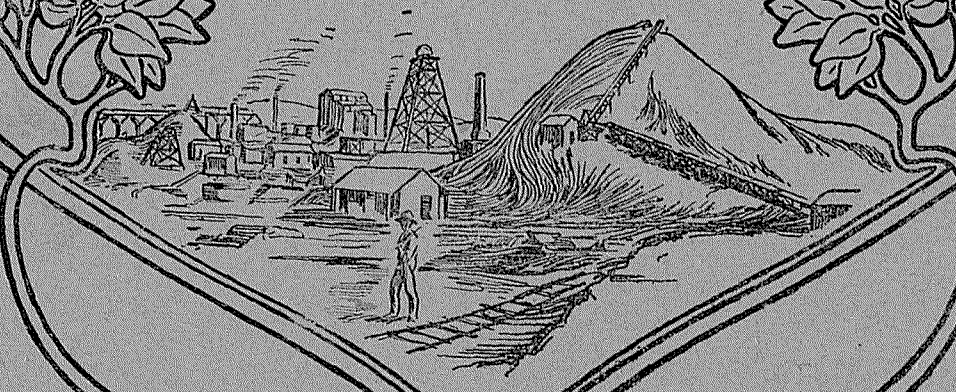




REPORT
OF THE
DEPARTMENT OF MINES
FOR THE YEAR
WESTERN · 1938. · AUSTRALIA



PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND



H.D.C. HIGGINS

1939.

WESTERN AUSTRALIA.

REPORT
of the
Department of Mines
FOR THE YEAR
1938

PERTH :

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ANNUAL REPORT OF THE DEPARTMENT OF MINES, WESTERN AUSTRALIA, 1938.

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STATE OF WESTERN AUSTRALIA.

Report of the Department of Mines for the State of Western Australia for the Year 1938.

To the Hon. Minister for Mines.

Sir,—I have the honour to submit the Annual Report of the Department for the year 1938, 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, 1939.

DIVISION 1.

The Hon. Minister for Mines,—

I have the honour to submit, for your information, a report on the Mining Industry for the year 1938.

The estimated value of the mineral output of the State for the year was £5,491,718 (calculating gold at £4 4s. 11.45d. per fine ounce); an increase in value of £774,920 over the preceding twelve months. The estimated value of the premium paid to gold producers amounted to £A5,402,565, bringing the gross value of all minerals up to £A10,894,283, an increase of £A1,684,204 in Australian currency over the 1937 production.

There were increases in the quantities and value of arsenic, asbestos, coal, felspar, gold, glauconite, gypsum, and silver. Decreased quantities of antimony, lead-ore, 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 £A10,363,023 (and equalled 95.12 per cent. of all minerals). (See footnote to Table 1, Part II.) Other minerals realised:—Coal, £375,083; Arsenic, £71,982; Silver, £28,852; Tantalite, £13,094; Gypsum, £12,409; Felspar, £10,431; Tin, £7,421; Asbestos, £5,314; Antimony, £3,859; and Glauconite, £915.

Dividends paid by mining companies amounted to £1,103,244, a decrease of £110,285 when compared with 1937. (See Table 6, Part II.)

To the end of the year 1938, the total amount distributed by gold mining companies in dividends was £35,234,403. To the same date the value of the mineral production amounted to £204,348,895, of which the gold production accounted for £188,485,932

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 £27,094,577.

GOLD.

The reported yield of gold, totalling 1,172,950 fine ounces, showed an increase of 165,661 fine ounces.

The calculated average value per ton of ore treated in the State as a whole fell from 28.15 shillings per ton in 1937 to 26.50 shillings per ton in 1938, calculated at the rate of £4 4s. 11.45d. per fine ounce, but the averaged premium obtained for gold during the 12 months (108.935 per cent.) would more than double this estimate. For the East Coolgardie Goldfield (which produced approximately 42.91 per cent. of the State's reported yield of gold) the calculated average value of the ore treated dropped from 30.85s. per ton to 29.75s. 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 Mine and Central Norseman Gold Corporation) were 17.94s. (17.81s.), 31.80s. (31.23s.), 18.55s. (22.59s.), and 30.66s. (31.86s.) respectively; 1937 figures in parentheses.

The tonnage of ore reported to have been treated in 1938, viz., 3,759,720 tons, was the highest recorded tonnage in the history of gold mining in this State, being 654,716 tons more than the previous highest tonnage recorded for the year 1909 and an increase of 720,113 tons when compared with 1937 figures.

Increased tonnages were reported from all Goldfields, excepting Mt. Margaret, North Coolgardie, and Yilgarn Goldfields which showed decreases of 10,472, 27,687 and 10,912 tons respectively, attributable to the stoppage of operations on the Lancefield Mine for some two months; the cessation of operations at the Gladsome-Sand Queen and Edjudina mines; and the Marvel Loch Development and the Southern Cross United Mines. The principal increases of tonnage were from the following Goldfields:—Murchison, 328,813 tons; East Coolgardie, 253,710 tons; East Murchison, 103,006 tons and Dundas, 32,907 tons.

The quantity of gold recorded as being received at the Perth branch of the Royal Mint (1,054,171.13 fine ounces) and exported for treatment, in bullion, concentrates and other gold-bearing material (113,620.06 fine ounces) exceeded that of 1937 by 167,144.44 fine ounces (*vide* Table 1). The reported yield of fine gold from the tonnage of ore treated exceeded that of 1937 by 165,661 fine ounces (*vide* Table 3).

Only three Goldfields failed to report yields of gold in excess of 1937 output, viz., Mt. Margaret, North Coolgardie and Yilgarn, of 1,560, 5,858, and 4,868 fine ounces respectively. The principal increased outputs came from East Coolgardie, 74,156; Murchison, 58,705; East Murchison, 23,128 and Dundas Goldfields 11,335 fine ounces.

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 Murchison and Dundas Goldfields; a comprehensive comparison of 1937 and 1938 figures will be found in Table 4.

The completion during the year of the erection of new plants and the additions to others accounted for a reduction in the averaged number of men engaged in the industry; the relative figures for 1937 and 1938 being 17,136 and 16,427 respectively, a decrease of 709 men. The averaged number engaged in the production of gold dwindled by 800, whilst the averaged number engaged in the raising of and search for other minerals showed an increase of 91 men. More men were reported as having been employed in preliminary operations at Koolan Island, (18); in raising coal, (42); asbestos, (31), and tin, (15). Twenty-five men less were occupied in the lead mines at Northampton, the number engaged in raising other minerals showing very little fluctuation.

YILGARN GOLDFIELD.

This field experienced a successful year, although the ore treated was 10,473 tons, and the return of gold 4,868 fine ounces less than in 1937.

Bullfinch was a very active centre, the main producers being the "Copperhead," "Copperhead Deeps," "Mistletoe," and "Rising Sun" leases. This centre recorded 4,347 fine ounces of gold from 12,788 tons treated, while 94 men were engaged in mining operations.

Corinthia and Eenuin were also busy, the former district producing 1,285 fine ounces. There were two batteries operating at Corinthia, one on the "Corinthian" lease and the other on the "Deliverance."

At Eenuin, two new finds were made, one by Messrs. Hamilton and Pringle and the other near the "Trump" lease.

At the end of the year 55 men were mining in this centre, which is quite promising.

A new district which attracted much attention was Evanston. The year's production therefrom totalled 1,656 fine ounces from 3,030 tons of ore. One five head battery has been erected, while a water supply for treatment purposes has been located by the Water Supply Department. Seventy-two men were working in this vicinity at the end of 1938 and hopes are entertained that it will develop into a large producing centre.

Forrestonia, mainly on account of the absence of crushing facilities, was rather neglected.

Golden Valley, as usual, was busy and the "Maries Find" lease operated by Ora Banda Mines, N.L., crushed continuously at its own mill, while the consistent "Radio" returned 605 fine ounces from 819 tons treated. This locality kept 64 men engaged.

Greenmount and Hopes Hill were fairly quiet, the main operation at the latter being the treatment of sands.

Production was intermittent at Holleton, water for crushing purposes being scarce, owing to the prolonged dry spell. However, 431 tons were treated for 261 fine ounces of gold.

At Kennyville 65 men were employed and a consistent production recorded. The "Battler" and "Leviathan" were the main producers, the former employing 12 men.

Koolyanobbing was quiet, but Marvel Loch proved an excellent centre and recorded 11,913 fine ounces from 33,747 tons treated. Here 175 men were engaged in mining at the 31st December last and when it is considered that of this total the largest employer, the New Yilgarn Gold Mine, employs only 25 men, it will be seen that the major portion of the activity is the result of individual effort.

The Marvel Loch Gold Development, N.L., ceased operations in April, 1938.

The "May Queen" continued to treat high grade ore, 1,342 fine ounces coming from 943 tons treated.

The N.G.M., Ltd., at Nevoria has not yet been able to proceed with its proposed plan of erecting machinery, presumably on account of financial difficulties caused by the unsettled state of affairs in Europe. This centre's prospects are, generally speaking, very bright.

Mt. Jackson was also a busy district, returning 1,423 fine ounces from 4,248 tons of ore, the largest producer being the Mt. Jackson Gold Mining Company's property which was worked by tributers. Forty-eight men were at work at Mt. Jackson in December last.

At Mt. Rankin a battery is in course of erection, and this will undoubtedly give a fillip to local operations, as ore had previously to be railed to Kalgoorlie for treatment.

Mt. Palmer's main producer was of course the Yellowdine Gold Development, Ltd., which crushed 47,175 tons for 9,524 fine ounces, while a further 20,517 fine ounces was recovered by cyanidation from 59,371 tons of sands.

This mine employs 143 men.

At Parker's Range, three batteries crushed for the public, and 51 men were occupied in mining. One

thousand two hundred and five fine ounces were recorded from 4,466 tons of ore treated.

This is a good prospecting centre.

Southern Cross centre was not as active as previously, only 27 men being engaged in mining in December last. The cessation of operations in February, 1938, of the Southern Cross United Mines, Ltd., was greatly responsible for the reduced activity.

Towards the end of the year individual activity was on the increase, and as battery facilities are available, the centre should progress during 1939.

Westonia, as a result mainly of the Edna May (W.A.) Amalgamated, N.L., property recorded 5,734 fine ounces from 14,867 tons of ore. One hundred and eleven men were engaged in mining operations, 89 of them being employed by the company.

A new battery was erected during the year on the "Phar Lap" lease, and will undertake public crushing.

COOLGARDIE GOLDFIELD.

This field showed an increased yield of 1,954 fine ounces of gold.

Coolgardie District.—Bonnievale, noted for its rich patches, recorded an interesting return from the "Jenny Wren" lease of 286.86 fine ounces of gold from 72 tons. Bulla Bulling and Cave Rocks showed normal activity, but Burbanks was a particularly busy centre, and a number of prospectors were engaged. The principal producer was the "Boshter" lease.

At Coolgardie itself the Consolidated Gold Mines of Coolgardie carried on extensive development at the "Tindals" Mine and employed 88 men. Erection of machinery has commenced, and it is estimated that the mine will be in production early in 1939. The Phoenix Gold Mines, Ltd., have also continued the development of the "Bayleys" Mine and reports a fair ore reserve. Fifty-two men were employed thereon. There was considerable other activity, and 1939 should provide a revival in the industry at this centre. Eundynie, Gnarlbine, Grosmont, Hampton Plains, Higginsville, Larkinville, all recorded small productions and kept a number of prospectors engaged.

At Gibraltar the "Lloyd George" mine recorded 139 ounces of gold from 271 tons of ore, and it is reported that the owners intend erecting their own battery.

Londonderry was another busy centre, while at Spargoville the "Spargos Reward" Mine erected a new tailings treatment plant. This mine is the main producer in the Coolgardie Goldfield and treated 21,520 tons for 2,296 fine ounces during the year. Fifty-two men were employed.

Widgiemooltha, Wannaway and St. Ives were other producing centres. The Coolgardie State Battery crushed continuously throughout the year, and also treated 10,060 tons of sands for 1,182 fine ounces of gold.

Kunanalling District.—An increased output was recorded for this district as compared with 1937, of 5,637 tons, and 1,567 fine ounces of gold.

Kintore provided the principal producer in the Gold Fields Australian Development Company, Ltd., which employed 21 men and treated 3,754 tons for 3,335 fine ounces of gold.

Carbine and Chadwins were active fields, while at Kunanalling itself a large number of prospectors were at work, and the main mine, that owned by Kunanalling Gold, N.L., was responsible for a good yield.

Other centres showed activity and most of them recorded some gold returns.

Generally speaking, the Coolgardie Goldfield looks to have a bright mining future. Prospecting is active, while several large companies should come into production at an early date.

DUNDAS GOLDFIELD.

This is an extremely busy goldfield and its production for the year totalled 59,574 fine ounces of gold from 163,442 tons of ore, which is an increase of 11,335 fine ounces as compared with 1937.

The principal producers were the Norseman Gold Mines, N.L., and the Central Norseman Gold Corporation, N.L., while the phenomenally rich Blue Bird Mine experienced another year of remarkable crushings. Seven hundred and ninety-six men were directly employed on mines in the district, while also there were numerous prospectors at work.

The field's importance is such that it was found necessary in December to re-open the office of Mining Registrar at Norseman. The State Battery had a busy year and crushed continuously.

The Central Norseman Company in December commenced sinking a vertical shaft to a depth of approximately 2,000 feet, with the object of cutting the Norseman line of reef. It is expected that this will cost £130,000.

On the other big producer, the Norseman Gold Mines, N.L., approximately £48,000 was expended on new plant and buildings. These items are evidence of the faith which the companies have in this goldfield.

EAST COOLGARDIE GOLDFIELD.

The East Coolgardie and Bulong districts make up this Goldfield which experienced a very successful year, producing 1,529,686 tons from which were obtained 503,331 fine ounces of gold. These figures exceeded 1937 respectively by 331,403 tons and 74,156 ounces. The number of men engaged in gold mining was 6,293, which was an increase of 25.

East Coolgardie District.—The Lake View and Star was again the principal producer, and employed an average of 1,260 men. Additional roasters were installed during the year and considerable additions made to the surface plant. Retreatment operations on tailings were also continued, 570,257 tons being dealt with.

The Great Boulder increased its monthly output from 18,000 to 29,000 tons, and employed 1,051 men. Underground development proceeded, and future prospects are bright.

The North Kalgurli (1912), Ltd., maintained its output, and undertook extensive and satisfactory development. A new steel Handframe was erected on the main shaft.

Boulder Perseverance, Ltd., showed a small increase in tonnage, and a slight decrease in yield.

Gold Mines of Kalgoorlie, Ltd., was credited with a year of exceptional progress. Its production totalled 96,293 tons for 32,610 fine ounces, the return being practically double that of 1937, while in addition tri-

buters produced 3,098 fine ounces. This company owns a large group of leases and is pursuing an active development policy.

The Paringa Company also greatly increased its yield, having during the year commenced treatment at its own plant.

The South Kalgurli mine recorded an increased output, while the Enterprise mine entered the list of regular producers with 11,448 fine ounces from 35,868 tons of ore. Its main shaft was sunk to 1,300 feet and satisfactory development work was undertaken.

The Golden Horseshoe (New), Ltd., continued re-treating and put through 576,600 tons of tailings.

The Broken Hill Proprietary recorded an increased output, and continued its main shaft to 1,150 feet. Surface improvements included new steel head gear, bins, skips and an electric winder. Generally speaking, all companies were active and future prospects are excellent.

Golden Ridge, Celebration and Binduli centres were quiet, but Mt. Monger recorded some excellent returns, the "Melano" Mine being a consistently rich producer. This is a good prospectors' district.

The Kalgoorlie State Battery crushed continuously with 15 heads of stamps, and also treated 18,570 tons of tailings.

Bulong District.—This district engaged the attention of 101 men in mining operations, and produced 679 fine ounces of gold from 1,910 tons of ore. There were no developments of particular note and no large scale mining operations going on.

NORTH-EAST COOLGARDIE GOLDFIELD.

This field showed a slightly increased yield, and 163 men were operating therein during the year.

Kanowna District.—This district was a little more active than usual, and the main centres were Gindalbie, Gordon, Kalpini, Kanowna and Mulgarrie.

Kurnalpi District.—At Mulgabbie several shows produced rich crushings of the type for which this centre is noted. Kurnalpi and Jubilee centres also recorded several good returns, but elsewhere things were quiet.

BROAD ARROW GOLDFIELD.

An appreciable increase was recorded in the yield for 1938, the figures being 42,371 tons for 20,629 fine ounces, as compared with 18,910 fine ounces in the previous year. Steady progress was made in most centres and some excellent crushings put through.

The principal producer was Ora Banda Amalgamated Mines, N.L., at Grant's Patch, which treated 18,712 tons for 8,928 fine ounces.

The Western Mining Corporation continued operations at Collard's Find and crushed 3,739 tons for 2,250 fine ounces. Unfortunately this shoot is reported to be cutting out.

Black Flag, Waverley, Smithfield, Windanya centres attracted a few prospectors, while Paddington maintained its popularity and was most active. One good return was that from the "Miss Catherine" Mine, comprising 466 fine ounces from 76 tons of ore.

Ora Banda, Bardoc and Broad Arrow centres were particularly busy.

The State Battery at the former had a year of continuous crushing and in addition treated 9,298 tons of tailings. The field had 662 men engaged in mining operations.

NORTH COOLGARDIE GOLDFIELD.

This field showed a decreased gold yield as follows:—

1937, 35,662 fine ounces.
1938, 29,804 fine ounces.

Menzies District.—The closure of the Sand Queen Mine at Comet Vale meant a reduction in output for this district. At Menzies centre itself, the Lady Shenton yield decreased in grade and future prospects of this mine do not appear to be bright.

The "First Hit" property proved the principal producer with 5,537 fine ounces from 7,794 tons treated.

Other centres such as Yundaga, Mt. Ida and Copperfield continued to be busy centres and at the former the Mt. Ida Gold Mines, Ltd., crushed 3,126 tons of ore for 876 fine ounces. Other centres were quiet.

Ularring District.—This district received more attention than for many years past and consequently showed a greatly increased gold yield.

At Riverina, the Riverina Gold Mines, Ltd., the main producer in the district, recorded 5,216 fine ounces from 15,812 tons treated.

Morley's Find, a recent centre, reported numerous excellent returns, the Reward Lease "Two Chinamen" having a particularly rich yield of 1,120 fine ounces from 71 tons. This centre is most promising and has undoubtedly given a great fillip to the industry in the Ularring district.

Mulline, Mulwarrie and Callion, all had a number of producing mines, while Davyhurst was particularly active. Altogether 295 men were engaged in mining operations in the district.

Yerilla District.—On account, mainly of the closing of the property held by the Edjudina Gold Mining Company, N.L., at Porphyry, the yield was below that for 1937 from this district.

Leases held by the Paget Gold Mines at Edjudina were also mostly under exemption during the year.

In other centres, such as Pinjin, Yilgangee, and Yarri, prospecting activity was maintained, and altogether 203 men were at work in the district.

Niagara District.—This district also returned less gold than in 1937, caused by the cessation of operations at the Cosmopolitan Gold Mine at Kookynie. Sixty-two men were at work in the district, the main centres being Desdemona, Niagara and Tampa.

MURCHISON GOLDFIELD.

This field comprises the Cue, Day Dawn, Meekatharra and Mt. Magnet districts, and as expected, its yield for the year greatly exceeded that for 1937. The tonnage treated was 653,040, while 145,038 fine ounces were recorded, compared with 86,333 in the previous 12 months.

Cue District.—The Big Bell Mine, Ltd., with 400,473 tons and 70,537 fine ounces of gold was chiefly responsible for the Cue district's record yield of 109,360 fine ounces, but throughout the district

mining has been of an active and prosperous nature. The average grade of ore treated by this company was 3.52 dwts. and its success should encourage the development of other low-grade propositions in the State.

Cuddingwarra centre was fairly active and at the end of the year drilling operations were taking place on the "Golden Gate" property, where great hopes of ultimate success were held.

At Cue, the State Battery operated for approximately six months of the year, and also treated a large parcel of sands.

At Culculli, the main development was a find by Mr. Gaddini in new country, which crushed 103 tons for 89 fine ounces. A plant is being erected and the find has possibilities.

Harris' Find, Mindoolah, Ryansville and Tuekarrarra were active prospecting centres without any special developments.

