	
Bismuth ores ..	3	ducts	2
Clays	5	Barite	1
Tantalum ores ..	3	Beryllium	1
Graphite ores ..	3	Toxicological exhibit	
Tin ores	10	(animal)	1
Lead ores	3	Water	2
Copper ores	2	Soils	3
Asbestos	11	Mineral oils (sup-	
Tungsten ores ..	2	posed)	3

Foods and Condiments:

The number of samples examined was 138. Most of these were submitted by the Government Tender Board in connection with the testing of supplies delivered under contract during the year for use in Government Institutions. Some were examined in pursuance of complaints made by the users. A number of milks was examined for local authorities, samples of margarine for the Dairy Products Marketing Board, and an umpire milk sample for the Police Magistrate. The following table summarises the results obtained from the principal items of food examined:—

Foodstuff.	No. of Samples Received.	No. below Standard.	Remarks.
Bread	1	....	<i>Nil.</i>
Baking powder ..	1	....	<i>Nil.</i>
Cocoa	3	....	Complied with the Health Act Regulations but fat content much below customary amount.
Cordials	25	5	Deficiency in fruit juice, incorrect and misleading labelling.
Essences	4	....	<i>Nil.</i>
Self-raising flour ..	2	1	Deficient in carbon dioxide.
Honey	4	....	<i>Nil.</i>
Jam	18	7	Mixed jams deficient in first-named fruit, others deficient in soluble solids.
Jelly crystals and fancy jellies	5	2	Unwarranted use of the words "cream" and "fruit juice." Artificial colour not declared.
Milk	20	13	Non-compliance with the chemical standard.
Margarine	4	2	Artificially coloured and deficient in requisite starch.
Pickles and sauces	9	2	Below standard of contract samples.
Vinegar	7	2	Below standard of contract samples. One contained formaldehyde.

One sample of Australian-produced maize oil was reported on favourably for use as an edible salad oil.

During the year a survey was commenced of the chemical composition of some of the principal West Australian fruits used in jam-making, and of citrus fruits used for the preparation of cordials and "squash" drinks. At present there is little available detailed analytical information on these fruits, especially regarding content of sugars, acid, pectin, insoluble solids, etc. It is hoped that the series of

figures which will be accumulated, showing the ranges and means of these constituents for the different varieties, will prove useful in connection with the analysis of jams and also to the industry. Apricots, plums and the citrus fruits are being examined first.

An examination of the fruit juice cordials on the local market with a view to determining what proportions of genuine fruit juice they contain revealed some interesting results. Of twenty-four (24) samples three were deficient in fruit juice (20 per cent. only is required by the Food and Drug Regulations), one was incorrectly labelled, and one imitation product was labelled as genuine. The deficiencies occurred in orange juice and grapefruit cordials.

Drugs and Medicines:

In all one hundred and fourteen (114) drugs and medicines were examined. Sixty-eight (68) of these were samples of ether regularly submitted for testing for peroxides by the Perth Hospital and by the Drug Officer of the Health Department. Of these seven (7) failed to comply with the requirement of the British Pharmacopoeia as to freedom from peroxides. In addition seven (7) of the samples made by one company contained small amounts of water. Thirty-four (34) miscellaneous samples of pharmaceutical preparations and drugs were examined, mainly in connection with drug supplies for the Government. Those found deficient were A.P.C. tablets which did not comply with the formula of the B.P. Codex, compound syrup of ferrous phosphate (Parish's Food) lacking in ferrous and calcium phosphates, adeps lanae (wool fat) with too high an acid value, ethyl chloride of low strength, zinc oxide containing excessive lead, paraldehyde containing low boiling point constituent, ephedrine tablets 8 per cent. deficient in weight, mercury ointments deficient in mercuric oxide and mercury ammonium chloride respectively.

Six quack medicines were examined. Three of these were in connection with a case in which a herbalist was charged with being an unauthorised practitioner, in that he had treated a person for gonorrhoea. One of these preparations consisted of scented tap water, whilst two powders contained copper sulphate and alum, and Epsom salts, sugar, buchu, and turmeric respectively, but no other active drug. The case was dismissed, however, on technical grounds connected with its presentation. A substance which was being sold by another person as a "cancer cure" consisted entirely of commercial lactose (milk sugar). Two preparations retailed in tablet form under fancy names at a so-called "tonsil clinic" were also found to consist entirely of lactose with a little binding material. Four samples of cattle medicine and supposed race-horse dope were also examined.

Waters:—

Of the 444 waters received for analysis during the year the Engineer for Metropolitan Water Supply submitted 134; included in these were 48 ocean water samples collected near the effluent ocean outfall sewer; these will be dealt with under sewage. Ground water samples collected along the line of the proposed Bassendean main sewer totalled 42. These were examined for soluble sulphates and acidity with a view to the possible damage that they may cause to cement pipes. In some sections the sulphates were found to be in dangerous amounts. The balance of the samples comprised seepage water from the Canning Dam, and

others from the reservoirs and streams supplying the metropolitan area. The engineers from the Department of Works and Labour submitted 90 samples taken from various country town supplies, trial bores and old mining shafts for proposed town supplies or stock purposes. Regular samples are also received from the Mundaring and Mt. Charlotte reservoirs, also the water as received from these sources in the town of Kalgoorlie.

Farmers, graziers, and market gardeners, sent in 145 samples taken from bores, wells, soaks and streams; these are principally for stock and irrigation purposes. A number of these were found to be too saline to be used for any purpose. Samples of water were also received from various other State Departments, also from the Works Director, Department of Commonwealth Works.

Satisfactory standards have been laid down for the limits of salinity of stock waters to be given to horses, cattle, and sheep, but no figures are available for pigs. This latter question is now being investigated in collaboration with the Chief Veterinary Surgeon of the Department of Agriculture.

Soils:—

The number of soils received for examination during the year totalled 486, a decrease of 215 samples from the previous year. Sixty-nine (69) of these samples were submitted by the Department of Agriculture for detailed chemical examination, including copper and manganese. The chemical analyses of the soils collected during the Salmon Gums Survey was finalised during the year. The Forests Department sent in 397 soils from their pine nurseries and plantations at Keenan, Lowden, Gwangara, Applecross, Boranup, Wonnerup, Myalup, Ludlow and Big Brook. Samples were also submitted from pine plantations at Mt. Crawford, South Australia. The balance of the samples (20), came from private sources and other Government Departments. Five of these were collected in April from the Spectacles Swamp, Mandogalup, after the major part of it had been destroyed by fire.

Fertilisers:—

Forty-nine (49) samples were received during the year. Of these 32 were official samples submitted by the Inspector under the Fertilisers Act, of which 87.5 per cent. complied with the Regulations under the Act. The balance of the samples comprised nine superphosphates as supplied to the various Agricultural Research Stations, one fowl manure, and seven samples of air dried sewage sludge for moisture determination—this varied from 38.5 per cent. to 69.3 per cent.

Liquors, Etc.:—

The number of samples examined under this category was thirty-two (32). A number of samples of beer and hop beer was examined for the Liquors Inspection Branch of the Police Department. Most of these were in connection with charges under the Illicit Sale of Liquor Act, one case involving a number of samples requiring a visit to the country to give evidence before the local court.

A number of spirit measuring appliances (6) used in hotels was examined and in several cases tested by exposing them to the action of spirits to ascertain if they caused contamination, metallic or otherwise, of spirits. In several cases contamination by traces of

zinc and copper or by particles resulting from the disintegration of washers was shown to take place, usually through faulty design and materials. The chief visible effect was cloudiness of the spirit. The view was taken that such contamination, whilst the amount of impurity might not be harmful to human beings, was a contravention of section 206 (1) of the Health Act, which states:—"Any person who sells any food or drug shall deliver the same to the purchaser in its pure state." One firm, which markets a considerable number of these measures, complied with the requirements by having the insides of their measures tinned with pure tin solder.

Toxicology and Industrial Hygiene:—

In all two hundred and sixty-seven (267) exhibits and specimens were examined in connection with several branches of toxicology.

The human poisoning cases numbered 24. The poisons found were as follow:—cyanides (6); strychnine (3); phenolic disinfectants (2); A.B.C. liniment (2); and hydrochloric acid (1). In nine (9) cases no poison was detected and in one case, in which choking was thought to be due to aspirin tablets, aspirin was detected. Evidence was given in court by Mr. H. E. Hill and Mr. F. J. Malloch in connection with a number of these cases.

Twenty-six (26) specimens were received in connection with 16 cases of real or supposed animal poisoning. Strychnine, cyanide, phosphorus, arsenic and Paris green were the poisons used in cases where a positive result was obtained. A sample of the urine of a calf suffering from disease was examined for alteration products of blood pigments.

Another record year was experienced in industrial toxicology, one hundred and sixty-six (166) specimens and materials being examined. These consisted of urines 104, nails 17 and hair 16 tested for arsenic and/or lead, received mainly in connection with cases (many of them claims under the Workers' Compensation Act) of exposure to industrial fumes, also water 16, beer 10, air, cotton waste, and a gas mask.

The samples of beer were examined for lead, as it had been suggested that heavy beer drinkers, who are also exposed industrially to lead hazard, might be obtaining some of the lead excreted in their urine from beer. Samples of draught beer gave the following results:—

Lager (4 samples)	.02-.03 parts per million
Ale (5 samples)	.03-.20 parts per million

Some of the samples were taken after standing for periods of from 12 to 60 hours in hotel beer pipes. The lead, where excessive, however, appeared to be derived during the process of manufacture and not from the pipes. Amounts of more than 0.1 part per million found in the ordinary pale ale of one brewery would appear, in the light of recent investigations (see Monier-Williams, Lead in Food, Reports on Public Health and Medical Subjects, No. 88, 1938) to be undesirably high.

The sample of air was taken from a mess deck in one of the ships of the Royal Australian Navy, to ascertain the conditions of ventilation. A gas mask of the pattern proposed to be used in emergency in cases of "gassing" from fumes of explosives in mines, was examined, and a report and recommendations made.

Eighteen (18) miscellaneous exhibits were examined for the police in connection with criminal cases.

Wheat:

The total number of wheats received for examination during the year was 78. Of these 72 were from the Royal Agricultural Society's wheat-growing competition. These were analysed for moisture, protein and Pelshenke value. The balance of the samples were f.a.q. wheats for the 1938-39 season, two coming from this State and the others from South Australia, Victoria and New South Wales. The Eastern States and one local sample were analysed for moisture, protein and Pelshenke value. The other local f.a.q. sample was milled in the experimental mill, and the flour obtained analysed.

The figures obtained are shown in Appendix V.

Sewage:

The amount of work carried out under this heading increased considerably during the year; altogether 2,353 samples were received. Of these, 2,165 were samples collected from the sewage sedimentation tanks at the Subiaco and Swanbourne treatment works.

The Health Department submitted 10 samples of effluent from private septic tank installations; none of these were up to the standard of purification required before discharging on to open ground or into streams. The West Australian Commonwealth Works Branch sent in four effluents from the septic tanks installed at the Pearce aerodrome; two of these were in a fit state for discharge into the open or streams.

As mentioned under "water," 48 samples of ocean water collected during the afternoon of January 9th, in the vicinity of the effluent outfall sewer from the Subiaco and Swanbourne treatment plants, were examined for oxygen absorbed in four hours from $KMnO_4$, total ammonia, phosphorus and chlorine. No chemical indication of pollution could be detected a few hundred yards from the outlet of the sewer. In connection with the deterioration of cement sewers by hydrogen sulphide, an investigation was commenced in July last to determine the amount of hydrogen sulphide in the sewer gases, both without and with forced ventilation. Altogether 169 samples were collected and the investigation will be continued in 1940.

Fungicides and Insecticides:

Only four (4) samples were received during the year, three of these being sodium fluosilicate sent in by the Agricultural Department as the result of complaints as to the purity of the products on the market. One sample on analysis gave a 95% purity, the analysis of the other two samples had to be carried over into the next year. A sample of supposed lead arsenate, that caused scorching of foliage when used as a spray, proved to be almost pure arsenious oxide (white arsenic) 99.12%.

Bran and Pollard:

Eight (8) samples were received altogether; these comprised two pollards from a private firm and six samples of bran and pollard from the f.a.q. wheat,

milled in the experimental mill, the Brabender mill and a commercial mill. No samples were received from the inspector under the Feeding Stuffs Act.

Poultry and Stock Feed:

Three (3) samples only were received under this heading, one being an egg food and another a milk food. These were for protein only. A sample of stock food received appeared to consist wholly of wheat germ that had a portion of the oil extracted by some process.

Spectrographic Analysis:

Forty-five (45) samples were examined spectroscopically. These comprised:—Minerals (10), such as feldspars and micas examined for rubidium and lithium; pastures (8), potatoes (8) and wheat plants (5), examined for minor elements, especially copper and manganese, in connection with experimental work conducted by the Agricultural Department; vine leaves (10), examined for copper; and soils (4) in connection with the investigation of the red-legged earth mite.

Gold Ores:

There was a considerable falling off in the number of gold ores received for examination, only 1,517 were registered this year against 2,279 for the previous year. This falling off is mainly due to the completion of the North Australian Survey, which was responsible for forwarding 644 samples during 1938, and to a lesser extent to the fact that the State Mining Engineer submitted only 18 samples against 210 for the previous year. In view of the high price of gold and the necessity for increasing war-time production of that metal, it is difficult to account for any reduction in the number of samples forwarded to this branch for assay.

Iron Ores:

An interesting series of specimens representing the various types of iron ores occurring at Koolyanobbing were received from the Government Geologist for mineralogical examination. Amongst these was a granular crystalline haematite with a little magnetite embedded in limonite which also forms veins in it. This material assayed 65.7 per cent. of total iron. Although this is a very rich ore, it contained a deleterious amount of phosphorus, which is probably present as a ferric phosphate. Another specimen consisting of dense limonite with some embedded granules of haematite, contained an unduly high amount of phosphorus.

Tin Ores:

One hundred and eighteen (118) samples of tin ore were registered for examination. Of 108 submitted by the Government Geologist the majority were taken in connection with the sampling of ML6, Greenbushes.

An unusual specimen of tantaliferous tin ore resembling ainalite (an isomorphous mixture of cassiterite and tapiolite) was received from Ubini. The specimen did not respond readily to the test for cassiterite with hydrochloric acid on metallic zinc, some parts of the specimen being coated only after prolonged treatment. An analysis showed it to contain SnO_2 , 79.2 per cent.; $(TaNb)_2O_5$, 17.5 per cent.

A sample of concentrates from 15 miles south of Greenbushes, consisted of zircon and cassiterite with some rutile and a little kyanite and staurolite.

Cassiterite was recognised in association with tourmaline, limonite and muscovite in a sample received from an island in Sunday Strait.

Vermiculite:

Samples of vermiculite from the Young River and Bulong deposits were forwarded by this office to the Principal of the Mineral Resources Department of the Imperial Institute, London, who reported that the mineral from the former locality gave an expanded product weighing as little as 4 lb. per cubic foot and that from the Bulong deposit gave 6½ lb. per cubic foot.

The expansions compared with American material were:—

	½mm. thick.	1mm. thick.
Young River vermiculite	24	24
Bulong vermiculite ..	14	22
Standard American ..	12.4	15

Miscellaneous Notes:

Phosphates.—A soft pink schist from the centre of the iron deposit at Yampi contained 2.6 per cent. P₂O₅ which could not be present as apatite on account of the total absence of lime in the rock. It is probably present as variscite (AlPO₄.2H₂O).

Alunite.—A bright red ochreous material from 23 miles S.W. of Ravensthorpe contained alunite 47 per cent., limonite 29 per cent., and copiapite 9 per cent. No jarosite was present.

Felspar.—A bulk sample of a greyish white felspar which crushed to a white powder was received from ¾-mile north of M.L. 85, Londonderry. It assayed, K₂O, 12.60 per cent.; Na₂O, 2.63 per cent., representing microcline 73.8 per cent. and albite 22.2 per cent. A few small isolated patches of quartz and a little muscovite were present but it was almost free from minerals rich in iron.

A brown felspar from Nardoo Creek consisted of microcline, quartz, limonite and a hydrous ferric phosphate. The microcline was brown throughout due to thin films of limonite and the hydrous ferric phosphate in the cleavages.

Magnesite.—An official sample of the soft magnesite in a five-foot face below the hard crust of magnesite on M.L. 87, Coolgardie, contained MgO, 47.03 per cent.; CaO, nil; FeO, 0.06 per cent.; MnO, trace; Al₂O₃, 0.09 per cent.; CO₂, 51.20 per cent.

Scheelite.—A sample from the Weld Range proved to be scheelite in a chlorite schist containing a little beryl and apatite. It assayed WO₃, 62.33 per cent.

Scorodite.—A pale green mineral forming a vein in an auriferous quartz lode at Evanston consisted mainly of scorodite with some common opal. The arsenical minerals recognised in a sulphide gold ore from this district were arsenopyrite, scorodite and symplectite.

Scorodite was also recognised in a specimen of auriferous quartz from nine miles south of Randells.

Manganocolumbite.—A sample composed of several crystals of this mineral from Logan's Find was fairly uniform in composition, ranging in specific gravity from 5.50-5.57 equal to Ta₂O₅, 16 per cent.; Nb₂O₅, 65 per cent.

A specimen from the Yinnietharra bismuth show at Nardoo Creek had a specific gravity of 6.54 equal to Ta₂O₅, 51 per cent.; Nb₂O₅, 32 per cent.

Manganocolumbite assaying Ta₂O₅, 34 per cent.; Nb₂O₅, 48 per cent. was recorded from 30 miles N.E. of Mooloo Downs homestead.

Beryl.—Beryl with a surface staining of limonite and a hydrous ferric phosphate was received from Nardoo Creek.

Corundum.—A greenish micaceous rock from about six miles S.E. of Greenbushes consisted mainly of fuchsite mica, with some black granules of ilmenite and reddish grains of corundum. The vicinity of this find warrants further prospecting for possible commercial supplies of corundum.

Abrasives.—A soft siliceous sedimentary rock from three miles east of Coolgardie, which crushed readily to a powder under slight pressure, would be suitable for the manufacture of cheap abrasives such as sand soap and bath brick.

A sizing test gave:—

—90 mesh	..	95.2 per cent.
+90 mesh—60 mesh	..	1.9 per cent.
+60 mesh—30 mesh	..	2.7 per cent.
+30 mesh—10 mesh	..	.2 per cent.
		100.0

Charcoal.—Several commercial samples were analysed in connection with the inquiry into the suitability of various charcoals for producer gas manufacture.

The figures obtained were:—

Variety of charcoal.	Wandoo.		Jarrah.		Gimlet.	Redgum.
	%	%	%	%	%	%
Proximate analysis						
Moisture	4.80	2.79	5.46	3.03	2.91	3.86
Volatile hydrocarbons ..	21.51	17.37	12.66	10.84	18.52	21.61
Fixed carbon	72.24	78.62	81.66	85.77	77.14	73.03
Ash	1.45	1.22	.22	.36	1.43	1.50
	100.00	100.00	100.00	100.00	100.00	100.00
Calorific value, B.T.U.	12780	13405	13405	14015	13584	12954

Publications.—The following papers were published by members of the staff:—

Simpson, E. S.: "Mineral Provinces and Metallogenetic Epochs in Western Australia." *Pres. Ad., Journ. Roy. Soc., W.A.*, 25.

Grace, J. N. A.: "The Occurrence of Xenotime in Western Australia." *Jour. Roy. Soc., W.A.*, 26.

Le Mesurier, C. R.: "Carminite and Bindheimite from the Ashburton District." *Jour. Roy. Soc., W.A.*, 25.

I desire to acknowledge the assistance given me in the preparation of this report by Mr. H. E. Hill, Supervising Chemist and Toxicologist, Foods, Drugs and Toxicology Section, and Mr. A. J. Hoare, Supervising Chemist, Agriculture, Water Supply and Sewerage Section.

H. BOWLEY, F.A.C.I.,
Government Mineralogist and Analyst.

Perth, 25th June, 1940.

APPENDIX I.

KYANITE DEPOSIT AT SMITHFIELD.

By E. S. Simpson, D.Sc., B.E., F.A.C.I.

The Acting Government Geologist and myself inspected the kyanite deposit at Smithfield to the south-west of Bridgetown on 17th May, and the former has already reported fully on the field occurrence. There is very little that I can add to his notes in this respect.

Briefly, the deposit occurs in gently undulating forest country in the south-eastern corner of Location 1395, extending southwards over the border of that block. Over an area of 10 x 2 chains large and small boulders of kyanite from a few ounces to two hundredweight in weight, and all worn smooth on the surface, have been found loose in the soil, and to a less extent embedded in primary laterite. Fifty tons of boulders were collected this year in a few days and sold to the Newbold Silica Firebrick Co., of N.S.W., and used in their factory at Waratah in the manufacture of super-refractory bricks. This parcel seems to have almost exhausted the visible supply of mineral, not more than half a ton more being seen by us on our visit. By burning off the scrub and ploughing the outcrop, a few more tons could possibly be obtained. No boulders were to be seen beyond the area of 10 x 2 chains defined by Mr. Ellis. Microscopic grains of kyanite were, however, detected in a concentrate from a stream about three-quarters of a mile east of this area, and in primary laterite samples collected within that area and up to half a mile to the north and south of it. No kyanite has yet been detected in its original rock matrix, that known up to the present being found in alluvial or eluvial material. In similar material small fragments have been found at Bunbury, Greenbushes, Fly Brook, Pemberton, and Jasper Lake in this district.

To my mind there is a strong probability that the mineral is derived from lenses in the Chittering series of metamorphic sediments, which extend for several hundreds of miles along the western portion of the Darling Range. In the Chittering Valley itself,

kyanite is extremely plentiful in this series, both in lenses of almost pure mineral, and in small crystals scattered freely through certain beds of rock, which I feel certain will ultimately be concentrated by oil flotation for a yield of commercial kyanite. In the Chittering Valley staurolite is often associated with kyanite, and it is important to note that I found this mineral associated in granules with kyanite at various spots at Smithfield.

Owing to the extensive beds of laterite and great depth of soil in the district, no outcrops of bedrock are visible anywhere near the Smithfield deposit. This will make prospecting for further supplies of the mineral very difficult. I would suggest as a preliminary step that from carefully marked spots within a radius of two miles of the outcrop concentrates should be obtained from creek beds, beds of swamps and surface soils for examination in the Government Laboratory. At the same time samples of laterite should be collected for detailed mineralogical examination. This may lead to the location of concentrations of granular kyanite, where prospecting could be carried a further step by costeaning or sinking. At the same time a look-out should be kept for further surface pebbles along a north and south line through the present known outcrop.

The demand for kyanite in Australia and abroad is likely to increase owing to its suitability for the manufacture of super-refractories for use in the steel and other industries employing high temperatures. The Smithfield mineral is of good commercial quality for such a purpose, being well over 95 per cent. pure.

APPENDIX II.

SPECTACLES SWAMP, MANDOGALUP.

The Effect of Burning on the Soil.

By E. S. Simpson, D.Sc., B.E., F.A.C.I.

In April I visited the Spectacles Swamp at Mandogalup, near Rockingham, after a fire had swept over the greater part of the northern section of it.

As the soil had been examined by Messrs. B. L. Southern and L. J. H. Teakle in 1934, and as a small area had been saved from burning when I saw it, it is possible to compare its original condition with that after burning.

The northern basin of the swamp, which is that affected, covers 300 acres, of which an area of a few acres in the north-west corner, and a similar area in the north-east corner were alone saved from the fire by trenching down to water level.

The basin was originally filled to a depth of three feet with a diatomaceous earth, heavily charged with organic matter differing somewhat from ordinary humus, and derived from the diatoms and from a thick growth of bulrushes which covered most of the surface. From the agricultural point of view this earth has been described as a "colloidal pulpy peat." In drying it shrinks considerably, cracking in every direction and becoming more or less cloddy. In this condition it is inflammable owing to the very large proportion of organic matter in it, and when once lighted continues to smoulder freely until noth-

ing is left but an extremely porous, slightly coherent ash. This consists almost entirely of diatom skeletons, which are composed of silica, and are normally white, but in this case are stained slightly by iron oxide. The latter is derived from the small amount of iron sulphide (marcasite) distributed through the peat. Small crusts of ammonia salts, which were seen on the burnt surface, were derived from the nitrogen compounds in the "humus."

The fire is said to have been started by burning the rushes on the surface at the end of an unusually dry summer. The surface layers of peat were soon ignited over a large area, spreading ultimately over about 250 acres of the swamp. The heat of the burning surface dried out the underlying layers and the cracks formed by its shrinkage allowed free access of air, so that by the end of about three weeks the fire had consumed the combustible part of the peat right to its bottom.

The burning of the peat was accompanied by choking fumes of acetic acid, phenols, methyl alcohol, ammonia salts, oxides of sulphur, etc. With favourable winds these were plainly and objectionably noticeable even in Perth 20 miles away.

The effect of the fire from an agricultural standpoint has been disastrous. The original peat was somewhat difficult to bring into a condition of good tilth, but when that was attained, it proved a good soil for pasture grasses and many crops, having a good depth of very rich "humus" to draw upon. Its slight acidity was of no disadvantage for certain crops, and could be readily remedied for others by application of burnt lime, limesand or marl, all of which are available in the district.

The composition of the original soil is shown in cols. 1 to 6 of the accompanying table. That of the burnt peat in cols. 7 to 9.

It has been calculated that the burning has destroyed 98.7 per cent. of the humus, and converted half of the remainder into useless charcoal. This loss amounts to about 700 tons per acre, or 175,000 tons in all.

Of the nitrogen, 89 per cent. has been lost, and much of the balance has been converted into water soluble salts which will have been washed away by the first heavy rains.

The minute amounts of potash and phosphoric oxide in the original peat will probably not have been lost, but the potash will now be liable to be washed away by the winter rains.

Finally the acidity of the soil has been appreciably increased.

The physical condition of the soil has deteriorated beyond measure. What was previously a firm surface capable of supporting the weight of cattle and farming implements, and being worked up to a good tilth, is now an extremely loose porous mass in which a person would sink up to his waist. Furthermore, owing to the excessive shrinkage, the surface has taken on the structure of a deeply cross-ploughed field. It will take many years to consolidate the peat ash to a mass capable of supporting man or beast, and even then it will be hopelessly barren. In my opinion the value of the burnt area for agriculture has been reduced to nil.

From the point of view of the mineral industry the burnt peat may have some small value. It is now a diatomaceous earth in suitable condition for use as an insulator or abrasive, or for filtering purposes, or for use as an absorbent of such compounds as phenol, etc.

PEAT SOIL FROM SPECTACLES SWAMP.

Condition	Unburnt Peat.						Burnt Peat.		
	1	2	3	4	5	6	7	8	9
Depth (inches)	0-15	15-34	0-24	24-33	0-18	Average	0-24	0-12	Average
Ignition loss	55.2	47.2	55.3	51.0	61.2	54.0	4.44	5.52	4.98
Organic carbon	25.9	25.5	31.4	28.2	33.3	28.9	.42	.38	.40
Humus	44.7	44.0	54.1	48.6	57.3	49.7	.72*	.65*	.68
Nitrogen	1.32	0.83	1.33	1.08	1.39	1.19	.11†	.16‡	.135
Sulphur	n.d.	n.d.	1.57	2.90	1.95	2.14	n.d.	n.d.	n.d.
Phosphoric oxide ... ..	.038	.034	n.d.	n.d.	n.d.	.36	n.d.	n.d.	n.d.
Potash ... ..	.033	.063	n.d.	n.d.	n.d.	.048	n.d.	n.d.	n.d.
Total water soluble salts ...	.179	.393	n.d.	n.d.	n.d.	.286	n.d.	n.d.	n.d.
Salt (NaCl) ... ..	.007	.066	n.d.	n.d.	n.d.	.036	n.d.	n.d.	n.d.
pH	4.51	6.07	4.25	4.15	n.d.	4.74	3.99	n.d.	n.d.

* Includes charcoal. † Of this .04 is present as water soluble ammonia salts. ‡ Of this .11 is present as water soluble ammonia salts.

N.B.—All results are calculated on oven dry soil. The air dry soil averages about 25 per cent. of moisture.

"n.d." means "not determined."

Nos. 3, 4, and 7 were from N.E. corner of the swamp. Nos. 5 and 8 from the N.W. corner.

APPENDIX III.

The Resinous Exudation of Grevillea leucadendron,
A. Cunn.

H. E. Hill, A.I.C., A.A.C.I.

This plant, which is a native of the Kimberley district and the Northern Territory, is locally known as "turpentine bush." The ripening follicles exude a

sticky resinous substance which is characteristic also of another closely related species, *Grevillea viscidula* gardn., the resin of which is said by the natives to be used, after mixing with ashes, for rubbing into the tribal scars, for the purpose of forming the prominent cicatrices with which the northern natives are decorated.

The material examined was obtained by the State Mining Engineer, Mr. R. C. Wilson, the plant being identified by the Government Botanist, Mr. C. A. Gardner.

A small amount of the exudation, in contact with the skin, soon causes an intense itching, followed in a few hours by the formation of a blister. This later festers and forms a scab. Chemical examination showed the material to be completely soluble in alcohol. Only a small proportion, 2.5 per cent. was soluble in water. The alcohol-soluble, water-insoluble portion only showed the vesicant action. This was completely soluble in light petroleum (b.p.40-60°C.). The greater part was unsaponifiable:—saponification value 39 (approx.) acid value 34. It contained no nitrogen. The exudation appears to belong to the chemically ill-defined group of plant products allied to resins, gums and waxes, but more closely resembles the resins. It is hoped to examine a larger amount of material more completely at some future date.

APPENDIX IV.

Chemical Examination of Seeds of Macrozamia Reidlei (Zamia Palm).

By F. J. Malloch, A.A.C.I.

This examination was undertaken primarily to attempt to ascertain the nature and distribution of the toxic substance which has long been known to be present in zamia seeds and which has frequently caused the death of cattle.

The seeds consist of:—

- (1) Red outer fleshy layer.
- (2) Middle stony layer (shells).
- (3) Inner papery layer or spermoderm.
- (4) Endosperm (kernel).

The structure of the ripe seed is a three layered seed coat or testa, consisting of the three above layers, the whole enclosing the starchy endosperm, in which the embryo is embedded.

Two samples of the seeds were obtained, one collected in the vicinity of City Beach road and the other near the Applecross pine plantations. Although both samples were ripe and mature, the Applecross samples were much fresher and of better quality, the red outer fleshy layer being softer, owing to the higher proportion of water present.