At Reedy the Triton Gold Mines, N.L., maintained a monthly average output of 9,000 tons, the ore averaging 6.27 dwts. Men employed in the industry throughout the year totalled 765.

Day Dawn District.—This district fell away slightly as compared with 1937. At Day Dawn itself a number of crushings were recorded, the most consistent producers being the "Lone Hand," "Creme D'or" and "Klondyke."

Lake Austin Centre was fairly quiet, and Mainland particularly so. Pinnacles and Webb's Patch recorded some small crushings. Altogether 70 men were engaged mining in the district.

Mt. Magnet District.—While a decreased production was recorded in this district, it is considered that the industry is on a sounder basis than in 1937. A greater tonnage of ore was treated, vigorous development work on the larger mines undertaken and additional plant erected.

Jimbulyer, Lennonville and Moyagee were all actively prospected, and numerous good crushings reported.

Paynesville was quieter than for some years.

Wynyangoo yielded some exceptionally high returns, mostly from rich leaders for which it is noted.

Mt. Magnet itself was the main centre, producing 93 per cent. of the total yield. The Mt. Magnet Gold Mines, Ltd., produced 7,639 fine ounces from 59,671 tons and thus holds the State record for low-grade ore, the average per ton being 2.56 dwts. Considerable expenditure on plant and development took place, and it is reported that the ore reserves are sufficient to keep the present mill running for some years. This company deserves great credit for its operations which are conducted at a very low cost.

Hill 50 Gold Mine, N.L., was also a large producer, and added to its plant and also undertook considerable development during the year.

Mr. A. Cassey's "Edward Carson" Mine continued to be the third highest producer of the district, and the owner added considerably to his plant.

The Metropolitan Mining and Development Company, Ltd., was actively engaged developing the "Black Cat" lease which will undoubtedly be a regular producer during 1939.

Another promising mine was the "Broken Bond" over which an option was given to the Swan Bitter Gold Mining Company, Ltd., which erected a substantial plant. The "Saturn" Mine at Boogardie should also become a big producer next year. Other producers of note were the "Neptune," "Havelock," "Last Chance" and "Three Boys" properties.

The Boogardie State Battery is to be increased to a 10-head plant during 1939, and it ran continuously during the year.

Meekatharra District.—This district's output declined considerably on account of the reduced activity on the Ingliston Consols Extended Mine which only produced approximately half the yield of the previous year.

Men employed in the industry totalled 207, compared with 347 in 1937.

The most active centres were Gabanintha, where several good crushings were recorded and Garden Gully and Meekatharra. The latter was easily the most important and had 99 men within its boundaries.

At Nannine activity also fell away, although the Aladdin Company through the installation of a cyanide plant increased its production.

At Quinns, the "Commonwealth" group of leases operated for the greater part of the year, but subsequently ceased operations on account of lack of capital.

Yaloginda declined, both in output and number of men engaged.

YALGOO GOLDFIELD.

This field recorded a greatly increased output of 11,444 fine ounces, as compared with 7,464 fine ounces in 1937.

Bilbertha and Field's Find centres reported good prospectors' crushings, the "Rose Marie" lease at the latter being a consistent producer and employing several men.

Payne's Find was the principal centre, and the "Carnation," "Orchid" and "Aster" Mines all treated good tonnages. The "Orchid" brought into operation a 3-head battery during the year.

Gullewa, with the King Solomons Gold Mines, Ltd., was also a busy district. This company employed 16 men and operated a five-head mill.

The "Mugga King" and "Shenandoah" properties also recorded good tonnages.

At Noongal considerable activity was manifested, particularly on the "City of Melbourne," "Continental" and "East Victory" properties.

Pinyalling and Warriadar centres recorded several good crushings, while at Rothsay, the Rothsay Gold Mines, N.L., treated 15,135 tons for 3,088 fine ounces at its own mill. This company's future programme is doubtful, as the grade of ore has rather fallen away in value.

There were all told ten ore treatment plants operating in the Yalgoo field during the year, including three State batteries, and future prospects generally appear to be bright.

PEAK HILL GOLDFIELD.

A slight increase was shown for the year in the production of gold, while 77 men were engaged in

operations, as compared with 68 in 1937. One development of interest was the discovery of alluvial gold in the Labouchere Ranges. Over 300 ounces were located during the year, and at one stage 30 men were operating. Lack of water caused a reduction in this number, but there is no doubt that considerable attention will be given to the locality when water is available.

At Mt. Egerton, the "Pegasus" produced 738 fine ounces from 351 tons, and should continue to produce for some time. A 3-head mill and cyanide plant has been erected on the property.

Mt. Seabrook and Peak Hill centres were active, and particularly from the latter were numerous crushings put through. The State Battery crushed continuously and also cyanided 2,925 tons of sands.

EAST MURCHISON GOLDFIELD.

This field again increased its yield, producing 186,206 fine ounces, as compared with 163,078 during 1937.

Black Range District.—This district had a very good year, and the satisfactory development of the Youanmi Gold Mines, Ltd., was most pleasing.

The number of men employed in the industry increased from 380 to 401, due to increased employment on the company's mine. Bellchambers, Hancock's, and Curran's Find centres were more active than hitherto, but Jonesville, on account of the cessation of operations by the Swan Bitter Company, showed a decrease in yield. Sandstone was fairly quiet, but Youanmi was a busy centre. The company treated 75,159 tons for 20,396 fine ounces, and it is pleasing to note that the grade of ore treated rose from 4.63 dwts. in 1937 to 5.43 dwts. per ton.

Lawlers District.—This district also produced more gold than in 1937, mainly owing to the operations of the Emu Gold Mines, Ltd., at Agnew, which treated 48,370 tons of ore for 11,953 fine ounces. The mine employs 112 men.

There were numerous prospectors' crushings recorded from Lawlers, Mt. Sir Samuel and Kathleen Valley centres, and mining generally was most progressive.

Wiluna District.—A satisfactory year resulted in this district, a much greater tonnage being treated, and an increased gold yield recorded.

Cole's Find, Corboy's Find and Diorite centres all had a number of producing mines and were active during the twelve months.

Gum Creek, Kingston, Mt. Eureka, Mt. Keith and Mt. Fisher were fairly quiet.

At Joyner's Find, Linden (W.A.) Gold, N.L., recovered 2,712 fine ounces of gold from 8,799 tons of ore treated. This mine appears likely to be a consistent and profitable producer for some years.

New England Centre employed 35 men and recorded crushings from nine mines.

Wiluna was of course the principal producing centre, and the Wiluna Gold Mines, Ltd., averaged over 49,000 tons per month. The main shaft was completed to the 2,150 foot level and serviced to the 2,000ft. level. 34,455 feet of diamond drilling was undertaken. An internal shaft was completed to the 2,600ft. level and diamond drilling from this shaft will, it is understood, be done to test the lode.

The Moonlight Wiluna Gold Mines, Ltd., experienced a successful year, and carried out a programme of extensive development.

MT. MARGARET GOLDFIELD.

This goldfield produced slightly less gold than in 1937, but notwithstanding experienced a very successful year.

Mt. Margaret District.—Burtville centre was active as usual and two new finds were made during the year, "Escreets" and Brockhoffs." The former proved unpayable, but the latter is being tested by one of the big companies.

At Duketon the main development was the erection of plant on the "Famous Blue" lease.

At Erlistoun, the Western Mining Corporation, Ltd., produced 17,766 fine ounces of gold from 17,985 tons of ore from its "Cox's Find" Mine, and has carried out a vigorous policy of development.

The Lancefield (W.A.) Gold Mine, N.L., at Laver-ton the field's principal mine, produced 29,609 fine ounces from 101,139 tons of ore, which figures are below those of 1937, on account of the 10 weeks' strike on the mine.

The Gladiator Gold Mine, Ltd., commenced production in November, and expects higher returns when the plant is run in.

Other centres, such as Euro, Mt. Barnicoat, Mt. Shenton, all contained prospectors, but recorded no particular developments.

Mt. Morgans District.—Linden centre was the most important, the greatest activity being in the Mt. Celia area. The "Coronation" Mine recorded 591 fine ounces from 12½ tons, while Prospecting Area 1120F produced 243 fine ounces from 28¾ tons.

At Mt. Morgans itself Sands Retreatment, Ltd., employed 25 men and anticipates operating for three years. 24,550 tons were dealt with in 1938, the recovery being 718 fine ounces.

At Yundamindera, Messrs. Cable and Coverley located gold near the Wilga Trig and obtained 97 fine ounces from 31 tons. This area is now receiving general attention.

Murrin, Eucalyptus and Redcastle were all being prospected and recorded crushings.

Mt. Malcolm District.—The district reported an increased tonnage of ore treated, but a slightly decreased yield of gold.

Cardinia, Diorite and Darlot all recorded crushings, but by far the greater proportion of the district's yield came from the Leonora centre, attributable, of course, to the Sons of Gwalia Mine.

This property reported 45,692 fine ounces of gold from 138,203 tons of ore.

Of the other centres the most important were Mt. Clifford, Randwick (where the owner of the "Mighty Splash" erected a 5-head mill). Wilson's Creek and Wilson's Patch. Four hundred and seventy-eight men were engaged in mining operations in the Mt. Malcolm district at the end of the year.

PHILLIPS RIVER GOLDFIELD.

An increased yield was recorded for 1938, but activity was mainly of a prospecting nature, and no promising new finds were unearthed.

Hatters Hill centre still kept a number of prospectors employed, but the most important centre was Kundip. The Beryl Gold Mines, Ltd., practically ceased operations, and now only retain three leases in its name.

At Ravensthorpe the production declined considerably.

It is estimated that 77 men were employed in mining activities during the year in the goldfield.

PILBARA GOLDFIELD.

A substantial increase in the gold yield was recorded and considerable activity manifested in the industry.

Marble Bar District.—The Comet Gold Mines, Ltd., returned 2,854 fine ounces from the treatment of 5,496 tons while, in addition, 4,505 fine ounces were recovered from the treatment of sands. A plant was in course of erection on this mine, and with its completion, mining on a much bigger scale will be undertaken. There were a number of good crushings also reported from this centre from the "Tassy Queen" "Leviathan," "Homeward Bound" and "Outward Bound" leases. The State Battery is in course of being increased from a five to a ten-head mill.

Bamboo Creek also recorded a good yield, mainly from the "Mt. Prophecy," "Bonnie Doon," "Kit-chener," "Bulletin," and "Prince Charlie" properties.

Other busy centres were McPhee's Patch, Talga and Sharks.

Nullagine District.—Most interest has been centred round the Middle Creek, 20 Mile Sandy, and Blue Spec Areas, but parties are working at Mosquito and Eastern Creeks and at Nullagine. A plant was erected on the Blue Spec lease, and one is in course of erection on the "Barton."

The principal producers were the "Bill Jim," "Blue Spec," "All Nations North," "Hopetoun" and "Par-nell North" leases.

KIMBERLEY GOLDFIELD.

Six hundred and fifty-nine fine ounces of gold were produced in this field, and as the result of the establishment with Government assistance of a battery at Hall's Creek, a number of prospectors were at work.

WEST KIMBERLEY AND GASCOYNE GOLDFIELDS.

Very little activity was displayed in either of these fields, although a two-head mill is in course of erection in the former field.

ASHBURTON GOLDFIELD.

Three hundred and thirty-eight fine ounces of gold were recorded, mainly as the result of alluvial operations.

OUTSIDE PROCLAIMED GOLDFIELDS.

From districts outside the proclaimed goldfields, gold production was reported from Burracoppin, Donnybrook, Seabrook, and West Pilbara, while a little alluvial was obtained at Toodyay.

At West Pilbara, the five-head Weerianna Mill was reopened by Mr. J. Shaw, and public ore can now be treated.

The periodical examination of mine workers was continued throughout the year by the Commonwealth Department of Health, under arrangements similar to those of 1937, and the results of such examination, together with those of previous examinations, are shown in the following table and graphs:—

TABLE SHOWING RESULTS OF PERIODICAL EXAMINATION OF MINE WORKERS, FROM INCEPTION OF EXAMINATIONS (1925) TO 31st DECEMBER, 1938.

<i>First Examination (1925-26).</i>										Per cent.		
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
<i>Second Examination (1927).</i>										Per cent.		
Normals, etc.—												
Previously reported as Normals, etc.	2,290		
New cases (<i>i.e.</i> , 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

<i>Third Examination (1928).</i>								Per cent.
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 case	...	...	...	...	...	...	1	
								4 = .1
Total number of men examined								3,483 = 100.0

<i>Fourth Examination, (1929).</i>								Per cent.
Normals, etc.—								
Previously reported as Normals, etc.	...	...	...	...	...	...	2,099	
New cases	...	...	...	...	...	...	21	
								2,120 = 8.19
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

<i>Fifth Examination (1930).</i>								Per cent.
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	...	...	...	...	...	...	3	
								383 = 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

<i>Sixth Examination (1931).</i>								Per cent.
Normals, etc.—								
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	2,530	
							<u>2,530</u>	= 84.0
Silicosis Early—								
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	94	
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	252	
							<u>346</u>	= 11.5
Silicosis Advanced—								
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	18	
Previously reported as Silicosis Advanced ... ..	...	...	...	...	...	...	35	
							<u>53</u>	= 1.8
Silicosis plus Tuberculosis—								
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	4	
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	35	
Previously reported as Silicosis Advanced ... ..	...	...	...	...	...	...	19	
							<u>58</u>	= 1.9
Tuberculosis only—								
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	25	
							<u>25</u>	= .8
Total number of men examined							<u>3,012</u>	= <u>100.0</u>

<i>Seventh Examination (1932).</i>								Per cent.	
Normals, etc.								3,835	
							<u>3,835</u>	= 89.5	
Silicosis Early—									
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	35	
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	338	
							<u>373</u>	= 8.7	
Silicosis Advanced—									
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	6	
Previously reported as Silicosis Advanced ... ..	...	...	...	...	...	...	47	
							<u>53</u>	= 1.2	
Silicosis plus Tuberculosis—									
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	3	
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	9	
Previously reported as Silicosis Advanced ... ..	...	...	...	...	...	...	4	
							<u>16</u>	= .4	
Tuberculosis only—									
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	8	
							<u>8</u>	= .2	
Total number of men examined							<u>4,285</u>	= <u>100.0</u>	

<i>Eighth Examination (1933).</i>								Per cent.	
Normals, etc.								2,920	
							<u>2,920</u>	= 86.5	
Silicosis Early—									
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	57	
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	322	
							<u>379</u>	= 11.2	
Silicosis Advanced—									
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	1	
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	15	
Previously reported as Silicosis Advanced ... ..	...	...	...	...	...	...	44	
							<u>60</u>	= 1.8	
Silicosis plus Tuberculosis—									
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	2	
Previously reported as Silicosis Early ... ..	...	...	...	...	...	...	9	
Previously reported as Silicosis Advanced ... ..	...	...	...	...	...	...	4	
							<u>15</u>	= .4	
Tuberculosis only—									
Previously reported as Normals, etc. ... ..	...	...	...	...	...	...	3	
							<u>3</u>	= .1	
Total number of men examined							<u>3,377</u>	= <u>100.0</u>	

Ninth Examination (1934).

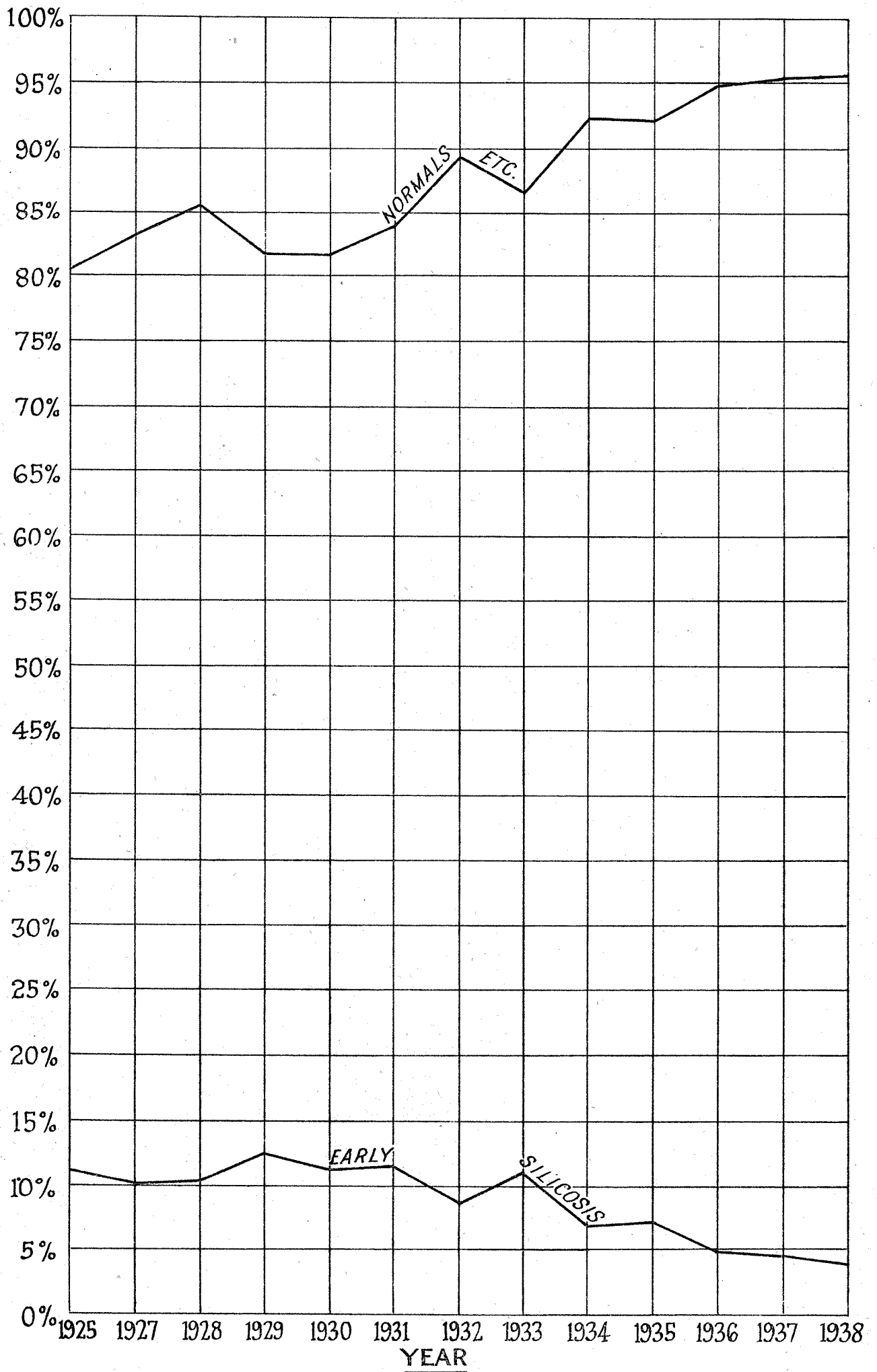
		Per cent.
Normals, etc.	5,140	
	5,140	= 92·4
Silicosis Early—		
Previously reported as Normals, etc.	54	
Previously reported as Silicosis Early	315	
	369	= 6·6
Silicosis Advanced—		
Previously reported as Normals, etc.	1	
Previously reported as Silicosis Early	24	
Previously reported as Silicosis Advanced	12	
	37	= 7
Silicosis plus Tuberculosis—		
Previously reported as Normals, etc.	6	
Previously reported as Silicosis Advanced	6	
	12	= 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	
	4,437	= 92·3
Silicosis Early—		
Previously reported as Normals, etc.	35	
Previously reported as Silicosis Early	303	
	338	= 7·0
Silicosis Advanced—		
Previously reported as Silicosis Early	24	
Previously reported as Silicosis Advanced	2	
	26	= 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

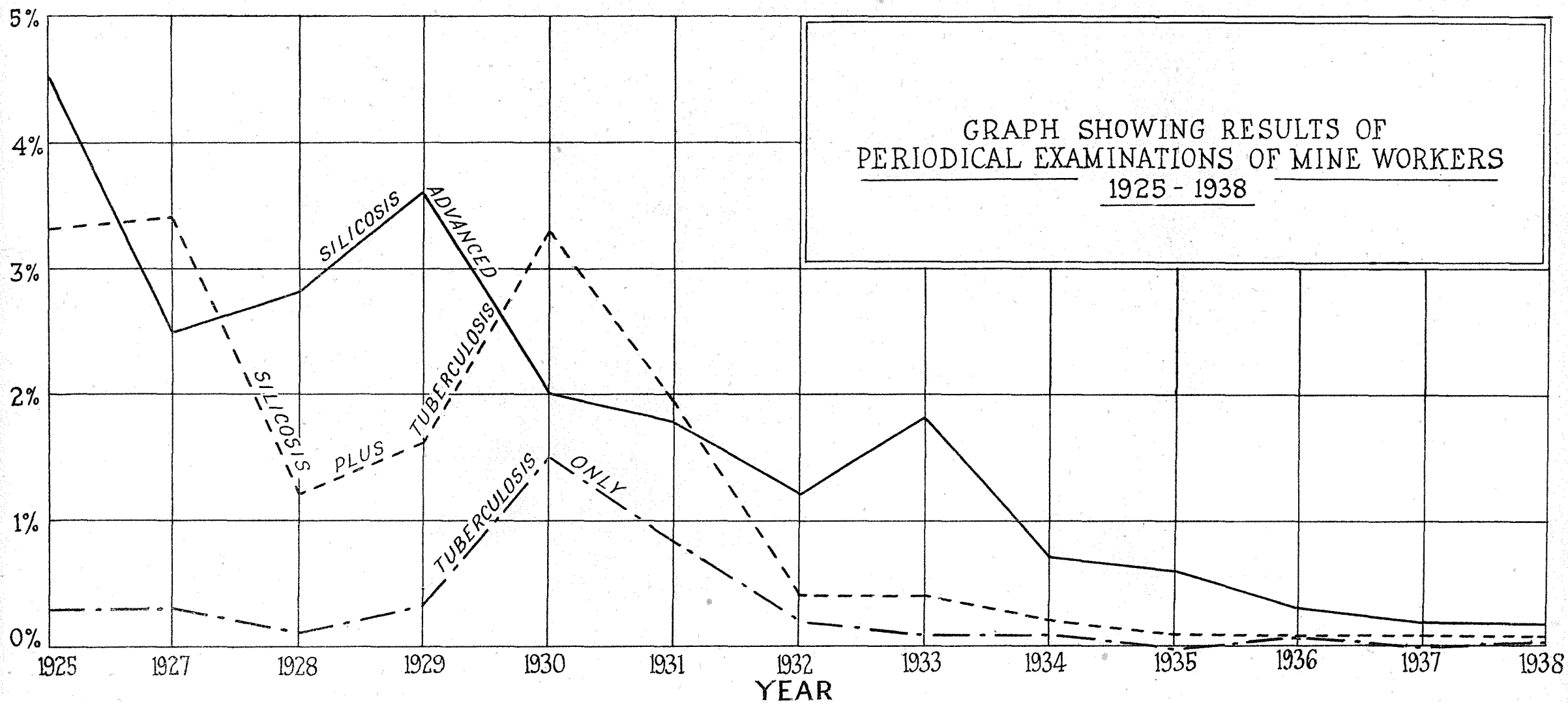
Eleventh Examination (1936).

		Per cent.
Normals, etc.	6,972	
	6,972	= 94·7
Silicosis Early—		
Previously reported as Normals, etc.	29	
Previously reported as Silicosis Early	323	
	352	= 4·8
(NOTE.—Of the 352 cases of Early Silicosis reported, 23 were already suffering from Early Silicosis and 4 from Pneumoconiosis when re-admitted to the industry on the Re-admission 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	
	20	= 3
Silicosis plus Tuberculosis—		
Previously reported as Normals, etc.	3	
Previously reported as Silicosis Early	8	
	11	= 1
Tuberculosis only	8	
	8	= 1
Total number of men examined	7,363	= 100·0



GRAPH SHOWING RESULTS OF
 PERIODICAL EXAMINATIONS OF MINE WORKERS
 1925 - 1938
 Showing Normals and Early Silicotics

GRAPH SHOWING RESULTS OF
PERIODICAL EXAMINATIONS OF MINE WORKERS
1925 - 1938



Showing Silicosis Advanced thus —————
 " Silicosis plus Tuberculosis " - - - - -
 " Tuberculosis only " - · - - - -

<i>Twelfth Examination (1937).</i>										Per cent.		
Normals, etc.	7,487	7,487 =	95.4
Silicosis Early—												
Previously reported as Normal, etc.	15		
Previously reported as Silicosis Early	319	334 =	4.3
(NOTE.—Of the 334 cases of Early Silicosis reported, 37 were already suffering from Early Silicosis when re-admitted to the industry on the Re-Admission Certificate under Regulation 7 of the Mines Regulation Act, 1906.)												
Silicosis Advanced—												
Previously reported as Silicosis Early	14		
Previously reported as Silicosis Advanced	4	18 =	.2
Silicosis plus Tuberculosis—												
Previously reported as Normals, etc.	1		
Previously reported as Silicosis Early	10	11 =	.1
Tuberculosis only	2	2 =	.0
Total number of men examined										7,852	=	100.0

<i>Thirteenth Examination (1938).</i>										Per cent.		
Normals, etc.	6,833	6,833 =	95.68
Silicosis Early—												
Previously reported as Normal, etc.	13		
Previously reported as Silicosis Early	266	279 =	3.91
(NOTE.—Of the 279 cases of Early Silicosis reported, 32 were already suffering from Early Silicosis and 4 from Penumoconiosis when re-admitted to the industry on Re-Admission Certificates under Regulation 7 of the Mines Regulation Act, 1906.)												
Silicosis Advanced—												
Previously reported as Normal, etc.	15		
Previously reported as Silicosis Early	2	17 =	.24
Previously reported as Silicosis Advanced	2		
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	3 =	.04
Total number of men examined										7,141	=	100.0

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.

TIN.

The quantity of tin exported was 68 tons, valued at £7,421; a decrease of 12 tons, and in value, £5,000. The production reported was 12 cwt. from the Pilbara Goldfield, valued at £75, and 52½ tons from Greenbushes Mineral Field, valued at £6,250. The averaged number of men employed in the industry in the latter field being 25, a reduction of 26 when compared with the previous year.

TANTALITE.

Twelve tons, valued at £13,094 were exported, a decrease in quantity of 7 tons, and in value of £3,752. The reported production was 19½ tons, all obtained from the Pilbara Goldfield.

COPPER.

Twenty-nine tons of copper, valued at £1,275 were exported. Three tons, valued at £161, and 2½ tons, valued at £246, were reported from Wiluna and Phillips River respectively.

COAL.

The coal output was 604,792 tons, valued at £375,082. This exceeded the output of 1937 by 51,283 tons. The whole production came from the Collie Coalfield, and the average number of men employed was 765, the output per man working out at 791 tons, compared with 766 tons in the previous year.

ASBESTOS.

The production of Asbestos reported for the year was 121 tons, valued at £5,314, an increase of 79 tons, and in value of £2,957. The number of men reported as engaged increased from 27 in 1937 to 58 in 1938.

OTHER MINERALS.

The quantity of Silver, obtained principally as a by-product in refining gold bullion at the Perth Mint, exported was 271,346 fine ounces, valued at £28,852; an increase of 90,784 ounces and £8,252.

1,873 tons of felspar were reported to have been raised of a value of £5,746, while 3,464 tons, valued at £10,431, were exported.

183 tons of Glauconite were produced, valued at £915.

13,429 tons of Gypsum were raised, valued at £12,409; an increase of 4,356 tons, and £2,600 in value.

Arsenic, totalling 3,999 tons, was produced of a value of £71,982; an increased tonnage of 1,945, valued at £35,010.

The amount of Antimony in concentrates for the year 1937 was 566 tons, valued at £9,235, the balance of £16,088 given as the value in last year's report being the value of the gold content in the concentrate. In 1938, 339 tons of Antimony of a value of £3,859 were exported from Wiluna.

The development of the Yampi Sound Iron Deposit suffered a severe setback as the result of the embargo imposed by the Commonwealth Government in regard to the export of ore from Australia. Such Government decided, however, to continue with exploratory operations, and finally arranged with the lessee company and the Department of Mines to carry on operations with the existing personnel. These operations are to continue until a reliable estimate is obtained of the quantity and grade of ore contained in the deposit, and the Commonwealth Government is being responsible for the necessary expenditure.

While on the subject of minerals, I would briefly draw attention to numerous deposits within economic reach of Perth which either have not been utilised at all, or whose utilisation could be greatly extended. Foremost among these is clay, which is available in a wide range of types, such as china, ball, semi-ball, coarse and fine grained refractory, stoneware and terracotta. These have been used on a considerable scale in the past for housebrick, roofing tile, firebrick and sanitary ware, but in other directions there is ample scope for their extended use. In this connection, the availability of high grade felspar at a low price as a flux for fine table and electrical ware is of importance. Felspar could also be utilised as an abrasive in soaps and polishes.

Of growing importance in the ceramic industry are those minerals known as super-refractories, which will withstand much higher temperatures than firebrick. Of these there are local supplies of kyanite, sillimanite and andalusite, of which as yet only small trial parcels have been consumed. Other minerals which as yet are only being used locally in extremely small quantities are mica, asbestos and magnesite, all of which could be made available in Perth in large quantities at competitive prices.

Amongst the laterite ("ironstone gravel") beds of the Darling Range there are patches sufficiently rich in aluminium oxide to be classified as "bauxite," which is the main source of metallic aluminium. Even if the metal were not electrically smelted here, there is no reason why the local ore should not be used as an original source of supply, and the first essential stage of purifying the oxide carried out locally. The immense lacustrine beds of alunite in the Wheat Belt could be used to supplement the aluminium supply, and at the same time yield as by-products, potash salts and alum.

Glauconite is already being dug on a small scale and converted into a water softener. This appears to be an industry capable of expansion. A glass sand of the highest quality also exists a few miles only from the city, and might be used in the production of the finest table ware. Close to it are large deposits of diatomite, which so far have been neglected, though in other countries this mineral is put to a large number of uses.

There are thus within convenient reach of Perth, a large number of minerals worthy of more extensive development, and as there is an active movement to increase the number of industries in Western Australia, prospective manufacturers might well bear the deposits in mind.

MINING GENERALLY.

The only base metals produced were Tin, Tantalite, Copper and Antimony.

As forecasted in my last report, a substantial increase in the gold yield was recorded for 1938, while the actual Australian currency value of such yield was the highest in the State's history.

There are still more companies to come into production, and, in the ordinary course of events, I anticipate a bigger yield again during the year 1939.

The policy of assisting prospectors was continued, and the total number helped since the inception of the Prospecting Scheme in June, 1933, was 7,354.

At the end of the year, the number receiving assistance was 725. At that date, the total costs of the scheme including rations, rail fares, equipment and supervision, amounted to £192,748, while refunds from successful prospectors totalled £35,464.

Of the cost of the scheme quoted above, £80,904 was provided by the Commonwealth Government under its Vote "Assistance to Metalliferous Mining" and the balance from State funds.

Crushings reported by assisted men amount to 49,450 tons of ore from which 25,347 fine ounces of gold were obtained. Once payable gold has been obtained, the men, of course, go off the scheme and their progress is not then followed. Such being the case, the scheme has been responsible for a much greater production than that quoted.

The fund "Assistance to Metalliferous Mining" granted by the Commonwealth Government terminated on the 30th June, 1938, and the expenditure for the three years it was in operation totalled £126,295. The money was used for the Prospecting Scheme, for establishment of the Wiluna School of Mines, and the extension of the Kalgoorlie School of Mines, for increased geological examinations and for assistance in establishing batteries in promising districts not supplied with crushing facilities.

AERIAL, GEOLOGICAL, AND GEOPHYSICAL SURVEY OF NORTHERN AUSTRALIA.

During 1938, the examination of the mineral deposits of that portion of the State situated north of the twenty-second parallel of latitude which had not been examined in previous years was completed.

In the course of the year's work, some 46 mining centres were investigated, chiefly in the Pilbara and Ashburton districts.

The Yampi Sound iron deposits were examined in detail and iron deposits at Ellarine Hills and Andover were also investigated. Geophysical work was carried out at Wiluna and Norseman, while Koolan and Cockatoo Islands, together with a strip along the extension of the strike of the rocks on the mainland, were aerially photographed.

With the exception of some copper deposits near Obergooma Station in the West Kimberley district and a few minor occurrences of gold and base metals, the national stock-taking of mineral resources north of the twenty-second parallel of latitude may now be regarded as complete.

The objects of the W.A. Section of the Survey having been completed, the association of the State with the Aerial, Geological, and Geophysical Survey of Northern Australia has been terminated.

MINING DEVELOPMENT ACT.

The expenditure incurred in rendering assistance to mine owners and the industry generally under the provisions of this Act totalled £21,915 17s. 9d., and in the preceding year £7,300 7s. 1d.

PART II.—MINERALS.

TABLE I.

Quantity and Value of Minerals produced and/or exported during Years 1937 and 1938.

Description of Minerals.	1937.		1938.		Increase or Decrease for Year compared with 1937.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£
1. Antimony (reported), statute tons	*562	*9,196	339	3,859	— 223	— 5,337
2. Arsenic (reported), statute tons	2,054	36,972	3,999	71,982	+ 1,945	+ 35,010
3. Asbestos (reported), statute tons	42	1,950	†121	5,314	+ 79	+ 3,364
4. Copper (exported), statute tons	35	986	29	1,275	— 6	+ 289
5. Coal (raised), statute tons	553,510	340,444	604,792	375,083	+ 51,282	+ 34,639
6. Felspar (exported), statute tons	2,989	9,031	3,469	10,431	+ 480	+ 1,400
7. Glauconite (reported), statute tons	165	825	183	915	+ 18	+ 90
8. Gold (exported and minted), fine ozs.	1,000,647	4,250,474	1,167,791	4,960,458	+167,144	+709,984
9. Gypsum (reported), statute tons	9,073	9,809	13,429	12,409	+ 4,356	+ 2,600
10. Lead Ore (raised), statute tons	6,163	7,248	350	590	— 5,813	— 6,658
11. Silver (exported), fine ozs.	180,562	20,596	271,346	28,852	+ 91,784	+ 8,256
12. Silver-lead ore (exported), statute tons ... ..	...	...	2	35	+ 2	+ 35
13. Tantalite (exported), statute tons	19	16,846	12	13,094	— 7	— 3,752
14. Tin (exported), statute tons... ..	80	12,421	68	7,421	— 12	— 5,000
...	...	*4,716,798	...	5,491,718	...	+774,920

* Amended from previous report.

† Actual quantity of Asbestos *exported* 334 tons valued at £17,711; presumably total quantity produced not reported.The value of fine gold is computed at £4 4s. 11 ¹¹/₁₆d. per ounce; in addition the estimated premiums received by producers amounted to £A5,402,565 in 1938, as compared with £A4,493,281 for 1937.

TABLE 2.

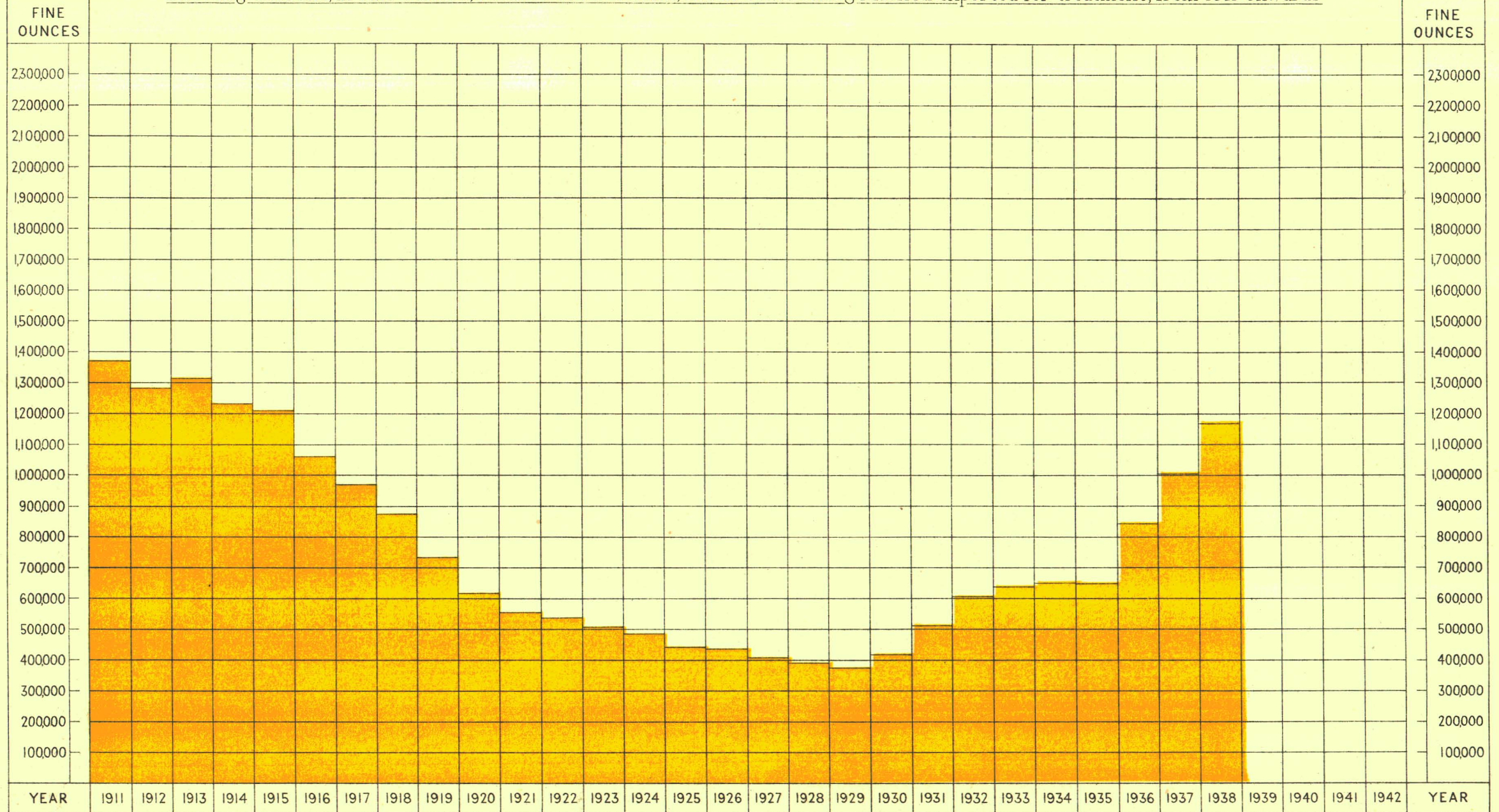
Value and Percentage of Mineral Exports in relation to the Value of Total Exports from Western Australia.

Year.	Total Exports.	Mineral Exports (exclusive of Coal).	Percentage.
	£	£	
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	24,187,367	10,417,563	43·07
Total since 1902 ...	479,443,720	186,765,169	38·96

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.).	
	1937.	1938.	1937.	1938.	1937.	1938.
	fine ozs.	fine ozs.			shillings.	shillings.
1. Kimberley	397	659	·039	·056	...	69·16
2. West Kimberley ... ..	...	12	...	·001	...	...
3. Pilbara	13,175	14,721	1·308	1·255	77·60	64·39
4. Ashburton	245	338	·024	·029	...	24·47
5. Gascoyne	12	4	·001	...	...	...
6. Peak Hill	2,607	2,699	·259	·230	35·53	26·05
7. East Murchison	163,078	186,206	16·190	15·875	17·813	17·942
8. Murchison	86,333	145,038	8·571	12·365	22·587	18·549
9. Yalgoo	7,464	11,444	·741	·976	38·81	30·42
10. Mt. Margaret	104,923	103,363	10·416	8·812	31·23	31·80
11. North Coolgardie	35,662	29,804	3·540	2·541	38·278	45·404
12. Broad Arrow	18,910	20,629	1·877	1·759	45·47	39·073
13. North-East Coolgardie	2,534	2,863	·252	·244	105·475	50·288
14. East Coolgardie	429,175	503,331	42·607	42·911	30·849	29·754
15. Coolgardie	18,007	19,961	1·788	1·702	48·676	31·942
16. Yilgarn	74,930	70,062	7·439	5·973	42·25	42·567
17. Dundas	48,239	59,574	4·789	5·079	31·86	30·656
18. Phillips River	1,226	1,486	·122	·123	22·77	20·97
Outside Proclaimed Goldfield	372	756	·037	·064	...	...
Totals and Averages	1,007,289	1,172,950	100·000	100·000	28·153	26·504

The total yield of 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 1937 and 1938.