The percentage of each part of the seeds obtained from each locality is given for comparison:—

	Zamia Seeds.			
	City Beach.		Applecross.	
	Average weight from 1 seed (grams)	% of whole	Average weight from 1 seed (grams)	% of whole
Whole seed	24.16	—	32.57	—
Red outer fleshy layer	7.42	30.7	11.69	35.9
Middle stony layer ..	3.94*	16.3*	5.02	15.4
Inner papery layer (spermoderm) ..	—	—	0.23	0.7
Endosperm (kernel)	12.80	53.0	15.63	48.0

*Including spermoderm.

The following is a proximate analysis of the red outer fleshy layer of the seeds, collected near Applecross.

Red Outer Fleshy Layer.

Water (loss on drying at 50°C) = 54.9%.

Proximate analysis of sample (dried at 50°C).		%
Water .. .. .	.. .. .	6.5
Oil (petroleum ether extract) .. ..	.. ..	28.2
Protein (N x 6.25) .. .. .	.. .. .	8.0
Fibre .. .. .	.. .. .	8.9
Ash .. .. .	.. .. .	2.6
Nitrogen free extract (by difference)		45.8
		100.0

A more detailed analysis showed the 45.8 per cent. of nitrogen free extract to be comprised of:—

		%
Starch (by diastase) .. .. .	.. .. .	5.08
Sugars .. .. .	.. .. .	3.00
Acid (calc. as malic acid) .. .. .	.. .. .	1.34
Not estimated (mucilage, pentosans, hemicellulose, etc.) .. .. .	.. .. .	36.33

A large amount of mucilage was present.

Petroleum ether extracted an orange red oil from the outer fleshy layer of the seeds, which gave indications of the presence of carotene by the usual chemical tests. The physical and chemical constants of the extracted oil are as follows:—

Saponification value	213.0
Acid value	7.2
Iodine value (wijs)	61.1
Refractive index	1.4630 at 25°C
	1.4573 at 40°C
	1.4500 at 60°C

These figures closely resemble those of palm oil.

The following is a proximate analysis of the endosperm (kernel) of the seeds collected near Applecross.

“Endosperm.”

Water (loss on drying at 50°C) = 45.4%

Proximate analysis of sample (dried at 50°C).		%
Water .. .. .	.. .. .	7.4
Fat (petroleum ether extract) .. ..	.. ..	0.7
Protein (N x 6.25) .. .. .	.. .. .	13.0
Fibre .. .. .	.. .. .	0.7
Ash .. .. .	.. .. .	1.8
Nitrogen free extract (by difference)		76.4
		100.0

The 76.4% nitrogen free extract was comprised of:

		%
Starch .. .. .	.. .. .	60.7
Sugars .. .. .	.. .. .	2.6
Acid (calc. as malic acid) .. .. .	.. .. .	0.2
Not estimated (mucilage, etc.) .. ..	.. ..	12.9

Summary.

1. A chemical examination of the red outer fleshy layer and the endosperm of the seeds of the zamia palm has been made.

The red fleshy layer (dried at 50°C) contains 28.2 per cent. of oil containing a considerable amount of carotinoid pigment. This oil closely resembles palm oil in its physical and chemical constants.

The endosperm (kernel) contains starch as the chief constituent, this being present to the extent of 60.7 per cent. calculated on the sample dried at 50°C.

2. The toxic substance, which is present in the endosperm, has been found to consist of a water and alcohol soluble substance of neither glycosidal nor alkaloidal character, which is not precipitated by lead acetate nor extracted by the usual immiscible solvents.

A water solution of an alcoholic extract of the endosperm (kernel) equivalent to 3.4 zamia seeds, when used as a drench on a guinea pig, caused the death of the animal over-night, whilst a water solution representing as little as 1.7 zamia seeds, caused death in approximately 30 hours.

The toxic substance appears to be present in the endosperm and not in the red fleshy outer layer of the seed, the degree of toxicity probably varying according to the time of the year when collected and the age of the seeds. In view of the absence of glycosidal and alkaloidal poisons, the poisonous effect of the endosperm may possibly be due to the presence of toxalbumins. Saponin poisons are not likely to be present, as nothing of a saponaceous nature was detected in the examination

APPENDIX V.

Sample of F.A.Q. Wheat—1938-39 Season.

Lab. No.	.. .. .	372
Sample	.. .. .	F.A.Q. Wheat
Mark	.. .. .	1938-39 Season
Condition and size	.. .. .	Sound plump grain.

Grain Analysis:

Moisture (%)	.. .. .	11.50
Bushel weight in lbs. (sample as received)	.. .. .	62¼
Bushel weight in lbs. (cleaned sample)	.. .. .	62¾
Weight of 1,000 grains in grams	.. .. .	38.4
Flour, 1st extraction (%)	.. .. .	56.96
Flour, 2nd extraction (%)	.. .. .	15.63
Total flour (%)	.. .. .	72.59
Bran (%)	.. .. .	13.96
Pollard (%)	.. .. .	13.45
Milling character	.. .. .	Free
Date milled	.. .. .	7th, 8th, 9th Feb.

Wheat Meal Analysis:

*Protein (Nitrogen x 5.83) (%)	.. .. .	10.60
*Ash (%)	.. .. .	1.34
Pelshenke Test. Time factor in minutes	.. .. .	36
Specific Protein Quality	.. .. .	3.4

Flour Analysis:

Lab. No.	Sample	610	611
		Flour 1st.	Flour 2nd.
Mark		F.A.Q.	1938-39.
Moisture (%)	12.00	11.37
*Ash (%)	0.60	1.09
†Protein (%)	9.36	10.74
*Crude fibre (%)	0.17	0.46
Flour fineness (%) plus No. 11 silk	nil	nil
*Strength water absorption (%)	58.0	66.0
*Gluten wet (%)	26.83	25.48
dry (%)	9.03	9.71
*Maltose figure, K.J. (%)	3.43	6.07
Original pH	6.3	6.7
Buffer value Pelshenke	1.1	1.3
Petrol figure, K.J.	8.5	10.2
Flour colour A	4.0	3.5
Pekar B	4.0	3.5
C	4.0	3.0

* Analysis expressed on standard moisture basis of 13.5%.

† Protein Flour nitrogen x 5.7.

Division VIII.

Annual Report of the Chief Inspector of Explosives for the Year 1939.

The Under Secretary for Mines,

I have the honour to submit for the information of the Honourable Minister for Mines in compliance with section 45 of the Explosives Act, 1895, my report on the working of the Branch for the year 1939.

The quantity of explosives imported into the State during the year is shown in the Table No. 1 and Table No. 2 gives a comparison of the quantities imported during the past five years.

It will be noted from these figures that there was a slight falling off in the amount of explosives actually landed in the State when compared with the importations of 1938 but the quantity actually used was greater as is shown in Table No. 3.

TABLE No. 1.

Importation of Explosives into Western Australia during 1939.	
Gelignite	2,307,750
Gelatine Dynamite	2,651,850
Blasting Gelatine	74,650
Permitted Explosives	145,950
Powder (Blasting and Pellet)	112,550
Miscellaneous	16,750
Total	5,309,750
Detonators: Number	4,417,000
Fuse: Yards	8,952,000

TABLE No. 2.

Explosives.	1935. lbs.	1936. lbs.	1937. lbs.	1938. lbs.	1939. lbs.
Gelignites	1,519,050	1,007,050	1,800,900	1,907,600	2,307,750
Gelatine Dynamite	1,543,750	2,457,450	2,930,650	2,748,950	2,651,850
Blasting Gelatine	175,050	72,500	15,200	56,300	74,650
Permitted Explosives	111,800	70,300	105,550	267,400	145,950
Powder (Blasting and Pellet)	110,000	151,250	120,250	319,250	112,550
Miscellaneous .. .. .	..	5,000	3,600	14,550	16,750
	3,459,650	3,763,550	4,975,900	5,450,050	5,309,750
Detonators: Number	4,316,000	2,673,000	3,860,000	4,872,000	4,417,000
Fuse: Yards	4,704,000	6,926,400	7,449,600	7,346,000	8,952,000

TABLE No. 3.

The quantity of Explosives used in the different classes of industry during the years 1938 and 1939 is given.

	1938.		1939.	
	lbs. used.	Percentage of total.	lbs. used.	Percentage of total.
Gold mining	4,778,000	93.20	5,407,475	93.40
Agricultural and land clearing	27,900	.50	28,500	.49
Government Departments — Water Supply, Railways, Public Works	87,350	1.40	89,450	1.55
Quarrying	158,300	3.50	167,850	2.90
Coal mining	55,350	.90	60,550	1.05
Lead and other base metals	27,950	.50	35,550	.61
	5,134,850		5,889,375	

With a view to determining the chemical stability of the explosives arriving in and stored in the State, and also the sensitiveness to detonation, the following tests were made:—

Heat tests	2,157
Fuse tests	746
Velocity of detonation	159
A.D.C. tests	10
Fireworks tests	43
Complete tests	1
Miscellaneous	17
Tests of detonators	15

These tests showed that the explosives on arrival and during storage were stable and gave satisfactory velocities of detonation and therefore efficient results should have been obtained in practical use.

The storage accommodation of the Woodman's Point Explosives Reserve was increased during the year by the creation of three thirty-ton magazines. The building of these new magazines necessitated providing a further twenty chains of railway.

Provision was also made for the storage of larger quantities of explosives on the Kalgoorlie Reserve where two new magazines were erected.

The growth of scrub on the Woodman's Point Reserve had become so dense that it presented very definite fire risks. In the early part of the year practically the whole area had the scrub and undergrowth grubbed and burnt up, and as a result it is felt that greater safety has been assured.

The following licenses for the storage of explosives were issued during the year:—

Magazines on Government Reserves	59
Magazines used by Government	32
Magazines on private property	42
Store Licenses (mode a)	109
Store Licenses (mode b)	Nil
Fireworks Licenses only	232
Importation Licenses	2

Nearly all the licensed magazines and store premises were visited at least once during the year, when the stocks were examined and inquiries made with a view to ascertaining if the requirements of the Act and Regulations were being complied with.

It was not found necessary to take legal proceedings against any person for breaches or non-observance of the law governing the storage of explosives, but the following quantities had to be destroyed as being unfit for use:—

Date.	Place.	Kind.	Reason for Destruction.
2-1-39	Fremantle	65 lbs. Gelatine Dynamite	Damage by water.
1-2-39	Roebourne	1,175 lbs. Nitro-Glycerine Compounds	Owing to chemical deterioration.
19-4-39	Fremantle	50 lbs. Gelnignite, "40" A.N.	Fell off train Swan View, contained moisture.
4-5-39	Albany	5 lbs. Gelnignite	Owing to exudation.
9-5-39	Kellerberrin	5 lbs. Gelnignite	Chemical deterioration.
6-6-39	Fremantle	50 lbs. Gelnignite	Owing to absorption of moisture.
9-8-39	do.	150 lbs. Gelnignite	do. do. do.
9-8-39	do.	150 lbs. Gelnignite	Chemical deterioration.
29-11-39	do.	100 lbs. Gelnignite	Owing to absorption of moisture.

There has been a silting up of sand at the jetty with the result that there was insufficient depth of water for the boats discharging explosives to be alongside with safety during weather conditions that caused an extensive swell.

To overcome this disability the Fremantle Harbour Trust authorities who have jurisdiction over this jetty extended the structure 120 feet which has assured a satisfactory depth of water for all vessels likely to use it.

In the past considerable trouble has been experienced by sand drift at the foot of the jetty, the clearing of which has been laborious and costly. With a

view to minimising the drift and expense of the removal of this sand, a 6-foot galvanised fence has been erected for 200 feet along the south side of the jetty and this I feel sure will eliminate the trouble.

The small staff provided have throughout the year given loyal and energetic services which has enabled the work of the branch to be carried out efficiently thus assuring the desired safety which was the intention and purpose for providing an Act to control the storage, etc., of explosives.

T. N. KIRTON,
Chief Inspector of Explosives.

19th March, 1940.

Division IX.

Annual Report of the Chairman Miners' Phthisis Board and Superintendent Mine Workers' Relief Act for the Year 1939.

The Under Secretary for Mines.

I have the honour to submit for the information of the Hon. Minister for Mines my report upon this branch of the Mines Department for the year 1939.

The periodical examination of mine workers was continued throughout the year by the Commonwealth Department of Health under arrangements similar to those of 1938. The work is continuously carried on by the Commonwealth Health Laboratory at Kalgoorlie and by a mobile laboratory which visits the centres in the various goldfields. The mobile unit takes nearly two years to complete a circuit. The only goldfields not visited were the Ashburton, Kimberley, Gascoyne, Phillips River, West Kimberley, and West Pilbara, which are all remote and contain few mine workers.

Examinations conducted under the Mine Workers' Relief Act during the year totalled 6,975 compared with 7,141 last year. This reduction is due to the mobile laboratory being unused for several weeks due to several changes in staff and an examination of the incidence of dust in the lungs of bulk wheat lumpers. The results of the examination for 1939, together with those for previous examinations, are shown in the table annexed hereto. A graph is also attached to illustrate the trend of the examinations since their inception. In explanation of these figures, I desire to make the following comments.

Normals, etc.—These number 95.63 per cent. of the men examined and include men having first class lives or suffering from pneumoconiosis only. The figure for 1938 was 95.68 per cent.

Early Silicosis.—Although there are 282 men with this complaint only 18 represent new cases for the year. In all, the early silicosis cases represent 4.04 per cent. of the men examined compared with 3.91 per cent. last year.

Advanced Silicosis.—Of the 10 cases reported seven were men who advanced from early silicosis during the year. The number (10) represents .14 per cent. of the men examined and is an improvement on the figure for the previous year (.24 per cent.).

Silicosis plus Tuberculosis.—These 11 cases compare with nine in 1938. The percentage increased from .13 to .16 per cent.

Tuberculosis only.—Tuberculosis only is not an industrial disease although the sufferers are compensated under the Act. These men are removed from the mines to prevent the spread of the infection. There were two men (.03 per cent.) reported compared with three men (.04 per cent.) in 1938.

General.—The above figures are very satisfactory. There should not be much fluctuation in the percentages in the future as conditions appear to be as nearly perfect as it is practically possible to make them.

In addition to the above men the two laboratories also examined a further 2,301 men under the provisions of the Mines Regulation Act, 1906. These comprised 1,622 new applicants for the initial certificate and 679 re-examinees for the initial certificate. The particulars of these examinations are set out below:—

New Applicants.	
Normal	1,557
Pneumoconiosis	38
Early silicosis	2
Advanced silicosis	—
Query tuberculosis	22
Tuberculosis	1
Pneumoconiosis plus query tuberculosis	—
Pneumoconiosis plus tuberculosis	—
Early silicosis plus query tuberculosis	—
Early silicosis plus tuberculosis	—
Advanced silicosis plus query tuberculosis	1
Advanced silicosis plus tuberculosis	—
Other conditions	1
Total	1,622

Of the above applicants for admission to the industry, 1,557 received the initial certificate (Form No. 2), 1 received a rejection certificate (Form No. 4), 12 received re-admission certificates (Form No. 6), 51 received special certificates (Form No. 9) and 1 received a prohibition certificate (Form No. 13). Thus, of 1,622 applicants, 1,557 were eligible for employment anywhere on a mine, 63 were eligible for surface employment and two were not eligible for any work on a mine.

There is no means available for ascertaining how many of these new applicants actually entered the industry.

Re-Examinations.		
Normal	488	
Pneumoconiosis	118	
Early silicosis	25	
Advanced silicosis	2	
Query tuberculosis	40	
Tuberculosis	1	
Pneumoconiosis plus query tuberculosis	0	
Pneumoconiosis plus tuberculosis	0	
Early silicosis plus query tuberculosis	1	
Early silicosis plus tuberculosis	0	
Advanced silicosis plus query tuberculosis	0	
Advanced silicosis plus tuberculosis	0	
Other conditions	4	
Total	679	

These men had previously been examined and some were engaged in the industry prior to this examination. 488 received the initial certificate (Form No. 2), four received temporary rejection certificates (Form No. 3), four received rejection certificates (Form No. 4), 51 received re-admission certificates (Form No. 6), and 132 received special certificates (Form No. 9). Thus, of 679 re-examinees 488 were eligible for employment anywhere on a mine, 183 were eligible for surface employment and eight were not eligible for employment on a mine. There is no means available for ascertaining how many of these men are actually engaged in the industry.

Grouping the two sets of figures discloses that the following certificates were issued under the Mines Regulation Act, 1906.

Initial certificates (Form No. 2)	2,045
Temporary rejection certificates (Form No. 3)	4
Rejection certificates (Form No. 4)	5
Re-admission certificates (Form No. 6)	63
Special certificates (Form No. 9)	183
Prohibition certificate (Form No. 13)	1
Total	2,301

Miners' Phthisis Board.

Payments to beneficiaries and their dependants under the Miners' Phthisis Act still continue, although slightly reduced in total amount, due to deaths of beneficiaries and the attainment of 16 years of age by some of the dependant children. This large liability will continue for many more years.

E. J. R. HOGG,
Chairman Miners' Phthisis Board
and
Superintendent Mine Workers' Relief
Act.

14th February, 1940.

TABLE SHOWING RESULTS OF PERIODICAL EXAMINATION OF MINE WORKERS FROM INCEPTION OF EXAMINATIONS (1925) TO 31ST DECEMBER, 1939.

First Examination (1925-26).		
Normals, etc.	3,239	= 80.5
Silicosis early	459	= 11.4
Silicosis advanced	183	= 4.5
Silicosis plus tuberculosis	131	= 3.3
Tuberculosis only	11	= .3
Total number of men examined	4,023	= 100.0

PERIODICAL EXAMINATION OF MINE WORKERS—continued.

Second Examination (1927).		
Normals, etc.—		
Previously reported as normals, etc.	2,290	
New cases (i.e., cases examined for the first time)	826	
	3,116	= 83.6
Silicosis early—		
Previously reported as early	348	
New cases	33	
	381	= 10.2
Silicosis advanced—		
Previously reported as advanced	85	
New cases	8	
	93	= 2.5
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	13	
Previously reported as silicosis early	27	
Previously reported as silicosis advanced	62	
New cases	26	
	128	= 3.4
Tuberculosis only	10	= .3
Total number of men examined	3,728	= 100.0

Third Examination (1928).		
Normals, etc.—		
Previously reported as normals, etc.	2,738	
New cases	239	
	2,977	= 85.5
Silicosis early—		
Previously reported as normals, etc.	47	
Previously reported as silicosis early	303	
New cases	12	
	362	= 10.4
Silicosis advanced—		
Previously reported as normals, etc.	1	
Previously reported as silicosis early	16	
Previously reported as silicosis advanced	79	
New cases	2	
	98	= 2.8
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	10	
Previously reported as silicosis early	14	
Previously reported as silicosis advanced	10	
New cases	8	
	42	= 1.2
Tuberculosis only—		
Previously reported as normals, etc.	3	
New cases	1	
	4	= .1
Total number of men examined	3,483	= 100.0

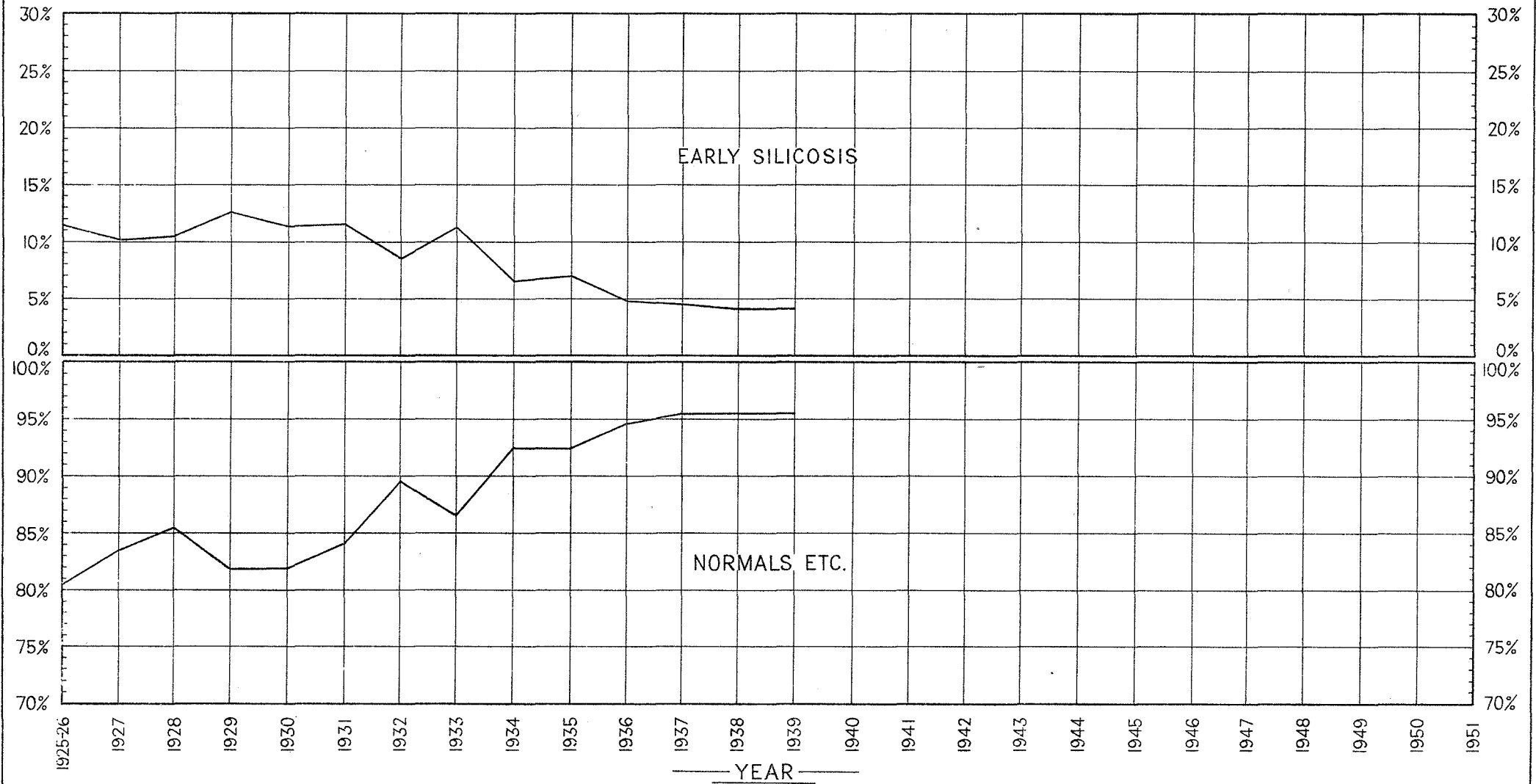
Fourth Examination (1929).		
Normals, etc.—		
Previously reported as normals, etc.	2,099	
New cases	21	
	2,120	= 81.9
Silicosis early—		
Previously reported as normals, etc.	100	
Previously reported as silicosis early	224	
New cases	2	
	326	= 12.6
Silicosis advanced—		
Previously reported as silicosis early	34	
Previously reported as silicosis advanced	60	
	94	= 3.6
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	8	
Previously reported as silicosis early	14	
Previously reported as silicosis advanced	19	
	41	= 1.6
Tuberculosis only—		
Previously reported as normals, etc.	7	
	7	= .3
Total number of men examined	2,588	= 100.0

Fifth Examination (1930).		
Normals, etc.—		
Previously reported as normals, etc.	2,751	
New cases	34	
	2,785	= 81.9
Silicosis early—		
Previously reported as normals, etc.	133	
Previously reported as silicosis early	247	
New cases	8	
	388	= 11.3
Silicosis advanced—		
Previously reported as silicosis early	22	
Previously reported as silicosis advanced	43	
New cases	2	
	67	= 2.0
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	6	
Previously reported as silicosis early	60	
Previously reported as silicosis advanced	46	
New cases	2	
	114	= 3.3
Tuberculosis only—		
Previously reported as normals, etc.	47	
New cases	3	
	50	= 1.5
Total number of men examined	3,399	= 100.0

PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH N°1

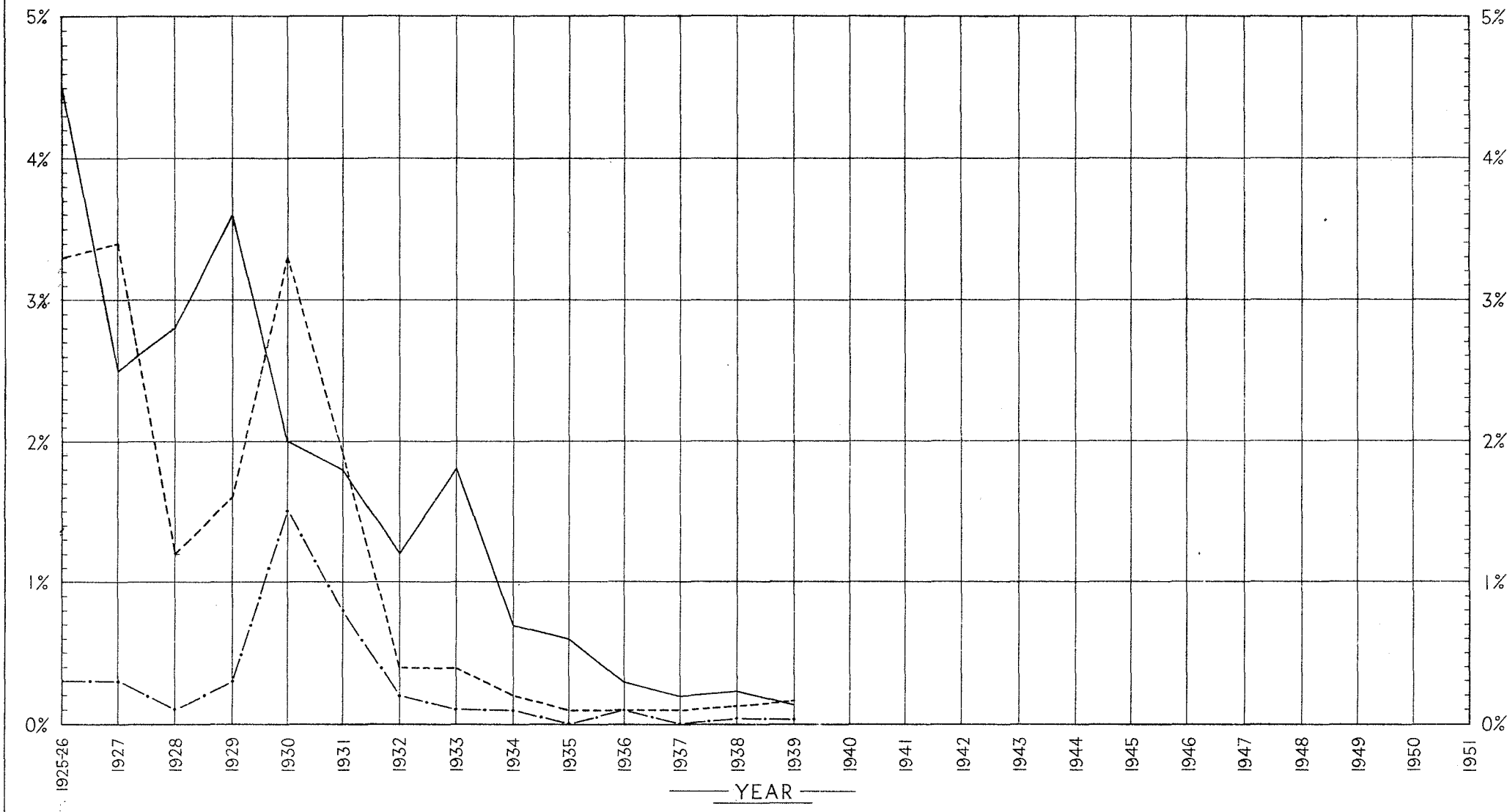
Showing Percentages of Normals and Early Silicotics, from 1925-26 onwards



PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH N°2

Showing Percentages of Silicosis Advanced, Silicosis plus Tuberculosis and Tuberculosis only, from 1925-26 onwards



Silicosis Advanced ———

Silicosis Plus Tuberculosis - - - - -

Tuberculosis Only - · - · - ·

PERIODICAL EXAMINATION OF MINE WORKERS—continued.

Sixth Examination (1931).

		Per cent
Normals, etc.—		
Previously reported as normals, etc.	2,530	84.0
Silicosis early—		
Previously reported as normals, etc.	94	
Previously reported as silicosis early	252	11.5
Silicosis advanced—		
Previously reported as silicosis early	18	
Previously reported as silicosis advanced	35	1.8
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	4	
Previously reported as silicosis early	35	
Previously reported as silicosis advanced	19	1.9
Tuberculosis only—		
Previously reported as normals, etc.	25	
	25	.8
Total number of men examined	3,012	100.0

Seventh Examination (1932).

		Per cent.
Normals, etc.	3,835	89.5
Silicosis early—		
Previously reported as normals, etc.	35	
Previously reported as silicosis early	338	8.7
Silicosis advanced—		
Previously reported as silicosis early	6	
Previously reported as silicosis advanced	47	1.2
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	3	
Previously reported as silicosis early	9	
Previously reported as silicosis advanced	4	.4
Tuberculosis only—		
Previously reported as normals, etc.	8	
	8	.2
Total number of men examined	4,285	100.0

Eighth Examination (1933).

		Per cent.
Normals, etc.	2,920	86.5
Silicosis early—		
Previously reported as normals, etc.	57	
Previously reported as silicosis early	322	11.2
Silicosis advanced—		
Previously reported as normals, etc.	1	
Previously reported as silicosis early	15	
Previously reported as silicosis advanced	44	1.8
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	2	
Previously reported as silicosis early	9	
Previously reported as silicosis advanced	4	.4
Tuberculosis only—		
Previously reported as normals, etc.	3	
	3	.1
Total number of men examined	3,377	100.0

Ninth Examination (1934).

		Per cent.
Normals, etc.	5,140	92.4
Silicosis early—		
Previously reported as normals, etc.	54	
Previously reported as silicosis early	315	6.6
Silicosis advanced—		
Previously reported as normals, etc.	1	
Previously reported as silicosis early	24	
Previously reported as silicosis advanced	12	.7
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	6	
Previously reported as silicosis advanced	6	.2
Tuberculosis only—		
Previously reported as normals, etc.	5	
	5	.1
Total number of men examined	5,563	100.0

Tenth Examination (1935).