Goldfield.	1937.				1938.			
	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
2. West Kimberley ... ..	...	...	...	...	...	...	...	...
3. Pilbara	89·43	45·87	82·86	42·50	129·05	60·36	101·53	47·48
4. Ashburton ... ..	...	...	...	...	91·14	28·64	30·75	9·66
5. Gascoyne ... ..	...	...	...	...	...	...	...	...
6. Peak Hill	207·79	103·89	86·90	43·45	310·42	136·15	107·95	47·34
7. East Murchison	685·84	386·55	143·81	81·05	797·78	453·76	168·66	95·93
8. Murchison	412·39	189·22	109·67	50·31	838·94	419·47	186·18	93·09
9. Yalgoo	105·93	44·77	49·76	20·45	195·72	88·27	71·08	32·06
10. Mt. Margaret	416·68	225·11	153·19	82·75	416·60	202·62	156·61	76·17
11. North Coolgardie	139·10	66·18	62·67	29·82	110·67	52·03	64·09	30·13
12. Broad Arrow	95·75	45·01	51·25	24·09	132·43	61·53	64·07	29·77
13. North-East Coolgardie	28·75	11·86	35·69	14·73	49·88	20·94	42·11	17·67
14. East Coolgardie	458·63	269·95	166·55	98·03	550·46	323·19	192·99	113·29
15. Coolgardie	39·83	18·94	22·82	10·85	78·24	36·55	30·85	14·41
16. Yilgarn	250·66	136·33	124·65	67·81	267·69	148·97	114·13	63·51
17. Dundas	230·10	137·60	86·29	51·54	303·06	185·24	111·17	63·32
18. Phillips River	86·25	43·13	23·12	11·56	105·48	82·36	26·06	20·35
Total Averages	354·43	187·93	117·45	62·28	459·45	244·55	143·34	76·29

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	1,167,791	4,960,458	62·814	58·065
2. Victoria	144,243	612,704	7·759	7·172
3. New South Wales	88,707	376,811	4·771	4·411
4. Queensland	151,432	643,241	8·145	7·530
5. Tasmania	22,200	94,298	1·194	1·104
6. South Australia	5,292	22,478	·285	·263
7. Papua	(a) 29,834	126,726	1·605	1·483
8. Northern Territory	12,378	52,577	·666	·615
9. Mandated Territory of New Guinea	(b) 237,254	1,007,789	12·761	11·797
10. New Zealand	152,050	645,866	...	7·560
	2,011,181	8,542,948	100·000	100·000

(a) Estimated by Commonwealth Statistician.

(b) Subject to revision.

* Exclusive of premium.

TABLE 6.

Dividends, etc., paid by Western Australian Mining Companies during 1938 and the Total to date.

(Mainly compiled from information supplied to the Government Statistician's Office, by the Chamber of Mines of Western Australia.)

Goldfield.	Name of Company.	Dividends.	
		1938.	Grand total paid to end of 1938.
Peak Hill	Various Companies	£ ...	£ 160,666
East Murchison	Linden (W.A.) G.Ms., N.L.	4,750	4,750
Do.	Swan Bitter G.M., N.L.	1,760	5,280
Do.	Various Companies ... ..	...	1,644,634
Murchison	Hill 50 Gold Mine, N.L.	6,250	6,250
Do.	Triton G.Ms., Ltd.	72,000	168,000
Do.	Western Gold Ms., N.L.	18,750	18,750
Do.	Various Companies ... ..	...	2,005,166
Mt. Margaret	Lancefield (W.A.) G.Ms., Ltd.	50,000	262,500
Do.	Central G.Ms., N.L.	10,000	10,000
Do.	Sons of Gwalia, Ltd.	89,375	1,656,613
Do.	Various Companies ... ..	...	376,213
North Coolgardie	First Hit (1934) G.Ms., N.L.	13,982	18,643
Do.	Various Companies ... ..	...	575,032
Broad Arrow	Ora Banda Amalgamated Mines, Ltd.	10,000	40,000
North-East Coolgardie	Various Companies ... ..	...	89,854
East Coolgardie	Boulder Perseverance, Ltd.	(a) 89,928	1,894,993
Do.	Golden Horseshoe (New), Ltd.	(b) 36,667	187,917
Do.	Gold Mines of Kalgoorlie, Ltd.	30,500	53,375
Do.	Great Boulder Proprietary, Ltd.	93,750	6,550,547
Do.	Lake View and Star, Ltd.	(c) 280,000	1,707,000
Do.	North Kalgurli (1912), Ltd.	110,000	432,500
Do.	Paringa M. and E. Co., Ltd.	19,906	19,906
Do.	South Kalgurli Consolidated, Ltd.	(d) 40,626	768,127
Do.	Various Companies ... ..	...	14,927,489
Coolgardie	do. do. ... ..	...	339,495
Yilgarn	do. do. ... ..	...	749,180
Dundas	Blue Bird G.M., N.L.	45,000	50,000
Do.	Norseman G.Ms., N.L.	80,000	273,898
Do.	Various Companies ... ..	...	237,625
		£1,103,244	£35,234,403

(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 1938

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

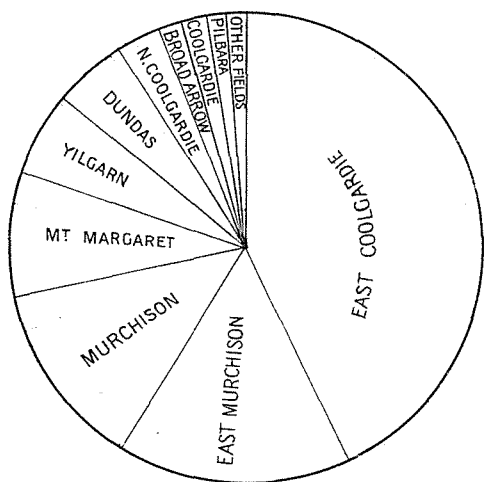


FIG. 2. Gold produced from various Goldfields as given by the Export and Mint Returns.

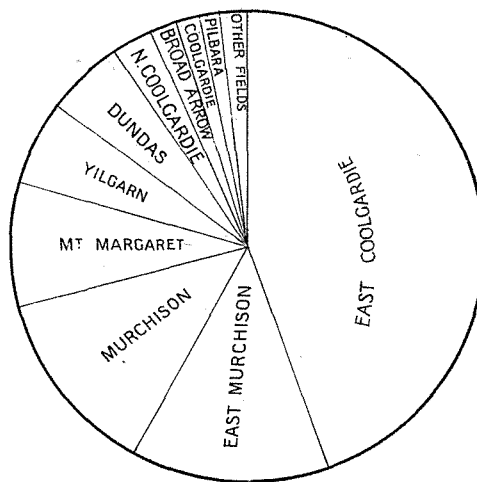


FIG. 3. Value of Gold and other Minerals.

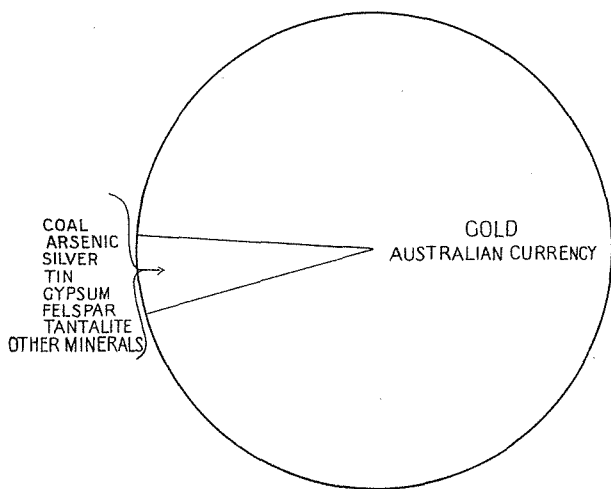


FIG. 4. Value of Minerals other than Gold.

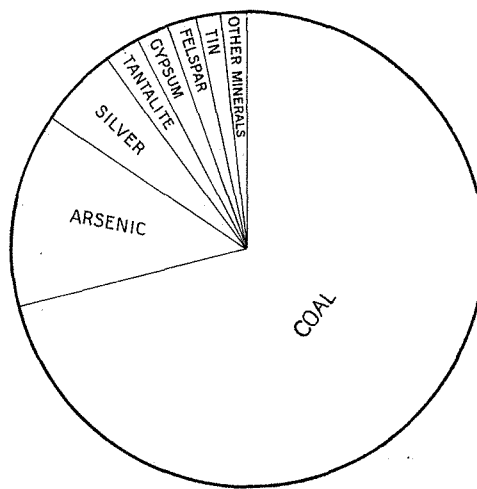


FIG. 5. Areas of land leased for Goldmining on various Goldfields.

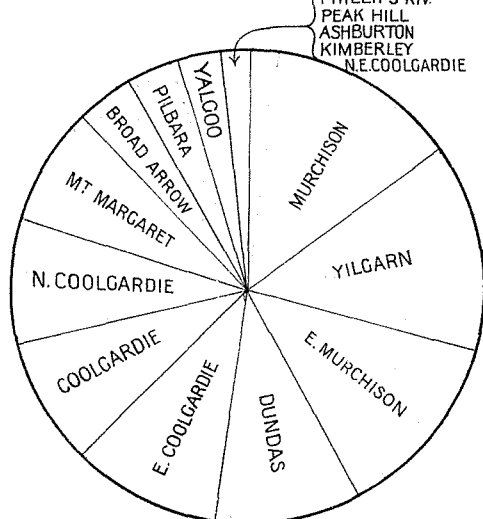
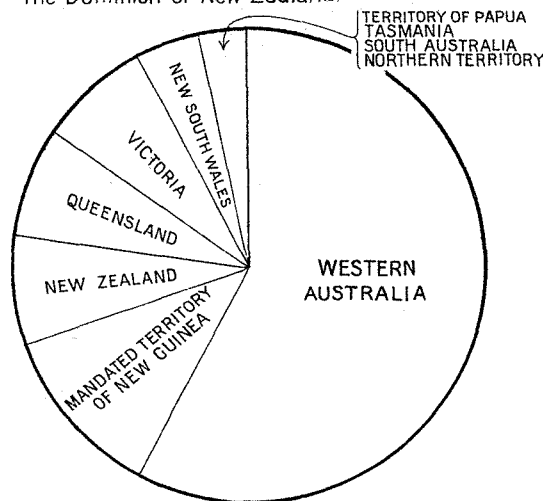


FIG. 6. Output of Gold in the States of Australia and the Dominion of New Zealand.



Note: Output Figures for New Guinea not Available.

TABLE 7.

Quantity and Value of Minerals, other than Gold, reported to the Mines Department during 1938.

Goldfield, District or Mineral Field.	1938.		Increase or Decrease as compared with 1937.	
	Quantity.	Value.	Quantity.	Value.
	tons.	£A	tons.	£A
ANTIMONY.				
East Murchison (Wiluna)	339	3,859	— 223	— 5,337
Pilbara (Nullagine) ... ..	...	...	— 3	— 39
ARSENIC.				
East Murchison (Wiluna)	3,999	71,982	+ 1,945	+ 35,010
ASBESTOS.				
Pilbara (Marble Bar)	1	75	+ 1	+ 75
Pilbara (Nullagine)	66	2,796	+ 46	+ 1,617
Ashburton ... ..	...	...	— 8	— 770
Outside Proclaimed Goldfield	54	2,443	+ 40	+ 2,035
FELSPAR.				
Coolgardie	1,873	5,746	— 1,027	— 55
COPPER.				
East Murchison (Wiluna)	3	161	+ 3	+ 161
Phillips River	2	85	+ 2	+ 85
GLAUCONITE.				
Outside Proclaimed Goldfield	183	915	+ 18	+ 90
GYPSUM.				
Yilgarn	2,296	2,296	+ 1,817	+ 1,817
Outside Proclaimed Goldfield	11,133	10,113	+ 2,539	+ 783
TANTALITE.				
Pilbara (Marble Bar)	20	27,557	...	— 1,454
LEAD ORE.				
Northampton	350	590	— 5,813	— 6,658
TIN.				
Pilbara (Marble Bar)	1	75	— 2	— 425
Greenbushes	51	6,253	...	— 845
MAGNESITE.				
Coolgardie	10	12	+ 10	+ 12

TABLE 8.

Quantity of Coal raised during 1937 and 1938, 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	1937	553,510	340,444	148	575	963	766
	1938	604,792	375,083	158	607	996	791

The quantity of coal raised during the year 1938, and the estimated value thereof showed considerable increase, amounting to 51,282 tons of coal valued at £34,639; the average number of men employed and the averaged number of tons raised per man employed also increased by 42 men and 25 tons respectively, when compared with figures for 1937.

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, 1937 and 1938.

Description of Leases.	1937.		1938.	
	No.	Acreage.	No.	Acreage.
Gold Mining Leases on Crown Land	1,656	28,926	1,584	27,152
" " " Private Property	20	434	7	108
Mineral Leases on Crown Land	175	38,935	163	38,506
" " " Private Property	3	74	2	64
Mineral Claims	111	8,049	115	10,856
Prospecting Areas	*1,875	38,633	†1,825	44,850
	3,840	115,051	3,696	121,536

* Includes 1 Coal Prospecting Area of an area of 3,000 acres. of a total area of 11,992 acres.

† Includes 4 Coal Prospecting Areas

The number of Gold Mining Leases decreased by 85 and the area by 2,100 acres.

The number of Mineral Leases decreased by 13 and the area by 439 acres.

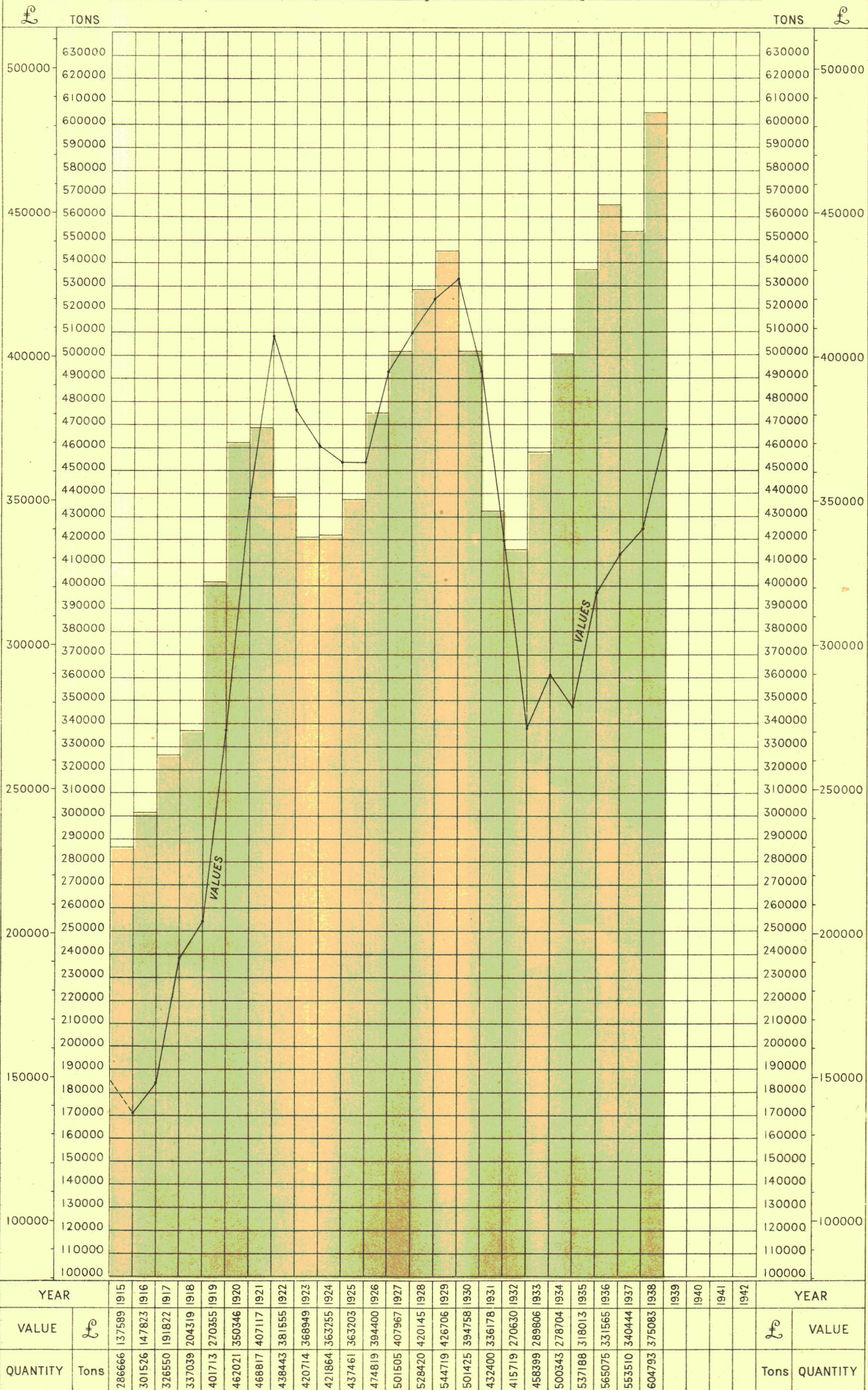
The number of Mineral Claims increased by 4 and the area by 2,807 acres.

The number of Prospecting Areas decreased by 50 and the area increased by 6,217 acres.

The total number of leases, etc., decreased by 144 and the area increased by 6,485 acres as compared with the year 1937.