		Per cent.
Normals, etc.	4,437	92.3
Silicosis early—		
Previously reported as normals, etc.	35	
Previously reported as silicosis early	303	7.0
Silicosis advanced—		
Previously reported as silicosis early	24	
Previously reported as silicosis advanced	2	.6
Silicosis plus tuberculosis—		
Previously reported as silicosis early	5	
	5	.1
Tuberculosis only—		
Previously reported as normals, etc.	2	
	2	.0
Total number of men examined	4,808	100.0

PERIODICAL EXAMINATION OF MINE WORKERS—continued.

Eleventh Examination (1936).

		Per cent.
Normals, etc.	6,972	94.7
Silicosis early—		
Previously reported as normals, etc.	29	
Previously reported as silicosis early	323	4.8
	352	
(Note.—Of the 352 cases of early silicosis reported, 23 were already suffering from early silicosis and four from pneumoconiosis when readmitted to the industry on the readmission certificate under regulation 7 of the Mines Regulation Act, 1906.)		
Silicosis advanced—		
Previously reported as normals, etc.	1	
Previously reported as silicosis early	15	
Previously reported as silicosis advanced	4	.3
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	3	
Previously reported as silicosis early	8	.1
Tuberculosis only	8	.1
	8	
Total number of men examined	7,363	100.0

Twelfth Examination (1937).

		Per cent.
Normals, etc.	7,487	95.4
Silicosis early—		
Previously reported as normals, etc.	15	
Previously reported as silicosis early	319	4.3
	334	
(Note.—Of the 334 cases of early silicosis reported, 37 were already suffering from early silicosis when readmitted to the industry on the readmission certificate under Regulation 7 of the Mines Regulation Act, 1906.)		
Silicosis advanced—		
Previously reported as silicosis early	14	
Previously reported as silicosis advanced	4	.2
Silicosis plus tuberculosis—		
Previously reported as normals, etc.	1	
Previously reported as silicosis early	10	.1
Tuberculosis only	2	.0
	2	
Total number of men examined	7,852	100.0

Thirteenth Examination (1938).

		Per cent.
Normals, etc.	6,833	95.68
Silicosis early—		
Previously reported as normal, etc.	13	
Previously reported as silicosis early	266	3.91
	279	
(Note.—Of the 279 cases of early silicosis reported, 32 were already suffering from early silicosis and four from pneumoconiosis when readmitted to the industry on readmission certificates under regulation 7 of the Mines Regulation Act, 1906.)		
Silicosis advanced—		
Previously reported as normal, etc.	....
Previously reported as silicosis early	15	
Previously reported as silicosis advanced	2	.24
Silicosis plus tuberculosis—		
Previously reported as normal, etc.	1	
Previously reported as silicosis early	8	
Previously reported as silicosis advanced	....
	9	.13
Tuberculosis only—		
Previously reported as normal, etc.	3	.04
	3	
Total number of men examined	7,141	100.00

Fourteenth Examination (1939).

		Per cent.
Normals, etc.	6,670	95.63
Silicosis early—		
Previously reported as normal, etc.	18	
Previously reported as silicosis early	264	4.04
	282	
(Note.—Of the 282 cases of early silicosis reported, 28 were already suffering from early silicosis and one from pneumoconiosis when readmitted to the industry on readmission certificates under regulation 7 of the Mines Regulation Act, 1906.)		
Silicosis advanced—		
Previously reported as normal, etc.	....
Previously reported as silicosis early	7	
Previously reported as silicosis advanced	3	.14
Silicosis plus tuberculosis—		
Previously reported as normal, etc.	1	
Previously reported as silicosis early	9	
Previously reported as silicosis advanced	1	.16
Tuberculosis only—		
Previously reported as normal, etc.	2	.03
	2	
Total number of men examined	6,975	100.00

Men employed in the outlying districts were not examined during 1929 or 1931; only those employed in Kalgoorlie and surrounding district being examined. The increase in numbers diagnosed as early silicosis and tuberculosis in 1930 was due to the improved plant and radiographic technique.

Only new miners and those whose previous diagnoses warranted review were examined in the outlying districts during 1933.

MINING STATISTICS TO 31st DECEMBER, 1939.

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TABLE I.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT AS REPORTED TO THE MINES DEPARTMENT DURING 1939, AND THE TOTAL PRODUCTION TO DATE.

(Note.—Lease numbers in brackets indicate that the holding was *voided* during the year.)

(Note.—* denotes mainly derived from treatment of tailings.)

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.					
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	
Kimberley Goldfield.													
Brockman	...	Voided leases and sundry claims	...	...	8.50	30.46	...	7.62	...	3,829.75	3,262.40	...
Hall's Creek	...	do. do. do.	...	...	10.00	5.55	...	...	...	527.55	554.58	...
Mt. Dockrell	107	Erin-go-bragh	...	...	...	12.02	...	...	...	...	12.02	...
	95	Irish Lass	...	...	...	32.43	...	13.66	...	184.00	198.28	...
	103	Old Mac	...	...	192.95	105.05	...	...	...	194.70	146.33	...
	85	Western Lead	...	...	100.00	40.32	...	...	...	100.00	42.75	93.00
	...	Voided leases and sundry claims	...	...	...	...	...	20.03	...	264.00	656.77	...
Ruby Creek	98	Goliath	...	...	...	...	...	...	...	7.50	9.01	...
	97	Ruby Queen	...	...	646.00	375.70	...	...	...	817.25	494.35	...
	100	St. Lawrence	...	...	...	...	...	...	...	10.00	11.32	...
	96	West and Left	...	...	...	...	...	...	...	10.00	5.30	...
	...	Voided leases and sundry claims	...	...	23.75	20.83	...	...	...	12,900.25	9,606.22	...
The Mary	...	Voided leases	...	...	...	...	...	...	...	399.00	210.03	...
The Panton	...	Voided leases and sundry claims	...	...	...	...	...	...	...	37.70	153.71	...
	From Goldfield generally :—												
		Reported by Banks and Gold Dealers	342.73	6,495.64	...	75	1.54	...
		Totals	342.73	...	1,081.20	...	6,503.26	...	19,282.45	15,364.61	93.00

Pilbara Goldfield.

MARBLE BAR DISTRICT.

Bamboo Creek	856	Bulletin	...	...	465.00	152.06	...	...	5.05	2,302.00	728.82	...
	850	Federation	...	...	39.00	8.00	...	...	...	321.00	526.01	...
	866, 901	Greater Bonnie Doon (1935), Limited	...	...	527.00	200.81	...	...	...	2,530.00	1,043.86	...
	866	(Bonnie Doon)	...	...	...	...	...	...	...	204.00	78.03	...
	707	Kitchener	...	...	283.00	69.83	...	...	...	8,665.00	13,018.06	...
	1010	Mickey	...	...	521.00	93.83	...	...	...	749.00	140.20	...
	740, 794, etc.	Mt. Prophecy leases	...	...	768.00	672.38	...	...	...	6,820.50	7,318.85	...

	740	...	(Mt. Prophecy)	...	...	...	...	...	...	1.11	1,040.50	1,898.07	...
	794	...	(Perseverance)	...	...	...	...	...	...	...	290.50	584.21	...
	817	...	Prince Charlie	...	...	48.00	88.35	...	...	3.68	1,623.75	2,788.05	...
	907	...	Princess May	...	...	104.25	36.07	...	...	4.87	404.25	271.63	...
	865	...	Queen	...	...	135.00	53.77	...	...	...	926.00	470.26	...
	924	...	True Blue	...	...	84.00	5.70	...	...	...	456.00	36.74	...
			Voided leases	...	...	...	...	...	13.54	545.85	16,331.10	24,832.40	...
			Sundry claims	...	...	270.00	80.80	...	8.97	307.83	4,193.35	2,771.46	...
Boodalyerrie	...	...	Voided leases and sundry claims	...	...	...	...	...	...	299.23	120.25	587.86	...
Lalla Rookh	...	...	Voided leases and sundry claims	...	...	8.00	6.69	...	...	4.78	11,541.00	12,367.89	574.01
Marble Bar	1019	...	Alethia	...	...	482.50	21.89	...	...	...	482.50	21.89	...
	927, 930, 956, 979, 934, etc.	...	Comet Gold Mines, Ltd.	...	...	5,872.25	5,563.50	...	...	...	15,658.25	18,947.71	...
	930, etc.	...	Prior to transfer to present holders	...	...	...	...	...	...	...	1,609.00	1,211.72	...
	854	...	Coongan Star	...	...	29.00	5.80	...	...	...	1,067.00	2,035.37	...
	1031	...	Elsie May North	...	...	43.00	6.33	...	...	...	43.00	6.33	...
	1012	...	Gleaming Dawn	...	...	75.75	2.06	...	...	...	75.75	2.06	...
	1029	...	Guba	...	...	6.50	6.54	...	...	...	6.50	6.54	...
	(981)	...	Gwalia	...	...	6.50	7.04	...	...	...	106.50	89.99	...
	912	...	Homeward Bound	...	...	963.50	725.47	...	...	...	1,947.50	1,215.61	...
	914	...	Jo Jo	...	...	77.00	27.56	...	...	...	467.00	299.75	...
	926	...	Leviathan	...	...	684.75	214.60	...	...	4.60	1,660.75	565.41	...
	845, 869	...	Outward Bound leases	...	...	168.50	54.13	...	...	...	1,437.30	795.07	...
	845	...	(Outward Bound)	...	...	...	...	...	...	...	1,543.50	1,873.91	...
	869	...	(Outward Bound East)	...	...	...	...	...	...	...	30.00	26.79	...
	909	...	Stray Shot	...	...	53.50	32.54	...	...	...	160.50	99.63	...
	844, 851	...	Viking leases	...	...	97.25	86.29	...	...	...	1,226.25	918.10	...
	844	...	(Anglo French)	...	...	...	...	...	...	...	467.00	706.25	...
	851	...	(Viking)	...	...	...	...	...	...	...	34.50	45.52	...
	1001	...	White Hill	...	...	145.75	32.33	...	...	...	208.75	46.94	...
	929	...	Wingello G.Ms., N.L.	...	...	1,464.00	984.78	...	...	...	2,323.50	1,425.64	...
			Voided leases	...	...	...	...	...	...	187.35	23,483.45	29,003.83	...
			Sundry claims	...	15.89	1,171.25	525.18	...	65.71	174.20	15,838.89	11,005.27	...
North Pole	...	...	Voided leases and sundry claims	...	...	20.75	11.78	...	...	...	638.75	507.99	...
North Shaw	...	...	do. do. do.	...	...	...	...	...	10.37	567.06	1,222.95	1,105.77	...
Pilgangoora	879	...	Birthday Gift	...	...	113.00	24.45	...	8.34	...	1,473.00	232.73	...
			Voided leases	...	...	...	...	...	8.31	...	782.00	170.87	...
			Sundry claims	...	...	60.00	10.54	...	161.08	8.13	481.60	146.39	...
Sharks	868	...	Mount Ada	...	...	167.75	146.80	...	...	...	1,140.25	1,345.44	...
			Voided leases	...	...	...	...	...	...	...	78.00	222.02	...
			Sundry claims	...	8.83	18.75	59.25	...	162.10	34.73	1,013.75	1,464.68	...
Talga	1032	...	Black Cat	...	...	164.00	31.94	...	...	...	164.00	31.94	...
	(915)	...	North Star	...	7.91	29.00	14.43	...	...	7.91	431.00	541.95	...
			Voided leases and sundry claims	...	9.09	211.00	95.15	...	64.70	163.57	3,023.65	2,651.77	...
Tambourah	...	...	do. do. do.	...	...	274.00	138.57	...	89.52	355.68	3,677.25	3,566.37	...
Warrawoona	1017	...	Cuban	...	...	5.00	9.06	...	...	...	5.00	9.06	...
			Voided leases and sundry claims	...	...	1,911.75	380.53	...	70.98	603.97	15,546.09	22,090.23	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

PILBARA GOLDFIELD—continued.
MARBLE BAR DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Western Shaw ...	...	Voided leases and sundry claims	...	...	9.00	6.77	...	22.34	67.47	1,294.00	1,039.29	...
Wyman's Well ...	1002 ...	Copenhagen ...	...	...	654.75	19.74	...	...	...	1,046.75	42.87	...
	1021 ...	Rising Moon ...	...	...	191.50	16.31	...	...	...	191.50	16.31	...
	1013 ...	Trump ...	...	...	332.25	71.45	...	...	...	332.25	71.45	...
		Voided leases and sundry claims	...	.95	784.00	117.58	...	.93	86.93	2,074.65	1,867.98	...
Yandicoogina ...	874 ...	Uncle Tom ...	...	...	5.00	5.35	...	...	...	416.00	391.59	...
		Voided leases and sundry claims	...	...	45.50	20.50	...	4.32	380.65	3,283.95	6,428.96	...
		<i>From District generally:—</i>										
		Sundry parcels treated at:										
		Bamboo Creek State Battery ...	...	...	...	*319.88	33.95	...	...	...	*7,700.57	113.85
		Marble Bar State Battery ...	...	...	...	*898.90	...	...	...	12.00	*6,017.93	...
		R. H. Fox Cyanide Plant ...	...	...	...	*87.47	...	...	...	...	*213.90	...
		Various Works ...	...	...	...	...	...	...	...	237.95	1,391.56	...
		Reported by Banks and Gold Dealers ...	167.73	13.67	...	...	...	13,803.73	435.76	...	...	...
		Totals ...	167.73	56.34	19,590.25	12,250.78	33.95	14,494.94	4,250.41	166,961.93	199,081.35	687.86

NULLAGINE DISTRICT.

Eastern Creek ...	268L ...	Doherty's Reward ...	...	...	54.50	105.21	...	...	...	54.50	105.21	...
	251L ...	Rose ...	...	...	32.00	25.47	...	...	...	91.00	74.96	...
	253L ...	Shamrock ...	...	...	...	...	...	...	...	72.00	59.11	...
		Voided leases and sundry claims	...	8.97	28.00	38.29	...	...	20.93	5,782.50	10,290.63	28.67
Elsie ...	...	do. do. do.	...	...	...	...	...	...	...	630.50	1,781.57	...
McPhee's Creek ...	...	do. do. do.	...	...	15.00	39.71	...	...	...	204.50	310.37	...
Middle Creek ...	230L ...	All Nations ...	...	...	...	...	...	...	...	160.75	60.20	...
	260L ...	All Nations North ...	...	...	985.00	204.77	...	...	...	1,333.00	408.07	...
	229L ...	Barton ...	1.22	...	...	...	...	1.22	...	47.50	37.76	...
	231L, etc. (245L) ...	Blue Spec leases ...	...	...	92.00	226.63	...	...	...	969.50	775.14	...
	258L ...	Elsie Jean ...	...	...	...	...	...	...	...	34.00	8.24	...
	246L ...	Junction ...	...	...	27.50	4.24	...	...	...	27.50	4.24	...
	247L ...	Hopetoun ...	...	...	380.00	101.79	...	...	...	1,154.00	305.15	...
		Hopetoun North ...	...	...	136.00	28.64	...	...	...	136.00	28.64	...
		Voided leases and sundry claims	...	...	1,489.00	580.75	...	...	...	10,561.40	10,301.72	...

Mosquito Creek ...	234L ...	Alrema ...	...	...	...	...	...	...	...	...	139.00	32.98	...
	235L ...	Beatrice ...	...	...	...	...	...	...	...	43	390.00	129.70	...
	236L ...	Western ...	...	...	...	...	...	...	...	...	31.00	9.62	...
		Voided leases and sundry claims	...	...	54.00	26.05	...	1.07	190.13	10,932.74	16,273.60	...	
Nullagine ...	252L ...	Marjie ...	...	...	81.50	140.90	...	...	...	...	137.50	365.78	...
		Voided leases and sundry claims	...	...	34.00	10.39	...	210.64	243.75	12,077.55	21,227.90	...	
Twenty-mile Sandy	256L ...	Bill Jim ...	...	...	96.00	27.36	...	...	...	...	387.00	193.21	...
	267L ...	Little Wonder ...	...	...	1,084.00	209.83	...	...	...	...	1,084.00	209.83	...
	269L ...	Sunday Mine ...	...	...	40.00	64.97	...	...	...	...	40.00	64.97	...
		Voided leases and sundry claims	...	9.95	535.60	322.23	...	33.10	33.70	9,946.95	12,823.03	...	
<i>From District generally :-</i>													
Sundry parcels treated at:													
Greig's Cyanide Plant ...						*55.71	...	...	...	...		*110.34	...
Simpson's Cyanide Plant (Twenty-mile Sandy) ...						*302.10	...	...	...	...		*323.28	...
Various Works ...						...	...	...	...	112.50	6,218.62	...	
Reported by Banks and Gold Dealers ...			280.29	9.03	...	...	...	8,745.00	97.45	...	...	24.77	...
Totals ...			281.50	27.95	5,164.10	2,465.04	...	8,991.03	586.39	56,536.89	82,558.64	28.67	...

Ashburton Goldfield.

Belvedere ...	40, 41 ...	Belvedere leases ...	...	...	710.00	173.10	38.95	...	9.88	1,227.00	351.70	73.68
Dead Finish ...	45 ...	Star of the West ...	...	...	78.00	29.50	...	...	...	78.00	29.50	...
		Sundry claims ...	...	11.89	35.75	154.10	...	11.89	35.75	154.10	...	
Melrose ...	43 ...	Melrose ...	...	...	1,262.00	267.13	87.21	...	...	1,667.00	313.43	90.16
		Voided leases and sundry claims	1.41	7.09	163.50	61.13	.69	12.41	21.88	1,225.50	608.19	6.47
Mt. Edith ...	...	Sundry claims ...	...	...	...	...	...	...	...	5.00	3.97	...
Mt. Mortimer ...	...	Sundry claims ...	...	...	...	...	...	364.63	315.64	44.50	40.25	74.47
Uaroo ...	...	Voided leases ...	...	...	...	...	...	...	...	...	...	7,713.22
<i>From Goldfield generally :-</i>												
Reported by Banks and Gold Dealers ...			35.92	...	...	...	...	8,662.32	16.59	...	7.12	...
Totals ...			37.33	18.98	2,249.25	684.96	126.85	9,039.36	375.88	4,282.75	1,508.26	7,958.00

Gascoyne Goldfield.

Bangemall ...	...	Voided leases and sundry claims	...	...	...	...	...	88.97	39.77	387.00	517.29	...
<i>From Goldfield generally :-</i>												
Reported by Banks and Gold Dealers ...			63.94	...	...	...	...	563.61	1.80	...	...	...
Totals ...			63.94	...	...	...	...	652.58	41.57	387.00	517.29	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

Peak Hill Goldfield.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.						
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.		
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.		
Egerton	556P	Pegasus Voided leases and sundry claims	...	...	247·00	771·33	...	...	...	572·00	1,437·15	...	...	...
Horseshoe	(557P) (558P)	Brilliant Mt. Labourchere Voided leases and sundry claims	...	...	5·00	7·69	...	...	...	5·00	7·69	...	...	...
Jimblebar ... ..	...	do. do. do.	...	...	...	...	...	...	...	15·57	...	...	...	...
Mt. Fraser ... ..	...	do. do. do.	...	1·24	157·00	101·01	...	...	15·70	2,792·24	1,258·18	2,333·47	...	2·00
Mt. Seabrook	541P, 542P 541P, 542P	(Mt. Seabrook Gold Mines, Ltd.) Prior to transfer to present holders Sundry claims ... ..	...	...	62·00	22·61	...	...	...	13·79	238·70	8,574·30	3,136·11	·58
Peak Hill	512P 510P 552P 507P 511P 448P 514P 553P 508P 506P 492P (555P)	Atlantic Atlantic North Bobby Dazzler Central Commercial Evening Star Jasper Bar Morning Star Mount Pleasant No. 1 North North Star Sunshine Voided leases and sundry claims	...	...	329·00 200·00 140·00 1,105·00 ...	45·33 8·93 78·23 52·35 ...	...	...	...	88·28	40·61	790·25	662·10	...
Ravelstone ... ..	...	Voided leases and sundry claims	...	...	...	...	...	...	...	...	...	...	...	...
Wilgeena ... ..	...	do. do. do.	...	...	...	...	...	...	...	...	...	...	...	...
Wilthorpe ... ..	...	do. do. do.	...	...	...	...	...	...	...	...	...	...	...	...
Yowereena ... ..	...	do. do. do.	...	...	...	...	...	...	...	...	...	...	...	...
	From Goldfield generally :— Sundry parcels treated at : State Battery, Peak Hill Smith's Cyanide Plant Various Works Reported by Banks and Gold Dealers ... ..		...	...	...	*263·24 *356·45...	...	...	...	...	...	...	...	...
		Totals	105·70	49·92	5,518·50	2,380·33	...	...	2,660·15	443·21	...	286,554·75	2,311·33	...

East Murchison Goldfield.

LAWLERS DISTRICT.

Bronzewing	...	...	Voided leases and sundry claims	...	...	...	...	...	...	...	476.00	326.09	1.94
Cork Tree	...	...	do. do. do.	...	...	...	...	...	...	55.40	3,780.00	3,302.19	...
Kathleen Valley	1330	...	Beth-Heno	...	...	68.00	83.01	...	...	...	68.00	83.01	...
	1332	...	Mossbecker	...	...	280.00	47.76	...	...	...	280.00	47.76	...
	1331	...	Mt. Pascoe South	...	...	31.50	9.47	...	...	...	31.50	9.47	...
	1321	...	Yellow Aster	...	...	209.00	90.01	...	...	...	209.00	90.01	...
		...	Voided leases and sundry claims	...	...	649.00	339.96	...	14.37	670.88	81,463.25	49,704.05	...
Lawlers	1236, 1240, etc.	...	Emu G.Ms. Ltd.	...	...	48,542.00	12,648.54	164.00	...	...	106,624.00	26,877.41	164.00
	1236-49-40	...	Prior to transfer to present holders	...	...	...	...	...	13.02	...	168.50	*1,216.93	...
	1323	...	Mate's Lease	...	...	91.00	40.11	...	...	...	91.00	40.11	...
	1317	...	Tallon Doon	...	...	33.00	56.13	...	...	...	169.00	97.98	...
		...	Voided leases and sundry claims	11.86	6.16	439.50	222.74	...	395.85	1,071.70	1,298,227.70	499,154.18	14,619.27
Sir Samuel	1238	...	Vanguard	...	...	2,390.00	305.51	...	...	...	4,217.00	974.88	...
	1314	...	Westralia	...	...	223.50	68.13	...	...	...	370.50	85.40	...
		...	Voided leases and sundry claims	...	...	408.00	141.35	...	50.42	423.99	274,465.80	143,944.79	10,225.58
		...	<i>From District generally :-</i>										
		...	Sundry parcels treated at:										
		...	State Battery, Sir Samuel	...	...	10.00	*53.26	...	...	...	53.50	*2,209.16	...
		...	King's Cyanide Plant	...	...	...	*62.63	...	...	...	...	*62.63	...
		...	McPherson's Cyanide Plant	...	...	12.00	*389.50	...	2.12	...	12.03	*3,895.46	...
		...	Dower and Maund's Cyanide Plant	...	...	...	*320.81	...	...	...	...	*558.76	...
		...	Westralia T.T. Plant	...	...	...	...	...	...	...	...	*3.43	...
		...	Vanguard Cyanide Plant	...	...	...	*243.18	...	...	...	...	*243.18	...
		...	Various Works	...	...	...	...	...	...	...	1,699.50	*25,141.69	936.09
		...	Reported by Banks and Gold Dealers	37.07	...	...	...	...	6,312.62	100.17	...	9.84	...
		...	Totals	48.93	6.16	53,386.50	15,122.10	164.00	6,788.40	2,322.14	1,772,406.33	758,078.41	25,946.88

WILUNA DISTRICT.

Coles	628J	...	Blackadder	...	...	104.00	126.37	...	...	...	928.50	399.25	...
	639J	...	Pay Day	...	...	84.00	13.07	...	...	...	84.00	13.07	...
	(637J)	...	Pay Day	...	...	99.75	18.59	...	...	...	162.50	34.75	...
		...	Voided leases and sundry claims	...	...	223.00	71.70	...	...	...	3,734.00	1,410.51	...
Collavilla	...	...	do. do. do.	...	...	...	...	...	...	...	1,548.00	517.75	...
Corboys	359J	...	Corboys Reward North	...	...	198.00	53.99	...	...	...	1,903.75	1,259.40	...
	659J	...	Ida	...	...	80.00	30.68	...	...	...	80.00	30.68	...
	435J	...	Old Toscana	...	...	82.00	135.20	...	...	...	585.00	456.39	...
	627J	...	Vinaurum	...	...	758.00	483.78	...	...	...	1,510.00	1,515.14	...
	433J, 434J	...	Waratah G.Ms. Ltd., N.L.	...	...	50.00	53.92	...	...	...	359.00	587.92	...
	433J, 434J	...	Prior to transfer to present holders	...	...	...	...	...	...	...	308.00	233.62	...
		...	Voided leases and sundry claims	...	...	335.50	142.31	...	17.36	1.25	9,705.85	7,347.66	5.00
Gum Creek	...	...	do. do. do.	...	...	...	...	...	20.75	1.36	1,759.25	716.62	...
Mt. Eureka	...	...	do. do. do.	...	...	...	...	...	...	...	926.00	644.92	...
Mt. Keith	463J, 545J	...	(Coolgardie Brilliant, N.L.)	...	...	480.00	289.20	...	...	...	2,607.00	725.12	...
	463J, 545J	...	Prior to transfer to present holders	...	...	...	...	...	...	6.35	4,841.75	1,929.04	...
		...	Voided leases and sundry claims	...	...	414.50	146.71	...	4.81	202.29	12,706.00	10,011.90	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued

EAST MURCHISON GOLDFIELD—continued.

WILUNA DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
New England ...	587J ...	Bill's Find ...	3·45	...	111·00	56·58	...	5·74	38·16	385·25	296·86	...
	(636J) ...	Federal ...	...	...	30·00	15·75	...	...	...	288·00	114·12	...
	638J ...	Longshoot ...	...	...	777·00	223·24	...	...	...	777·00	223·24	...
		Voided leases and sundry claims	...	...	772·50	303·48	...	...	63·32	7,472·75	5,015·70	...
Wiluna ...	631J ...	Brilliant Reduced ...	...	...	474·50	66·78	...	...	...	927·25	155·56	...
	552J ...	Florence No. 3 ...	...	...	3,663·75	1,316·54	...	...	...	6,657·00	2,005·41	...
	607J ...	Linden (W.A.) Gold, N.L. ...	...	...	7,541·00	1,866·94	...	...	...	16,340·00	4,578·87	...
	607J ...	Prior to transfer to present holder	...	...	...	...	...	...	...	1,156·75	655·83	...
	10J, 37J, 91J, etc.	Moonlight Wiluna G.Ms., Ltd. ...	...	...	95,804·61	26,816·23	...	...	...	326,944·69	90,316·59	...
	10J, etc.	Prior to transfer to present holders	...	...	...	...	...	...	...	36,975·50	14,174·75	...
	630J ...	North Brilliant Reduced ...	...	...	1,040·00	349·16	...	...	...	2,046·25	533·03	...
	625J ...	Palmer's Puzzle ...	...	...	124·25	45·53	...	...	...	637·75	185·40	...
	6J, etc.	Wiluna Gold Mines, Ltd. ...	...	...	581,245·00	90,169·40	1,213·99	...	...	4,285,821·00	930,789·80	1,213·99
	6J, etc.	Prior to transfer to present holders	...	...	...	...	...	...	...	341,730·57	133,457·92	89·32
		Voided leases and sundry claims	...	2·96	448·65	137·74	...	105·39	790·55	159,957·55	88,386·53	124·33
		<i>From District generally :—</i>										
		Sundry parcels treated at :										
	State Battery, Wiluna ...					*438·63	...	...	592·00	*21,403·60	218·70	
	Toscana Cyanide Plant ...					*30·90	...	...	...	*1,947·36	...	
	Various Works ...					...	...	...	...	*1,237·68	12·68	
	Reported by Banks and Gold Dealers ...					...	...	...	...	2·53	...	
	Totals ...		3·45	12·70	694,941·01	123,403·26	1,213·99	193·98	1,157·09	5,232,457·91	1,323,314·52	1,664·02

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BLACK RANGE DISTRICT.

Barrambie ...	972B, 976B ...	Scheelite leases	29·00	36·39	238·00	301·80	...
	972B ...	(Scheelite) ...	...	...	...	...	...	...	...	105·50	108·88	...
	976B ...	(Scheelite North) ...	...	...	...	...	...	...	...	92·75	92·83	...
		Voided leases and sundry claims	...	1·54	10·34	46·25	59·70	...	5·07	190·59	18,102·22	17,072·76	125·60
Bellchambers ...	1051B ...	Bellchambers ...	...	...	832·75	353·80	...	...	...	1,260·25	687·91	...
	1068B ...	Lucky Mine ...	...	...	276·00	22·40	...	...	...	276·00	22·40	...
		Voided leases and sundry claims	...	...	26·50	14·77	...	...	111·80	612·52	737·10	...
Birrigrin ...		do. do. do.	...	...	...	...	...	996·08	14,530·48	16,324·31	...	