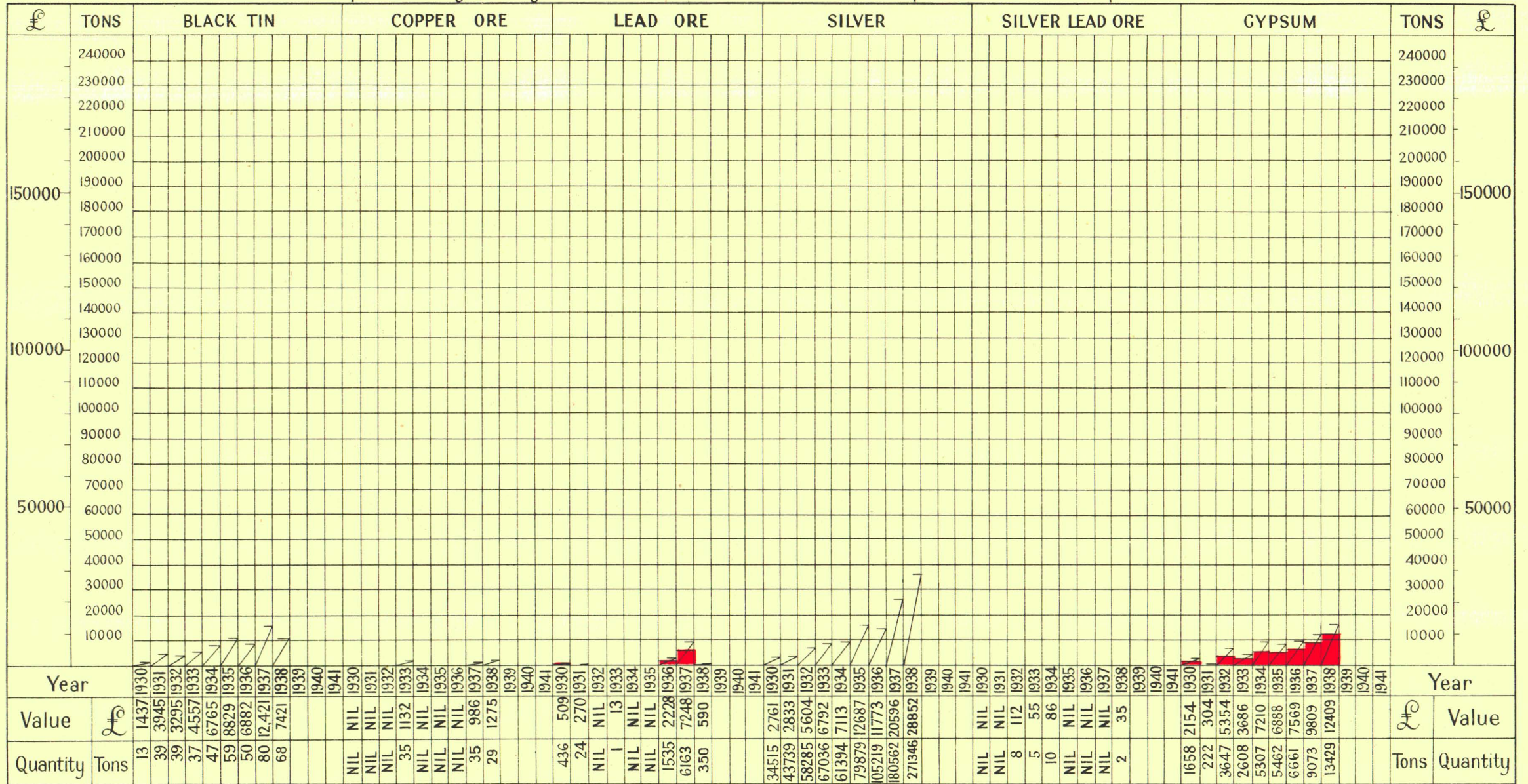
DIAGRAM OF COAL OUTPUT

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



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



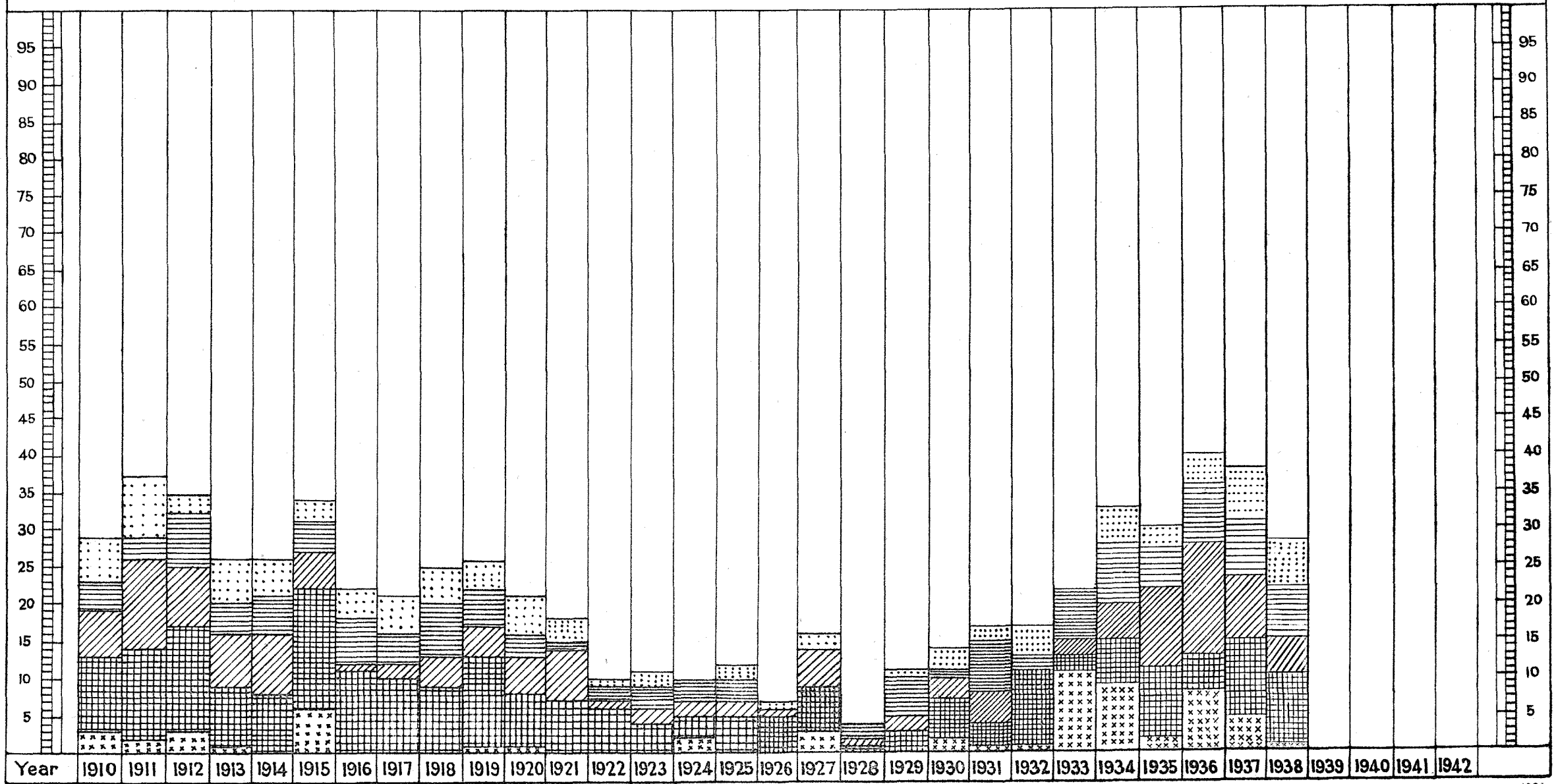
NOTE : The Red denotes Quantities produced & Diagonal lines Values thereof .

Minerals not shown above
 Tantalite 12 tons Value £13,094
 Glauconite 183 . . . £ 915
 Asbestos 121 . . . £ 5,314
 Arsenic 3999 . . . £ 71,982
 Felspar 3464 . . . £ 10,431

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			

DIAGRAM SHEWING THE NUMBER OF DEATHS FROM ACCIDENTS ARRANGED IN FIVE CLASSES,
IN THE MINES OF WESTERN AUSTRALIA DURING THE YEARS 1910 AND ONWARDS.



EXPLOSIONS
 FALLS OF GROUND
 IN SHAFTS
 MISCELLANEOUS UNDERGROUND
 ON SURFACE INCLUDING MACHINERY

PART IV.—MEN EMPLOYED.

TABLE 10.

Average number of Men reported as engaged in Mining during 1937 and 1938.

Goldfield.	District.	Reef or Lode.		Alluvial.		Total	
		1937.	1938.	1937.	1938.	1937.	1938.
1. Kimberley	...	3	22	6	6	9	28
2. Pilbara	Marble Bar	247	237	4	3	251	240
	Nullagine	57	66	2	4	59	70
3. West Kimberley	...	...	3	...	6	...	9
4. Ashburton	...	10	35	2	...	12	35
5. Gascoyne	...	...	...	3	3	3	3
6. Peak Hill	...	59	57	1	...	60	57
7. East Murchison	Lawlers	199	192	...	...	199	192
	Wiluna	1,433	1,347	...	...	1,433	1,347
	Black Range	380	402	...	...	380	402
	Cue	805	765	12	3	817	768
8. Murchison	Meekatharra	339	244	7	7	346	251
	Day Dawn	86	64	10	6	96	70
	Mt. Magnet	453	469	4	...	457	469
9. Yalgoo	...	365	357	...	...	365	357
	Mt. Morgans	114	139	...	...	114	139
10. Mt. Margaret	Mt. Malcolm	509	487	...	...	509	487
	Mt. Margaret	645	731	...	...	645	731
	Menzies	547	427	12	15	559	442
11. North Coolgardie	Ularring	229	261	6	9	235	270
	Niagara	68	61	...	...	68	61
	Yerilla	326	209	8	7	334	216
12. Broad Arrow	...	757	666	28	27	785	693
13. North-East Coolgardie	Kanowna	117	105	9	8	126	113
	Kurnalpi	41	44	5	5	46	49
14. East Coolgardie	East Coolgardie	4,209	4,397	50	44	4,259	4,441
	Bulong	112	94	7	8	119	102
15. Coolgardie	Coolgardie	1,130	927	86	73	1,216	1,000
	Kunanalling	409	353	34	32	443	385
16. Yilgarn	...	1,101	938	4	...	1,105	938
17. Dundas	...	908	851	28	21	936	872
18. Phillips River	...	105	73	1	...	106	73
19. State Generally	...	82	60	...	4	82	64
Gold Mining Total		15,845	15,083	329	291	16,174	15,374
MINERALS OTHER THAN GOLD.							
	Arsenic	22	19	...	...	...	19
	Asbestos	27	58	...	...	...	58
	Coal	723	765	...	...	...	765
	Copper	...	4	...	...	...	4
	Felspar	9	9	...	...	...	9
	Glauconite	2	3	...	...	...	3
	Gypsum	22	22	...	...	...	22
	Iron Ore	36	54	...	...	...	54
	Lead Ore	29	4	...	...	...	4
	Magnesite	...	1	...	...	...	1
	Mica	...	5	...	...	...	5
	Red Oxide	...	2	...	...	...	2
	Tantalite	32	34	...	...	...	34
	Tin	51	65	9	8	...	73
Total—Other Minerals		953	1,045	9	8	962	1,053
GRAND TOTAL		16,798	16,128	338	299	17,136	16,427

PART V.—ACCIDENTS.

TABLE 11.

MEN EMPLOYED IN MINES KILLED AND INJURED IN MINING ACCIDENTS
DURING 1937 AND 1938.

A.—According to Locality of Accident.

Goldfield.	Killed.		Injured.		Total Killed and Injured.	
	1937.	1938.	1937.	1938.	1937.	1938.
1. Kimberley ... ..	...	...	...	...	...	...
2. West Kimberley ... ..	...	...	...	...	...	...
3. Pilbara ... ..	...	3	1	4	1	7
4. West Pilbara ... ..	...	...	...	2	...	2
5. Ashburton ... ..	...	...	...	...	...	...
6. Gascoyne ... ..	...	...	...	...	...	...
7. Peak Hill ... ..	...	...	...	...	...	...
8. East Murchison	3	2	167	135	170	137
9. Murchison	5	5	65	58	70	63
10. Yalgoo	2	1	2	2	4	3
11. Mt. Margaret	3	3	123	136	126	139
12. North Coolgardie ... ..	...	...	17	16	17	16
13. North East Coolgardie ... ..	...	...	1	...	1	...
14. Broad Arrow	3	1	2	1	5	2
15. East Coolgardie	9	7	582	570	591	577
16. Coolgardie	1	...	9	3	10	3
17. Yilgarn	5	2	30	25	35	27
18. Dundas	5	2	18	55	23	57
19. Phillips River ... ..	...	...	1	...	1	...
MINING DISTRICTS—						
Northampton	2	1	...	...	2	1
Greenbushes ... ..	...	...	...	...	...	...
Collie ... ..	...	1	251	364	251	365
South-West ... ..	...	...	39	83	39	83
	38	28	1,308	1,454	1,346	1,482

From the above table it will be seen that the number of fatal accidents for the year 1938 was 28, as against 38 in 1937. The number injured showed an increase of 146. 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.	1937.		1938.		Comparison with 1937.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. Exposures	5	13*	1	8	— 4	— 5
2. Falls of Ground	10	67	9	82	— 1	+ 15
3. In Shafts	8	32	5	37	— 3	+ 5
4. Miscellaneous Underground	8	892	7	987	— 1	+ 95
5. Surface	7	304†	6	340‡	— 1	+ 36
Total	38	1,308	28	1,454	— 10	+ 146

* Includes 1 serious in Quarries.

† Includes 38 serious in Quarries.

‡ Includes 83 serious in Quarries.

Twenty-three fatal accidents occurred on gold mines, two on asbestos mines, one on a lead mine, one on a tantalite mine and one in a coal mine.

The death rate per 1,000 men employed at gold mines was 1.49 as against 2.23 in 1937.

PART VI.—STATE AID TO MINING.

The number of State batteries existing at the end of the year was 24, with 3 leased. From inception to the end of 1938, gold and tin to the value of £10,183,769 15s. 7d., including gold premium estimated at £1,825,887 11s. 4d., has been recovered from State plants. 2,278,254.94 tons of auriferous ore have been treated and have produced £8,053,662 10s., plus estimated premium by amalgamation; £1,759,655 6s. by cyanidation; £265,266 by slimes; £10,779 14s. from residues; and 81,786 tons of ore produced tin to the value of £93,834, and in addition £572 3s. 4d. was recovered from residues.

During the year gold ore treated was 108,966.00 tons for 59,489.30 ozs. of bullion by amalgamation, producing 51,898.5 tons of payable tailing yielding 16,698.3 ozs., 43,103 tons of unpayable tailing, yielding 3,075.8 ozs., and 3,111.25 tons refractory tailing yielding 769.45 ozs., making a total of 98,112.75 tons for 20,543.55 ozs.

The working expenditure for all plants was £112,557 0s. 9d. and the revenue £124,179 11s. 11d., which shows a profit of £11,622 11s. 2d. on the year's operations.

The capital expenditure since inception of the scheme has been £524,497 5s. 3d., £390,108 2s. 2d. from General Loan Fund, £91,981 1s. 8d. from Consolidated Revenue, £28,621 13s. 5d. from Assistance to Gold Mining Industry, and £13,786 8s. from Commonwealth Assistance to Metalliferous Mining.

The cost of administration for the year was £6,808 15s. 9d., as against £7,564 12s. 10d. for the year 1937.

The working expenditure from inception to the end of the year exceeds the revenue by £81,415 5s. 2d.

GEOLOGICAL SURVEY.

The work of the Geological Survey under this heading during 1938 is represented by the following reports, which are fully set out in the Annual Report of the Geological Survey:—

“Artesian and Sub-Artesian Water Possibilities of Cardabia Station.”

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 4,401, as against 4,193 for the preceding year, showing an increase of 208.

Of this total number, 2,435 were out of use at the end of the year; 1,912 thorough and 76 working inspections were made, and 1,924 certificates were issued.

Permanent condemnations totalled 12. The total number of machinery groups registered was 15,156, as against 13,933 for the previous year, an increase of 1,223.

PART VIII.—SCHOOL OF MINES.

(a) *Kalgoorlie*.—The individual enrolment for 1938, exclusive of the Correspondence Course, reached 606, as compared with 617 during 1937.

The Correspondence Course enrolment totalled 56. This course is self-supporting.

In the Public Assay branch of the School, 668 gold assays and 105 mineral determinations were carried out, mainly for prospectors.

“Vulcan Tin Mine, Greenbushes.”

“Yilgarn Goldfield—North of Great Eastern Railway.”

“An area in the vicinity of Laverton and Morgans.”

“Some Yilgarn Mining Groups.”

“Erlistoun Gold Mine—Cox's Find.”

“Gladiator Gold Mine—Mt. Margaret Goldfield.”

“Mary Mac Gold Mine, Laverton.”

“Notes on portion of Mt. Margaret Goldfield.”

“Notes on Banded Jaspilites of the Mt. Morgans—Mt. Margaret Districts.”

ASSISTANCE UNDER MINING DEVELOPMENT ACT, 1902.

The following statement shows the sum advanced during the year 1938, under the Mining Development Act, 1902:—

	£	s.	d.
1. Advanced in aid of mining work and equipment of mines with machinery	5,209	18	4
2. Subsidies on stone crushed for the public	1,139	16	4
3. Providing means of transport equipment and sustenance to prospectors	15,282	11	3
	£21,632	5	11
Other assistance granted from the vote during the year on various matters totalled	283	11	10
The subsidies paid on stone crushed for the public amounted to	1,139	16	4
And are subsidies paid to owners of plants crushing for the public, the conditions being that they crush at fixed rates. The ore crushed during the year at those plants totalled 8,246¾ tons. The receipts under the Mining Development Act, exclusive of interest payments, amounted to	3,447	2	2
And included—			
Refunds of advances	857	5	10
Sales of securities	18	7	6
Miscellaneous refunds	2,571	8	10
	£3,447	2	2

Inspections made totalled 11,245; an increase of 393 over 1937.

365 applications for engine-drivers' and boiler attendants' certificates were granted.

The total revenue from all sources during the year was £8,706 13s. 4d., as compared with £8,801 14s. 2d. for 1937.

The total expenditure for 1938 was £7,168 1s. 11d., as against £7,336 3s. 5d. for 1937, the operations for the year thus showing a profit of £1,538 11s. 5d.

The Metallurgical Laboratory completed 32 investigations into the treatment of ores and metallurgical products, thus greatly assisting mines confronted with ore problems.

In connection with this work, 1,403 assays for gold were carried out, and 140 chemical analyses.

During the year considerable improvements to the school and equipment were effected.

(b) *Wiluna*.—Classes continued with satisfactory attendance. The average class enrolment was 139, compared with 123 in 1937.

A new school building was erected during the year, and will be utilised at the commencement of the 1939 school year. New equipment has been ordered to fit up the laboratory, drawing room and engine room.

The school should now progress very considerably.

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 the exceedingly busy year experienced.

I have, etc.,

A. H. TELFER,
Under Secretary for Mines.

Department of Mines,
Perth, 31st March, 1939.

DIVISION II.

Report of the State Mining Engineer for the Year 1938.

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 1938.

STAFF.

Mr. J. Boyland was appointed District Inspector of Mines at Leonora in place of Inspector Elvey, who resigned in November, 1937. He took up his duties in May.

District Inspector W. A. Hughes resigned in August to accept the new position of Director of Mines for the Northern Territory. Mr. Hughes' work while with this Department was of a uniformly high standard, and it is felt that the Commonwealth Public Service has gained a very competent officer.

Mr. I. W. Morley, having been appointed to the position rendered vacant by Inspector Hughes' resignation, took up his duties at Kalgoorlie in November.

Mr. D. J. Leahy, Workmen's Inspector of Mines at Kalgoorlie, resigned to successfully contest the Parliamentary election for the seat rendered vacant by the death of the late Hon. Minister for Mines, Mr. S. W. Munsie, and I should like here to record my appreciation of the excellent work done by him while with the Department.

In the biennial elections for Workmen's Inspectors, Messrs. R. J. Wallis (Kalgoorlie), R. McMennemin (Wiluna) and W. E. Boyce (Cue) were re-elected, and Messrs. R. McKerlie (Kalgoorlie) and T. A. Birch (Leonora) were the other successful candidates. Workmen's Inspector H. Greyman (Leonora) did not offer himself for re-election on account of ill health.

ACCIDENTS.

During the year there were reported to this office a total of 28 fatal and 1,454 serious accidents (including 1 fatal and 447 serious accidents in coal mines and quarries), as compared with 38 fatal and 1,308 serious accidents in 1937 (including 2 fatal and 290 serious accidents in coal mines and quarries). These

figures show a decrease of 10 fatal and an increase of 146 serious accidents on the previous year.

The increased number of accidents reported by coal mines and quarries is largely due to the fact that all quarries have now been brought under the provisions of the Mines Regulation Act, and must, therefore, now report all accidents to this Department.

Of the fatal accidents, 23 occurred on gold mines, compared with 36 in 1937, 1 was on a lead mine, 1 on a tantalite mine, 1 in a coal mine and 2 occurred on blue asbestos leases in the Hamersley Range. There were no fatalities in any of the quarries working under the provisions of the Mines Regulation Act, 1906.

The total number of serious accidents reported on gold mines was 1,007, a decrease of 9 on the 1,016 cases reported in the previous year. The number of men employed during the period decreased from 16,174 to 15,374.

On coal mines the number of serious accidents showed a sharp increase from 251 to 364, while the number of men employed increased from 723 to 765.

In tabulating serious accidents as defined by the Mines Regulation Act, 1906, all those are included which cause the absence of an employee from his usual duties for a period of a fortnight or more.

It is felt that this classification, without some modification, may be apt to lead to an erroneous impression, as many accidents recorded as serious involve only very minor injuries, and the medical certificates granted to the injured workmen, advising a rest of fourteen days or more before returning to work, are often rather in the nature of a precaution against infection of a slight wound than a statement that the patient is physically incapable of following his ordinary calling.

I have, therefore, in addition to supplying the usual accident returns, segregated the serious accidents, as far as possible with the information available, into two main divisions showing major and minor injuries, each division being again subdivided to show the nature of the injuries.

This tabulation is shown hereunder.

SERIOUS ACCIDENTS—1938.