Curran's Find	...	...	Voided leases and sundry claims	...	...	24.00	5.05	...	18.24	252.27	9,331.00	3,930.88	...
Erroll's	...	...	do. do. do.	...	...	...	...	...	20.70	551.40	15,135.25	9,924.37	...
Hancock's	1050B	...	Duke of Windsor	...	...	160.00	134.45	...	...	...	302.00	190.64	...
	1070B	...	Hill View	...	...	58.50	76.39	...	...	...	58.50	76.39	...
		...	Voided leases and sundry claims	...	1.64	438.25	96.56	...	4.21	6,652.56	39,208.00	35,824.42	55.72	
Maninga Marley	...	...	do. do. do.	...	...	223.50	51.83	...	...	353.36	63,884.88	50,245.28	22.55
Montagu	967B, 998B	...	North End leases	...	...	4,428.00	642.67	...	...	...	24,985.45	3,777.84	...
		...	Voided leases and sundry claims	...	...	...	...	...	...	171.26	44,363.25	19,942.39	...
Nungarra	1072B	...	Wirraminna	...	...	143.75	16.56	...	...	...	143.75	16.56	...
		...	Voided leases and sundry claims	...	...	601.50	81.27	...	76.21	2,410.40	17,118.90	7,806.28	...
Sandstone	1064B	...	Goldstone Mining Co., Ltd.	...	...	740.75	73.61	...	...	...	740.75	73.61	...
	1064B	...	Prior to transfer to present holders	...	...	...	...	...	...	...	463.00	64.34	...
	959B, 1017B, etc.	...	Atlas Gold Mines, Ltd.	...	...	197.00	49.45	...	...	...	197.00	49.45	...
	959B, 1017B	...	Prior to transfer to present holders	...	...	...	...	...	...	136.06	553.75	688.26	...
	958B	...	Lady Mary	...	...	...	...	...	...	...	3,979.25	3,681.92	...
	1069B	...	Sonny Boy	...	...	9.50	2.91	...	...	...	9.50	2.91	...
		...	Voided leases and sundry claims	...	...	351.00	41.50	...	45.92	5,000.53	704,830.47	450,097.04	11,754.22
Youanme	1046B	...	Camberra	...	...	444.50	97.54	...	...	...	812.50	207.47	...
	960B, etc.	...	Youanmi G.Ms., Ltd.	...	...	77,220.72	20,696.18	817.70	...	...	208,209.80	53,667.26	2,947.20
	960B	...	(Youanme)	...	...	...	...	...	...	...	38.50	3.91	...
		...	Voided leases and sundry claims	...	...	31.50	14.36	...	1.43	145.71	364,802.58	178,485.81	4,608.55
<i>From District generally :-</i>														
Sundry parcels treated at:														
			North End Cyanide Plant	...	...	...	*628.03	...	...	...	...	*4,004.85	...
			Parkinson's Cyanide Plant	...	...	...	*119.86	...	...	...	...	*173.13	...
			State Battery, Sandstone	...	...	...	*28.63	...	...	...	256.00	*20,403.85	59.53
			State Battery, Youanme	...	...	...	...	...	...	...	40.00	*5,106.99	...
			Various Works	...	...	...	...	...	...	...	37.00	*6,325.89	...
			Reported by Banks and Gold Dealers	...	2.86	...	...	...	1,438.37	50.84	...	20.38	...
Totals				...	4.40	11.98	86,282.97	23,343.91	817.70	1,610.15	17,022.86	1,534,718.80	890,140.11	19,573.37

Murchison Goldfield.

CUE DISTRICT.

Big Bell	2050, etc.	...	Big Bell Mines. Ltd.	...	...	447,322.00	59,727.07	19,074.78	...	...	933,753.00	140,404.57	49,061.34
	2050	...	(Little Bell)	...	...	...	...	...	...	4.49	579.75	60.95	...
	2203	...	Paraliser	...	...	118.75	105.04	...	...	...	118.75	105.04	...
		...	Sundry claims	...	...	52.75	34.32	...	...	6.32	83.25	64.63	...
Cuddingwarra	2182	...	Desert Gold	...	...	8.25	9.01	...	...	...	97.50	53.35	...
	(2199)	...	Never Can Tell	...	6.43	132.00	29.57	...	...	6.43	176.25	34.59	...
	(2090)	...	Shaughran	...	...	47.25	11.70	...	...	1.50	559.00	128.28	...
		...	Voided leases and sundry claims	...	...	263.30	101.92	...	19.56	469.17	108,393.00	60,383.76	109.71
Cue	2186	...	Desert Flower	...	...	68.75	24.91	...	...	...	68.75	24.91	...
	2208	...	Dunedin	...	...	20.50	10.31	...	...	...	20.50	10.31	...
	2211	...	Treasure	...	9.69	88.50	22.99	...	...	9.69	88.50	22.99	...
	2084	...	Trovato di Pietro	...	...	85.00	43.17	...	...	1.77	1,937.25	1,108.87	...
		...	Voided leases and sundry claims	...	5.57	73.82	863.00	329.43	226.70	1,405.81	320,750.38	235,682.18	66.63

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

MURCHISON GOLDFIELD—continued.

CUE DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Eelya ... ..	...	Voided leases and sundry claims	...	...	156·50	53·07	...	...	110·64	1,902·90	2,547·41	...
Mindoolah ...	2212	Two Reef ... ..	...	2·54	535·50	176·61	...	...	2·54	535·50	176·61	...
		Voided leases and sundry claims	...	...	178·75	111·81	...	3·07	29·30	10,815·60	6,926·84	42·97
Reedy	2092	Culeulli North	1·46	...	258·00	139·50	...	1·46	...	1,006·75	1,247·45	...
	(2185)	Snake Gully ... ..	...	...	156·00	53·95	...	...	...	156·00	53·95	...
	1977, etc. ...	Triton Gold Mines, Ltd. ... ..	...	...	107,201·00	33,776·25	3,013·34	...	...	390,531·00	128,173·31	11,783·79
	1977, etc. ...	Prior to transfer to present holders	...	...	...	...	...	...	...	14,492·50	7,073·36	5·00
		Voided leases and sundry claims	...	...	186·50	41·88	...	169·59	305·26	8,660·73	10,520·05	...
Tuckabianna ...	2130	Garibaldi ... ..	...	24·30	47·00	10·34	...	...	44·36	183·88	514·23	...
		Voided leases and sundry claims	...	175·15	88·75	33·85	...	24·06	596·57	14,480·35	7,982·88	...
Tuckanarra ...	2079	Batchelor	2·88	7·91	37·00	19·36	...	2·88	58·49	418·50	353·08	...
	2200	Blue Peter ... ..	...	275·21	86·00	215·77	...	...	275·21	86·00	215·77	...
		Voided leases and sundry claims	...	1·52	478·50	95·12	...	129·88	3,832·27	28,306·13	31,910·22	172·77
Weld Range ...	2183	Joy Long ... ..	...	...	210·50	39·24	...	...	...	334·50	151·53	...
		Voided leases and sundry claims	...	...	...	...	...	...	27·54	1,694·25	1,236·95	...
		<i>From District generally :—</i>										
		Sundry parcels treated at :										
		Barker-Edmund's Cyanide Plant	...	...	...	...	...	...	...	...	*4·81	...
		State Battery, Cue	...	...	...	*395·85	...	...	...	12·75	*14,688·48	91·93
		State Battery, Tuckanarra	...	...	...	*70·86	...	...	...	518·50	*5,384·63	...
		Various Works	...	...	...	...	...	...	...	6,925·52	*29,371·15	1,147·77
		Reported by Banks and Gold Dealers	215·46	...	...	...	...	2,979·58	90·73	...	18·82	...
		Totals	225·37	576·57	558,690·05	95,682·90	22,088·12	3,556·78	7,278·09	1,847,687·24	686,635·96	62,481·91

MEEKATHARRA DISTRICT.

Abbott's ...	1804N	Blue Horse ... ..	...	...	221·25	122·11	...	...	...	538·00	331·65	...
	1726N	Murchison King ... ..	...	...	22·50	65·47	...	...	...	373·25	867·44	...
		Voided leases and sundry claims	...	...	242·25	100·93	...	...	31·74	39,093·37	39,606·13	...
Burnakura ...	1846N	Empire ... ..	...	...	261·00	45·77	...	...	8·16	261·00	45·77	...
	1849N	New Alliance ... ..	...	...	26·00	7·47	...	...	...	26·00	7·47	...
		Voided leases and sundry claims	4·52	13·32	231·00	96·94	...	17·03	3,333·86	39,860·75	31,275·43	26·90

Chesterfield	...	do.	do.	do.	...	...	...	...	29.02	461.95	7,697.06	8,174.13	80
Gabarintha	(1845N) ...	Lucky Zac	...	...	...	...	18.00	24.98	11.79	...	18.00	24.98	...
	1844N ...	Mab	...	...	...	...	309.50	76.42	...	...	309.50	76.42	...
	1725N ...	New Brew	...	...	...	...	112.00	146.36	...	...	592.75	747.25	...
		Voided leases and sundry claims	...	...	...	...	92.25	74.60	16.78	176.54	25,731.00	15,521.07	815.57
Garden Gully	1719N ...	Sabbath	...	...	...	...	73.50	39.06	...	...	351.50	381.87	...
		Voided leases and sundry claims	...	2.13	...	...	466.50	109.45	26.36	82.42	32,568.26	23,073.05	1,102.59
Gum Creek	...	do.	do.	do.	4.37	...	18.75	4.68	29.64	176.82	4,582.83	4,435.27	...
Holden's	1551N ...	New Waterloo	...	...	...	...	...	*243.52	...	.99	1,468.00	888.29	...
		Voided leases and sundry claims	...	...	...	...	...	...	164.95	67.07	17,018.15	6,680.75	...
Jillawarra	...	do.	do.	do.	...	...	...	...	173.02	1,284.72	1,803.30	3,033.76	...
Meeka Pools	...	do.	do.	do.	...	...	...	...	...	2.84	345.15	287.65	...
Meekatharra	1855N ...	Commodore	...	...	...	...	47.75	25.94	...	...	47.75	25.94	...
	(1735N) ...	Halcyon Extended	...	...	...	...	256.00	45.21	...	108.38	1,423.50	239.13	...
	1466N ...	Haveluck	...	...	...	...	152.75	80.65	...	...	2,209.55	1,759.18	...
	1559N ...	Ingliston	...	...	...	...	363.00	149.77	...	25.32	1,138.30	863.71	...
	1542N, etc.	Ingliston Alberts leases	...	...	...	...	914.25	206.49	...	...	2,976.95	1,278.17	...
	475N, etc.	Ingliston Consols Extended leases	...	...	...	...	17,107.00	3,035.27	...	...	872,091.22	355,760.55	...
	475N, 477N	Prior to transfer to present holders	...	...	...	...	...	...	...	...	323,853.94	277,527.17	30
	1539N, 1606N	Ingliston South Gold Development, N.L.	...	...	...	...	312.50	618.91	...	...	433.00	899.92	...
	1539N ...	Prior to transfer to present holders	...	...	...	...	...	...	...	...	16,274.61	12,815.17	...
	1811N ...	Kelly's Luck	...	...	3.00	...	...	...	...	3.00	363.25	94.49	...
	533N ...	Marmont	...	...	...	...	535.50	358.58	...	51.03	57,672.95	41,702.06	...
	580N ...	Marmont Extended	...	...	...	...	71.50	55.25	...	...	1,547.45	1,481.74	...
	580N, (888N) ...	Marmont Extended leases	...	...	...	...	...	...	...	...	152.00	129.61	...
	1576N, 1547N	Meekatharra Central Gold, N.L.	...	...	...	...	839.50	572.13	...	5.29	3,995.00	1,933.86	...
	1576N, 1547N	(Lady Central leases)	...	...	...	...	...	...	...	11.06	2,951.42	5,198.33	...
	1552N, 1565N, etc.	Mines Selection of W.A., Ltd.	...	...	1.81	...	1,005.75	244.94	...	235.54	4,502.26	1,922.69	...
	1552N, 1565N, etc.	Prior to transfer to present holders	...	...	...	...	...	...	...	6.24	2,316.15	1,342.83	...
	1577N ...	Mopoke	...	...	...	...	310.50	46.45	...	...	934.25	204.47	...
	1603N ...	Patricia	...	...	2.64	...	37.50	3.97	...	43.39	191.37	89.20	...
	1800N ...	Peter Pan	...	...	...	...	109.75	14.26	...	...	828.25	78.44	...
	1571N ...	Phar Lap	...	...	...	...	624.75	542.04	...	...	3,944.75	2,572.48	...
	1529N, etc.	Prohibition G.M. Co., N.L.	...	...	...	...	2,190.50	461.02	...	...	8,169.25	1,577.45	...
	1529N ...	(Prohibition)	...	...	...	...	...	...	...	...	29,422.00	4,971.30	...
		Voided leases and sundry claims	...	...	...	...	456.25	124.33	233.59	1,449.89	380,666.74	205,355.76	2,454.74
Mistletoe	...	do.	do.	do.	...	...	...	...	123.29	1,072.09	436.75	488.24	...
Mt. Maitland	...	do.	do.	do.	...	...	9.25	3.76	...	...	436.75	305.48	...
Munara Gully	...	do.	do.	do.	...	...	201.25	93.94	...	33.47	14,127.50	6,859.16	...
Nannine	1564N, 1700N, 1564N, 1700N ...	Aladdin G.Ms., Ltd.	...	...	...	...	...	*378.43	...	...	15,901.50	2,320.63	...
	1580N ...	Prior to transfer to present holders	...	...	...	...	...	...	...	...	3,925.15	510.32	...
		Caledonian	...	...	...	...	...	...	...	...	299.10	199.38	...
		Voided leases and sundry claims	...	14.06	63.43	...	150.50	74.65	152.27	1,744.38	99,038.85	73,918.21	167.45
Quinn's	(1634N, etc.) ...	Quinn's G.Ms., Ltd.	...	...	...	...	...	21.66	...	...	503.00	103.06	...
	(1634N, etc.) ...	Commonwealth leases	...	...	...	...	...	...	...	...	8,189.00	2,507.36	...
		Voided leases and sundry claims	...	...	1.18	...	28.25	11.62	22.37	2,476.15	28,441.33	13,495.19	90.70

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

MURCHISON GOLDFIELD—continued.

MEEKATHARRA DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Ruby Well ...	...	Voided leases and sundry claims	...	...	29·00	15·40	...	1,015·87	452·85	7,957·25	4,671·29	...
Stake Well ...	...	do. do. do.	...	...	64·25	19·64	...	31·91	234·85	22,321·35	10,136·51	...
Star of the East ...	...	do. do. do.	...	...	...	...	...	...	...	27,371·62	20,400·37	...
Yaloginda ...	1853N ...	Bluebird ...	...	...	1,040·00	119·35	...	...	...	1,040·00	119·35	...
	1851N ...	Edenhope ...	...	127·77	168·75	177·34	...	...	127·77	168·75	177·34	...
	1807N ...	Rocklee ...	...	...	61·75	26·23	...	...	3·50	224·75	102·08	...
		Voided leases and sundry claims	...	23·29	1,145·00	274·10	...	80·92	2,418·10	35,835·71	18,222·05	8·68
		<i>From District generally:—</i>										
		Sundry parcels treated at:										
		State Battery, Meekatharra ...	...	...	...	*921·77	...	...	...	68·50	*19,476·78	19·00
		Butler's Cyanide Plant ...	...	...	...	*20·50	...	...	...	...	*20·50	...
		Gabanintha Gold Recovery Works ...	...	...	...	*17·50	...	...	...	...	*36·63	...
		Various Works ...	...	...	...	...	...	...	...	172·75	*6,297·35	342·17
		Reported by Banks and Gold Dealers ...	...	227·03	1·96	...	68	11,643·77	134·22	...	12·81	...
		Totals ...	...	249·98	240·87	30,327·25	9,919·54	13,772·58	16,263·63	2,157,203·39	1,235,712·12	5,028·90

DAY DAWN DISTRICT.

Day Dawn ...	(640-1D, 648D)	Crete D'or leases ...	...	...	292·00	168·98	...	...	58·68	918·25	1,159·42	...
	(640D)	New Ballarat ...	...	...	...	...	...	...	...	149·50	76·47	...
	647D ...	Klondike ...	...	...	106·00	116·16	...	...	86·96	732·50	658·50	...
	639D ...	Lone Hand ...	...	7·06	609·75	582·04	...	...	7·06	1,510·50	1,726·15	...
	573D ...	Mountain View ...	...	...	105·75	27·18	...	...	94·05	1,571·03	1,493·36	...
	576D ...	New Fingall ...	...	...	502·75	173·19	...	6·12	6·84	1,790·75	801·35	...
		Voided leases and sundry claims	11·27	22·98	688·00	324·99	...	218·01	1,044·54	1,926,815·04	1,225,505·53	169,210·44
Lake Austin ...	649D ...	New Golconda Mines, N.L. ...	...	...	140·00	38·91	...	...	...	500·00	163·91	...
		Voided leases and sundry claims	...	138·83	40·00	28·33	...	660·99	3,962·69	38,874·79	51,639·28	...
Mainland ...	...	Voided leases and sundry claims	7·18	24·90	14·25	89·35	...	16·87	4,039·61	8,517·32	25,645·30	...
Pinnacles ...	(642D)	Baby Mine ...	...	...	55·25	62·96	...	...	...	125·75	120·10	...
		Voided leases and sundry claims	43·03	90	191·50	66·16	...	47·93	1,659·52	21,069·07	11,062·21	...

<i>From District generally:—</i>													
Sundry parcels treated at:													
Heine's Cyanide Plant	...	...	...	*186·39	...	...	...	...	*186·39
Various Works	...	...	...	...	...	...	16·61	940·75	1,741·97
Reported by Banks and Gold Dealers	...	...	...	...	...	1,927·86	33·02	...	...		
Totals	109·32	194·67	2,745·25	1,864·64	...	2,877·78	11,009·58	2,003,515·25	1,321,980·71	169,210·44

MOUNT MAGNET DISTRICT.

Jimbulyer	...	1365M	...	Pantomine	...	...	...	2·32	53·25	51·79	...	...	2·32	150·75	112·39	...
				Voided leases and sundry claims	...	16·71	65·78	313·75	188·53	...	...	18·45	107·26	662·50	492·71	...
Lennonville	...	1308M	...	Empress	...	...	...	...	*24·01	...	...	...	...	285·00	119·10	...
		1379M	...	Galtee Moore	...	...	...	...	952·00	235·31	...	...	...	952·00	235·31	...
		1378M	...	Gambier Lass	...	...	5·85	75·00	32·44	...	...	...	5·85	75·00	32·44	...
		(1362M)	...	Gambier Lass	...	...	...	...	...	...	...	...	...	76·50	62·99	...
		1396M	...	Lady Audrey	...	...	...	108·50	67·73	...	...	...	...	108·50	67·73	...
		1374M	...	Souvenir	...	...	...	30·75	68·62	...	...	...	...	46·75	101·79	...
		(1370M)	...	St. Mary	...	...	...	143·00	112·10	...	...	...	...	143·00	112·10	...
				Voided leases and sundry claims	...	...	...	1,879·50	240·80	...	...	19·14	3,318·40	155,659·57	129,713·46	458·82
Mt. Magnet	...	1273M	...	Abbott's	...	...	...	...	...	...	...	1·43	...	1,599·50	154·48	...
		1275M	...	Cascade	...	...	...	17·75	2·31	...	...	...	...	122·25	24·23	...
		1382M	...	Corona	...	...	...	589·00	286·48	...	...	...	...	589·00	286·48	...
		1394M	...	Eclipse	...	...	6·53	...	...	...	...	...	6·53	...	...	...
		1255M, 1367M	...	Edward Carson leases	...	...	...	3,727·00	1,978·11	...	...	...	...	10,685·50	9,091·95	...
		1367M	...	Edward Carson West	...	...	...	44·75	16·33	...	...	...	...	127·25	35·91	...
		1286M	...	Evening Star	...	...	...	132·75	47·11	...	...	...	36·37	581·32	867·13	...
		1332M	...	Fine Cut	...	...	...	44·00	67·78	...	...	...	...	164·75	204·11	...
		1383M	...	Hall Mark	...	...	9·84	22·50	11·17	...	...	...	9·84	22·50	11·17	...
		(1366M)	...	Hall Mark	...	...	...	17·50	9·35	...	...	...	...	377·50	51·41	...
		1287M	...	Havelock	...	...	2·47	674·75	133·01	...	...	...	...	11·05	1,872·50	438·59
		1320M	...	Hesperus Dawn	...	...	...	...	...	...	...	...	56·49	47·00	55·62	...
		1395M	...	Hidden Treasure	...	...	...	66·50	88·78	...	...	...	...	66·50	88·78	...
		1353M	...	Hill Crest	...	...	...	...	...	...	...	...	...	161·50	23·77	...
		1282M, 1356M	...	Hill 50 G.M., N.L.	...	...	...	24,763·90	7,911·58	3·62	...	...	...	77,406·90	21,440·38	10·93
		1361M	...	Jupiter	...	...	...	33·00	6·93	...	...	...	...	148·25	60·62	...
		(1375M)	...	Last Chance	...	...	...	19·00	90·58	...	...	...	...	19·00	90·58	...
		1377M	...	Little Friend	...	...	30·09	22·75	46·31	...	...	...	30·09	22·75	46·31	...
		1339M	...	Mars	...	...	...	457·00	55·85	...	...	...	...	1,229·50	205·88	...
		1334M, 1256M, 1349M	...	Metropolitan Mining and Development Co., Ltd.	...	...	...	2,467·50	1,598·36	...	...	...	...	2,890·85	2,304·41	...
		1334M, 1256M	...	Prior to transfer to present holders	...	...	...	...	...	...	...	...	...	2·12	988·30	974·23
		1381M	...	Mortomoro	...	...	26·86	69·25	46·71	...	...	...	26·86	69·25	46·71	...
		1215M, 1254M, etc.	...	Mt. Magnet Gold Mines, Ltd.	...	...	...	60,019·00	7,091·37	87·91	...	...	...	286,593·00	42,550·21	87·91
		1215M, 1254M	...	Prior to transfer to present holders	...	...	...	...	...	...	...	...	...	45·00	25,715·03	12,176·93
		1246M	...	Neptune	...	...	116·19	1,664·00	700·20	...	...	...	829·41	2,638·65	1,990·48	...
		1281M	...	Saturn	...	...	...	6,084·00	1,180·46	...	...	...	...	1·92	8,293·00	1,696·96
		1392M	...	Sovereign	...	...	...	...	...	...	...	...	...	41·35	...	...
		1251M	...	Swan Bitter G.M. Co., N.L.	...	...	...	15·25	2,964·00	1,076·58	...	...	...	15·25	2,964·00	1,076·58
		1251M	...	Prior to transfer to present holders	...	...	...	2·43	3,752·00	1,368·10	...	...	...	320·12	6,081·25	3,180·61
		1322M, (1368M)	...	Three Boys leases	...	...	63·65	35·00	46·25	...	...	...	...	154·26	212·28	425·86
		1388M	...	Top-not	...	...	...	44·00	53·36	...	...	...	...	44·00	53·36	...
		1357M	...	Wind Bag	...	...	...	370·75	308·81	...	...	...	...	784·00	656·57	...
				Voided leases and sundry claims	...	1·04	185·31	1,263·25	489·86	...	...	148·39	10,755·19	432,292·20	244,643·57	714·36
Mt. Magnet East	...			do. do. do.	...	...	...	...	...	...	...	63·29	801·75	5,940·53	3,240·04	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

MURCHISON GOLDFIELD—continued.

MOUNT MAGNET DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Moyagee ...	1355M ...	Moyagee ... Voided leases and sundry claims	...	...	1,188·50	2,366·67	226·24	...	...	1,857·50	3,328·92	226·24
			...	...	...	...	...	2·83	135·00	6,540·10	9,185·43	...
Paynesville ...	(1245M) ...	Milgoo Mine ... Voided leases and sundry claims	...	...	...	*5·33	...	...	...	220·50	527·07	...
			...	...	...	...	...	3·36	2,138·17	1,098·84	1,941·85	...
Winjangoo ...	(1371M) ...	Make Sure ... Voided leases and sundry claims	...	3·47 40·14	...	...	...	...	100·40 314·80	9·00 87·75	49·22 37·67	...
			...	...	6·25	3·37	...	·99	...	...	...	...
		<i>From District generally:—</i>										
		Sundry parcels treated at:										
		State Battery, Boogardie ...	...	...	32·75	*1,645·58	...	...	...	125·26	*28,164·39	...
		Welcome Cyanide Plant ...	...	...	...	*364·39	...	...	...	...	*438·58	...
		Various Works ...	...	...	...	...	...	...	...	43·06	*17,427·01	1·00
		Reported by Banks and Gold Dealers ...	45·52	13·67	...	...	...	2,035·08	60·95	...	12·38	...
		Totals ...	63·27	633·12	114,148·15	30,118·41	317·77	2,292·96	19,331·12	1,038,891·39	540,356·46	1,499·26

Yalgoo Goldfield.

Bilberatha ...	1139 ...	Blaney's Gold Mine ...	...	...	506·50	455·76	...	...	...	843·00	733·30	...
	1167 ...	Picata Joker ... Voided leases and sundry claims	...	...	207·00	76·67	...	...	...	207·00	76·67	...
			...	...	133·50	35·44	...	...	6·64	3,448·05	1,609·90	...
Carlaminda ...	1095 ...	Reliance ... Voided leases and sundry claims	...	3·39	79·50	20·85	...	1·28	3·39	921·75	298·62	...
			...	...	89·50	44·05	...	...	...	2,284·82	1,116·31	3·30
Field's Find ...	907 ...	Brown's Reward ...	...	...	...	...	...	...	...	4,840·55	3,876·07	...
	1119 ...	Field's Find Central West ...	...	...	...	...	...	...	...	65·50	8·20	...
	1116 ...	Field's Find No. 2 South ...	...	...	...	...	...	...	...	160·50	20·77	...
	1115 ...	Rose Marie ... Voided leases and sundry claims	...	...	413·50	234·67	...	...	...	1,548·00	692·38	...
			...	...	287·50	25·69	...	5·77	392·79	43,182·55	28,921·68	...
Goodingnow ...	1144 ...	Adeline ...	...	...	42·50	17·07	...	...	...	42·50	17·07	...
	1063 ...	Ark ...	...	...	46·25	16·26	...	...	...	378·25	177·79	...
	1102 ...	Astor ...	...	...	1,024·75	509·27	...	...	...	2,314·75	1,335·23	...
	1025 ...	Carnation ...	...	...	2,720·50	1,316·77	...	...	...	10,253·55	8,048·10	...
	1049 ...	Lake View ...	...	...	...	...	...	...	...	3,260·00	1,633·09	...
	1121 ...	Lake View West ...	...	...	...	...	...	...	...	32·50	4·62	...

	1169	Marraposa ... ..	...	...	128.50	89.58	...	...	...	128.50	89.58	...
	1090	Orchid ... ..	...	...	1,609.00	749.31	...	...	...	7,658.50	4,244.57	...
	1145	Oversight ... ..	...	...	186.75	79.80	...	...	...	186.75	79.80	...
	1085	Sweet William ... ..	...	...	157.50	32.51	...	...	2.97	695.00	230.43	...
		Voided leases and sundry claims	...	...	496.25	137.13	...	299.23	441.70	41,881.56	43,248.06	...
Gullewa	(1123)	Golden Stream ... ..	...	...	27.00	8.68	...	...	...	335.50	99.20	...
	1096, etc. ...	King Solomon's Mines, Ltd. ... ..	...	...	413.00	314.57	26.49	...	...	4,480.10	1,938.24	26.49
	1047	Mugga King ... ..	...	...	1,776.00	527.19	10.27	...	...	5,839.50	1,789.08	12.62
	1065	Shenandoah ... ..	...	10.51	241.00	23.68	...	...	10.51	1,830.00	613.49	...
		Voided leases and sundry claims	...	...	75.50	16.38	...	...	171.23	27,318.25	17,021.91	...
Kirkalucka		do. do. do.	...	...	...	...	...	...	4.14	307.30	167.23	...
Messenger's Patch	1010, 1011 ...	Gnow's Nest leases ... ..	...	...	60.00	170.49	...	...	13.89	1,923.75	1,891.29	...
		Voided leases and sundry claims	...	...	8.00	.96	...	463.12	655.78	38,375.61	26,830.38	1,083.01
Mt. Farmer		do. do. do.	...	...	23.75	8.76	...	...	...	457.50	169.53	...
Mt. Gibson		Voided leases and sundry claims	...	18.10	80.25	30.03	...	...	51.16	1,367.10	1,233.58	...
Ninghan		do. do. do.	...	...	...	...	...	...	...	334.75	124.69	...
Noongal	1137	City of Melbourne ... ..	...	...	374.00	187.92	...	...	...	1,294.50	687.47	...
	1138	Continental ... ..	...	...	...	...	...	...	...	209.00	462.35	...
	1136	East Victory ... ..	...	...	42.50	17.25	...	...	...	254.00	165.54	...
	1168	Noongal ... ..	...	...	200.00	92.70	...	...	...	200.00	92.70	...
	953	Revival ... ..	...	...	211.50	42.00	...	...	...	2,693.25	1,171.45	...
		Voided leases and sundry claims	...	...	867.00	229.70	...	42.43	335.19	11,631.05	5,442.95	...
Nyounda		do. do. do.	...	17.21	79.50	38.32	...	...	239.12	889.50	318.83	...
Pinyalling	1165	Mayfair ... ..	...	17.20	3.00	4.37	...	...	17.20	3.00	4.37	...
	(1143)	Trump ... ..	...	8.66	...	...	...	...	75.24	11.75	53.10	...
		Voided leases and sundry claims	...	68.08	35.00	15.65	...	...	127.27	3,224.10	1,361.09	...
Retaliation	1046	Alma May ... ..	...	...	200.50	37.76	...	...	...	1,108.25	481.85	...
	1023	Atlas G.Ms., Ltd. ... ..	...	...	...	...	...	...	...	2,176.25	527.60	...
	1023	(Hayes Reward) ... ..	...	...	...	...	...	...	...	117.50	52.30	...
		Voided leases and sundry claims	...	...	...	...	...	...	...	1,652.00	829.54	...
Rothsay	1013, 1014, etc.	Rothsay Gold Mines, N.L. ... ..	...	...	7,893.00	1,604.90	...	...	...	30,623.00	6,976.02	...
	1013, 1014, etc.	Prior to transfer to present holders	...	...	...	...	...	...	...	415.50	176.15	...
		Voided leases and sundry claims	...	...	268.50	64.74	...	...	...	15,245.75	5,979.96	...
Wadgingarra	1163	Wadgingarra ... ..	...	...	149.50	49.72	...	...	...	149.50	49.72	...
		Voided leases and sundry claims	...	...	77.00	18.56	...	...	...	2,632.91	1,152.09	...
Warda Warra	1001, (1040) ...	Western Queen (1936), N.L. ... ..	...	...	...	...	...	...	...	1,430.00	586.32	...
	1001, (1040) ...	Western Queen leases ... ..	...	...	...	...	...	...	...	8,403.00	4,958.42	...
		Voided leases and sundry claims	...	...	...	...	...	...	...	1,861.25	687.17	...
Warriedar	1081	Highland Chief ... ..	...	...	100.00	21.98	...	...	...	1,424.50	287.74	...
		Voided leases and sundry claims	...	...	263.00	40.19	...	...	2.84	20,939.85	6,200.48	7.30
Yalgoo		do. do. do.	...	...	33.50	3.86	...	...	26.79	8,819.25	10,948.08	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

YALGOO GOLDFIELD—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Yuin	...	Voided leases and sundry claims	...	...	...	...	...	131·82	68,475·00	27,976·10	130·13
		<i>From Goldfield generally:—</i>										
		Sundry parcels treated at:										
		Revival Cyanide Plant	...	...	...	*4·35	...	...	...	*574·60	...
		State Battery, Payne's Find	...	...	...	*182·46	...	...	38·50	*3,610·91	...
		State Battery, Warriedar	...	...	...	...	...	...	...	*6,227·55	...
		State Battery, Yalgoo	...	...	...	*37·85	...	...	...	*881·67	...
		Shenandoah Cyanide Plant	...	...	...	*6·85	...	...	...	*252·73	...
		Various Works	...	...	...	...	...	9·42	...	664·00	*2,131·66
		Reported by Banks and Gold Dealers	9·55	...	...	...	...	878·51	46·63	...	26·67
		Totals	9·55	143·15	21,631·00	7,642·70	36·76	1,699·76	2,756·30	393,489·10	239,649·37	1,289·52

Mt. Margaret Goldfield.