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.											
Pilbara and West Pilbara						1							1								2								1							2
Ashburton							1														1												1			1
East Murchison	1		2	1		1			2		1		5					1		2	17	6	8	5	5	1	9	35	9	5	13	6	16	118		
Murchison	1		3			2			3		3		2					1			15	4	1	5	2	2	5	11	2	1	3	5	2	43		
Yalgoo													1								1		1											1		
Mt. Margaret			3			1			4				6	1		1				4	24	2	1	6	3	1	8	33	15		23	8	12	112		
North Coolgardie													1							1	2	1					1	2	2		1	2	4	14		
Broad Arrow																																		1	1	
East Coolgardie	4	1	11	4		6			4		9		8						2	2	1	52	16	21	24	10	13	24	161	88	3	46	52	60	518	
Coolgardie																				1		1						1					1	2		
Yilgarn			2				1		1		1								4		9	2					2	4	7		1			16		
Dundas				1				1	1		4								1	1		9	3		3	4	1	2	8	7	1	5	2	10	46	
Collie			1	2		6					4								1	1	2	18	4	14	30	15	12	26	77	42	6	58	36	26	346	
South-West Mining District	1					2			1										1	1		6	3		1	6	3	6	21	10	1	15	5	6	77	
Total	7	1	22	8		18	2	2	16		22		25	1		1	1	4	18	2	7	157	41	46	74	45	34	83	354	182	17	166	116	139	1 29.	

It will be noted immediately on perusal of the above table that the major injuries constitute only a small percentage of the serious accidents, amounting to 13.2 per cent. on the Goldfields and 4.9 per cent. at Collie.

The subdivisions showing the nature of injuries should be of value in deciding what protective equipment is most necessary or desirable in the crusade against mining accidents.

It would appear that the item of equipment most definitely indicated as desirable is gloves, as the number of accidents to hands and fingers is about one-third of the total. Again, another 15 per cent. of the total accidents are injuries to feet and toes, which might be largely eliminated by the use of proper boots. It will also be noted that the proportion of head injuries is much higher at Collie than on the Goldfields, where the protective helmet is becoming more universal.

A pleasing feature of the year's work is the very appreciable drop in the number of fatal accidents. This year's total, 28, is the lowest since 1933, and encourages the hope that the efforts of Safety Committees, Mine Managers, and Departmental officials to secure safer working are bearing fruit. While the death rate is still too high, the proportion of easily preventable fatalities is considerably less than in the previous year.

It is worthy of note that there were no deaths due to explosive accidents on the Goldfields for the year.

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

The following table shows the number of fatal accidents recorded during the last five years and the death rate per 1,000 men employed.

	1934.	1935.	1936.	1937.	1938.
Fatal accidents to men engaged in mining (exclusive of quarries)	30	30	38	38	28
Total number of men engaged in mining (average) ...	13,310	15,557	16,652	17,136	16,419
Accident death rate per 1,000 men	2.25	1.93	2.28	2.22	1.70
Fatal accidents at quarries	3	...	2	...	...

FATAL ACCIDENTS.

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

Explosives.

There was one fatality during the year due to explosives.

James McMillan Black, a miner employed at the Proprietary Colliery at Collie, with his mate, had bored three holes 18 inches deep in the stone floor of the seam in preparation for a box drain. They charged the holes and lit two of the fuses, but had difficulty in lighting the third. They decided to leave the third fuse until the other two charges had exploded and retired to a safe position. After two shots were heard, Black immediately returned to light the third fuse. He had apparently just reached the hole when the charge exploded, killing him.

Both men were certain that the third fuse had not been lit, but they should have waited longer before returning.

Falls of Earth.

Falls of earth were responsible for ten deaths.

Norman Henry Nicholas Jack Richards was a miner employed by the Central Norseman Gold Corporation, Limited, and was engaged in operating a mechanical scraper which pulled ore from a stope into a chute.

The ore body is a fairly flat one and a fall of rock occurred from the hanging wall, striking and killing him. Nobody saw exactly what he was doing at the time of the accident, but as he was found near an iron pin in the hanging wall on which a pulley block was previously hung, with a hammer by his side, it is presumed that he was attempting to recover the pin for future use.

Deceased was an experienced miner and no evidence was found of any carelessness.

Bartolo Camadini, a miner employed in breaking mullock for stope filling in the open cut at the Sons of Gwalia Gold Mine, was killed instantly by a fall of rock coming away from a greasy head. Camadini and his mate, both experienced miners, had spent at least half an hour barring down the face after a previous firing, and considered the place safe.

Every reasonable precaution had been taken and there was no evidence of negligence.

James Withnell was killed and his mate seriously injured by a fall of ground from the back of a stope at Cox's Find Gold Mine. Withnell was boring in the face of the stope when a fall of about 15 tons occurred with little or no warning, burying both men. The back had been previously sounded and appeared safe. All reasonable precautions appeared to have been taken.

Isaia Nicoli was one of a party of tributers operating on the Commonwealth Gold Mine at Quinn's. A stull that was supporting a slab of ground on the hanging wall had been knocked out by a recent firing and Nicoli was deepening a hitch on the footwall to take another stull when the slab fell on him, causing fatal injuries.

It is considered that the deceased made an error of judgment in attempting to hold up this slab instead of barring it down.

John Joseph Hudson was a miner working on a blue asbestos lease in Yampire Gorge, Hamersley Range. It would appear that he returned to his working face, situated on a ledge on the face of a cliff, after firing out, and while examining the face a piece of hanging rock came away unexpectedly and

fell on him, causing injuries as a result of which he died some hours later, before medical attention could be provided.

David Lionel Silva, a prospector working on the D.B.D. Gold Mine in the Erlistoun district, was sitting down in a stope for a spell, after filling buckets of ore to send to the surface. While sitting down about a ton of earth came way and fell on him, causing injuries to which he eventually succumbed some days later in Laverton Hospital. There was no evidence of neglect.

Charles Watson, a timberman employed at the South Kalgurli Gold Mine, with his mate, was rilling ore in a stope. The lode, which was broken out to about 6 feet wide had a slight underlay and the broken rock had a tendency to hang up on the foot-wall. Watson went down on a rope to free some of this rock, and whilst he was there a fall of hanging wall occurred, which struck and killed him.

John Thomas Crick, a part owner of the Broken Bond Mine, was working in a stope above the 60ft. level. He had barred down some bad ground in the stope and left it for a few minutes. On his return a fall occurred of about 7 or 8 tons, burying him. When he was uncovered life was extinct.

Vivian George Murace O'Brien and his mate were working in an open cut or quarry at the Wodgina Mine of Tantalite, Limited. They had fired two holes on a bench below the hanging wall. After firing O'Brien tested the hanging wall and considered it safe. Some time afterwards, both men, who had been spalling rocks, sat down in the shade of the hanging wall for a spell. The mate saw some small stones fall, called a warning to O'Brien and jumped clear as the wall fell. O'Brien was buried by the fall and was found to be dead when extricated.

There was no evidence of negligence or carelessness.

Shafts.

There were five fatalities under this heading.

Thomas Henry Vanstan, a prospector and part owner of the Marigold Gold Mine at Payne's Find, was working in the shaft of that mine, 250 feet below the surface. A roller, constructed of 2 inch diameter iron piping, became dislodged from near the collar of the shaft and apparently struck him on the temple, inflicting fatal injuries. The body fell into the water in the bottom of the shaft and was not recovered for about three hours.

Richard Taylor Holman and Charles Arthur McMullen lost their lives through falling or being thrown out of a skip at the Triton Gold Mine. These men and the skipman boarded the skip at the 600ft. loading station and rang to the surface. On passing the 400ft. level the skip evidently fouled the shaft timbers and Holman and McMullen were thrown out while the skipman was knocked unconscious on the floor of the skip.

Access was gained to the skip by means of a steel ladder hooked on to the front portion. Before starting it was the practice to remove this ladder to the side. As the ladder was found badly twisted after the accident, it is conjectured that it was left hanging on the front of the skip and that it was the lugs of the hooks that fouled the shaft timbers.

The Coroner's jury found that there was insufficient evidence to allow of a decision being arrived at as to the cause of the accident.

Albert William Dudley, a pipe-fitter employed by the Wiluna Gold Mines, Limited, was, with others, installing a 6-inch pipe column in the shaft. The cage was servicing them. The signal had been given to hoist the cage very slowly and this was being done when Dudley apparently tried to step on to the moving cage. His foot slipped and he fell between the cage and the shaft timber, sustaining fatal injuries. The cage was stopped immediately, but death was instantaneous, due to the crushing of the spinal cord.

Deceased was in a position of safety before attempting to step on to the cage, and there was no apparent reason why he should have moved.

Rex Thomas Edwards and his mate were working a prospecting show near Bulong. His mate had already descended the mine and Edwards appears to have begun to descend the ladder when one of the wooden rungs broke, causing him to fall 80 feet into 7 feet of water at the bottom of the shaft. As the ladders only extended to the 50ft. level, his mate, who suspected that he had fallen into the water, had to seek help to get him out. In the meantime, Edwards, who sustained a broken leg and severe head injuries, was drowned.

Both men were experienced miners and the defect in the ladder was unexpected.

Miscellaneous Underground.

The fatalities under this heading totalled six for the year.

Eric Robert Glover was working alone at a grizzly above the 1,000ft. level on the Wiluna Gold Mine, passing ore through the bars. He was found lying unconscious on the grizzly with extensive head injuries and died when removed to the surface.

It is presumed that he was struck by a rock coming down the open throat above the grizzly. His safety helmet was found unmarked close by.

Deceased was an experienced grizzly man, but showed lack of judgment in working at the grizzly while the throat was open.

Milan Ciganovich, an employee of Lake View and Star, Limited, was barring down some loose ground in a stope immediately over a winze and would appear to have missed his footing, thereby falling down the winze a distance of 120 feet and sustaining fatal injuries. It was usual to cover this winze while drilling operations were in progress, opening it after firing in order to pass ore down it. Ciganovich should have cleared away loose dirt and placed boards over the winze before commencing to bar down.

Gordon David Grigg was a trucker employed at the 700ft. level of the Great Boulder Gold Mine. He was returning along the main crosscut to the plat with an empty trolley after taking a load of timber along the level. There was an ore pass a few feet to the south of the crosscut with a set of rails leading to it and a kickup, or automatic truck tipper, at the mouth of the pass. The trolley ran into the kickup and both man and trolley were precipitated 200 feet down the ore pass. He was dead when recovered at the 900ft. level. It is definitely established that the rail points to the kickup were open and it is conjectured that

Grigg was riding the trolley facing backwards and did not notice the points.

A safety attachment has been devised on the kickup which should have the effect of preventing a recurrence of accidents of this nature.

James Sutherland, a pipe fitter employed by the Central Norseman Gold Corporation, N.L., was fatally injured by an electric shock. He was noticed by his workmate to be receiving electric current whilst screwing pipes in the drive. His mate dragged Sutherland away from the pipes and summoned assistance. Artificial respiration methods were applied without success.

A faulty connection at a plug was the cause of the leakage.

A most unfortunate double fatality occurred at Edward's Find when Francesco Pagoda and Paul Patrick Casserley lost their lives through being overcome by poisonous fumes in a winze below the 200ft. level.

Pagoda, coming on shift in the morning, descended the winze, which had been fired out on the previous afternoon, and after a short interval, called to his mate to pull him up. When he was raised a few feet he fell out of the chair. His mate went to the 100ft. level for assistance. Casserley and others came down, and put the air hose down the winze and blew out for a few minutes. Casserley then descended the winze and was himself overcome by fumes. He called to be pulled up, but fell out of the chair. At a second attempt he was raised almost to the brace and again fell off. A miner named Thomas Liversedge now came on the scene and, summing up the situation, gave the winze a good blow out, descended the winze and brought up Casserley alive and Pagoda's body. Casserley died in the Southern Cross Hospital a week later from injuries received.

The actions of both Casserley and Liversedge were highly commended by the jury at the ensuing inquest, but it is regrettable that Casserley did not take sufficient time to blow out the winze properly before descending, as the two lives would probably have been saved.

William John Magher, a miner working in a gloryhole on the Big Bell Gold Mine, came to work on night shift, but after leaving the shift bosses' room was not seen alive again. His body was found some hours later lying on a grizzly underground. Details of the accident are very meagre and it is assumed that he must have fallen down the gloryhole and into the ore pass. Medical evidence was to the effect that death must have been instantaneous.

There was no evidence of any carelessness or negligence.

Surface.

Accidental deaths on the surface for the year totalled seven.

Harold Woodcock was employed on the Grand Junction Lead Mine at Galena in dismantling the poppet legs. He was lying across one cap piece, prying loose the corresponding piece on the opposite side of the structure, when the member on which he was lying gave way, precipitating him to the ground and causing fatal injuries. The cap which was supporting his weight had apparently been previously loosened.

It would appear that the exercise of more care on the part of the deceased would have avoided this accident.

Walter Augustus Veitch was a relieving pump man employed by the Golden Horseshoe (New) Limited Retreatment Company at their pumping station. He was working alone and was found dead on the floor of the pumping house, lying near the switchboard in a little water which had seeped through the concrete floor. He had apparently been dead about six hours when found and the circumstances pointed to electrocution as the cause of his death, although there was no direct evidence to corroborate this.

The verdict returned by the jury was death from electric shock, a rider being added to the effect that men working alone at the pumping station should be visited several times during the course of a shift.

The equipment was considered reasonably safe by Departmental Inspectors.

Harold Hetherington was the victim of an unfortunate fatality which occurred at Reid's Asbestos Mine, Dale Gorge, Hamersley Range. He was not employed at this mine, but was lying on the ground, reading, near the tripod of a flying fox used for conveying asbestos from the bottom of the gorge to high ground by means of a wire rope attached by a hook to the back of a motor truck.

The hook somehow became detached from the truck and, as a result, the load of asbestos raced to the bottom again and the hook, as it ran along the ground, caught round Hetherington's neck, breaking it.

No evidence was adduced to show how the hook became detached from the truck.

John Eyloff Rasmussen, while wiring new office buildings under construction for the Broken Hill Pty., Limited, at Hannan's North Gold Mine, slipped through a plaster board ceiling on to a rafter, sustaining a ruptured intestine. Peritonitis supervened and he succumbed to his injuries on the following day. The cause of death was purely accidental.

Arthur Henry Deering, part owner of the Zoroastrian Gold Mine and Battery at Bardoc, got up on a platform to replace a pump belt with the shafting in motion. He was wearing rubber boots and loose clothing. He appears to have slipped on the wet floor and his clothing caught in the revolving shafting and he was whirled around until a shaft coupling broke and he fell away. He sustained multiple injuries and was removed by ambulance to Kalgoorlie Hospital, where he died the same day.

Numerous accidents have been caused by wearing loose clothing while working near revolving machinery and it is a practice which should be strongly discouraged. The fact of the deceased wearing rubber boots on a wet floor was probably also contributory to the accident.

Robert Hansen Moyle was the victim of an unfortunate fatality at the Great Boulder Mine. He was an electrician engaged in laying conduit along the wall of a new building and was standing on the crane way above the switchboard, when he apparently slipped and fell on to the switchboard, where he was found unconscious, and all efforts to revive him failed.

The injuries received from the fall were not considered by the doctor sufficient to have caused death. It is thought that he may have received an electric

shock, but there is no positive evidence of this and it did not appear likely that he had come into contact with any live wire or metal either before or after he fell. There was no evidence of carelessness or neglect and the fall was purely accidental.

The following tabulation shows the total number of fatal and serious accidents reported to the Department in 1938, classified according to the gold or mineral field in which they occurred and also according to the causes of the accidents.

	Explosives.		Falls of Ground.		In Shafts.		Miscellaneous Underground.		Surface.		Total.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. East Coolgardie	2	1	6	1	16	2	437	3	109	7	570
2. Mt. Margaret	1	3	5	...	6	...	102	...	22	3	136
3. Coolgardie	1	...	...	...	2	...	...	...	3
4. North Coolgardie	1	...	12	...	3	...	16
5. North-East Coolgardie
6. Broad Arrow	1	...	...	...	...	1	...	1	1
7. Dundas	1	1	2	...	1	1	33	...	18	2	55
8. Yilgarn	3	...	...	2	14	...	8	2	25
9. Murchison	2	1	2	5	1	42	...	10	5	58
10. East Murchison	2	...	...	1	7	1	80	...	46	2	135
11. Peak Hill
12. Yalgoo	1	1	...	...	...	1	1	2
13. Northampton	1	...	1	...
14. Greenbushes
15. South-West	83	...	83
16. Phillips River
17. Collie	1	2	...	61	...	...	...	265	...	36	1	364
18. Pilbara	2	...	...	...	...	...	1	4	3	4
19. West Pilbara
20. Ashburton	2	...	...	...	...	...	...	...	2
Totals for 1938	1	8	9	82	5	37	7	987	6	340	28	1,454
Totals for 1937	5	13	10	67	8	32	8	892	7	304	38	1,308

WINDING MACHINERY ACCIDENTS.

During the year 23 accidents to winding machinery were reported. These included three skip derailments, nine overwinds, one broken winding rope and ten miscellaneous accidents.

Skip Derailments.

Two derailments were caused through the skip striking stones on the rails. In one of these accidents no damage was caused, while in the other three shaft centres were dislodged. The third derailment was due to the loosening of a rail joint.

Overwinds.

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

Broken Ropes.

A winding rope attached to a bailing tank broke. The reason for the failure was not clear on investigation.

Miscellaneous Accidents.

On three occasions ropes were kinked owing to the cage being caught in the shaft while descending. The rope in each case was lowered on top of the cage, causing the kinking. No other damage was done.

The reversing lever on a winding engine jumped from the hoisting to the lowering position when the kibble was 20 feet from the shaft bottom. No damage was done.

Whilst hoisting a truck of ore in a cage, a stone rolled off the top of the full load, caught the wall plate and caused the truck to tip. The driver pulled up within a few feet and only minor damage resulted.

A skip load of ore being hauled up the shaft apparently caught. The safety hook broke and became detached from the rope and the skip fell to the bottom of the shaft. The skip was destroyed and extensive damage to shaft timbering resulted. The cause of the accident is unknown.

A skip tipped before reaching the proper position, discharging a quantity of ore down the shaft. The cause of the accident is unknown, but it is surmised that a stone fouled the guide wheel before it entered the guides.

The clutch on a winding engine broke. The driver noticed the defect and immediately secured the skip. No other damage was done.

A cage jammed in the shaft. A truck filled with steel overbalanced in the ascending cage and the wheels caught in the shaft timbers. The cause of the accident was that the steel had been placed in the truck without a steel rack. Minor damage only was caused.

A truck in an ascending cage caught in the shaft timber through the bridle of the cage not being properly engaged on the truck. Some shaft skids were dislodged.

ADMINISTRATION.

Amendments of Acts.

Mines Regulation Act, 1906.

Regulation 4.—General Rule 48 deleted and new General Rule 48 inserted—re Times of Blasting. Gazetted 11th March, 1938.

General Rule 48B cancelled and new General Rule 48B inserted—re Maximum Depth of Hole where

Nitro Glycerine Compound Used. Gazetted 11th March, 1938.

New General Rule inserted—re Raising and Lowering Tools. Gazetted 18th February, 1938.

Regulation 10.—Clauses (b) and (c) deleted and new clauses (b) and (c) inserted in lieu thereof, re Plans of Mines. Gazetted 9th September, 1938.

Regulation 17.—Amendment of clause 5, Division 2, re Workmen's Inspectors of Mines. Gazetted 14th October, 1938.

Notice defining Districts assigned to various Inspectors of Mines cancelled and new notice issued in lieu thereof. Gazetted 14th April, 1938.

Mining Development Act.

Amendment to regulation 7 (a). Gazetted 26th August, 1938.

PROSECUTIONS.

There were fifteen prosecutions undertaken during the year under the Mines Regulation Act, 1906, and in each case a conviction was registered and a fine imposed.

A manager was prosecuted under regulation 4, General Rule 1 (f) for not providing adequate ventilation in a rise.

Three machine miners and one trucker were proceeded against under regulation 4, General Rule 45A, for neglecting to use the cartridge method of firing.

A miner was convicted under section 57 for returning to the face within twenty-five minutes of firing.

A manager was prosecuted under section 57, and fined, for endangering the safety of men under his control. After conviction the defendant appealed, but lost the appeal.

Two miners were prosecuted for a breach of regulation 7, clause 2, by working underground without the proscribed medical certificate.

Two managers and two engine-drivers were fined for contravention of section 31, the managers for employing drivers without the prescribed certificate and the drivers for taking charge of the winding engines, not being the possessors of such certificates.

A manager was prosecuted under regulation 15 for allowing a miner to take charge of a hoist underground who was not the possessor of a hoist driver's certificate, and the miner was also fined for breach of the same regulation in taking charge of the hoist without such certificate.

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 120, of whom 88 were successful in gaining certificates.

There were 2 reciprocal certificates of competency issued without examination to holders of Mine Managers' Certificates for other States, and 1 Certificate of Service to an applicant who was employed as underground supervisor at the date of the gazettal of regulation 17A.

Two duplicate certificates were approved and issued to persons who had lost the originals.

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 31 (4) of the Mines Regulation Act, 1906, 150 certificates were issued for exemption from the provisions of section 31, subsection 1 (b), as compared with 213 during the previous year.

SUNDAY LABOUR.

Eighteen permits were granted during the year to employ men on Sunday, as set out hereunder.

Two men to work on Sunday for two months on shaft sinking on account of excessive water and the soft nature of the country.

Five men to work one Sunday cleaning out a shaft in order to prevent a hold up of work during the week.

Five men to work one Sunday repairing an ore pocket to avoid subsequent loss of time.

Nine men to work on Sunday repairing an ore pocket to avoid loss of time in subsequent working.

Two men cleaning down glory holes.

Six men to work one Sunday repairing shaft.

Four men to work one Sunday timbering in shaft.

Thirty men each shift for three shifts one Sunday to effect repairs to a rock crusher and avoid loss of time in subsequent working of the mine.

Three men to work one Sunday repairing shaft.

Six men to work one Sunday timbering bad ground.

Twelve men to work two Sundays repairing a pent-house.

Four men to work one Sunday repairing spillage doors.

Twelve men to work one Sunday installing new rock breakers to save loss of time in subsequent working of the mine.

One hundred and twenty men to work repairing main shaft until completion of repairs, to avoid loss of time in subsequent working of the mine.

Thirty-five men to work one Sunday on construction of new poppet legs to avoid loss of time in subsequent working of the mine.

Five men to work five Sundays making alterations to air main in shaft to avoid holding up the working of the mine.

Fourteen men to work four Sundays preparing new foundations, thus avoiding stoppage of ore hauling operations.

Six men to work one Sunday installing new air main in shaft to save loss of 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	5,209	18	4
Providing transport and general assistance to prospectors	15,282	11	3
Subsidies paid to privately owned batteries	1,139	16	4
Miscellaneous expenditure	283	11	10
	£21,915	17	9

The total expenditure was £21,915 17s. 9d., compared with £7,300 7s. 1d. during 1937 and £13,956 11s. 3d. during 1936. (Appendix I.)

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

VENTILATION.

Special attention has again been paid to the proper ventilation of mines, and numerous improvements have been carried out. Inspector Brisbane's annual report on this subject is quoted in full hereunder:—

During this year a record of the ventilation of all mines using fans has been compiled. The Lake View and Star leases on the western side of the Boulder Belt were surveyed early in the year and since that time the ventilation has been reorganised. The upkeep of the Horseshoe Main Shaft has given a great deal of trouble and it has been abandoned. A fresh survey will be made during the coming year.

The Great Boulder mine installed fans during the year 1937 and the ventilation system is now being put in order. This mine will also be surveyed.

Improvements which are projected are, an additional fan for the Norseman mine, a fan for the Hannans North mine, and possibly a fan for the Enterprise mine.

In most cases, the natural current in mines equipped with only one shaft tends to upcast in the shaft. This is thought to be due to the heating effect of electric lamps, motors and transformers near the shaft.

On the Hannans North mine the air current was reversed by means of compressed air jets. Fires in upcast shafts have been used in this mine and at the Edna May Amalgamated to maintain the ventilating currents.

Experience in the Wiluna mine has shown that the system in which exhaust fans at the surface are used is liable to serious practical disadvantages. Mines which are to be worked by open stoping methods are better ventilated by a fan at the bottom of the downcast shaft. This system has been adopted at Big Bell.

The main ventilation of the larger producers is in very fair order. There is some trouble on the West Lode of the Wiluna mine. Some of the stoppings involved are in workings which are now inaccessible and restoration of the system will probably be difficult. The connection of the Happy Jack shaft on the 1,800ft. level, which is now being made, may help the ventilation of the West Lode.

A reduction in the average temperature of working places underground amounting to about 2° F. has been made in the Sons of Gwalia and the deep workings of the Chaffers Shaft.

One fuming accident with fatal results to two men occurred during the year and there were a few cases in which men were seriously affected. One of the men referred to above lost his life in attempting to save the other. The recurrence of incidents of this nature shows the need for education concerning the precautions necessary for dealing with accumulations of poisonous gases.

One man was prosecuted for returning to the face after firing without taking any precautions for his safety.

An attempt at collecting the fumes in the roaster house at Wiluna has not been successful. Further work is in hand and it is hoped that this will lead to a satisfactory solution of the problem. Some cases of lead poisoning have been reported amongst the men employed on the smelters. The principal danger spots have been hooded over for the collection of lead fume.

During the year 1937, several lines of inquiry into the cause of silicosis were reported in the technical journals and some interesting results were published. This year there has been no reference to any of this work.

The general standard of ventilation has in general been similar to that of last year. Improvements have been made on the Lake View and Star, the Sons of Gwalia, and the Great Boulder. Troubles due to upcast in working shafts have been encountered in the Hannans North and Enterprise. The extension of the workings beyond the effect of the main fan has made alterations to the system necessary in the Norseman Mine.

ELECTRICAL.

The Special Inspector of Mines (Electricity), Mr. C. F. Buttle, reports as follows on the electrical installations at mines visited by him during the year:—

"There has been a steady increase in the use of electric power in all districts visited by me, with the exception of the Southern Cross district, where two large plants, the Marvel Loch Gold Development and the Southern Cross United Mines, have ceased operations.

At Norseman high tension lines are being run by the Norseman Gold Mines to their outer bases and the Central Norseman Gold Corporation is extending its plant.

At Kalgoorlie an electric winder has been put in by the Great Boulder Proprietary at an internal shaft.

At the Lake View and Star a steam winder has been converted to electric drive and the Kalgoorlie Enterprise Mine is using a small electrically driven winch for shaft sinking.

An order has been placed by the North Kalgurli (1912), Limited, for an electric winder to replace the steam winder at the North Kalgurli shaft, and a change-over is to be made at the Croesus shaft.

At Hannans North, the Broken Hill Proprietary has installed an electric winder and the steam plant has been shut down.

At the Kalgoorlie Electric Power and Lighting Corporation the work of installing the new 7,500 K.W. set is almost complete. Perhaps no company has demonstrated greater faith in the Goldfields over a period of years than this one. In the last six years the Corporation has spent over £200,000 in alterations and additions to its plant, the growth of which is illustrated by the following figures:—

In 1933 the peak load was 2,500 K.W. which rose to 7,500 K.W. in 1938 and in the same period the monthly units generated increased from 1,000,000 to 4,000,000 units. The consumption of wood fuel has increased from 120 tons to 300 tons daily and the staff employed has doubled."

GOLD MINING.

Once again the State's gold production for the year showed a substantial increase on that of the previous year, the total in fine ounces reaching 1,172,950, as against 1,007,289 in 1937. This output is the highest recorded since 1915, and the value is a record for all time, reaching the figure of £10,409,928, the previous highest figure being in 1937, when the value of gold reported to the Department amounted to £8,797,662.

The tonnage of ore treated exceeded that of 1937 by 720,112 tons, reaching the record total for the State of 3,759,720 tons, the highest figure previously reached being in 1909, on which occasion it totalled 3,105,004 tons.

A further high level record reached for the year was the average price realised per fine ounce of gold, at 177.50s., a rise of about 2s. 10d. per ounce on the average price for 1937.

A new low level record of 6.24 dwt. per ton average yield, coupled with the fact that wages generally have increased, indicates increased efficiency in methods of mining and treatment.

The average number of men employed decreased by 800 to 15,374, largely due, possibly, to the completion of plant construction operations on a number of large mines, as well as to the closing down of such mines as Southern Cross United, Marvel Loch, Celebration, Edjudina and Nevoria.

Among the mines chiefly responsible for the increased output may be mentioned the following:—

- (a) The Big Bell, which commenced production late in the previous year, and has been a regular producer of 5,000 ounces per month and upwards for the whole of the year.

- (b) The Great Boulder, which by undertaking a vigorous development policy and doubling its plant capacity, has been able to double its monthly output of previous years.
- (c) The Kalgoorlie Enterprise, which came into production in April.
- (d) The Paringa Mining and Exploration Company, which brought its own treatment plant into operation and increased production.
- (e) The Gold Mines of Kalgoorlie, who produced to the full capacity of their new treatment plant for the year.
- (f) The Emu at Agnew and Edna May Amalgamated both came into regular production.
- (g) The Blue Bird, at Norseman, which, crushing at the State Battery, produced 8,756 fine ounces over the plates from 1,183 tons, the sands averaging 2 ozs. 3 dwts. 17 grs. per ton.

It is pleasing to note that a number of small mines worked by private persons or syndicates have installed plants and are operating successfully on many fields. A number of these plants crush for the public, which, where State Batteries are not available, is of great assistance in prospecting the country.

Apart from an unfortunate dispute on the Lancefield Mine, resulting in the cessation of operations on that mine for some weeks, there were no serious industrial disputes during the year.

It may be said generally that the gold mining industry has reached a very stable condition in which it would appear likely to remain for a number of years.

Hereunder is a tabulation of statistics illustrating the position since 1929:—

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 Yield 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

OPERATIONS OF THE PRINCIPAL MINES.

I attach again a tabulation showing the names and output of mines producing 5,000 ounces or upwards of gold since 1934. It will be noticed that, during the year under review, two of these mines, Marvel Loch Gold Development and the Celebration-Golden Hope Group, went out of production, while two others in Ingliston Consols Extended and Lady Shenton fell well below the previous year's production.

On the other hand, four new names appear on the list in Kalgoorlie Enterprise, Emu Gold Mines, Edna May Amalgamated and Blue Bird, all of which should continue producing regularly over a period of years.

It will be noted again that Lake View and Star, Wiluna Gold Mines and Great Boulder Proprietary were the only three mines to produce more gold than the State Batteries.

Among the smaller mines which are not included in this list, but are worthy of special mention are:—

- (a) Milano at Mt. Monger, which, mining small leaders, produced 2,473 fine ounces from 600 tons of ore.

- (b) New Hope at Celebration, 1,371 ozs. from 7,935 tons with a Huntington Mill plant.

- (c) Lake View South treated 8,888 tons at the plant of the Gold Mines of Kalgoorlie for 3,111 ounces.

- (d) Linden (W.A.) at Wiluna treated 8,799 tons for 2,712 ounces.

- (e) Swan Bitter at Mt. Magnet treated 2,302 tons for 1,264 ounces.

- (f) The Edward Carson Mine at Mt. Magnet obtained 2,064 ounces from 2,839 tons.

- (g) Rothsay treated 15,135 tons for 3,085 ounces.

- (h) Edward's Reward obtained 1,017 ounces from 1,412 tons.

- (i) The Rising Sun at Bullfinch treated 3,754 tons for 1,434 ounces.

- (j) New Yilgarn at Nevoria treated 4,024 tons for 1,980 ounces.

- (k) May Queen at Marvel Loch treated 943 tons for 1,377 ounces.

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

Mine.	1934.			1935.			1936.			1937.			1938.		
	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.	*519,407	164,331	6.33	493,265	138,911	5.63	524,998	174,409	6.64	542,330	167,272	6.17	566,749	172,703	6.09
Wiluna Gold Mines, Ltd.	496,838	126,445	5.09	470,205	108,405	4.69	557,099	113,495	4.08	599,567	113,376	3.78	594,739	105,307	3.54
Great Boulder Pty., Ltd.	115,602	54,382	9.41	127,498	55,054	8.64	166,755	72,901	8.74	188,120	72,478	7.71	276,430	97,232	7.04
Big Bell Mines, N.L. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	85,958	†10,140	†2.36	400,473	70,537	3.52
State Batteries	97,454	59,701	12.25	108,360	63,298	11.68	102,086	64,619	12.65	102,800	60,033	11.67	108,966	73,253	13.44
Sons of Gwalia, Ltd.	121,916	42,740	7.01	94,513	35,770	7.67	125,260	45,095	7.20	136,522	45,687	6.69	138,203	45,692	6.61
Boulder Perseverance, Ltd.	76,310	27,011	7.08	80,651	29,642	7.35	97,752	34,392	7.04	110,171	42,221	7.66	111,824	40,958	7.32
North Kalgurli (1912), Ltd.	87,006	32,804	7.54	104,945	32,663	6.22	147,197	45,430	6.17	140,468	55,173	7.85	135,135	52,340	7.75
South Kalgurli Consolidated, Limited.....	50,260	19,095	7.60	46,383	16,701	7.20	45,308	14,302	6.53	76,947	21,130	5.96	87,947	25,195	5.73
Norseman Gold Mines, N.L.	17,773	10,391	11.69	37,767	15,422	8.16	67,860	22,440	6.61	76,069	30,771	8.09	79,250	27,692	7.00
Broken Hill Pty., Ltd. (Hannans North)	17,501	7,011	8.01	15,991	6,194	7.75	19,316	8,169	8.46	22,096	10,363	9.38	30,224	12,617	8.35
Ingliston Consols Extended	43,762	7,363	3.36	41,689	7,983	3.83	37,204	7,221	3.88	30,815	5,367	3.48	23,385	3,430	2.94
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
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
Triton Gold Mines, N.L. ....	.....	.....	.....	22,307	7,232	6.48	27,757	26,811	6.89	74,388	25,917	6.97	108,878	34,437	6.33
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
Gold Mines of Kalgoorlie, Ltd. ....	.....	.....	.....	.....	.....	.....	22,520	16,709	14.85	30,432	16,971	11.15	102,615	36,059	7.03
Yellowdine Gold Development, N.L. ....	.....	.....	.....	.....	.....	.....	27,050	12,842	9.49	44,899	36,958	16.46	47,175	30,041	12.74
Cox's Find ....	.....	.....	.....	.....	.....	.....	6,999	6,412	18.32	16,768	14,042	16.75	17,985	17,872	19.87
Central Norseman Gold Corporation, N.L.	.....	.....	.....	.....	.....	.....	20,303	5,840	5.70	48,896	13,785	5.64	71,117	17,691	4.98
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
Youanmi Gold Mines, Ltd. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48,184	11,153	4.63	75,160	20,396	5.43
Paringa Mining and Exploration Co., Ltd.	.....	.....	.....	.....	.....	.....	.....	.....	.....	15,305	6,998	9.14	40,939	9,804	4.79
First Hit Gold Mine, N.L. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8,377	6,831	16.31	7,794	5,728	14.68
Comet Gold Mine, Ltd. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,790	6,822	28.48	4,996	6,563	26.27
Hill 50 Gold Mine, N.L. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23,878	6,689	5.60	24,424	5,569	4.56
Riverina Gold Mines, Ltd. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13,822	5,565	8.05	15,812	5,166	6.53
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
Kalgoorlie Enterprise, Ltd. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39,594	12,592	6.36
Emu Gold Mine, Ltd. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48,370	11,952	4.94
Edna May Amalgamated ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14,450	5,451	7.54
Blue Bird ....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,185	†8,277	†139.70
Total	1,643,829	551,274	6.71	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
All Others	129,102	88,597	13.72	149,388	97,375	13.04	241,254	123,293	10.22	257,701	135,210	10.49	265,807	140,819	10.60
GRAND TOTAL	1,772,931	639,871	7.22	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

* Including output of Associated Gold Mine, later absorbed by Lake View and Star, Ltd. † 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 again in the total. The yield shown from this mine is by amalgamation only, the tailings averaging 2 ozs. 3 dwt. 17 grs. by assay.

Hereunder are tabulated the development footages reported for the year by most of the principal mines of the State:—

Mine.	Shaft Sinking.	Driving.	Cross-cutting.	Rising and Winzing.	Diamond Drilling.	Total.
	feet.	feet.	feet.	feet.	feet.	feet.
PILBARA GOLDFIELD—						
Comet Gold Mines, Ltd. ... ..	...	118	477	83	1,473	2,151
EAST MURCHISON GOLDFIELD—						
Wiluna Gold Mines, Limited	317	18,815	...	4,681	37,086	60,899
Moonlight Wiluna, Limited	271	3,505	319	2,134	6,993	13,222
Youanmi Gold Mines, Limited	272	2,764	1,306	2,425	2,217	8,984
Emu Gold Mines, Limited ... ..	...	1,318	373	539	...	2,230
MURCHISON GOLDFIELD—						
Ingliston Consols	139	542	48	396	...	1,125
Triton Gold Mines, N.L.	163	2,405	513	1,956	1,870	6,907
Big Bell Mines, Limited	118	2,044	...	1,627	...	3,789
Mt. Magnet Gold Mines	28	1,154	187	631	...	2,000
Hill 50 Gold Mine, N.L. ... ..	...	66	52	179	827	1,124
YALGOO GOLDFIELD—						
Rothsay ... ..	...	323	...	185	...	508
MT. MARGARET GOLDFIELD—						
Sons of Gwalia, Limited	169	1,845	573	1,345	1,635	5,567
Lancefield (W.A.), N.L.	324	2,625	238	908	6,659	10,754
Gladiator Gold Mine, Limited	101	639	289	278	426	1,733
Cox's Find Gold Mine	386	361	242	257	...	1,246
Hill End Gold Mine	80	190	50	130	...	450
NORTH COOLGARDIE GOLDFIELD—						
Riverina Gold Mines, Limited	146	1,035	173	453	...	1,807
First Hit Gold Mine, N.L. ... ..	...	470	664	451	...	1,585
Lady Shenton Gold Mines, N.L.	86	604	563	552	1,554	3,359
BROAD ARROW GOLDFIELD—						
Lochinvar Gold Mines, Ltd.	20	52	171	...	...	243
Ora Banda Amalgamated, N.L. ... ..	...	2,300	520	470	...	3,290
EAST COOLGARDIE GOLDFIELD—						
Lake View and Star, Limited	56	19,417	6,203	11,290	15,751	52,717
Great Boulder Proprietary, Ltd. ... ..	...	11,785	2,492	4,482	18,020	36,779
Boulder Perseverance, Ltd. ... ..	...	4,937	83	1,309	6,917	13,246
South Kalgurli Consolidated, Ltd. ... ..	...	2,754	1,563	700	3,429	8,446
North Kalgurli (1912), Limited ... ..	...	4,606	2,956	430	...	7,992
Paringa Mining and Exploration Co., Limited	138	1,999	800	1,463	1,077	5,477
Broken Hill Proprietary, Limited	180	1,188	467	490	...	2,325
North Kalgurli United, Limited	100	1,897	694	518	280	3,489
Gold Mines of Kalgurli, Limited	111	3,046	1,213	1,691	8,290	14,351
Kalgurli Enterprise, Limited	475	939	492	466	1,515	3,887
COOLGARDIE GOLDFIELD—						
Phoenix Gold Mines, Limited ... ..	...	1,050	417	1,328	...	2,795
Consolidated Gold Mines of Coolgardie, Limited	12	1,891	890	559	359	3,711
Spargo's Reward	114	607	120	255	...	1,096
DUNDAS GOLDFIELD—						
Norseman Gold Mines, N.L. ... ..	...	3,779	307	2,642	922	7,650
Central Norseman Gold Corporation, N.L.	600	4,399	372	2,065	4,094	11,530
Norseman Developments, N.L. ... ..	...	777	35	98	1,204	2,114
YILGARN GOLDFIELD—						
Yellowdine Gold Development, Ltd.	264	1,836	624	337	5,151	8,212
Edna May Amalgamated ... ..	...	1,340	503	193	1,882	3,918

East Coolgardie Goldfield.

The East Coolgardie Goldfield, including the Golden Mile mines, was again the main centre of production. The total gold recovered from this field for the year was 502,637 fine ounces, or 42.9 per cent. of the total production of the State, while the total ore treated amounted to 1,376,349 tons.

A noticeable feature of the whole field is the general air of prosperity and confidence in the future. The proved ore reserves are now greater than at any other period of its history. New high grade ore bodies have been found in the upper levels of the

old mines, and profitable extensions of the known lodes have been located at depth.

Mining costs are comparatively low, having due regard to the nature of the ore bodies, and the general standard of efficiency is high in both underground working and treatment.