MOUNT MORGANS DISTRICT.

Australia United...	...	Voided leases and sundry claims	...	...	...	...	...	2,492·61	17,200·94	25,492·94	1·76
Eucalyptus	...	do. do. do.	...	31·98	165·50	80·17	...	3,384·74	2,659·35	4,246·82	...	
Linden	522F ...	Ailsa ...	...	...	126·00	81·17	...	...	126·00	81·17	...
	396F, etc. ...	Bindah Gold Mines, Ltd.	...	...	...	...	...	...	386·00	60·88	...
		Prior to transfer to present holders	...	...	...	...	...	...	478·00	80·41	...
	508F ...	Coronation ...	...	...	145·75	1,458·13	...	...	158·25	2,049·27	...
	517F ...	Dunn's Reward ...	...	10·97	20·00	75·10	...	10·97	20·00	75·10	...
	(519F) ...	Goulbourn ...	...	...	6·25	5·47	...	...	6·25	5·47	...
	494F ...	Local Lady ...	...	...	87·50	36·17	...	...	480·50	207·90	...
	503F ...	Mount Celia ...	...	...	221·00	65·95	...	...	410·00	122·34	...
	521F ...	North Democrat ...	...	...	90·75	181·72	...	...	90·75	181·72	...
		Voided leases and sundry claims	...	6·89	920·00	668·61	...	127·10	732·51	70,481·41	52,924·78	·68
Mt. Margaret	M.A. 12F ...	Mt. Margaret Mission Station	...	36·74	3·37	193·00	41·05	58·40	18·87	403·00	128·07	...
		Voided leases and sundry claims	318·00	80·39	...	25·59	99·50	9,877·49	5,814·62	12·55
Mt. Morgans	399F, etc. ...	Morgans Gold Mines, Ltd.	120·00	3,877·57	373·80	4,806·69	...
		Prior to transfer to present holders	16·66	779,578·43	354,225·86	5,552·63
	501F ...	V's United ...	...	...	...	...	...	...	68·75	28·44	...
		Voided leases and sundry claims	...	11·29	772·00	168·39	...	38·74	509·12	64,119·07	37,258·03	77·86
Murrin	395F ...	Arthur Rymer	70·00	23·44	8·42	3,826·25	736·22	...
	482F ...	Hill End	387·00	110·85	2,727·75	1,389·70	...
	518F ...	Vindicator	86·00	162·96	86·00	162·96	...
		Voided leases and sundry claims	...	59·49	598·50	165·45	...	61·58	736·31	134,652·70	105,426·16	29·60

Redcastle ...	...	do.	do.	do.	...	10.26	149.00	40.86	...	4.49	550.38	4,468.02	4,503.63	...
Yundamindera ...	510F ...	Landed at Last ...	...	...	...	...	1,467.00	213.05	...	...	...	2,472.00	348.59	...
	509F ...	New Golden Treasure ...	...	...	...	19.86	330.00	188.44	...	...	19.86	640.00	239.66	...
	520F ...	Trouble ...	...	...	...	7.63	67.50	148.98	...	...	7.63	67.50	148.98	...
		Voided leases and sundry claims	...	...	3.01	98.11	308.60	318.09	...	3.01	338.99	78,356.20	52,781.80	5.82
<i>From District generally :-</i>															
Sundry parcels treated at :															
		Hill End Cyanide Plant ...	...	...	...	...	...	*344.47	...	...	...	...	*344.47	...
		State Battery, Linden ...	...	...	...	1.53	...	*325.94	...	...	9.16	263.29	*8,251.73	...
		Rymer's Cyanide Plant ...	...	...	...	...	...	*177.14	...	...	...	...	*972.99	...
		Various Works ...	...	...	...	...	...	...	...	...	...	1,257.81	*5,238.32	99.97
		Reported by Banks and Gold Dealers	...	...	...	81.57	2.24	...	...	...	2,683.63	69.78	10.30	56.69
		Totals	121.32	263.88	6,649.35	9,039.56	...	3,002.54	9,005.51	1,175,745.81	668,392.41	5,780.87

MOUNT MALCOLM DISTRICT.

Cardinia ...	1769c ...	Black Chief ...	...	...	...	...	30.00	4.75	...	...	...	60.00	9.41	...
	1770c ...	Rangoon ...	...	...	...	...	944.00	102.19	...	...	...	944.00	102.19	...
		Voided leases and sundry claims	...	...	...	24.88	39.00	63.23	...	18.12	1,711.49	2,608.74	3,997.42	...
Diorite ...	...	do.	do.	do.	...	1.56	305.50	262.65	...	11.21	1,065.40	38,483.33	35,924.72	24.05
Dodger's Well ...	...	do.	do.	do.	...	...	...	...	...	.95	86.22	2,813.55	2,840.75	...
Lake Darlot ...	1772c ...	Afrikander ...	...	...	...	...	346.00	64.03	...	...	...	418.00	77.45	...
		Voided leases and sundry claims	...	...	...	...	226.50	121.19	...	67.68	5,033.13	73,955.80	54,412.91	2.60
Leonora ...	1777c ...	Forrest ...	...	...	...	...	550.00	81.56	...	...	...	550.00	81.56	...
	1754c ...	Gold Blocks ...	...	...	...	...	263.00	76.39	...	...	...	767.00	396.26	...
	1594c ...	Leonora Central G.M. Co., N.L.	...	...	...	...	651.00	113.29	...	...	...	3,575.00	239.35	...
	1701c ...	New Year Gift ...	...	...	...	...	40.00	3.20	...	...	...	84.50	7.89	...
	489c, etc.	Sons of G'walia, Ltd.	...	...	...	...	136,114.00	45,617.18	3,774.93	...	...	4,497,015.67	1,911,725.57	131,214.39
		Prior to transfer to present holders	...	...	...	...	...	...	...	...	...	109,081.00	55,989.21	8.66
	1557c ...	Tower Hill ...	...	...	...	...	43.00	13.62	...	...	...	215.55	82.79	...
		Voided leases and sundry claims	...	...	...	...	1,317.50	362.54	...	30.31	2,195.41	177,479.00	98,917.84	10.71
Malcolm ...	...	do.	do.	do.	...	...	68.00	15.36	...	5.75	80.46	66,738.00	50,109.48	...
Mertondale ...	...	do.	do.	do.	...	22.70	202.00	81.29	...	1.82	85.74	91,240.21	63,024.16	1,497.58
Mt. Clifford ...	1725c ...	Bannockburn ...	...	...	...	...	260.00	100.52	...	...	9.61	1,382.50	492.71	...
		Voided leases and sundry claims	...	...	...	10.60	339.50	132.26	...	53.98	1,906.72	11,903.06	18,971.90	...
Pig Well ...	...	do.	do.	do.	...	...	...	...	...	...	34.61	16,483.97	15,902.04	63.68
Randwick ...	1753c ...	Lady Doris ...	...	...	...	...	51.00	10.74	...	...	...	263.00	63.34	...
	1760c ...	Mighty Splash ...	...	...	...	...	455.00	397.28	...	...	...	1,259.00	721.26	...
		Voided leases and sundry claims	...	...	...	...	...	...	...	66.57	403.51	10,519.29	9,978.07	...
Webster's ...	...	do.	do.	do.	...	654.10	97.50	82.93	...	67.14	670.62	24,382.70	15,856.54	...
Wilson's Creek ...	...	do.	do.	do.	...	.70	...	...	...	.70	4.24	649.50	429.39	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

MT. MARGARET GOLDFIELD—continued.

MOUNT MALCOLM DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.					
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	
Wilson's Patch ...	(1748c) ...	Chien D'or ... ..	...	...	100·00	14·83	...	...	...	663·00	150·35	...
		Voided leases and sundry claims	...	...	106·50	29·03	...	4·68	149·95	29,706·76	14,265·02	1·05
	<i>From District generally :—</i>												
	Sundry Parcels treated at :												
	Homeward Bound Cyanide Plant ... ..		...	...	...	*26·07	...	...	...	...	*179·12	...
	Merton's Reward North Cyanide Plant ... ..		...	...	...	*24·88	...	...	...	...	*588·26	...
	Park & Hunt's Cyanide Plant ... ..		...	...	...	*48·92	...	...	...	...	*811·32	...
	Reefer Cyanide Plant ... ..		...	...	...	*242·53	...	...	...	...	*1,283·18	22·38
	Various Works ... ..		...	...	...	...	...	...	...	789·50	*20,217·33	123·15
	Reported by Banks and Gold Dealers		55·58	...	...	...	...	3,282·44	226·35	9·50	32·04	...
Totals		56·28	713·84	142,549·00	48,092·46	3,774·93	3,611·35	13,664·04	5,164,041·13	2,377,880·83	132,968·25		

MOUNT MARGARET DISTRICT.

Burtville	2138T	Nil Desperandum ... ..	...	...	57·25	99·13	...	...	5·30	1,259·12	2,803·94	...
	2426T	Nulli Secundus ... ..	...	...	283·75	149·97	...	...	...	283·75	149·97	...
	2412T	Sailor Prince ... ..	...	...	...	...	...	...	...	467·25	89·16	...
	Voided leases and sundry claims		...	46·18	250·00	275·30	...	4·19	622·07	74,748·34	109,329·96	275·27
Duketon ... ..	...	do. do. do.	...	59·74	508·55	326·54	...	3·54	3,504·45	32,669·22	23,406·28	27·23
Eagle's Nest ... ..	...	do. do. do.	...	...	...	...	...	11·45	601·44	1,460·50	1,536·74	...
Erlistoun	2141T, etc. ...	King of Creation G.Ms., Ltd. ... ..	...	...	150·00	151·88	...	...	...	6,358·00	1,288·92	11·00
	Prior to transfer to present holders		...	...	...	...	...	...	...	13,723·00	3,199·66	...
	2402T	Midas ... ..	...	...	148·75	88·64	...	...	...	506·25	262·00	...
	2411T	Victory ... ..	...	...	77·25	39·59	...	...	...	148·75	68·15	...
	2421T	Victory Extended	10·07	155·65	18·00	87·69	...	10·07	155·65	26·00	186·12	...
	2345T	Western Mining Corporation, Ltd. ... ..	...	...	17,615·00	12,657·11	790·88	...	...	59,367·00	50,983·37	2,602·85
Euro	Prior to transfer to present holders		...	...	...	...	...	...	...	119·25	140·97	...
	Voided leases and sundry claims		...	2·29	339·65	166·74	...	1,181·65	169·09	33,704·76	22,417·91	...
	do. do. do.		...	...	36·00	4·77	...	...	111·66	92,928·50	38,315·70	...
Laverton	(2260T)	Australian Mechanised Prospecting Co., Ltd.	...	...	38·25	5·96	...	...	...	219·25	41·36	...
	Prior to transfer to present holders		...	...	...	...	...	...	...	308·75	66·35	...
	2216T	Beria Main Lode ... ..	...	...	2,385·00	392·47	...	...	...	3,125·25	515·87	...
	2408T	Gladiator Gold Mines, Ltd. ... ..	...	...	24,169·00	6,759·85	...	...	...	27,797·00	7,260·52	...
2433T	Ida H Extended ... ..	...	...	18·50	8·78	...	...	...	18·50	8·78	...	

	2229r ...	(Ida H) ...	...	...	...	...	...	...	...	154.00	25.95	...
	2229r, 2230r ...	Ida H leases ...	...	...	...	...	...	...	...	2,683.75	379.62	...
	715r ...	Lancefield (W.A.) Gold Mines, N.L. ...	...	...	128,343.00	32,040.99	...	...	...	509,261.00	149,931.16	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	941,424.98	360,139.22	51,882.27
	2382r ...	Pinnacles ...	...	...	...	...	...	...	...	114.75	16.66	...
	(2423r) ...	She's Right ...	...	...	22.00	4.06	...	...	...	39.20	16.38	...
	2443r ...	White Horse ...	...	...	30.50	29.00	...	...	...	30.50	29.00	...
		Voided leases and sundry claims	...	10.88	836.25	420.64	...	230.47	3,454.30	474,764.49	269,938.67	4,674.69	
Mt. Barnicoat ...	2254r ...	Ulalla ...	...	...	36.00	7.12	...	...	...	392.50	92.44	...
		Voided leases and sundry claims	...	...	266.75	359.25	...	...	...	2,269.00	1,115.68	...
Mt. Shenton ...		do. do. do.	...	...	...	...	...	...	...	294.25	236.32	...
<i>From District generally:—</i>													
Sundry Parcels treated at:													
		Bolwarrah & Gordon's Cyanide Plant ...	...	...	...	*286.38	...	...	...	...	*4,761.27	...
		Craggiemore Cyanide Works ...	...	...	...	...	...	...	...	...	*629.72	...
		Hootanui Battery ...	...	...	2.50	*22.26	...	...	...	2.50	*36.60	...
		Mary Mac Cyanide Plant ...	...	...	...	...	...	...	...	...	*1,688.26	...
		State Battery, Laverton ...	...	...	...	*353.81	...	...	...	97.50	*5,624.60	15.64
		Various Works ...	...	...	...	...	...	...	...	157.00	*9,921.74	...
		Reported by Banks and Gold Dealers	...	44.36	17.34	...	1.72	...	2,414.09	96.50	...	11.80	
		Totals	54.43	292.08	175,631.95	54,739.65	790.88	3,855.46	8,720.46	2,280,923.86	1,066,666.82	59,488.95

North Coolgardie Goldfield.

MENZIES DISTRICT.

Comet Vale ...	5590z ...	King of the Hills ...	...	...	...	...	...	...	...	...	7.08	...
	5591z ...	Post Town ...	...	...	...	...	...	...	...	21.00	4.88	...
	5217z, etc.	Sand Queen Gladstone Mines, N.L. ...	...	...	...	19.11	...	...	...	42,096.75	14,125.40	6.45
		Prior to transfer to present holders	...	...	...	...	...	...	...	75,754.50	59,007.25	1,505.65
		Voided leases and sundry claims	...	...	55.00	22.46	...	...	459.93	150,220.88	120,228.76	3,839.28
Goongarrie ...		do. do. do.	...	98.70	54.50	156.16	...	47.40	3,306.57	29,530.31	20,347.65	...
Menzies ...	5699z ...	Alpha ...	...	...	10.00	17.13	...	...	...	10.00	17.13	...
	5539z ...	(Aeroplane) ...	...	...	...	...	...	...	...	151.50	174.25	...
	5543z ...	Black Swan ...	...	...	85.50	32.73	...	...	...	765.13	871.26	9.08
	(5676z) ...	Coronation ...	...	...	27.00	11.04	...	...	...	272.50	249.14	...
	5694z ...	Dark Horse ...	...	...	34.50	171.19	...	...	...	34.50	171.19	...
	5511z, etc.	First Hit G.M. (1934), N.L. ...	...	...	7,949.00	5,034.20	1,245.37	...	...	29,466.20	21,518.44	3,412.71
		Prior to transfer to present holder	...	...	...	...	...	...	...	1,672.75	4,687.69	...
	5542z ...	Good Block ...	...	...	329.50	186.56	...	...	7.32	1,319.50	1,404.95	...
	5696z ...	Goodenough ...	...	...	25.00	14.04	...	...	...	25.00	14.04	...
	5549z ...	Lady Harriet ...	...	...	...	...	...	...	...	221.00	64.18	...
	5689z ...	Lady Harriet North ...	...	...	40.00	14.41	...	...	...	193.50	76.64	...
	5575z ...	Lady Shenton Gold Mines (1934), N.L. ...	...	...	927.15	664.06	85.52	...	...	24,309.15	13,226.34	2,223.96
	5520z ...	Mignonette ...	...	...	...	...	...	...	...	168.50	209.47	...
	5697z ...	New Florence ...	...	...	75.50	49.70	...	...	...	75.50	49.70	...
	5666z ...	Spion Kopp ...	...	...	99.50	60.25	...	...	...	255.75	172.90	...
	5663z ...	Springfield ...	...	...	12.00	6.76	...	...	...	92.00	30.58	...
	5484z ...	Warrior ...	...	...	264.00	103.10	...	...	...	2,280.00	1,043.58	...
	5484z ...	(Happy Warrior G.Ms., N.L.) ...	...	...	...	...	...	...	...	285.96	132.77	...
		Voided leases and sundry claims	...	16.98	801.25	580.15	...	94.17	1,648.39	931,084.99	730,658.84	12,131.12

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

NORTH COOLGARDIE GOLDFIELD—continued.

MENZIES DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Mt. Ida	5658z	Carida ... ..	...	...	49·00	69·32	...	...	...	273·95	341·21	...
	5668z	Federation ... ..	...	...	...	...	...	...	...	175·00	288·76	...
	(5667z)	Golden Ridge ... ..	...	...	133·00	44·76	...	...	...	1,439·00	905·82	...
	5685z	Golden Ridge North ... ..	...	...	45·00	23·93	...	...	...	362·00	246·63	...
	5551z, etc. ...	Mt. Ida Gold Mines, Ltd. ... ..	...	...	...	...	...	...	...	5,375·50	2,429·38	31·06
	5537z	(Timoni) ... ..	...	...	...	...	...	...	...	1,512·75	737·95	...
	5674z	Quin Hill ... ..	...	...	507·10	110·43	...	...	...	1,351·60	286·68	...
	5651z	Temora ... ..	...	...	289·75	74·92	...	...	...	1,107·75	368·67	...
	5597z	Unexpected ... ..	...	...	39·00	8·81	...	...	...	330·25	58·79	...
		Voided leases and sundry claims	...	10·52	1,110·75	548·41	...	48·14	143·37	76,181·20	76,646·91	106·63
Twin Hills	(5677z)	Twin Hills South ... ..	...	...	75·00	45·54	...	...	...	305·00	323·49	...
		Voided leases and sundry claims	...	...	...	...	...	...	...	307·60	309·27	...
		<i>From District generally :—</i>										
		Sundry Parcels treated at:										
		Howell's Cyanide Plant ... ..	...	...	...	*30·04	...	...	...	...	*215·31	...
		Lady Harriet Battery ... ..	...	...	...	*688·43	...	...	...	279·50	*12,158·83	30·00
		Menzies Consolidated Cyanide Plant ... ..	...	...	...	*280·03	...	...	...	...	*1,938·42	...
		Mt. Ida State Battery ... ..	...	...	...	...	...	...	...	1,866·25	*5,370·61	...
		Parry Cyanide Plant ... ..	...	...	...	*44·40	...	...	...	...	*179·38	...
		Thompson's Cyanide Plant ... ..	...	...	...	...	...	...	...	...	*578·10	...
	Various Works ... ..	...	...	...	...	...	...	...	2,512·30	*33,015·90	1,813·40	
	Reported by Banks and Gold Dealers	...	15·07	101·97	...	...	...	1,359·93	378·85	35·00	7·72	...
	Totals		15·07	228·17	13,038·00	9,112·07	1,330·89	1,549·64	5,944·43	1,383,721·52	1,124,901·94	25,109·34

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ULARRING DISTRICT.

Davyhurst	1051u	Golden Pole	14·00	10·36	741·09	242·21	...
	1098u	Golden Rod	176·00	54·68	176·00	54·68	...
	1102u	Lights of Israel ... ..	...	...	100·00	40·82	...	...	...	100·00	40·82	...
	1077u	Makai ... ..	...	...	885·00	207·55	...	...	...	1,280·00	427·20	...
	1016u	New Callion ... ..	...	...	2,588·00	889·26	103·27	...	...	3,711·30	1,411·17	119·67
	1033u	Waihi ... ..	...	...	...	...	...	...	...	152·50	44·13	5·33
		Voided leases and sundry claims	...	...	343·50	66·41	...	2·93	182·40	169,935·17	129,145·09	5,403·14
Morley's	1101u	Emerald ... ..	...	...	56·00	85·19	...	...	...	56·00	85·19	...
	1090u	Fallen Star ... ..	...	15·59	8·00	27·73	...	15·59	...	8·00	27·73	...
	1094u	First Hit ... ..	...	...	138·00	427·66	...	...	...	138·00	427·66	...
	1088u	Golden Cockatoo ... ..	...	...	...	...	...	...	21·99	4·00	75·22	...
	(1100u)	Kurrajong ... ..	...	...	111·00	53·43	...	...	...	111·00	53·43	...

	1081u ...	Mabel Gertrude ...	...	...	68.50	76.16	...	...	...	146.00	172.67	...
	1080u ...	Morning Glory ...	...	...	41.50	64.45	...	...	10.50	85.50	244.95	...
	1089u ...	Paramount ...	...	...	294.50	323.39	...	...	...	362.50	461.13	...
	1078u ...	Rabbit ...	...	...	111.00	252.49	...	...	30.93	149.50	392.37	...
	1074u ...	Two Chinamen ...	...	2,211.79	362.00	1,539.02	...	...	3,076.40	455.50	2,039.02	...
		Voided leases and sundry claims	...	3.29	444.75	501.62	...	2.16	974.34	1,080.75	2,154.71	...	
Mulline ...	1107u ...	Ajax West ...	...	...	70.75	175.38	...	...	...	70.75	175.38	...
	1079u ...	Larne Pride ...	...	...	192.00	39.55	...	...	...	409.00	158.39	...
	1068u, etc.	Riverina Gold Mines, Ltd. ...	...	...	2,424.00	931.75	...	...	...	32,058.00	11,662.42	...
		Voided leases and sundry claims	...	3.46	665.25	390.88	...	...	446.70	111,470.11	110,834.54	531.44
Mulwarrie ...	1084u ...	Oakley ...	...	...	205.00	133.18	...	...	...	266.00	214.59	...
	(1093u)	Saunders's Find ...	...	108.45	8.50	44.58	...	...	108.45	8.50	44.58	...
		Voided leases and sundry claims	...	26.87	75.50	65.92	...	...	279.52	21,727.51	28,378.58	38.47
Ularring ...	1083u ...	Red Leaf ...	...	...	159.00	148.96	...	...	...	342.00	245.69	...
		Voided leases and sundry claims	...	...	62.50	42.69	...	...	563.34	10,081.10	13,948.91	...
<i>From District generally:—</i>													
Sundry Parcels treated at:													
		State Battery, Mulline ...	...	...	...	*154.96	...	...	...	639.99	*16,156.17	...
		State Battery, Mulwarrie ...	...	...	...	*114.60	...	...	...	613.18	*6,345.33	...
		Golden Pole Cyanide Works ...	...	...	...	*330.74	...	...	...	...	*3,643.48	...
		Waihi Cyanide Plant ...	...	...	...	*371.41	...	...	...	...	*1,690.34	...
		Young Australia Cyanide Plant ...	...	...	...	*131.55	...	...	...	...	*180.70	...
		Various Works ...	...	...	...	...	...	...	15.82	205.15	*816.79	...
		Reported by Banks and Gold Dealers	...	7.40	18.46	15.00	3.16	...	96.76	57.60	100.00	22.67	
		Totals	7.40	2,387.91	9,619.25	7,699.53	103.27	101.85	5,783.53	356,684.10	332,017.94	6,098.05

NIAGARA DISTRICT.

Desdemona ...	...	Voided leases and sundry claims	...	...	135.00	18.37	...	...	16.11	11,729.45	8,414.32	12.04
Kookynie ...	872g ...	Margery ...	...	...	375.00	122.60	...	...	...	1,158.00	469.13	...
	810g, 811g ...	Two D's leases ...	...	...	340.00	163.44	...	...	...	1,930.00	909.64	...
		Voided leases and sundry claims	...	...	346.00	195.45	...	60.09	447.14	747,176.51	398,022.97	5,375.97
Niagara ...	...	do. do. do.	...	...	240.00	84.40	...	28.10	201.76	98,375.66	59,766.41	...
Tampa ...	902g ...	Grafter ...	...	...	...	1.87	...	...	...	...	1.87	...
		Voided leases and sundry claims	...	...	353.00	98.26	...	32.60	321.76	57,092.90	26,936.34	174.24
<i>From District generally:—</i>													
Sundry parcels treated at:													
		Grafter Battery ...	...	...	...	*1.51	...	...	...	...	*8.62	...
		Moroney's Cyanide Plant ...	...	...	...	*6.18	...	...	...	...	*6.18	...
		Owen and Party's Cyanide Plant ...	...	...	...	*41.73	...	...	...	...	*50.91	...
		Various Works ...	...	...	...	...	...	...	...	1,220.50	*15,924.14	41.17
		Reported by Banks and Gold Dealers	...	15.17	...	...	...	1,578.66	823.66	...	63.53	...
		Totals	15.17	...	1,789.00	733.81	...	1,699.45	1,810.43	918,683.02	510,574.06	5,603.42

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

NORTH COOLGARDIE GOLDFIELD— continued.

YERILLA DISTRICT.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Edjudina ...	(1201R) ...	Edjudina Perseverance ...	...	...	68·50	26·68	...	...	...	193·25	122·33	...
	1134R ...	Fingall ...	...	...	23·00	2·43	...	...	...	226·00	69·78	...
	1122R ...	Paget Gold Mines of Edjudina, Ltd. ...	...	...	701·50	150·80	...	...	...	841·50	187·51	...
	(1123R) ...	Prior to transfer to present holders	...	...	...	...	...	...	...	738·75	559·80	...
		Seventy-two ...	...	...	14·00	3·39	...	...	...	214·75	147·55	...
		Voided leases and sundry claims	...	...	66·50	47·33	...	...	45·33	39,830·28	46,904·22	37·79
Patricia ...	1080R, 1081R ...	Kimberley Oil Options, N.L. ...	...	...	...	...	...	...	...	4,075·25	5,245·54	25·40
		Voided leases and sundry claims	...	...	...	...	...	...	...	78·25	30·61	...
Pingin ...	1206R ...	Ajax ...	...	...	2,005·00	273·03	...	...	...	2,325·50	333·69	...
		Voided leases and sundry claims	...	...	201·50	61·68	...	...	203·20	20,276·89	13,751·02	...
Yarri ...	1189R ...	East West Gold Reefs ...	...	...	49·50	35·95	...	...	...	319·75	181·25	...
	1126R, etc. ...	Edjudina Gold Mining Co., N.L. ...	...	...	34·00	61·83	...	...	...	30,220·00	4,333·15	448·52
		Prior to transfer to present holders	...	...	...	...	...	...	...	124·50	38·89	...
	1210R ...	Wallaby Central ...	...	...	204·00	67·65	...	...	...	204·00	67·65	...
		Voided leases and sundry claims	...	...	698·75	188·44	...	7·17	92·88	53,846·85	25,288·29	2·00
Yerilla ...	...	do. do. do.	...	...	50·00	16·09	...	19·30	3,138·05	18,843·51	14,243·38	13·93
Yilganie ...	(1207R) ...	Melody ...	...	8·34	...	...	...	...	8·52	...	...	...
	1194R ...	Yilganie King ...	...	...	137·50	70·10	...	...	...	309·25	204·12	...
	1176R ...	Yilganie Queen ...	...	...	218·50	198·59	...	...	·85	918·75	1,617·43	...
		Voided leases and sundry claims	...	...	279·75	81·98	...	121·67	89·00	2,845·80	1,906·60	...
		<i>From District generally:—</i>	...	...	...	...	...	...	...	...	...	...
		Sundry parcels treated at:	...	...	...	...	...	...	...	...	...	...
		Yarri State Battery ...	...	...	...	*419·94	...	...	...	271·50	*6,811·39	3·50
		Various Works ...	...	...	...	...	...	2·17	...	642·25	*6,049·24	...
		Reported by Banks and Gold Dealers ...	19·13	·49	...	...	...	1,153·70	160·08	...	1·56	...
		Totals ...	19·13	8·83	4,752·00	1,705·91	...	1,304·01	3,737·91	177,346·58	128,095·00	531·14

Broad Arrow Goldfield.

Balgarrie ...	...	Voided leases and sundry claims	...	...	...	...	...	10·94	94·05	6,631·25	5,317·53	1·38
Bardoc ...	2102w ...	Despatch ...	...	...	61·50	22·90	...	...	...	377·50	118·28	...
	2171w ...	Eureka ...	...	...	15·00	14·27	...	...	...	30·00	28·00	...
	2177w ...	Kempsey ...	...	...	2·50	14·72	...	...	...	2·50	14·72	...

	2183w	...	Nathan	...	...	15.00	55.90	...	...	...	15.00	55.90	...
	(2127w)	...	Ora Munda	...	...	82.75	69.88	...	...	432.92	179.34	258.56	...
	2093w	...	Revenue Central	...	...	543.00	131.87	...	...	...	543.00	131.87	...
	2079w	...	Wycheproof	...	...	304.00	169.40	...	...	12.02	1,828.00	732.52	...
	(1833w), (2089w)	...	Zoroastrian leases	...	...	1,526.00	283.60	...	...	23.25	4,792.45	922.11	...
		...	Voided leases and sundry claims	...	73	275.09	978.75	434.05	...	54.95	3,036.23	85,569.55	58,586.11	203.60
Black Flag	2190w	...	Bell Bird	...	...	28.75	4.07	...	...	...	28.75	4.07	...
	2149w	...	Bellevue Gold Mine	...	...	702.00	449.08	...	...	...	845.75	663.72	...
	2128w	...	King Edward	...	...	28.25	20.83	...	...	1.22	62.25	47.28	...
	2154w	...	Pirates Mine	...	...	...	...	...	...	...	670.00	105.35	...
		...	Voided leases and sundry claims	...	1.93	13.96	131.75	42.76	...	740.73	616.09	48,440.50	29,318.84	...
Broad Arrow	2176w	...	Bulletin	...	...	680.00	59.52	...	...	...	680.00	59.52	...
	2126w	...	Bulletin Extended	...	...	255.00	31.93	...	...	...	255.00	31.93	...
	(2160w)	...	Double A	...	...	315.00	33.23	...	...	...	459.00	58.26	...
	2039w	...	Golden Arrow	...	...	379.00	65.77	...	...	...	3,171.00	394.18	...
	(2074w)	...	Golden Basin No. 7	...	...	360.00	36.45	...	...	...	7,653.00	981.88	...
	2184w	...	Golden Crown	...	...	60.00	33.42	...	...	...	60.00	33.42	...
	1958w	...	Grace Darling	...	...	298.00	205.91	...	...	...	2,070.75	1,639.78	...
	2148w	...	Lady Betty	...	...	66.00	8.94	...	...	...	192.80	33.04	...
	(2159w)	...	Lady Phyllis	...	...	131.50	55.54	...	...	...	164.50	66.39	...
	2174w	...	Mona	...	28.33	36.00	91.04	...	...	28.33	36.00	91.04	...
	2165w	...	Monte Carlo	...	...	170.00	119.91	...	...	...	272.00	185.43	...
	(2136w)	...	Mt. Pleasant	...	...	283.00	39.82	...	...	...	1,434.00	311.65	...
	1771w	...	North Duke	...	...	...	...	...	...	1,533.79	192.80	628.42	...
	1933w	...	Oversight Tara United	...	12.97	...	...	...	...	1,144.69	401.54	835.51	...
	(2168w)	...	Trumps	...	...	4.00	1.66	...	...	...	13.01	193.11	...
	2151w	...	Vesuvio	...	...	60.00	37.80	...	...	2.78	698.50	323.74	...
	2187w	...	West Duke	...	...	15.00	16.78	...	...	...	15.00	16.78	...
		...	Voided leases and sundry claims	491.54	2,538.50	828.86	...	1,057.27	9,638.78	144,793.49	116,949.70	18.85
Cane Grass	(2028w)	...	Big Four	60.00	2.77	20.76	229.72	121.11	...
		...	Voided leases and sundry claims	234.56	1,116.30	830.01	...
Carnage	do.	do.	do.	195.25	47.25	176.04	665.74	4,147.58	3,022.60	...
Cashman's	2046w	...	Lady Evelyn	...	19.15	20.32	284.00	93.50	...
		...	Voided leases and sundry claims02	6.79	...	67.51	832.99	8,800.67	7,279.07	...
Christmas Reef	2167w	...	High Rock	...	29.39	29.39
	(2163w)	...	Moonstone	6.00	10.33	6.00	10.33	...
	2175w	...	New Mexico	44.00	34.64	44.00	34.64	...
		...	Voided leases and sundry claims	...	12.83	194.92	173.12	270.50	2,923.36	2,293.93	...
Fenbark	2186w	...	Fenbark	50.00	6.10	50.00	6.10	...
	2188w	...	Golden Penny	385.00	31.54	385.00	31.54	...
		...	Voided leases and sundry claims	...	48.65	1,014.00	160.04	53.07	4,875.52	2,702.34	...
Grant's Patch	1936w	...	Dundas G.Ms., N.L.	3,681.25	1,019.41	...
		...	Prior to transfer to present holders	4,642.00	1,689.27	...
	1962w, etc.	...	Ora Banda Amalgamated Mines, N.L.	18,955.00	8,019.87	67,373.00	32,312.88	175.00
		...	Prior to transfer to present holders	12,424.50	9,540.07	...
		...	Voided leases and sundry claims	...	15.36	544.75	182.83	594.12	9,714.64	3,599.38	...
Ora Banda	1336w, etc.	...	Associated Northern Ora Banda, N.L.	987.00	224.07	4.87	2,727.50	406.53	4.87
		...	Prior to transfer to present holders	315,958.95	123,252.22	1,664.70
	1943w, etc.	...	Ora Banda United Mines, Ltd.	2,182.25	74.80	...
		...	Prior to transfer to present holders	76,612.22	14,630.93	...
		...	Voided leases and sundry claims	1,363.15	354.44	990.02	34,403.75	16,000.25	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

BROAD ARROW GOLDFIELD—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Paddington ...	2122w ...	George and Mary ...	...	...	375·00	53·10	...	...	...	783·40	135·13	...
	2182w ...	Koala ...	...	...	358·50	37·46	...	...	...	358·50	37·46	...
	2059w ...	Lochinvar Gold Mines, Ltd. ...	...	...	...	...	...	...	...	223·50	12·15	...
			Prior to transfer to present holders	...	...	...	...	...	...	52·00	9·50	...
	2114w ...	Lone Oak ...	...	...	73·00	31·04	...	8·58	...	246·50	194·99	...
	2105w ...	Minnie Palmer ...	...	...	60·00	2·88	...	...	...	5,474·00	342·18	...
	2170w ...	Mt. Corlac ...	...	14·60	332·50	97·73	...	...	14·60	393·50	141·41	...
		Voided leases and sundry claims	...	5·06	786·50	222·62	...	7,271·88	706·45	191,025·89	91,145·05	18·96
Riches Find ...	(2173w) ...	Pole West ...	...	7·01	...	...	...	...	7·01	...	...	...
	2129w ...	Western Mining Corporation, Ltd. ...	...	...	2,140·25	1,713·31	20·17	...	...	5,971·00	4,038·71	69·96
			Prior to transfer to present holders	...	...	...	...	...	...	328·75	640·11	...
		Voided leases and sundry claims	...	...	172·00	78·53	...	...	133·75	1,219·84	1,751·13	...
Siberia ...	(2166w) ...	Cave Hill ...	...	28·62	...	...	...	...	28·62	...	...	...
		Voided leases and sundry claims	...	...	112·25	24·56	...	290·13	3,690·69	47,358·01	43,489·03	...
Smithfield ...	2139w ...	Mountain Maid ...	...	...	168·00	45·91	...	...	...	730·21	262·64	...
		Voided leases and sundry claims	...	40·39	624·00	155·90	...	...	98·08	2,911·34	977·01	...
		<i>From Goldfield generally:—</i>										
		Sundry parcels treated at:										
		Black Flag Cyanide Plant	...	...	20·00	*117·23	...	...	...	20·00	*2,143·63	...
		Bulletin Cyanide Plant	...	...	...	*31·76	...	...	...	...	*31·76	...
		Mitchell's Cyanide Plant	...	...	...	*20·88	...	...	...	...	*595·56	...
		Golden Arrow Cyanide Plant	...	...	...	*245·09	...	...	...	...	*1,134·80	...
		Minnie Palmer Cyanide Plant	...	...	...	*781·59	...	...	...	...	*1,227·40	...
		Pearce's Cyanide Plant	...	...	...	*256·48	...	...	...	...	*1,220·71	...
		Rustand's Cyanide Plant	...	...	...	*61·82	...	...	...	...	*334·81	...
		State Battery, Ora Banda	...	...	...	*803·19	...	...	...	80·05	*13,258·80	...
		Various Works	...	...	...	...	...	2,275·66	1·24	16,854·02	*38,710·26	1,875·77
		Reported by Banks and Gold Dealers	131·38	9·57	...	...	...	9,690·66	96·84	57·43	39·54	...
		Totals	134·04	1,052·52	39,091·34	17,415·28	25·04	21,644·35	25,065·91	1,139,255·37	639,963·32	4,033·09

North-East Coolgardie Goldfield.

KANOWNA DISTRICT.

Gindalbie ...	(1536x) ...	Melton ...	...	...	47·00	15·99	...	...	...	464·50	72·78	...
		Voided leases and sundry claims	...	32·75	498·50	246·86	...	...	731·72	47,946·80	42,024·83	38·31
Gordon ...	1532x ...	Sirdar ...	...	...	248·00	481·95	...	...	...	1,202·25	786·05	...
		Voided leases and sundry claims	...	...	349·75	52·11	...	...	767·26	50,341·23	17,639·32	...

Kalpini ... ..	...	do.	do.	do.	...	...	104.50	38.19	...	24.70	288.40	14,779.75	7,639.81	.07
Kanowna ... ..	...	do.	do.	do.	1.84	...	892.50	284.17	...	119.66	6,627.93	705,991.87	390,602.26	2,483.74
Mulgarrrie ... ..	...	do.	do.	do.	...	...	...	...	...	...	1,233.41	8,164.01	4,829.38	...
Six Mile ... ..	...	do.	do.	do.	...	4.65	168.25	23.07	...	...	1,649.77	1,095.25	961.20	...
<i>From Goldfield generally:—</i>														
Sundry parcels treated at:														
Beavis' Cyanide Plant	...	...	...	...	...	...	...	*2.66	...	...	...	...	*114.34	...
Carlson's Cyanide Plant	...	...	...	...	...	...	...	*95.41	...	...	...	...	*2,108.08	...
Job's Cyanide Plant	...	...	...	...	...	...	...	*116.56	...	...	...	...	*848.66	...
Leslie's Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	*49.53	...
Various Works	...	...	...	...	...	...	...	...	330.42	867.52	158,919.05	*149,486.04	...	...
Reported by Banks and Gold Dealers	...	...	...	...	178.98	...	...	1.19	...	105,587.91	34.55	97.44	...	...
Totals ... ..	...	...	...	...	180.82	37.40	2,308.50	1,358.16	...	106,062.69	12,200.56	988,905.21	617,259.72	2,522.12

KURNALPI DISTRICT.

Jubilee ... ..	...	Voided leases and sundry claims	...	...	31.00	4.50	...	25.57	158.65	3,290.50	1,959.26	...
Kurnalpi	(451K)	Rainbow ... ..	...	...	7.00	2.40	...	...	...	57.50	25.84	...
		Voided leases and sundry claims	...	72.51	153.00	94.75	...	674.54	3,696.17	8,169.87	5,893.39	6.27	
Mulgabbie	450K	Ernbill ... ..	...	105.31	37.00	186.95	...	...	263.48	56.00	201.64	...
	(449K)	V.R.C. ... ..	...	1.06	...	...	...	...	1.06	59.00	8.87	...
		Voided leases and sundry claims	...	19.00	257.50	85.59	...	6.50	3,468.14	1,025.20	9,601.76	4.95	
<i>From Goldfield generally:—</i>													
Sundry parcels treated at:													
Success Battery	...	...	...	...	...	*2.18	...	...	...	45.00	*194.84	...
Various Works	...	...	...	...	...	...	...	...	...	56.50	*193.15	...
Reported by Banks and Gold Dealers	...	...	...	114.40	.45	...	...	...	12,045.30	67.53	2.35	...
Totals	114.40	198.33	485.50	376.37	...	12,751.91	7,655.03	12,759.57	18,081.10	11.22

East Coolgardie Goldfield.

EAST COOLGARDIE DISTRICT.

Binduli ... ..	...	Voided leases and sundry claims	...	...	279.75	32.04	...	...	13.01	4,500.62	1,572.18	...
Boorara	5486E	Olympian ... ..	...	...	146.25	77.63	...	...	...	622.00	485.96	...
	5879E	Roma ... ..	...	...	64.75	10.86	...	...	...	64.75	10.86	...
		Voided leases and sundry claims	...	...	105.50	24.54	...	.49	548.72	309,233.14	173,109.67	408.36
Boulder	5862E	Albert Adventure	...	...	443.50	88.90	...	...	...	1,038.75	210.77	...
	5630E	Argennum ... ..	...	...	51.75	8.31	...	...	...	149.00	29.39	...
	5540E etc. ...	B.A.N.Z. Mines, Limited	...	...	160.00	68.18	...	...	...	308.25	120.87	...
	5465E	Birthday Gift	...	...	40.00	4.00	...	...	...	4,701.14	1,286.16	...
	5690E, (66E) ...	Boulder Perseverance, Ltd.	...	...	114,589.41	37,681.48	13,336.31	...	...	1,239,056.21	606,809.87	163,883.48
		Prior to transfer to present holders	...	...	...	...	...	...	...	3,306,942.88	1,841,159.00	203,821.43
	5556E	Brown Hill Extended	...	...	180.75	21.55	...	...	...	552.00	65.39	...
	5759E	Forty Five East	...	...	112.50	23.13	...	...	...	698.75	275.21	...
	5472E	Golden Key	...	...	35.25	5.55	...	18.27	19.31	296.75	120.19	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

EAST COOLGARDIE GOLDFIELD—continued.

EAST COOLGARDIE DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dolled and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dolled and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Boulder—continued.	5692E, etc. ...	Gold Mines of Kalgoorlie, Ltd. ...	...	...	104,052·00	34,418·75	14,309·08	...	...	265,586·11	106,056·16	35,399·80
		Prior to transfer to present holders	...	...	...	...	...	...	545·23	527,790·53	568,643·05	4,844·50
	5696E-9E, etc.	Great Boulder Proprietary G.M., Ltd.	...	1·53	358,634·00	110,323·54	54,199·56	...	1·53	5,791,306·83	4,227,977·95	598,291·65
	5845E ...	Happy Returns ...	...	...	...	...	...	...	...	135·00	42·44	...
	5345E ...	Kalgoorlie Enterprise Mines, Ltd.	...	...	59,336·42	19,274·13	2,296·25	...	...	106,849·78	34,835·86	3,236·27
		Prior to transfer to present holders	...	...	...	...	...	...	...	15,320·68	8,957·01	...
	5708E, (15E), etc.	Lake View and Star, Limited ...	...	...	604,340·00	171,622·76	4,677·49	...	...	4,348,994·55	1,580,120·52	95,166·35
		Prior to transfer to present holders	...	...	...	...	...	...	8·49	15,792,500·38	9,149,223·80	1,348,055·82
	519E ...	Lake View South (G.M.K.), Ltd.	...	...	10,384·50	3,520·36	...	...	...	24,868·38	9,993·56	...
	5891E ...	New Croesus ...	...	...	97·50	29·35	...	...	...	97·50	29·35	...
	5700E, (22E), etc.	North Kalgurli (1912), Ltd.	...	...	139,204·78	49,476·30	17,578·03	...	40·70	953,264·04	361,041·55	59,685·47
		Prior to transfer to present holders	...	...	...	...	...	43·99	...	4,018,436·01	2,815,911·21	97,625·03
	5429E, etc. ...	North Kalgurli United Mines, Ltd.	...	...	...	...	...	...	...	4,651·76	926·62	232·93
		Prior to transfer to present holders	...	...	...	...	...	...	...	131·74	76·74	...
	5539E ...	Oroya East ...	...	...	249·25	32·10	...	...	...	558·50	68·55	...
	5853E ...	Paringa Junction ...	...	...	19·00	10·32	...	...	...	19·00	10·32	...
	5854E ...	Paringa Junction North ...	...	...	...	...	...	...	...	35·00	8·13	...
	5855E ...	Paringa Junction South ...	...	...	481·50	67·95	...	...	...	588·50	94·36	...
	5456E, etc. ...	Paringa Mining and Exploration Co., Ltd.	...	...	78,676·00	18,748·55	1,460·45	...	...	142,377·06	38,549·01	1,914·31
		Prior to transfer to present holders	...	...	...	...	...	...	...	51,972·01	23,228·52	...
	5875E ...	Robert Adventure ...	...	...	92·75	5·27	...	...	...	92·75	5·27	...
	5808E, etc. ...	South Kalgurli Consolidated, Ltd.	...	...	89,405·00	24,835·58	...	...	...	1,973,461·25	835,906·28	15,071·52
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,344,254·70	531,792·77	17,722·97
	5466E ...	South Star ...	...	49·60	983·75	332·45	...	...	49·60	1,376·93	577·24	...
		Prior to transfer to present holders	...	...	...	...	...	...	5·22	1,835·75	748·78	...
		Voided leases and sundry claims	...	...	194·50	19·47	...	134·48	12,199·55	631,413·83	476,537·24	6·83
Cutter's Luck ...	...	Sundry Claims ...	...	5·55	...	...	...	...	120·45	650·15	235·25	...
Feysville ...	...	Voided leases and sundry claims	...	3·78	10·00	2·94	...	...	264·13	1,431·06	948·53	...
Hampton Plains ...	P.P.L. 9 ...	Celebration G.M. Co., N.L.	...	...	...	...	...	...	...	61,399·75	15,206·00	...
	P.P.L. 86 ...	Golden Hope, N.L.	...	...	...	...	...	...	...	5,964·00	2,006·14	...
	P.P.L. 1 ...	Consolidated Gold areas	...	...	14,235·00	2,450·95	638·80	...	...	44,247·53	14,992·74	638·80
	P.P.L. 252 ...	Mount Martin ...	...	...	598·75	57·39	...	...	...	14,953·75	5,574·11	...
	P.P.L. 279 ...	Mutooroo ...	...	...	333·52	52·10	...	...	...	5,555·52	911·08	...
	277 ...	New Hope ...	...	...	8,305·00	1,286·61	...	...	...	40,097·25	8,061·88	...
		Voided leases and sundry claims	...	6·64	3,474·93	836·42	...	4,568·30	234·83	93,944·78	29,144·69	69·60
Kalgoorlie ...	(5455E) ...	Argument ...	...	...	191·00	49·30	...	...	24·91	2,242·47	807·58	...
	5735E ...	Bonnie Lass ...	...	...	...	...	...	...	...	167·00	47·53	...
	5449E, etc. ...	Broken Hill Proprietary Co., Ltd.	...	3·99	37,179·25	17,026·06	...	...	3·99	152,218·01	65,820·37	1,843·28
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,027·75	166·81	...

5531E ...	Cassidy's Hill ...								.79	243.50	135.04	
5564E, etc. ...	Charity leases ...								.33	127.75	26.23	
5867E ...	Concord ...			18.00	5.10					18.00	5.10	
5665E ...	Jolly Bill ...									35.50	3.64	
5839E ...	Coronation ...			23.75	6.43					40.00	9.03	
5510E ...	Golden Dream ...									361.74	103.34	
5737E ...	Golden Mile Channel ...			195.50	13.07				.97	1,993.25	151.18	
5512E ...	Golden Mile North ...			15.50	1.69					502.50	98.51	
5903E ...	Golden Pheasant ...			49.25	7.32					49.25	7.32	
5519E ...	Hannan's Enterprise ...									362.00	79.80	
4547E, etc. ...	Hannan's Hill Amalgamated, Ltd. ...									766.75	211.31	
(5859E) ...	Prior to transfer to present holders								5.72	47,525.85	13,719.48	
5625E ...	Hidden Secret ...			135.00	20.37					236.00	38.02	
5878E ...	Kapai ...									320.00	75.60	
5549E ...	Lady Mary ...			184.00	31.61					184.00	31.61	
5437E ...	Maritana Hill ...									381.50	42.12	
5852E ...	North End Extended ...	48.23		16.75	48.73			464.19		196.80	318.07	
5468E ...	Pedestal ...			537.50	161.57					836.00	296.84	
5415E, etc. ...	Phar Lap ...			33.75	22.56					352.25	294.15	
5716E ...	Return ...			333.25	56.70				5.64	3,187.75	477.26	
	Two B's ...			253.75	53.18					634.77	178.61	
	Voided leases and sundry claims	50.47		1,053.75	191.85		474.89	10,406.35		1,016,432.87	418,607.16	44,017.12
Wombola ...	Big Bull ...			174.50	135.77					408.33	1,005.96	
	Caledonian ...			292.25	182.26					1,070.25	716.27	
	Champion ...	1.93		275.50	26.03				1.93	275.50	26.03	
	Daisy ...			705.75	551.57					1,772.00	2,354.92	
	Everly ...			23.00	6.66					23.00	6.66	
	Haoma ...			379.25	481.24					1,586.25	1,623.95	
	Happy-go-lucky ...			129.00	47.34					766.75	620.94	
	Inverness ...			269.25	83.52					398.25	121.24	
	Lady Dorothea ...			421.30	114.79					516.80	139.30	
	Leslie ...			37.50	54.00					602.00	939.10	
	Lurgan ...			108.50	112.91					450.25	208.36	
	Maranoa ...	7.23		552.75	246.67				7.23	1,152.25	517.30	
	Milano ...			1,253.50	3,801.92					3,291.75	9,705.16	
	M.L.S. ...			73.00	48.34					1,274.00	720.37	
	Pauline ...			37.75	48.90					101.00	186.85	
	Pericles G.M., Ltd. ...			117.00	81.70				358.11	4,453.03	19,250.99	
	Reggio ...			213.50	131.36					590.25	246.10	
	Transvaal ...			79.75	11.91					169.75	60.64	
	Twenty Grand ...			7.75	5.16					490.75	359.63	
	Wombola ...			20.00	13.29					20.00	13.29	
	Xmas Flat ...									330.25	264.74	
	Voided leases and sundry claims	18.82		2,081.05	551.52			2,277.65		29,553.81	26,200.30	
<i>From District generally:—</i>												
	Sundry claims ...							11,014.57	465.61	5,440.46	2,541.10	
	Sundry Parcels treated at:											
	Cavalier's Treatment Works ...				*26.67						*26.67	
	Golden Horseshoe (New), Limited ...				*28,766.51	22,372.08					*177,197.83	96,733.97
	Lakeside Retreatment Works ...				*112.38	57.17					*1,538.16	1,507.65
	Mt. Monger Cyanide Plant ...				*187.10					14.00	*809.12	
	New Kalgoorlie Cyanide Plant ...				*328.48					375.50	*1,911.64	2.00
	Pericles Cyanide Plant ...				*224.99						*224.99	
	Polkinghorne's Cyanide Plant ...										*147.72	
	Taylor's Cyanide Plant ...				*4.46						*4.46	
	Kalgoorlie State Battery ...			58.85	*2,462.69					120.60	*15,145.73	
	Various Works ...							384.36	64.70	40,673.27	*260,626.85	12,604.81
	Reported by Banks and Gold Dealers	252.73	31.51	39.09	71.78			16,025.57	9,239.08	181.59	1,047.23	
	Totals ...	252.73	229.56	1,636,887.35	532,066.92	130,925.22	32,664.92	37,377.97	42,460,871.50	24,501,959.54	2,802,783.95	

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

EAST COOLGARDIE GOLDFIELD—continued.

BULONG DISTRICT.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Balagundi	...	Voided leases and sundry claims	...	...	11.75	1.94	...	3.51	2,679.52	1,767.44	1,929.90	12.92
Bulong	(1306y) ... 1308y ...	Lady Gwen ... Southern Cross ... Voided leases and sundry claims	...	1.30	32.00 638.25 840.00	6.40 85.49 198.19	...	...	...	38.25 716.00 116,577.78	18.32 101.07 102,101.77	...
Majestic	...	do. do. do.	...	...	110.25	19.44	...	62.33	214.58	3,211.99	1,583.94	...
Morelands	...	Sundry claims	...	...	...	...	...	...	.13	159.00	53.31	...
Mt. Monger	...	Voided leases and sundry claims	...	...	...	...	...	215.60	2,771.39	1,816.90	1,564.58	...
Randall's	...	do. do. do.	...	...	579.00	154.82	...	20.70	64.20	35,625.10	11,621.83	...
Taurus	...	do. do. do.	...	...	357.50	74.92	...	114.75	55.58	3,867.35	1,855.27	...
Trans Find	P.P.L. 308	Dawn of Hope ... Voided leases and sundry claims	...	...	141.00	40.38	...	...	2.87 5.93	567.00 1,660.92	242.01 1,173.22	...
<i>From District generally :—</i>												
Sundry Parcels treated at :												
Davis Cyanide Plant			...	...	...	*15.78	...	...	...	...	*318.76	...
Martin's Cyanide Plant			...	...	...	*10.04	...	...	...	...	*10.04	...
Van Trip & Dorrington's Cyanide Plant			...	...	...	*9.15	...	...	...	...	*9.15	...
Various Works			...	...	...	...	...	...	...	6,102.15	*6,330.23	...
Reported by Banks and Gold Dealers			38.83	4.23	...	24.43	...	25,139.94	67.61	.01	28.44	...
Totals			38.83	5.53	2,709.75	640.98	...	27,320.23	15,876.95	172,109.89	128,941.84	12.92

Coolgardie Goldfield.

COOLGARDIE DISTRICT.

Bonnievale	5596 ... (5522) ... 4600 ...	Jenny Wren ... Lucky Hit ... Melva Maie ...	...	38.47	44.00 190.00	56.34 67.30	...	...	128.86	96.00 1,188.50 1,306.00	230.92 448.92 2,842.35	...
	5321 ...	Prior to transfer to present holders Westralia Extended Voided leases and sundry claims	...	...	7.00 173.50	3.15 65.68	...	...	...	614.50 148.50 356,749.77	1,099.21 30.33 192,606.67	11.63
Bullabulling	...	do. do. do.	...	...	22.00	11.29	...	5.21	15.98	2,085.07	1,226.67	...

Burbanks ...	5545 ...	Boshter ...	...	...	119.00	40.14	...	...	...	653.50	409.57	...
	5605 ...	Burbanks Deeps ...	...	...	15.00	28.85	...	...	...	31.00	35.67	...
	(5473) ...	Grosmont ...	...	...	79.00	20.39	...	...	...	1,482.00	379.43	...
	5263 ...	Lord Bobs ...	...	...	123.00	26.07	...	...	8.59	1,506.00	632.57	...
	5443 ...	New Gift ...	...	...	27.00	9.12	...	...	.59	405.50	144.40	...
	5614 ...	Resurrection ...	...	...	78.00	13.77	...	...	...	78.00	13.77	...
	5250 ...	Vice Regal ...	...	...	849.00	198.13	...	...	1.91	3,214.00	1,057.83	...
	5454 ...	Westraad ...	...	...	...	.72	...	...	...	28.00	7.96	...
		Voided leases and sundry claims	3.63	11.08	645.25	143.94	...	69.95	815.93	423,980.81	311,064.67	521.06
Cave Rocks ...	(5553) ...	Blue Spec ...	...	...	288.50	33.02	...	...	...	1,115.25	159.05	...
	5604 ...	Squeaker ...	...	...	222.25	85.56	...	...	...	349.80	141.90	...
		Voided leases and sundry claims	...	.67	210.75	33.70	...	...	50.00	3,111.75	665.97	...
Coolgardie ...	(5557) ...	Caledonia ...	...	...	254.00	79.40	...	...	...	659.00	236.87	...
	5297, etc.	Consolidated Gold Mines of Coolgardie, Ltd.	...	...	43,106.00	8,764.39	878.66	...	...	43,181.00	8,787.31	878.66
		Prior to transfer to present holder	...	...	...	...	...	...	4.55	1,946.35	547.45	3.22
	5597 ...	Evening Star ...	3.78	...	19.00	11.90	...	...	28.90	19.00	11.90	...
	5585 ...	Gleeson's ...	.60	...	106.00	43.00	...	...	.60	336.00	124.62	...
	5218 ...	Great Western ...	...	...	...	...	...	...	...	99.30	613.20	...
	(5607) ...	Helenvale ...	...	...	12.00	2.28	...	...	...	12.00	2.28	...
	5577 ...	Iron Duke ...	...	...	148.50	201.98	...	...	...	242.00	311.51	...
	5598 ...	King Solomon ...	2.69	...	87.00	20.02	...	2.69	...	117.00	22.34	...
	5590 ...	Lady Grace ...	...	...	242.00	80.63	...	...	...	466.00	166.93	...
	(5277) ...	Lady Theresa ...	...	...	...	2.68	...	...	...	216.00	207.79	...
	(5384) ...	Lindsay's Gold Mine ...	...	...	31.50	14.82	...	...	10.40	190.00	104.07	...
	5606 ...	Lucky Star ...	...	...	324.50	74.99	...	...	...	417.00	95.42	...
	(5595) ...	Morning Star ...	...	...	46.00	9.33	...	...	47.67	97.00	36.17	...
	5299, etc.	Phoenix Gold Mines, Ltd.	...	...	417.50	101.45	...	...	...	931.00	202.86	2.54
		Prior to transfer to present holders	...	...	...	...	...	...	2.74	167.56	237.80	...
	5225 ...	Queen Extended ...	...	...	...	.33	...	...	63.83	714.15	298.09	...
	5407 ...	Rose Hill United ...	...	...	20.00	4.16	...	...	...	383.50	65.97	...
	5573 ...	Teri-Bus ...	...	...	28.00	1.80	...	...	...	342.50	31.05	...
		Voided leases and sundry claims	2.64	6.64	1,891.50	384.49	...	1,500.84	6,899.37	624,209.01	346,415.31	.96
Eundynie ...	(5589) ...	Brilliant Gold Mine ...	...	...	...	26.39	...	...	...	138.00	62.80	...
	(5287) ...	Eundynie ...	...	...	45.00	18.99	...	.92	16.09	1,424.25	1,288.15	...
		Voided leases and sundry claims	...	...	20.00	8.10	...	...	...	30,733.14	15,358.19	1.75
Gibraltar ...	5217 ...	Lloyd George ...	1.39	...	626.00	160.64	...	...	14.69	3,799.88	2,622.36	...
		Voided leases and sundry claims	...	...	104.50	42.61	...	1.39	66.04	34,558.45	17,621.63	...
Gnarlbine ...	...	do. do. do.	...	...	362.50	57.57	...	...	18.85	3,844.35	1,820.17	...
Hampton Plains	P.P.L. 119 ...	Golden Eagle ...	...	...	569.50	338.80	...	...	7.63	2,022.59	2,216.63	...
	B. 59 ...	Surprise G.M. ...	...	...	154.00	151.05	...	...	...	154.00	151.05	...
		Voided leases and sundry claims	...	.59	560.50	347.34	...	...	526.71	10,152.00	8,535.11	...
Higginsville ...	5600 ...	Milesis Scheelite ...	...	...	59.75	42.08	...	...	...	59.75	42.08	...
	5496 ...	(Sons of Erin) ...	...	...	...	...	...	...	...	881.00	147.22	...
	5293, etc.	Two Boys ...	...	...	1,070.00	191.93	...	...	...	6,653.00	3,145.94	...
		Voided leases and sundry claims	...	41.93	59.75	10.36	...	...	396.58	39,623.18	18,353.40	134.79
Larkinville ...	5236 ...	Ground Lark ...	...	2.06	129.00	94.27	...	...	5.93	1,898.91	3,090.73	...
		Voided leases and sundry claims	...	51.78	88.25	114.67	...	22.77	140.35	314.50	539.21	...
Logan's Find ...	(5561) ...	Frankson ...	...	...	26.50	2.47	...	...	...	448.50	57.37	...
	5324, etc.	Spargo's Reward G.M. (1935), N.L.	...	...	13,313.00	4,190.92	...	...	...	37,868.00	6,948.13	...
		Voided leases and sundry claims	...	...	220.00	84.11	...	...	9.41	1,986.21	1,062.68	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

COOLGARDIE GOLDFIELD—continued.

COOLGARDIE DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.					
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	
Londonderry ...	(5402) ...	Christmas Box ...	...	...	170·00	21·30	...	...	1·37	2,567·50	2,216·13	...
		Voided leases and sundry claims	...	...	135·00	26·44	...	...	130·48	30,191·52	20,783·79	...
Mungari ...	...	do. do. do.	...	...	112·00	12·12	...	1·77	125·53	1,662·26	664·94	...
Paris ...	5311, 5500, 5530	Listers G.M. ...	...	...	2,005·00	754·95	...	...	...	5,877·00	2,958·83	...
	5500 ...	(Paris Central) ...	...	...	...	...	...	...	...	113·00	24·16	...
	5530 ...	(Paris Extended) ...	...	...	...	...	...	...	...	463·00	209·47	...
	5514 ...	Paris ...	...	...	52·00	19·48	...	...	...	335·00	149·02	...
		Voided leases and sundry claims	...	...	44·00	8·50	...	...	4·30	2,037·25	501·81	...
Red Hill ...	...	do. do. do.	...	...	33·50	10·86	...	30·16	1,641·92	42,092·67	31,771·04	...
Ryan's Find ...	...	do. do. do.	...	...	...	...	...	...	·44	155·85	380·35	...
St. Ives ...	5593 ...	Catherine ...	...	...	22·00	22·95	...	...	37·13	56·90	73·57	...
	4722 ...	Ives Reward Gold Mines, N.L. ...	...	...	...	...	...	...	...	19,710·66	6,120·23	...
		Prior to transfer to present holder	...	...	...	...	...	...	...	883·25	544·64	...
		Voided leases and sundry claims	...	...	62·75	22·57	...	273·15	1,049·98	20,572·96	10,113·86	...
Wannaway ...	5610 ...	Try Again ...	...	...	166·75	73·80	...	...	...	166·75	73·80	...
		Voided leases and sundry claims	...	...	47·00	11·53	...	...	186·20	2,683·77	2,064·05	...
Widgiemooltha ...	(5332) ...	Banquet ...	...	...	53·30	23·68	...	...	20·74	418·30	318·60	...
	5576 ...	Cardiff Castle ...	...	...	150·25	31·33	...	...	...	362·25	64·38	...
	5451 ...	Host Group ...	...	...	467·75	141·10	...	...	...	646·75	171·46	...
		Voided leases and sundry claims	...	14·50	645·05	150·95	...	54·02	1,470·53	27,126·11	14,787·70	·17	
		<i>From District generally:—</i>											
		Sundry parcels treated at:											
		Australian Machinery and Investment Company's Cyanide Plant	...	...	...	*395·75	...	...	...	...	*1,579·13	86·31
		Coolgardie State Battery ...	...	...	...	*853·65	...	...	...	771·01	*27,353·72	9·65
		Collin's (Coolgardie) Cyanide Plant	...	...	...	*329·26	...	...	...	...	*1,905·45	...
		C. B. Frank's Cyanide Plant	...	...	...	*100·50	...	...	...	...	*369·59	...
		H. A. Frank's Cyanide Plant	...	...	...	*209·63	...	...	...	...	*836·17	...
		Imperial Cyanide Plant	...	...	...	*6·26	...	...	...	26·00	*340·76	...
		Irwin's Cyanide Plant	...	...	...	*193·28	...	...	...	...	*193·28	...
		James' Cyanide Plant	...	...	...	*70·82	...	...	...	...	*318·50	...
		Parry Cyanide Plant	...	...	...	*295·59	...	...	...	...	*1,060·02	...
		Saltbush Cyanide Plant	...	...	...	...	...	...	...	...	*77·64	...
		Widgiemooltha Cyanide Plant	...	...	...	*118·44	...	...	...	...	*816·61	...
		Various Works	...	...	...	...	...	7·75	...	3,871·61	*21,389·86	223·06
		Reported by Banks and Gold Dealers	...	...	206·56	12·25	...	2·70	...	14,226·91	709·76	...
		Totals	216·91	184·35	71,401·35	20,429·56	878·66	16,197·53	14,849·04	1,812,278·65	1,105,068·67
			

KUNANALLING DISTRICT.

Carbine	(33s), 970s ... (33s), 970s, etc. 917s	Carbine Carbine leases Homeward Bound Gold Mines, N.L. ... Prior to transfer to present holders ... Voided leases and sundry claims ...	...	...	415·00 ... 4,098·00 ... 433·60	280·83 ... 431·53 ... 128·70	...	...	...	687·98 136·08 93·96	9,512·00 51,991·86 9,373·00 1,775·50 10,817·03	5,126·76 39,862·25 754·65 279·75 5,454·22	...
Chadwin	999s	Magdala Voided leases and sundry claims ...	...	...	585·90 908·00	220·78 158·14	...	14·28	...	53·82	687·50 5,731·10	294·75 5,317·76	...
Dunnsville	997s	Min Min Light Voided leases and sundry claims ...	...	22·35	17·00 266·75	125·47 115·88	...	2·82	...	170·94 1,576·82	17·00 19,444·91	126·77 10,057·21	...
Jourdie Hills ... ..	...	do. do. do. ... ..	...	...	30·00	23·77	...	1·86	...	67·81	29,612·49	20,197·82	28·45
Kintore	961s, 1004s ... 950s 902s 1000s	Gold Fields Australian Development Co. Hands Across the Sea North ... New Haven Newminster Voided leases and sundry claims ...	...	...	2,451·00 ... 441·25 100·00 1·41 24·50	2,322·12 ... 180·15 13·77 28·36	191·70 ... ... ... ...	...	...	...	6,205·50 8·50 2,232·50 100·00 47,327·02	5,858·54 7·97 867·79 13·77 34,029·01	677·88
Kunanalling	919s 987s 919s, 987s ... 913s (977s) 988s	Eureka Premier (Eureka leases) Golden Bounty Syndicate, Ltd. Prior to transfer to present holders ... Peter Pan Premier North Voided leases and sundry claims ...	...	...	760·00 250·00 ... 562·50 ... 25·00 170·00 72 290·00	542·57 182·47 ... 342·88 ... 4·45 139·04 182·40	...	...	...	4·66	1,209·00 802·00 7,172·50 737·50 2,946·19 150·00 170·00 2,496·00	918·24 329·28 6,288·07 518·24 1,730·36 222·63 139·04 124,472·54	... ... 12·78 ... 8·86 18·84
Kundana ... ..	...	do. do. do. ... ..	...	...	...	...	...	...	...	...	770·25	102·75	...
<i>From District generally :—</i>			...	...	...	...	...	...	42·23	...	1,782·26	*5,061·33	...
Sundry parcels treated at Various Works ... ..			...	...	...	...	...	...	761·49	17·93	...	2·38	...
Reported by Banks and Gold Dealers			7·09	1·04	...	...	...	...	...	...	...	...	...
Totals			7·09	25·52	11,828·50	5,424·08	191·70	1,377·85	5,429·16	335,048·15	239,742·71	749·31	...

Yilgarn Goldfield.

Blackborne's ... ..	...	Voided leases and sundry claims ...	...	...	...	...	...	...	...	...	1,623·00	415·96	...
Bullfinch	3345, etc. ... 3378, etc. ... 3337, 3458 ... 3400, etc. ... 3397, etc. ... 3753 3825 (3933) (3865) (10pp) 3350	Copperhead Copperhead Deeps Easter Gift leases Prior to transfer to present holders ... Frances May Goldfinch Lady Agnes Western Mining Corporation Prior to transfer to present holder ... One Under Peter Pan Reynold's Find Rising Sun Voided leases and sundry claims ...	...	...	35·00 1,446·00 184·00 ... 298·00 666·00 10·00 1,169·00 315·00 118·00 94·00 290·00 6,018·00 299·75	7·59 284·17 36·12 ... 61·61 101·65 1·77 1,197·57 336·27 40·71 61·38 88·36 1,359·25 113·46	...	...	...	48·03 7·74 6·73	6,834·32 12,568·65 1,550·00 3,594·26 8,248·55 5,744·03 316·00 1,169·00 2,113·00 118·00 266·00 1,490·25 16,615·53 488,855·57	1,944·70 3,924·58 455·87 1,169·82 3,263·00 2,438·92 152·45 1,197·57 1,518·43 40·71 265·58 564·58 7,419·71 183,687·00	... ... ... ... ... ... ... ... ... ... ... 125·00 ... 27,833·41
Totals ... ..			...	1·84	...	...	...	8·47	38·02	...	...	...	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

YILGARN GOLDFIELD—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.					
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	
Corinthian	(34PP)	Badaglo	...	...	104·00	78·01	...	...	...	393·00	470·03	...
	3398	Corinthian	...	...	490·00	138·28	...	...	...	7,383·75	2,529·10	...
	3425	Corinthian North	...	...	874·00	560·37	...	...	...	3,951·00	1,934·78	...
	3415	Deliverance	...	...	470·00	213·73	...	...	...	1,678·40	2,096·93	...
	36PP	Lochlee	...	...	20·00	86·44	...	...	...	20·00	86·44	...
		Voided leases and sundry claims	34·00	4·99	·68	135,548·85	29,882·84	...
Eenuin	3871	Eenuin Daisy	...	...	43·00	25·83	...	...	...	101·00	70·04	...
	(3968)	Helio	...	...	25·00	22·76	...	...	...	25·00	22·76	...
	3936	Yellowdine Gold Areas, N.L.	...	...	200·00	304·81	...	...	...	200·00	304·81	...
		Prior to transfer to present holders	194·00	323·11	281·00	418·04	...
	3938	Newfield East	14·00	13·33	14·00	13·33	...
	Voided leases and sundry claims	...	43·30	365·00	233·06	...	...	52·69	2,338·16	2,108·47	...	
Evanston	3895	Blue Peter	...	...	...	2·31	...	...	...	1,288·00	285·84	...
	3868	Evanston	...	...	7,235·00	3,894·49	...	...	...	8,410·30	4,659·10	...
	3870	Evanston East	...	...	...	34·00	...	...	...	...	13·59	...
	3869	Evanston North	...	...	802·04	372·54	...	...	...	1,244·99	882·79	...
	(3890)	Everett	...	...	26·00	25·81	...	...	...	300·00	142·49	...
	3888	Goldies	...	...	...	...	...	...	...	200·00	43·15	...
	3912	Harbour Lights	...	...	...	...	...	...	...	337·00	80·38	...
	3963	Four B's	...	...	12·00	7·83	...	...	...	12·00	7·83	...
		Sundry claims	...	...	128·00	31·75	...	...	...	415·00	95·89	...
		Voided leases and sundry claims	...	...	...	...	...	...	...	1,557·00	439·93	...
Golden Valley	3575	Great Bingin	...	...	3,302·00	2,321·79	...	...	...	4,173·00	2,854·09	...
	3573	Marie's Find	...	...	...	...	...	...	...	742·00	353·15	...
	3822	Queen Marie	...	...	103·50	92·82	...	...	...	180·50	164·83	...
	2994, etc.	Radio leases	...	...	714·00	570·61	...	...	2·70	13,352·30	33,869·11	7·43
	3248, etc.	Radio Deeps leases	...	...	146·00	52·88	...	...	...	4,992·58	6,005·00	...
		Voided leases and sundry claims	...	...	482·50	245·38	...	4·58	81·53	15,974·61	14,690·53	2·00
Greenmount	...	do. do. do.	...	...	234·00	44·92	...	46·45	25·89	126,653·72	32,130·62	944·50
Holleton	3923	Holleton East	...	...	669·00	68·92	...	...	...	1,044·00	112·52	...
	3312, etc.	North End leases	...	...	35·00	43·74	...	...	...	38,245·50	11,704·28	...
		Voided leases and sundry claims	...	...	...	...	...	...	13·08	4,655·80	1,646·25	31·79
Hope's Hill	3414, 14PP	Pilot leases	...	...	2,833·00	419·79	...	...	...	15,933·00	2,633·95	...
		Voided leases and sundry claims	...	...	1·50	2·17	...	6·12	108·14	135,625·57	37,515·29	1·00
Kennyville	3667	Battler Gold Mine	...	...	254·00	39·56	...	...	...	5,258·00	1,286·67	...
	3506	Cornishman	...	...	92·00	16·10	...	...	...	92·00	16·10	...

	3766	...	Golden Arrow	...	...	...	...	...	...	...	265.00	75.19	...
	3432, 3664	...	Coronation Gold Mining Co., Ltd.	...	...	682.00	105.49	...	...	...	682.00	105.49	...
		...	Prior to transfer to present holders	...	...	588.00	90.22	...	...	...	8,037.50	3,240.27	...
	3845	...	Rainbow	...	...	747.00	92.37	...	...	...	1,223.00	158.70	...
	3875	...	Victoria	...	...	1,605.00	231.25	...	...	...	1,872.00	332.81	...
		...	Voided leases and sundry claims	...	...	257.50	31.16	...	...	23.82	41,896.63	17,572.04	59
Koolyanobbing	...	...	do.	do.	do.	47.00	7.48	...	26	...	2,233.05	1,106.29	...
Marvel Loch	3918	...	Blanket	...	...	630.00	163.36	...	...	...	1,036.00	281.07	...
	3393	...	Bohemia	...	...	491.50	79.28	...	...	...	4,316.50	1,828.19	...
	3675	...	Christmas Gift	...	17.25	24.50	64.36	...	...	76.56	460.00	827.19	...
	3957	...	Comet	...	...	187.00	160.56	...	...	...	187.00	160.56	...
	13PP	...	Cricketer	...	...	...	...	...	...	...	1,405.00	844.24	...
	3966	...	Donovan's Find	...	...	52.00	4.78	...	...	...	52.00	4.78	...
	3942, 3943	...	Edward's Reward leases	...	...	3,150.00	1,434.58	...	...	...	4,561.50	2,451.16	...
	3942	...	(Edward's Reward)	...	...	...	...	...	...	...	2,080.00	2,016.32	...
	3943	...	(Sunshine)	...	...	...	...	...	...	...	3,866.00	2,120.04	...
	(3899)	...	Eveless Eden	...	...	56.00	21.44	...	...	...	364.00	143.07	...
	3947	...	Evelyn Molly	...	...	125.00	120.16	...	...	...	125.00	120.16	...
	3962	...	Firelight	...	...	526.00	103.63	...	...	...	526.00	103.63	...
	3917	...	Four Threes	...	...	36.00	410.33	...	...	...	46.00	493.33	...
	3724	...	Frances Firness	...	...	902.00	249.23	...	...	...	3,970.00	2,257.53	...
	3824	...	Ganymedes	...	158.77	935.00	707.66	...	...	160.01	3,042.00	1,747.79	...
	3941	...	Geelong	...	...	291.50	46.16	...	...	...	311.50	52.15	...
	3683	...	Golden Cube	...	...	93.00	27.09	...	...	18.39	502.00	310.37	...
	3958	...	Ireland	...	...	60.00	7.94	...	...	...	60.00	7.94	...
	(3542)	...	Jacoletti South	...	...	194.00	26.85	...	...	...	1,134.00	140.34	14
	3718	...	Kurrajong	...	...	2,382.00	587.13	...	...	...	5,762.00	2,432.25	...
	33PP	...	Lady Luck	...	...	68.00	28.24	...	...	1.32	275.00	168.62	...
	3431, etc.	...	Lenodo leases	...	...	892.00	170.36	...	...	...	3,542.00	691.69	...
		...	Prior to transfer to present holders	...	...	...	...	...	...	...	1,056.00	177.67	...
	(3928)	...	Marco Polo	...	...	38.00	4.65	...	...	...	94.00	29.60	...
	3413	...	Marvel Loch	...	...	570.00	134.34	...	...	...	2,742.00	555.67	...
	3423, etc.	...	Marvel Loch Gold Development, N.L.	...	...	185.00	13.21	...	...	...	83,801.10	12,260.40	1,239.90
		...	Prior to transfer to present holders	...	...	...	...	...	...	...	1,185.00	215.67	...
	3856	...	Marvel Loch North	...	...	558.00	79.51	...	...	...	1,355.00	215.49	...
	3914	...	May	...	...	...	...	...	...	...	39.00	27.89	...
	3837	...	Maydo	...	...	53.00	60.02	...	...	...	169.00	115.81	...
	3459	...	May Queen	...	...	1,460.00	1,432.82	...	...	...	3,738.00	6,857.65	...
	3835	...	Mountain King	...	...	523.00	259.01	...	...	...	1,187.00	705.99	...
	(3846)	...	Mountain Queen South	...	...	128.00	19.99	...	...	...	1,076.00	687.99	...
	3515, etc.	...	N.G.M., Ltd.	...	...	500.00	45.61	50	...	...	500.00	45.61	50
		...	Prior to transfer to present holders	...	...	...	...	...	...	...	2,675.00	459.60	...
	3404	...	New Yilgarn G.M., N.L.	...	...	4,524.40	2,194.72	207.23	...	...	8,770.40	4,224.18	355.32
		...	Prior to transfer to present holders	...	...	...	...	...	...	...	2,302.30	1,309.21	95.53
	3908	...	North Comet	...	...	264.00	37.75	...	...	...	586.00	87.40	...
	3468	...	(Prince George)	...	...	...	...	...	...	...	1,409.00	117.84	...
	(3382)	...	Salvation	...	...	42.00	26.82	...	...	...	1,843.00	1,347.16	...
	3960	...	Scorpio	...	15.62	89.00	175.96	...	...	15.62	89.00	175.96	...
		...	Voided leases and sundry claims	...	...	2,572.00	552.91	...	11.35	222.75	522,248.70	157,669.32	773.44
Mt. Jackson	(3860)	...	Allen's Find	...	...	226.00	109.96	...	...	28.22	726.00	494.49	...
	3930	...	Bull's Eye	...	...	224.00	32.40	06	...	...	404.00	56.78	06
	3449	...	Die Hardy	...	...	15.50	34.69	...	...	...	327.50	282.89	...
	3931	...	Dolly Pot Hill	...	...	195.00	63.96	...	...	...	285.00	151.76	...
	3940	...	Golden Reef	...	...	46.00	14.99	...	...	...	64.00	18.29	...
	3859	...	Great Unknown	...	...	107.00	103.01	...	...	...	455.00	292.54	...
	3418	...	Clamp's Central	...	...	943.00	430.91	...	...	...	943.00	430.91	...
		...	Prior to transfer to present holders	...	...	...	...	...	...	...	72.24	6,457.63	6.34

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

YILGARN GOLDFIELD—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Mt. Jackson—cont.	(3929)	Mt. King Enterprise ... ..	...	...	41·00	8·06	...	...	...	256·00	61·47	...
	3893	Trump ... ..	...	...	132·00	93·48	...	...	...	200·00	150·05	...
		Voided leases and sundry claims	...	...	489·00	104·46	...	6·44	167·75	50,872·88	33,840·92	2,306·02
Mt. Palmer ...	3544, etc. ...	Yellowdine Gold Development, Ltd. ...	...	...	47,534·00	23,703·02	...	...	...	170,653·50	106,646·89	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,564·65	2,540·71	...
		Voided leases and sundry claims	...	10·69	9·00	3·11	...	1,643·48	18·19	344·00	346·73	...
Mt. Rankin ...	3555	No Trumps ... ..	...	...	3,164·00	294·64	...	...	...	4,381·00	575·36	...
		Voided leases and sundry claims	...	...	...	...	...	3·84	5·20	987·00	239·76	...
Parker's Range ...	3967	Alpha ... ..	...	...	19·00	21·11	...	...	...	19·00	21·11	...
	3956	Black Cat ... ..	...	...	75·00	1·81	...	...	...	75·00	1·81	...
	3520	Centenary ... ..	...	...	195·00	26·45	...	...	...	1,167·00	395·35	...
	3460	Fortuna lease ... ..	...	...	401·00	83·23	...	...	...	1,342·00	358·19	...
	3959	Kookaburra ... ..	...	3·45	182·00	58·66	...	...	3·45	182·00	58·66	...
	3671	Mundy Hills 1 ... ..	...	...	653·00	117·35	...	...	...	1,269·00	274·41	...
	(3452)	Pomeranian ... ..	...	...	22·00	15·16	...	...	...	1,342·00	777·39	...
	2801	Scot's Greys ... ..	...	...	230·00	69·24	...	...	...	1,907·00	671·24	...
	3858	Snowdrop ... ..	...	...	80·00	21·49	...	...	...	880·00	393·80	...
	(3815)	Spring Hill No. 5 ... ..	...	...	267·00	66·71	...	...	...	2,198·00	499·05	...
	(3813)	Spring Hill No. 6 ... ..	...	...	32·00	4·35	...	...	...	2,088·00	459·20	·45
	(3818)	Triumph ... ..	...	...	...	5·23	...	...	...	504·00	115·80	...
	3969	White Horseshoe ... ..	...	...	35·10	61·54	2·58	...	...	35·10	61·54	2·58
		Voided leases and sundry claims	...	5·45	591·50	243·17	...	7·01	127·00	47,451·00	25,478·77	·04
Southern Cross ...	(3955)	Lady Veronica ... ..	...	2·07	90·00	23·10	...	...	2·07	90·00	23·10	...
	3944	Nil Desperandum ... ..	...	...	275·00	56·23	...	...	...	275·00	56·23	...
	3473	Queen Anne ... ..	...	...	541·00	76·68	...	...	...	2,072·50	333·52	...
	3770, etc. ...	Southern Cross United Mines, Ltd. ...	...	...	180·00	50·32	...	...	...	13,053·50	1,457·53	...
	3444	Three Boys ... ..	...	...	1,562·00	190·72	...	...	...	1,960·50	415·07	...
	3934	Three Boys North ... ..	...	...	45·00	5·40	...	...	...	45·00	5·40	...
	3444, 3934 ...	(Yellowdine Options, Ltd.) ... ..	...	...	220·00	73·18	...	...	...	8,074·25	2,000·29	...
	3981	Three Kings ... ..	...	...	64·00	6·91	...	...	...	64·00	6·91	...
		Voided leases and sundry claims	...	...	388·50	70·02	...	22·97	889·34	442,192·29	214,915·16	364·41
Westonia ...	3556	Contemptible ... ..	...	...	8·50	7·76	...	...	...	91·75	72·68	...
	3308, etc. ...	Edna May (W.A.) Amalgamated G.Ms., N.L.	...	...	15,822·00	5,970·17	495·30	...	...	34,732·00	12,892·19	942·61
		Prior to transfer to present holders	...	...	...	...	...	...	...	4,092·00	2,867·26	...
	3874	Thérésé ... ..	...	...	515·00	123·46	...	...	...	742·00	255·06	...
	Voided leases and sundry claims	...	...	93·56	15·37	...	9·51	69·02	448,159·15	316,463·27	21·78	

From Goldfield generally :-													
Sundry parcels treated at:													
Battler Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Butcher Bird Battery	...	...	...	...	...	...	...	...	...	...	...	...	...
Centenary Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Copperhead Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Corinthian Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Coronation G.M. Co. Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Evelyn Molly Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Holleton Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Howlett's Battery	...	...	...	...	...	...	...	...	...	110.00	...	...	...
Invermay Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Kurrajong Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Mt. Jackson Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...
North End Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...
Pilot Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Radio Deeps Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Rainbow Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Scot's Grey's Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Thérèse Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Three Boy's Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Triumph Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Wesley's Hope's Hill Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Wesley's Marvel Loch Cyanide Plant	...	...	...	...	...	...	...	...	...	...	...	...	...
Southern Cross Tailings Treatment	...	...	...	...	...	...	...	...	...	...	...	...	...
Sunshine Battery	...	...	...	...	...	...	...	...	...	...	...	...	...
Various Works	...	...	...	...	...	...	...	...	...	156.78	...	...	...
Reported by Banks and Gold Dealers	...	...	...	7.45	...	...	...	...	304.61	58.31	...	...	...
Totals	...	...	...	7.45	258.44	133,136.35	62,672.37	830.67	2,075.09	2,274.55	3,070,516.72	1,452,355.76	35,091.38

Dundas Goldfield.

Buldania	...	...	...	...	...	...	...	...	...	...	...	...	...
Dundas	...	1550	...	...	...	...	...	...	1.88	...	39.55	1,899.32	1,479.18
			Voided leases and sundry claims	...	...	170.50	39.60	...	...	...	...	...	...
			May Bell	...	...	538.50	99.05	...	...	...	...	587.50	115.52
			Voided leases and sundry claims	...	...	145.75	83.39	...	...	...	...	389.82	5,778.23
Norseman	...	1488	...	...	...	410.50	119.63	98.00	...	...	...	645.00	161.22
		1382	...	...	...	434.02	1,169.00	3,570.11	...	...	1,663.32	2,947.00	12,465.40
			Prior to transfer to present holders	...	...	...	...	...	...	...	...	651.25	1,141.90
			(Blue Bird South leases)	...	...	93.00	44.24	...	...	...	...	213.00	135.42
			Break O'Day	...	...	10.00	5.04	...	...	...	...	10.00	5.04
			Bull Ant	...	43.21	78.00	111.92	...	...	...	43.21	78.00	111.92
			Central Norseman Gold Corporation, N.L.	...	...	88,312.75	35,254.90	28,145.74	...	...	...	228,629.50	71,571.54
			Prior to transfer to present holders	...	...	...	...	...	...	...	...	16,382.71	13,939.02
			Cumberland Central	...	...	...	...	...	...	...	...	221.75	59.44
			Cumberland Central West	...	...	...	...	...	...	...	...	118.00	36.75
			Lady Mary	...	...	...	...	...	...	...	...	99.00	15.45
			(Lady Miller G.Ms., N.L.)	...	...	36.00	10.23	...	...	...	...	2,023.87	433.62
			Prior to transfer to present holders	...	...	...	...	...	...	...	...	805.00	216.37
			Lily	...	...	532.25	198.97	...	...	...	...	573.00	220.55
			Lily West	...	...	...	...	...	...	...	...	56.00	17.96
			Lone Hand	...	3.98	...	...	...	...	...	3.98	...	...
			New Moon	...	...	13.00	5.06	...	...	...	...	13.00	5.06
			Norseman Associated G.Ms., N.L.	...	...	5,078.00	778.00	1,201.00	...	...	...	5,078.00	778.00
			Prior to transfer to present holders	...	...	...	...	...	...	...	...	83.25	23.47
			Norseman Developments, N.L.	...	...	18,957.00	3,570.00	6,055.00	...	...	...	23,123.00	5,224.00
			Prior to transfer to present holders	...	...	...	...	...	...	...	...	502.50	126.64

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.
DUNDAS GOLDFIELD—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1939.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.
Norseman	1315, etc.	Norseman Gold Mines, N.L.	...	...	123,404·00	31,046·00	52,406·00	...	...	406,837·00	139,400·15	177,014·54
		Prior to transfer to present holders	...	...	...	...	...	...	...	2,656·75	669·38	...
	1588	O.K.	...	...	19·75	4·96	...	...	...	19·75	4·96	...
	1422	Onkaparinga	...	...	27·75	24·48	...	...	...	647·50	1,284·27	...
	(1499)	Penneshaw South	...	...	33·25	9·75	...	...	...	33·25	9·75	...
	1530	Second Try	...	...	64·00	19·92	...	...	...	85·75	26·10	...
	1347, etc.	(South Norseman G.M., N.L.)	...	...	276·00	68·86	...	...	...	276·00	68·86	...
	1516	Surprise	...	...	32·00	35·82	...	...	7·20	42·00	52·55	...
	1567	Trump	...	...	26·50	3·87	...	...	...	26·50	3·87	...
	1524	Valhalla	...	...	680·50	333·39	17·42	...	...	844·50	395·41	17·42
		Voided leases and sundry claims	10·14	9·75	1,096·75	348·71	...	1,033·42	13,750·12	922,849·03	601,885·76	35,691·29
Peninsula	1582	Peninsula	...	4·62	153·50	78·38	...	...	4·62	153·50	78·38	...
		Voided leases and sundry claims	...	...	...	...	...	...	17·61	8,715·39	5,335·67	...
		<i>From Goldfield generally:—</i>										
		Sundry Parcels treated at:										
		Davies Cyanide Plant	...	...	...	*265·78	10·84	...	...	...	*936·37	113·16
		Hill's Cyanide Plant	...	...	...	*22·63	...	...	...	...	*136·31	...
		Princess Royal Cyanide Plant	...	...	...	*262·64	173·17	...	...	...	*1,178·57	876·06
		State Battery, Norseman	...	...	...	*627·04	...	...	...	405·39	*19,175·89	885·41
		Various Works	...	...	...	...	...	...	54·52	483·14	*11,204·88	706·24
		Reported by Banks and Gold Dealers	89·73	...	...	...	...	1,170·55	41·03	47·50	11·43	...
		Totals	99·87	495·58	241,358·25	77,042·37	88,107·17	2,206·61	16,014·98	1,634,640·83	893,027·26	349,200·01

Phillips River Goldfield.

Hatter's Hill	...	Voided leases and sundry claims	...	...	582·00	199·17	...	74·91	26·07	5,950·65	3,542·32	1·25
Kundip	248	Ardpatrick	...	...	131·00	243·64	...	...	...	253·00	352·52	9·99
	249	Beryl Gold Mines, Ltd.	...	...	1,050·00	470·13	15·37	...	...	1,050·00	470·13	15·37
	247	Little Mary	...	...	2,386·00	264·74	...	...	...	8,335·00	806·28	...
	M.L. 370	North Harbour View	...	...	...	35·27	...	...	...	35·27	†22·16	...
		Voided leases and sundry claims	...	...	1,381·50	328·65	...	201·90	629·01	75,970·19	†58,316·79	†3,812·69
Mt. Desmond	...	do. do. do.	...	...	...	...	...	...	1·40	9·00	†3,938·27	†6,942·60
Ravensthorpe	(212)	Bridgetown	...	...	...	7·36	...	...	...	359·50	150·32	...
	255	Charmaine	...	...	169·80	84·49	...	...	...	169·80	84·49	...
	14PP	Floater Gold Mine	...	...	26·00	7·82	...	...	...	26·00	7·82	...
		Voided leases and sundry claims	...	...	359·00	89·61	...	163·96	148·40	30,719·32	†28,844·64	†4,425·19
West River	...	do. do. do.	...	...	...	...	...	...	...	...	†13·63	†34·50

<i>From Goldfield generally :—</i>														
Sundry Parcels treated at :														
Floater Cyanide Plant	...	...	...	...	...	...	...	...	12.00	*229.11	...
Daw and Toleman Cyanide Plant	...	...	...	...	*93.86	...	...	...	...	*295.76	...
Kundip Cyanide Plant	...	...	...	...	*1.73	...	...	...	...	*1.73	...
Maori Queen Cyanide Plant	...	...	...	...	*121.03	...	...	...	...	*541.70	...
Phillips River Prospectors and Leaseholders' Association	...	...	...	...	*125.56	...	...	...	...	*125.56	...
Plowman and Williams Cyanide Plant	...	...	...	...	*36.55	...	...	...	...	*94.06	...
Weston's Cyanide Plant	...	...	...	...	*67.58	...	...	...	...	*67.58	...
Various Works	...	...	...	...	*6.13	...	...	...	...	*1,126.05	493.66
Reported by Banks and Gold Dealers	...	...	...	...	...	...	161.42	11.47	...	...	...
Totals	97	...	6,085.30	2,148.05	15.37	602.19	816.35	122,889.73	99,030.92	15,735.25

Outside Proclaimed Goldfield.

Burracoppin	...	13PP	...	...	Christmas Gift	...	...	46.00	12.09	...	...	...	283.25	183.93	...
					Voided leases and sundry claims	...	...	...	...	...	...	...	800.35	736.42	...
Donnybrook	...	...	...	...	do. do. do.	11.28	...	...	...	...	52.06	37.83	1,732.80	831.94	15.18
Roebourne	...	5PP	...	...	Shaw's Shaft	...	...	116.00	166.97	13.19	...	...	156.00	204.23	13.19
					Voided leases and sundry claims	4.00	...	75.75	55.53	...	214.69	182.18	20,194.46	22,340.78	1,331.07
					Reported by Banks and Gold Dealers	16.51	1.30	...	...	...	5,999.50	159.47	103.50	228.32	...
<i>From State generally :—</i>															
Sundry Parcels treated at :															
					Fremantle Smelting Works	...	...	...	*273.90	371.32	...	...	...	*1,750.87	1,109.06
					Weerianna Cyanide Plant	...	...	...	*10.30	...	...	...	...	*69.55	...
					Various Works	...	...	...	...	...	...	...	27.00	*7,128.29	30,412.67
					Sundry specimens	...	...	...	...	...	4.24	56.85	...	...	...
					Voided leases and sundry claims	1.62	...	42.75	14.65	...	245.45	14.13	200.60	41.09	...
					Reported by Banks and Gold Dealers	57.24	52.68	...	...	...	655.06	760.54	...	211.66	59.99
Totals	...	...	...	...		90.65	53.98	280.50	533.44	384.51	7,171.00	1,211.00	23,497.96	33,727.08	32,941.16

† Includes Gold and Silver from smelted copper ore.

TABLE II.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT, AS REPORTED TO THE MINES DEPARTMENT DURING THE YEAR 1939.

Goldfield.	District.	DISTRICT.						GOLDFIELD.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.
		Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley ...	...	...	...	...	...	...	...	342.73	...	981.20	622.36	965.09	93.00
Pilbara ...	Marble Bar ...	167.73	56.34	19,590.25	12,250.78	12,474.85	33.95	} 449.24	84.29	24,754.35	14,715.82	15,249.35	33.95
	Nullagine ...	281.51	27.95	5,164.10	2,465.04	2,774.50	...						
Ashburton ...	...	...	...	...	...	...	...	37.33	18.98	2,249.25	684.96	741.27	126.85
Gascoyne ...	...	...	...	...	...	...	...	63.94	...	...	...	63.94	...
Peak Hill ...	...	...	...	...	...	...	...	105.70	49.92	5,518.50	2,380.33	2,535.95	...
East Murchison ...	Lawlers ...	48.93	6.16	53,386.50	15,122.10	15,177.19	164.00	} 56.78	30.84	834,610.48	161,869.27	161,956.89	2,195.69
	Wiluna ...	3.45	12.70	694,941.01	123,403.26	123,419.41	1,213.99						
	Black Range ...	4.40	11.98	86,282.97	23,343.91	23,360.29	817.70						
Murchison ...	Cue ...	225.37	576.57	558,690.05	95,682.90	96,484.84	22,088.12	} 647.94	1,645.23	705,910.70	137,585.49	139,878.66	22,405.89
	Meekeatharra ...	249.98	240.87	30,327.25	9,919.54	10,410.39	...						
	Day Dawn ...	109.32	194.67	2,745.25	1,864.64	2,168.63	...						
	Mt. Magnet ...	63.27	633.12	114,148.15	30,118.41	30,814.80	317.77						
Yalgoo ...	...	...	...	...	...	...	...	9.55	143.15	21,631.00	7,642.70	7,795.40	36.76
Mt. Margaret ...	Mt. Morgans ...	121.32	263.88	6,649.35	9,039.56	9,424.76	...	} 232.03	1,269.80	324,830.30	111,871.67	113,373.50	4,565.81
	Mt. Malcolm ...	56.28	713.84	142,549.00	48,092.46	48,862.58	3,774.93						
	Mt. Margaret...	54.43	292.08	175,631.95	54,739.65	55,086.16	790.88						
North Coolgardie ...	Menzies ...	15.07	228.17	13,038.00	9,112.07	9,355.31	1,330.89	} 56.77	2,624.91	29,198.25	19,251.32	21,933.00	1,434.16
	Ularring ...	7.40	2,387.91	9,619.25	7,699.53	10,094.84	103.27						
	Niagara ...	15.17	...	1,789.00	733.81	748.98	...						
	Yerilla ...	19.13	8.83	4,752.00	1,705.91	1,733.87	...						
Broad Arrow ...	...	...	...	...	...	...	...	134.04	1,052.52	39,091.34	17,415.28	18,601.84	25.04
N.E. Coolgardie ...	Kanowna ...	180.82	37.40	2,308.50	1,358.16	1,576.38	...	} 295.22	235.73	2,794.00	1,734.53	2,265.48	...
	Kurnalpi ...	114.40	198.33	485.50	376.37	689.10	...						
East Coolgardie ...	East Coolgardie	252.73	229.56	1,636,887.35	532,066.92	532,549.21	130,925.22	} 291.56	235.09	1,639,597.10	532,707.90	533,234.55	130,925.22
	Bulong ...	38.83	5.53	2,709.75	640.98	685.34	...						
	Coolgardie ...	216.91	184.35	71,401.35	20,429.56	20,830.82	878.66						
Coolgardie ...	Kunanalling ...	7.09	25.52	11,828.50	5,424.08	5,456.69	191.70	224.00	209.87	83,229.85	25,853.64	26,287.51	1,070.36
Yilgarn ...	...	...	...	...	...	...	...	7.45	258.44	133,136.35	62,672.37	62,938.26	830.67
Dundas ...	...	...	...	...	...	...	...	99.87	495.58	241,358.25	77,042.37	77,637.82	88,107.17
Phillips River ...	...	...	...	...	...	...	...	...	...	6,085.30	2,148.05	2,149.02	15.37
Outside Proclaimed Goldfields ...	...	...	...	...	...	...	...	90.65	53.98	280.50	533.44	678.07	384.51
		...	...	...	...	...	...	3,145.77	8,408.33	4,095,256.72	1,176,731.50	1,188,285.60	252,250.45

TABLE III.

RETURN SHOWING TOTAL PRODUCTION REPORTED TO THE MINES DEPARTMENT, AND RESPECTIVE DISTRICTS AND GOLDFIELDS FROM WHENCE DERIVED, TO 31ST DECEMBER, 1939.

Goldfield.	District.	DISTRICT.						GOLDFIELD.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	*Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	*Silver.
		Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley ...	...	...	...	...	...	...	...	6,503·26	33·69	19,282·45	15,364·61	21,901·56	93·00
Pilbara ...	Marble Bar ...	14,494·94	4,250·41	166,961·93	199,081·35	217,826·70	687·86	} 23,485·97	} 4,836·80	} 223,498·82	} 281,639·99	} 309,962·76	} 716·53
	Nullagine ...	8,991·03	586·39	56,536·89	82,558·64	92,136·06	28·67						
Ashburton ...	...	...	...	...	...	...	...	9,039·36	375·88	4,282·75	1,508·26	10,923·50	7,958·00
Gascoyne ...	...	...	...	...	...	...	...	652·58	41·57	387·00	517·29	1,211·44	...
Peak Hill ...	...	...	...	...	...	...	...	3,180·69	4,951·44	598,632·93	286,554·75	294,686·88	2,311·33
East Murchison ...	Lawlers ...	6,788·40	2,322·14	1,772,406·33	758,078·41	767,188·95	25,946·88	} 8,592·43	} 20,502·09	} 8,539,583·04	} 2,971,533·04	} 3,000,627·56	} 47,184·27
	Wiluna ...	193·88	1,157·09	5,232,457·91	1,323,314·52	1,324,665·49	1,664·02						
	Black Range ...	1,610·15	17,022·86	1,534,718·80	890,140·11	908,773·12	19,573·37						
Murchison ...	Cue ...	3,556·78	7,278·09	1,847,687·24	686,635·96	697,470·83	62,481·91	} 22,500·10	} 53,882·42	} 7,047,297·27	} 3,784,685·25	} 3,861,067·77	} 238,220·51
	Meekatharra ...	13,772·58	16,263·63	2,157,203·39	1,235,712·12	1,265,748·33	5,028·90						
	Day Dawn ...	2,877·78	11,009·58	2,003,515·25	1,321,980·71	1,335,868·07	169,210·44						
	Mt. Magnet ...	2,292·96	19,331·12	1,038,891·39	540,356·46	561,980·54	1,499·26	} 1,699·76	} 2,756·30	} 393,489·10	} 239,649·37	} 244,105·43	} 1,289·52
Yalgoo ...	...	...	...	...	...	...	...
Mt. Margaret ...	Mt. Morgans ...	3,002·54	9,005·51	1,175,745·81	668,392·41	680,400·46	5,780·87	} 10,469·35	} 31,390·01	} 8,620,710·80	} 4,112,940·06	} 4,154,799·42	} 198,238·07
	Mt. Malcolm ...	3,611·35	13,664·04	5,164,041·13	2,377,880·83	2,395,156·22	132,968·25						
	Mt. Margaret ...	3,855·46	8,720·46	2,280,923·86	1,066,666·82	1,079,242·74	59,488·95						
North Coolgardie ...	Menzies ...	1,549·64	5,944·43	1,383,721·52	1,124,901·94	1,132,396·01	25,109·34	} 4,654·95	} 17,276·35	} 2,836,435·22	} 2,095,588·94	} 2,117,520·24	} 37,341·95
	Ularring ...	101·85	5,783·58	356,684·10	332,017·94	337,903·37	6,098·05						
	Niagara ...	1,699·45	1,810·43	918,683·02	510,574·06	514,083·94	5,603·42						
	Yerilla ...	1,304·01	3,737·91	177,346·58	128,095·00	133,136·92	531·14	} 21,644·35	} 25,065·91	} 1,139,255·37	} 639,963·32	} 686,673·58	} 4,033·09
Broad Arrow ...	...	...	...	...	...	...	...
N.E. Coolgardie ...	Kanowna ...	106,062·69	12,200·56	988,905·21	617,259·72	735,522·97	2,522·12	} 118,814·60	} 19,855·59	} 1,001,664·78	} 635,340·82	} 774,011·01	} 2,533·34
	Kurnalpi ...	12,751·91	7,655·03	12,759·57	18,081·10	38,488·04	11·22						
East Coolgardie ...	East Coolgardie ...	32,664·92	37,377·97	42,460,871·50	24,501,959·54	24,572,002·43	2,802,783·95	} 59,985·15	} 53,254·92	} 42,632,981·39	} 24,630,901·38	} 24,744,141·45	} 2,802,796·87
	Bulong ...	27,320·23	15,876·95	172,109·89	128,941·84	172,139·02	12·92						
Coolgardie ...	Coolgardie ...	16,197·53	14,849·04	1,812,278·65	1,105,068·67	1,136,115·24	1,873·80	} 17,575·38	} 20,278·20	} 2,147,326·80	} 1,344,811·38	} 1,382,664·96	} 2,623·11
	Kunanalling ...	1,377·85	5,429·16	335,048·15	239,742·71	246,549·72	749·31						
Yilgarn ...	...	...	...	...	...	...	...	2,075·09	2,274·55	3,070,516·72	1,452,355·76	1,456,705·40	35,091·38
Dundas ...	...	...	...	...	...	...	...	2,206·61	16,014·98	1,634,640·83	893,027·26	911,248·85	349,200·01
Phillips River ...	...	...	...	...	...	...	...	602·19	816·35	122,889·73	99,030·92	100,449·46	15,735·25
Outside Proclaimed Goldfields ...	...	...	...	...	...	...	...	7,171·00	1,211·00	23,497·96	33,727·08	42,109·08	32,941·16
		...	...	...	...	...	...	320,852·82	274,818·05	80,056,372·96	43,519,139·48	44,114,810·35	3,778,307·39

* By-product from treatment of auriferous ore, with exception of yield from Ashburton G.F. and outside Proclaimed Goldfield.

TABLE IV.

TOTAL OUTPUT OF GOLD (BULLION AND CONCENTRATES ENTERED FOR EXPORT AND GOLD RECEIVED AT THE ROYAL MINT, PERTH), FROM 1ST JANUARY, 1886, TO 31ST DECEMBER, 1939; SHOWING IN FINE OUNCES THE QUANTITY CREDITED TO THE RESPECTIVE GOLDFIELDS.

Year.	Export.	Mint.	Total.	Export.	Mint.	Total.
	KIMBERLEY.			PILBARA.		
	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.
Prior to 1937	22,422·06	8,944·64	31,366·70	147,302·43	196,160·21	343,462·64
1937	...	364·09	364·09	...	12,836·23	12,836·23
1938	...	789·03	789·03	6·22	14,672·11	14,678·33
1939	...	823·84	823·84	47·36	17,143·60	17,190·96
Total	22,422·06	10,921·60	33,343·66	147,356·01	240,812·15	388,168·16
	(a) WEST PILBARA.			ASHBURTON.		
Prior to 1937	4,351·11	26,760·61	31,111·72	4,104·96	2,861·03	6,965·99
1937	...	...	...	...	266·93	266·93
1938	...	...	...	...	342·55	342·55
1939	...	...	...	...	924·08	924·08
Total	4,351·11	26,760·61	31,111·72	4,104·96	4,394·59	8,499·55
	(b) GASCOYNE.			(c) PEAK HILL.		
Prior to 1937	304·55	971·57	1,276·12	41,102·62	193,641·17	234,743·79
1937	...	16·50	16·50	...	2,085·61	2,085·61
1938	...	10·72	10·72	...	1,777·79	1,777·79
1939	...	38·96	38·96	...	1,638·92	1,638·92
Total	304·55	1,037·75	1,342·30	41,102·62	199,143·49	240,246·11
	EAST MURCHISON.			MURCHISON.		
Prior to 1937	231,239·57	2,027,911·47	2,259,151·04	1,485,780·01	2,275,306·91	3,761,086·92
1937	2,824·25	141,790·81	144,615·06	27,222·02	58,354·76	85,576·78
1938	2,497·92	154,036·79	156,534·71	33,623·15	119,543·65	153,166·80
1939	4,566·11	141,301·92	145,868·03	23,507·54	115,162·86	138,670·40
Total	241,127·85	2,465,040·99	2,706,168·84	1,570,132·72	2,568,368·18	4,138,500·90
	(d) YALGOO.			(e) MT. MARGARET.		
Prior to 1937	11,613·31	145,340·81	156,954·12	617,919·18	3,137,111·94	3,755,031·12
1937	46·64	7,562·69	7,609·33	14,558·87	84,776·51	99,335·38
1938	943·00	13,549·90	14,492·90	19,186·81	78,426·81	97,613·62
1939	903·00	7,827·79	8,730·79	13,634·40	94,803·91	108,438·31
Total	13,505·95	174,281·19	187,787·14	665,299·26	3,395,119·17	4,060,418·43
	(f) NORTH COOLGARDIE.			(g) BROAD ARROW.		
Prior to 1937	262,434·90	1,805,890·66	2,068,325·56	122,049·54	289,981·70	412,031·24
1937	167·60	35,858·75	36,026·35	79·82	20,904·18	20,984·00
1938	48·83	32,548·83	32,597·66	66·53	21,652·86	21,719·39
1939	124·33	23,887·79	24,012·12	33·96	20,379·58	20,413·54
Total	262,775·66	1,898,186·03	2,160,961·69	122,229·85	352,918·32	475,148·17
	(f) NORTH-EAST COOLGARDIE.			(f) EAST COOLGARDIE.		
Prior to 1937	235,745·50	449,040·61	684,786·11	6,822,934·86	17,730,137·13	24,553,071·99
1937	17·81	1,683·71	1,701·52	14,087·36	410,360·95	424,448·31
1938	25·02	1,407·23	1,432·25	38,659·63	479,408·02	518,067·65
1939	8·00	1,184·43	1,192·43	36,968·29	548,187·12	585,155·41
Total	235,796·33	453,315·98	689,112·31	6,912,650·14	19,168,093·22	26,080,743·36
	(h) COOLGARDIE.			YILGARN.		
Prior to 1937	662,014·53	944,923·79	1,606,938·32	216,344·93	1,117,855·71	1,334,200·64
1937	55·49	20,659·01	20,714·50	135·29	64,473·09	64,608·38
1938	117·79	19,135·20	19,252·99	5·45	66,120·73	66,126·18
1939	112·04	25,963·53	26,075·57	144·70	61,728·24	61,872·94
Total	662,299·85	1,010,681·53	1,672,981·38	216,630·37	1,310,177·77	1,526,808·14
	(i) DUNDAS.			(j) PHILLIPS RIVER.		
Prior to 1937	119,322·16	705,595·56	824,917·72	40,195·24	52,193·65	92,388·89
1937	12,385·31	65,078·06	77,463·37	...	1,131·80	1,131·80
1938	18,228·02	47,272·26	65,500·28	...	2,013·44	2,013·44
1939	18,137·02	51,071·06	69,208·08	218·66	2,309·83	2,528·49
Total	168,072·51	869,016·94	1,037,089·45	40,413·90	57,648·72	98,062·62
	¶ DONNYBROOK.			OUTSIDE PROCLAIMED GOLDFIELD.		
Prior to 1937	282·21	557·53	839·74	18,358·19	27,892·52	46,250·71
1937	...	...	...	66·45	796·16	862·61
1938	...	...	...	210·01	1,464·89	1,674·90
1939	...	...	...	334·47	1,120·30	1,454·77
Total	282·21	557·53	839·74	18,969·12	31,273·87	50,242·99

^a Prior to 1st May, 1898, included with Pilbara and abolished 12th July, 1929.

^b Prior to March, 1899, included with

Ashburton. ^c From 1st August, 1897.

^d Prior to 1st April, 1897, included with Murchison.

^e From 1st August, 1897.

^f Prior to 1st May, 1896, included with Coolgardie.

^g From 1st September, 1897.

^h Declared 5th April, 1894, to which

date included with Yilgarn.

ⁱ Prior to 1893 included with Yilgarn.

^j Prior to 1902, included in State generally.

¶ Abolished 4th March, 1908.

TABLE V.

TOTAL OUTPUT OF GOLD BULLION, CONCENTRATES, ETC., ENTERED FOR EXPORT AND RECEIVED AT THE PERTH BRANCH OF THE ROYAL MINT.

Year.	Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.
1886 to 1929	10,987,594.38	26,899,852.59	37,887,446.97
1930	1,753.09	* 415,765.00	417,518.09
1931	1,726.66	508,845.36	510,572.02
1932	3,887.07	601,674.33	605,561.40
1933	2,446.97	634,760.40	637,207.37
1934	3,520.40	647,817.95	651,338.35
1935	9,868.71	639,180.38	649,049.09
1936	55,024.58	791,183.21	846,207.79
1937	71,646.91	928,999.84	1,000,646.75
1938	113,620.06	1,054,171.13	1,167,791.19
1939	98,739.88	1,115,497.76	1,214,237.64
Total	11,349,828.71	34,237,747.95	45,587,576.66

* Accumulated differences in calculations adjusted by addition of 1,148.88 fine ozs.

The estimated value of the above production (calculated prior to 1930 at £4.24773, 1930 at £4.2477 and subsequently at £4 4s. 11.45d. per fine ounce) amounted to £188,485,932 6s. 10d.; in addition premiums on sales of gold during 1920-1924 and 1930-1938 were received totalling approximately £26,933,129. The bonus paid under the Commonwealth Gold Bounty Act, 1930, was £161,448, bringing the gross estimated value of gold won up to £A215,580,509.

TABLE VI.—MINERALS OTHER THAN GOLD.

GENERAL RETURN OF ORE AND MINERALS, OTHER THAN GOLD, SHOWING THE QUANTITY PRODUCED AND THE VALUE THEREOF AS REPORTED TO THE MINES DEPARTMENT FROM THE RESPECTIVE GOLDFIELDS AND MINERAL FIELDS, DURING 1939, AND PREVIOUS YEARS.

Period.	ANTIMONY.								FELSPAR.		GLAUCONITE.	
	E. Murchison Goldfield.		Pilbara Goldfield.		State generally.		Total.		Coolgardie Goldfield.		State generally.	
	Tons.*	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £
Prior to 1936....	....	....	....	....	21	491	21	491	5,257	10,410	1,083	5,415
1936 .....	....	....	....	....	....	....	....	....	2,840	5,680	219	1,095
1937	562	9,196	3	39	....	....	565	9,235	2,900	5,801	165	825
1938	339	3,859	....	....	....	....	339	3,859	2,873	5,746	183	915
1939	364	3,234	....	....	....	....	364	3,234	†3,792	†7,584	142	710
Total	1,265	16,289	3	39	21	491	1,289	16,819	†17,662	†35,221	1,792	8,960

* By-product from Moonlight Wiluna G.Ms.

† Includes 250 tons valued at £500 from State generally.

Period.	ASBESTOS.								GYPSUM.					
	Ashburton Goldfield.		Pilbara Goldfield.		State generally.		Total.		Yilgarn Goldfield.		State generally.		Total.	
	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £
Prior to 1936....	2	189	1,160	53,633	994	23,222	2,156	77,044	6,730	6,730	40,294	57,438	47,024	64,168
1936 .....	....	....	34	770	122	2,520	156	3,290	455	455	6,206	7,114	6,661	7,569
1937	8	770	20	1,180	14	408	42	2,358	479	479	8,594	9,330	9,073	9,809
1938 .....	....	....	67	2,871	54	2,443	121	5,314	2,296	2,296	11,130	10,113	13,420	12,409
1939 .....	....	....	1	202	*32	*1,118	33	1,320	....	....	14,340	13,492	14,340	13,492
Total	10	959	1,282	58,656	1,216	29,711	2,508	89,326	9,960	9,960	80,566	97,487	90,527	107,447

* Includes 5 tons valued at £20 from East Coolgardie.

Period.	TIN.												
	Pilbara Goldfield—Marble Bar District.				Greenbushes Mineral Field.					Total.			
	Quantity.			Value. £	Quantity.			Value. £	Quantity.			Value. £	
	Lode.	Stream.	Total.		Lode.	Stream.	Total.		Lode.	Stream.	Total.		
Prior to 1936	372.62	5,511.75	5,884.37	543,722	350.96	10,775.03	11,125.99	968,423	*724.18	*16,291.65	*17,015.83	1,512,566	
1936 .....	....	4.60	4.60	677	....	21.85	21.85	2,784	....	26.45	26.45	3,461
1937 .....	....	2.77	2.77	500	27.09	24.19	51.28	7,098	27.09	26.96	54.05	7,598
1938 .....	....	.60	.60	75	41.25	10.65	51.90	6,253	41.25	11.25	52.50	6,328
1939 .....	....	....	....	....	10.78	....	10.78	1,447	10.78	....	10.78	1,447
Total	372.62	5,519.72	5,892.34	544,974	430.08	10,831.72	11,261.80	986,005	803.30	16,356.31	17,159.61	1,531,400	

* Includes 4.72 tons, value £360; 15 tons, value £15; and .60 tons, value £46, the produce of Cue and Coolgardie Districts and Yilgarn Goldfield respectively.

Period.	TANTALITE.											
	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £
Prior to 1936	21.84	157.31	179.15	32,723	....	3.94	3.94	2,009	21.84	161.25	183.09	34,732
1936	11.00	3.36	14.36	7,120	....	....	....	....	11.00	3.36	14.36	7,120
1937	19.66	....	19.66	29,011	....	....	....	....	19.66	....	19.66	29,011
1938	19.71	....	19.71	27,557	....	....	....	....	19.71	....	19.71	27,557
1939	8.28	....	8.28	12,073	....	....	....	....	8.28	....	8.28	12,073
Total	80.49	160.67	241.16	108,484	....	3.94	3.94	2,009	80.49	164.61	245.10	110,493

Period.	LEAD ORE.						*ARSENIC.		COAL.	
	Northampton Mineral Field.		State generally.		Total.		Wiluna District.		Collie Coalfield.	
	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £	Tons.	Value. £
Prior to 1936	408,667	1,270,141	107	1,529	408,774	1,271,670	8,600	155,874	12,153,915	8,095,642
1936	1,535	2,228	....	....	1,535	2,228	3,470	62,460	565,075	331,566
1937	6,163	7,248	....	....	6,163	7,248	2,054	36,972	553,510	340,444
1938	350	590	....	....	350	590	3,999	71,982	604,792	375,082
1939 .....	....	....	....	....	....	....	1,416	25,488	557,535	362,811
Total	416,715	1,280,207	107	1,529	416,822	1,281,736	19,599	352,776	14,434,827	9,505,545

* By-product from Ore treated by Wiluna G.Ms., Ltd.

TABLE VI.—Minerals other than Gold—continued.

Period.	COPPER ORE.													
	West Kimberley Goldfield.		Pilbara Goldfield.				West Pilbara Goldfield.		Ashburton Goldfield.		Peak Hill Goldfield.		East Murchison Goldfield.	
			Marble Bar District.		Nullagine District.								Lawlers District.	
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
Prior to 1936	tons. 109	£ 1,709	tons. 33	£ 386	tons. 14	£ 480	tons. 82,745	£ 748,482	tons. 351	£ 6,403	tons. 1,015	£ 32,212	tons. 238	£ 4,364
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1939	.....	.....	.....	.....	.....	.....	.....	.....	1	23	.....	.....	.....	.....
Total	109	1,709	33	386	14	480	82,745	748,482	352	6,431	1,015	32,212	238	4,364

Period.	COPPER ORE—continued.											
	Murchison Goldfield.		Yalgoo Goldfield.		Northampton Mineral field.		Yandanooka Mineral field.		Mt. Margaret Goldfield.			
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
Prior to 1936	tons. 1,024	£ 11,236	tons. 39	£ 413	tons. 24,019	£ 119,451	tons. 172	£ 1,889	tons. 47,861	£ 230,846		
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1939	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	1,024	11,236	39	413	24,019	119,451	172	1,889	47,861	230,846		

Period.	COPPER ORE—continued.										LIMESTONE.							
	North Coolgardie Goldfield.		East Coolgardie Goldfield.		Phillips River Goldfield.		State generally.		Total.		Murchison Goldfield.		Yilgarn Goldfield.		State generally.		Total.	
	Menzies District.		E. Coolgardie District.								Cue District.							
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1936	tons. 6	£ 51	tons. 51	£ 330	tons. 95,729	£ 588,115	tons. 19	£ 249	tons. 253,423	£ 1,746,621	tons. 298	£ 772	tons. 2,548	£ 1,607	tons. 90,859	£ 15,911	tons. 93,705	£ 18,290
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	2	85	3	161	5	246	.....	.....	.....	.....	.....	.....	.....	.....
1939	.....	.....	.....	.....	.....	.....	.....	.....	1	23	.....	.....	.....	.....	.....	.....	.....	.....
Total	6	51	51	330	95,729	588,200	22	410	253,429	1,746,890	298	772	2,548	1,607	90,859	15,911	93,705	18,290

Period.	IRONSTONE.								DIAMONDS.		EMERALDS.		MAGNESITE.		MANGANESE.	
	West Pilbara Goldfield.		E. Coolgardie Gf.		State generally.		Total.		Pilbara Goldfield.		Murchison Goldfield.		East Coolgardie Goldfield.		Peak Hill Goldfield.	
			E. Coolgardie D.						Nullagine District.		Cue District.		Bulong District.			
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1936	tons. 100	£ 300	tons. 450	£ 247	tons. 57,280	£ 36,148	tons. 57,830	£ 36,695	.....	£ 24	carats, cut and rough. 18,373	£ 1,609	tons. 825	£ 1,053	tons. 77	£ 436
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*10	*12	.....	.....
1939	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	100	300	450	247	57,280	36,148	57,830	36,695	.....	24	18,373	1,609	835	1,065	77	436

* From Coolgardie Goldfield; adjustment from 1938.

TABLE VI.—Minerals other than Gold—continued.

Period.	SILVER LEAD ORE.						TUNGSTEN ORES.											
	Pilbara Goldfield.		Ashburton Goldfield.		Total.		WOLFRAM.		SCHEELITE.									
	Marble Bar District.						State generally.		North Coolgardie Gf.		Broad Arrow Goldfield.		Coolgardie Gf.		Dundas Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	
Previous to 1936	195	3,658	2,974	35,796	3,169	39,454	265·89	1,295	407	942	3	175	86	155	·4	10	496·4	1,282
1936	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1937	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1938	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1939	....	....	....	....	....	....	....	....	10	28	....	....	....	....	....	....	10	28
Total	195	3,658	2,974	35,796	3,169	39,454	265·89	1,295	417	970	3	175	86	155	·4	10	506·4	1,310

Period.	FIRECLAY.				BERYL.		BISMUTH.		GADOLINITE.			
	Collie Mf.		State Generally.		State Generally.		Gascoyne Gf.		Pilbara Goldfields.			
	Marble Bar District.											
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
tons.	£	tons.	£	tons.	£	tons.	£	tons.	£			
Previous to 1936	1,051	738	....	....	....	....	....	1	112	
1936	
1937	
1938	
1939	830	522	7	60	·50	138	....
Total	1,051	738	830	522	7	60	·50	138	1	112

NOTE.—As the collection of Statistics of Minerals other than Gold commenced during 1899, the total production from the different localities can only be approximately estimated by the Customs Records.