Lake View and Star, Limited, treated 566,749 tons for a recovery of 172,703 fine ounces of gold, easily maintaining its position as the principal producer for the State. The milling plant operated normally. The roasting section was improved by the addition of two new roasters, and the fume nuisance has been

cleared up by fitting all roasters with dust and fume collecting flues. A saving in gold has also been effected by this installation. Major alterations have been effected to the tool sharpening and machine repair shops and the most up-to-date equipment is now in use.

Chaffers-Horseshoe Section.

No. 4 Lode.—On the No. 34 Level work was mainly confined to ore extraction. The face is 1,200 feet north of the Chaffers Crosscut with six winzes through to the No. 35 Level at 150 feet intervals. On the 35 Level stoping is in progress over a length of 1,400 feet and three winzes have been sunk to the 37 Level, which is being developed.

On the upper levels a series of winzes was sunk from No. 10 to No. 14 Level for ventilation purposes. From 12 to 14 these winzes passed through good ore which is being stoped.

Stoping on No. 4 Lode is in progress from No. 12 to No. 34 Level.

No. 3. Lode.—On this lode practically the only work done was stoping between the 18 and 30 Levels. This stope is continuous for a length of 2,000 feet and extends over a big width, supplying a considerable proportion of the mill ore.

No. 2 Lode.—Development was carried out north of the existing stopes from No. 21 to No. 30 Level. The stopes are continuous for 1,500 feet in length and average 10 feet in width. High tonnages are extracted from these stopes.

Hannans' Star Section.

Main Lode.—Drives were extended south on Nos. 6, 7 and 8 Levels in good grade ore. In the past ore has been mined over a length of 800 feet and it is intended to develop below the No. 8 Level from the Chaffers 1,000ft. Level, which is connected on No. 2 Lode, and good developments are anticipated.

Morrison's West Lode.—Stoping is in progress on Nos. 13, 15 and 17 Levels over a length of 350 feet, in good grade ore, 12 feet wide. The internal shaft is being sunk and is now below No. 17 Level. This will be sunk to the No. 24 Level and connected with the Chaffers haulage drive, which is now in progress.

Ivanhoe Section.

Stoping known ore bodies has been the principal work on this section, although development is in progress on Nos. 24, 26 and 27 Levels.

Preparations are being made for mining mullock for filling purposes by caving methods.

Associated Section.

Development in this section has been chiefly concentrated on Tetley's Lode, where a considerable tonnage of fair grade ore has been developed from No. 4 to No. 10 Level. The lower levels are being dewatered by pumping at the Perseverance Mine, while a haulage level, which is being driven on the Lake View 1900ft. Level, will also assist the drainage and permit haulage from the lower levels up the Lake View Shaft.

Lake View Section.

The principal work in progress is on the Central West Boulder Lode, which has been cut at the 1,000ft.

Level and driven on for a distance of 200 feet in good values, and is now being stoped. On the 1,900ft. Level a pump has been installed to deal with the water from the Associated when the connection mentioned above is through.

The amount of ore derived monthly from the various shafts is approximately as follows:—

Chaffers	..	..	..	..	25,000 tons
Ivanhoe	..	..	..	..	16,000 tons
Lake View	..	..	..	..	9,000 tons
Associated	..	..	..	..	5,000 tons

Great Boulder Proprietary, Limited, during the year successfully brought into operation their plan of increasing the mill tonnage from 15,000 to 30,000 tons per month, and present indications are that for the coming year it will rank second only to Lake View and Star as the premier gold producer of the State. The ore treated for the year totalled 276,430 tons for a yield of 97,232 fine ounces. The average grade of ore treated was 7.04 dwt. per ton.

The new crushing section, consisting of a Jacques rotary crusher, cone crusher and screens, came into operation in March. The new milling section was started in June and is giving satisfaction. A new roaster is nearing completion and a 120ft. diameter thickener, of 700,000 gallon capacity, has been built to dewater the residues.

In the mining section larger trucks have been installed which will increase the haulage capacity. Electric traction is employed underground, the plant consisting of four small loocs and one large one.

An extensive development programme has been mapped out and the company anticipates no difficulty in keeping up the tonnage.

Main Shaft.

The principal developments for the year consisted of opening up the east boundary system of lodes, including the Robertson and Conroy Lodes and branches and caunters to the 1,900ft. level. Below this they will be developed from the 2,650ft. level and the resultant ore will be trammed to the main bin at Edwards Shaft. Developments proved good values and widths over long lengths on all levels from 500ft. to 1,900ft. At the 1,900ft. level three branches have been opened up for a length of 200 feet and a cross lode developed. On the 2,650ft. level a connection has been made to Hamilton Shaft by driving and winzing from the 1,800ft. level. The internal shaft from the Hamilton Shaft workings is within 60 feet of this drive. This will be the main haulage level for ore from Hamilton and Main Shafts to the newly constructed bin at Edwards Shaft.

Edwards Shaft has been reconditioned and cleaned out and the main ore bin constructed at the 2,650ft. level. Some good developments took place on the 900ft., 1,000ft., and 1,400ft. levels.

Hamilton Shaft.—Most of the work done for the year in this section consisted of stoping, as developments are held up until the internal shaft reaches the 2,650ft. level. This shaft was advanced 300 feet and plats were cut at the 2,300, 2,400 and 2,500 feet horizons.

The mine generally shows great promise.

Of the monthly tonnage hauled, the proportions from the various shafts are roughly as follows:—

Hamilton Shaft	..	..	..	14,000 tons.
Main Shaft	..	..	..	8,000 tons.
Edwards and Lane Shafts	..	..	..	8,000 tons.

Boulder Perseverance, Limited.—The production of this mine was approximately of the same order as in the previous year, 111,824 tons of ore being treated for a return of 40,958 fine ounces.

The installation of the new electric winder at the Main Shaft was completed and the plant is operating satisfactorily, being responsible for an appreciable reduction in working costs.

Stoping is being carried out on all levels from the 500 to the 2,050ft. level.

An important development was the opening up on the 1,300ft. and 1,450ft. levels of the "G" Lode, a new ore body to the east of the Lake View Lode. This promises to be an important body and driving is in progress on the 1,600ft. level to prospect its downward continuation.

A noteworthy feature of this mine is its pleasing appearance, both on the surface and underground. Old dumps and scrapheaps on the surface have been removed, and a liberal use of whitewash on the plats and bitumastic paint on underground water and air pipes has, in addition to improving the general appearance, reduced maintenance costs.

Kalgoorlie Enterprise, Limited, under the same management as the Boulder Perseverance, Limited, is now producing some 5,000 tons per month, which is treated, together with ore from the Boulder Perseverance and North Kalgurli (1912), Limited, at the plant of Kalgoorlie Ore Treatment, Limited.

The progress of this mine has been excellent. In a little under two years it was prepared for stoping, the shaft stripped, a steel head frame and electric winder installed, breaking commenced, and an initial dividend paid.

The shaft was stripped and sunk over 300 feet to the 1,300ft. level and plats cut on the 1,100ft. and 1,200ft. levels. Sinking is now proceeding. Cross-cutting is in progress on the 1,100ft. level to cut the lode and connect with a winze from the 900ft. level.

Stoping on the 500ft. and 700ft. levels is on the shrinkage system and on the 900ft. level sub-level stoping and shrinkage are being employed. All stoping is on the Greenhill shoot, a continuation of the cross lode from the South Kalgurli workings.

The lay-out of both surface plant and underground workings is exceptionally good.

South Kalgurli Consolidated, Limited, improved a little on the previous year's production, mining and treating 87,947 tons for a yield of 25,195 fine ounces. A new steel head frame has been erected over the main shaft and new bins have been installed. Minor improvements effected underground include the use of a mechanical bogger and electric fans for auxiliary ventilation. Developments were extended on the known lodes and kept pace with production, the ore reserves remaining about the same as previously.

North Kalgurli (1912), Limited.—This group of mines, with ore reserves approximating three-quarter million tons (more than five years' mill supply at the present rate of mining), is in a very flourishing condition.

On the Kalgurli Section, which supplies 3,000 to 4,000 tons of mill dirt per month, the chief developments were on the N.E.D. lode formation, which was opened out from No. 15 to No. 3 level. This system is allied to the Hincheliffe Lode worked in the Iron

Duke. Values average about 11 dwt. for a width of 30 feet and 100 feet in length. This is a very useful reserve of high grade ore for grading mill supplies.

On the No. 8 level the Australia East Lode was stripped and a leading stope taken off. Values were fair and width up to 20 feet. The levels above to the 400ft. level will be developed and it is intended to prospect below the 800ft. level.

This mine looks well and there is still a considerable amount of ground to open up.

North Kalgurli.—This is the most important mine of the group, supplying from 6,000 to 7,000 tons per month to the mill.

A new steel head frame has been erected and an electric winder is being installed.

The principal developments for the year were from No. 4 to No. 8 Level on the Union Jack and East Lodes. The East Lode was developed on Nos. 5, 6, 7 and 8 Levels and some leading stopes were taken off for 200 feet over a width of 12 feet, worth 7 dwt. per ton. The majority of the stoping was from the Genevieve Lode.

The North Kalgurli Shaft is 1,000 feet deep and the development of this lease below that level will be undertaken from the Kalgurli Shaft workings which are down to a depth of 2,000 feet.

The Union Jack Shaft was sunk a further 85 feet and drives south connected with the No. 4 Level on the North Kalgurli. The southerly pitch of the ore body is carrying the ore away from the shaft, and the shoot below the 500ft. Level will be worked from the North Kalgurli Main Shaft.

The Croesus Proprietary has been worked by this company since March. Arrangements have been made to recondition the headgear and instal an electric winder. Vigorous development has opened up a considerable amount of payable ore.

The production for the year from this group was 135,135 tons for a recovery of 52,340 fine ounces, an average yield of 7.75 dwt. per ton.

Paringa Mining and Exploration Company, Limited.—During the year a total development footage of 4,400 feet was accomplished, exposing large tonnages of payable ore, which, when fully developed, will add considerably to the present ore reserves. At the end of August the reserves stood at 218,000 long tons, having an average grade of 6.06 dwt. per ton.

The Main North Shaft was sunk an additional 100 feet to a total depth of 680 feet, and a new level was opened out at 640 feet. Operations are in progress at this horizon to prove the continuation of the Greenhill Shoot, some 300 feet south of the shaft.

During May the company's new mill (oil flotation and roasting of concentrates) came into operation and to the end of the year a total of 35,563 tons was treated at an average head value of 5.5 dwt. per ton. The capacity of this mill is 5,500 tons per month, but, on account of the satisfactory results of recent underground developments, it is to be raised to 7,000 tons per month. The alterations and additions with this object in view are anticipated to be completed by May, 1939.

At the old Croesus South development work is opening up payable ore. The old Federal shaft has

been equipped with new poppet legs and headgear and a first motion winder installed. The main shaft is being skidded and a new ladderway has been put in to the 300ft. level.

This company is capably managed and should have a prosperous future.

Gold Mines of Kalgoorlie, Limited.—This company kept the mill operating continuously on ore derived from the Iron Duke, Australia East and Blue Gap leases, while about 800 tons per month was treated from the Lake View South. The tonnage treated for the year, exclusive of that from Lake View South, amounted to 102,615, the average yield per ton being 7.04 dwt. The total ore reserves are reported to stand at some 370,000 tons at an average value of 6 dwt.

At the Iron Duke operations have been chiefly confined to the Hinchcliffe Shoot and "B" Lode counter vein, which are both located west of the shaft. Development and stoping have been carried out from No. 5 to No. 12 level and exploratory work is in progress at Nos. 13 and 14 levels.

On the Australia East the North Lode channel at Nos. 2 and 3 levels was developed, but results were poor. Some stoping on rich ore was carried out from the surface to No. 1 level and a lens was stoped on No. 4 level.

All ore from this lease is hauled up the Oroya South shaft.

The *Blue Gap Lease* was developed off crosscuts from the Oroya South Shaft. Stoping and development have been carried out from No. 15 to No. 17 level with satisfactory results.

Mechanical transport has reduced costs and a system of transfer passes has simplified the handling of the ore.

Lake View South, Limited, is controlled and worked by the Gold Mines of Kalgoorlie, Limited. During the year 8,888 tons were treated for a recovery of 3,111 fine ounces of gold, a recovery of 7 dwt. per ton. Two small ore bodies are being worked and the development is promising.

Broken Hill Proprietary, Limited (Hannans North).—The main shaft has been sunk to 1,150 feet and a level is being opened out at this horizon. Developments are promising and have disclosed considerable extensions of the ore bodies to the south of the Golden Zone shaft.

Production for the year was 30,224 tons for 12,617 fine ounces of gold.

During the year a new steel head frame and ore bins have been erected and an electric winder installed. Skip haulage was also introduced. These improvements will have the effect of raising the tonnage to 3,000 monthly.

North Kalgurli United, Limited.—The new shaft is now down 700 feet and a considerable amount of exploratory work has been carried out at the 500ft., 600ft. and 700ft. horizons. Four lodes were developed on the 500ft. level and, in one, 800 feet of driving was done. Some fair widths were proved, but values were generally rather low.

On the 600ft. level, two lodes were driven on over a length of 650 feet, and a long east-west crosscut was put in. The values showed some improvement.

On the 700ft. level 400 feet of driving was done on one lode in ore of medium value.

A policy of diamond drilling is being laid out and will be put into operation during the coming year.

In the outside districts of the East Coolgardie Goldfield there is little of note to report.

The *Mt. Monger district* has been worked and prospected steadily throughout the year, the total gold production being nearly 5,500 ounces.

The biggest producer in this area is the Milano, which is being worked to the 350ft. level and has now installed its own 5-head battery. This rich small mine produced for the year 2,473 ounces of fine gold from 600 tons of ore. Previous recorded production is 1,438 tons crushed for a return by amalgamation of 3,431 fine ounces.

At *Hampton Plains* the only producer of note was the New Hope, at Celebration, which mined and treated with its Huntington Mill plant 7,935 tons of ore for a return of 1,371 ounces of gold.

Broad Arrow Goldfield.

Ora Banda Amalgamated, No Liability, was the only producing mine of note for the year, 8,700 fine ounces of gold being returned from the treatment of 18,730 tons of ore, the yield per ton being 9.29 dwt. This is the best return to date from this mine, although the average grade of ore treated is somewhat lower than in previous years.

A new main shaft has been sunk in a central position and equipped with a steam winding plant. This will greatly facilitate the haulage of ore, especially from the eastern leases.

Numerous prospectors are working on this goldfield and keeping the State Battery at Ora Banda busy. Some rich patches of gold have been found.

Coolgardie Goldfield.

Gold mining has been again active on this goldfield, the Coolgardie district producing 12,757 ounces from 36,279 tons, while in the Kunanalling district the total yield was 7,204 fine ounces from 14,347 tons of ore.

Spargo's Reward, No Liability, at Spargoville, was the biggest producer in the Coolgardie district for the year, treating 21,520 tons of oxidised ore for a return by amalgamation of 2,296 ounces of fine gold, an average yield per ton of 2.13 dwt. The tailings, estimated to contain from 2½ to 3 dwt. per ton, were stacked for future treatment. During the year a modern plant for the treatment of the sulphide ore was completed and should operate continuously during the current year. It is understood that operating costs were met by the amalgamation returns from the Huntington mill plant, and a substantial working profit should be shown now that cyanidation is in hand.

Consolidated Gold Mines of Coolgardie, Limited (Tindals).—Work on this group was confined to development, stope preparation, and plant construction. The development programme has been satisfactory, ore reserves being increased both in tonnage and value. The latest available estimate at the time of writing is 332,000 tons value at 5 dwt. per ton.

The treatment plant in course of erection is designed to treat 5,000 tons per month and will be

capable of expansion at a later date to double that output.

This mine shows promise and should be a regular producer over a long period when production commences.

Phoenix Gold Mines, Limited, are still in the stage of development, timbering and stope preparation. Most of the work done has been confined to the 800ft. and 1,000ft. levels of Price's Shaft and some winzings and driving on Bayley's South Shaft.

To test the value of the ore body discovered in the western part of the mine, a trial crushing was put through the Coolgardie State Battery, a return of 101 fine ounces being obtained by amalgamation from 513 tons of ore.

The development footages for the year were:—Driving 1,050 feet, crosscutting 417 feet, and rising and winzings 1,328 feet.

The Kintore Gold Mine, under the management of the Goldfields Australian Development, Limited, was the biggest producer in the Kuranalling district, producing 3,536 fine ounces as a result of treatment of 3,754 tons of ore. There was little development of note and although the grade of ore treated is good, the future of the mine is obscure at present.

Dundas Goldfield.

This goldfield, whose gold production is centred almost entirely in close proximity to Norseman, in contributing to the State's output 59,971 ounces for the year, has practically doubled its production since 1936. This advance may be attributed largely to the provision of a permanent water supply.

Norseman Gold Mines, No Liability, in producing 27,692 fine ounces from 79,250 tons of ore, a yield of 6.99 dwt. per ton, was the most important group. In addition to the main mine, the Star, Penneshaw, and Iron King leases each contributed a quota to the tonnage milled.

The Main Shaft workings have been developed to the 950ft. level and the position is regarded as quite satisfactory. The total number of men employed is 290, of whom 150 work underground.

The Penneshaw lease keeps 17 men employed in breaking 400 tons per month of 8 dwt. ore over a width of 2ft. 6in.

At the Star Mines, the shaft is being reconditioned and stripped to form three compartments, the finished overall size to be 12ft. by 5ft. in the clear. It is anticipated that during the current year 2,000 tons of 6 dwt. ore will be supplied to the mill monthly from the 200ft. and 400ft. levels. The width of the ore body is about 4ft. 6in.

At the end of December 40 men were employed on this section, but this number is expected to be increased to 60.

Power lines are being extended to this mine and to the Iron King, and at the latter, electric scrapers will be used for loading.

A 46ft. steel head frame will be erected at the Star Shaft, and an electric hoist and compressor of 500 cubic feet per minute capacity will be installed.

Plant extensions in course of preparation, and expected to be placed in operation early in 1939, are anticipated to more than double the production of

this group, the estimated monthly quota from each unit being as follows:—

Main Shaft workings ..	8,000 tons.
Penneshaw Shaft ..	400 tons.
Iron King	5,000 tons.
Star Shaft	2,000 tons.
Total	15,400 tons per month.

Development footages for the year were:—3,779 feet driving, 307 feet crosscutting, 2,642 feet rising and winzings, and 922 feet diamond drilling.

Ore reserves are estimated at 204,000 tons of 8 dwt. ore, and an additional 400,000 tons valued at 2.9 dwt. in the Iron King.

The progressive policy adopted by this company is most commendable and further success is yet to be expected.

Central Norseman Gold Corporation, No Liability, also had a successful year, the increase on the previous year's production being 23,221 tons treated and 3,906 fine ounces of gold. The figures for 1938 were 71,117 tons for 17,691 ounces, the average extraction being 4.98 dwt. per ton.

A vigorous development policy was continued, the work done comprising 600 feet of shaft sinking, 4,399 feet driving, 372 feet crosscutting, 2,065 feet rising and winzings, and 4,094 feet diamond drilling.

The main shaft was completed to the 1,700ft. horizon, flats being cut at Nos. 12, 15, and 16 levels. At No. 12 level driving south for a distance of 600 feet opened up ore for the last 200 feet averaging 6 dwt. per ton over a width of 5 feet. A drive north which was put in for a distance of 100 feet was for the last 50 feet in 15 dwt. ore, 5 feet wide.

The 1,600ft. level was driven north for 400 feet and, in this distance, 100 feet of payable ore was opened up, the values being 8 dwt. per ton over a width of 8 feet. The drive south was carried to 200 feet, but no ore was developed.

The 3,050ft. winze on the No. 8 level was continued from the horizon of No. 10 level to No. 16 level. Flats were cut at Nos. 13, 14, 15, and 16 levels and some useful development in fair values carried out.

The 4,400ft. winze from No. 8 level was sunk 300 feet but did not open up any ore.

At the Viking Shaft development was disappointing and nothing of importance was developed. A new shaft has been commenced to the east and is to be sunk 2,500 feet. This will be a four compartment shaft, each compartment measuring 5ft. by 4ft. 6in. in the clear. This shaft is expected to cut the Norseman Gold Mines lode at a depth of 2,000 feet.

This company is also interested in the Lady Miller Group, where stoping operations are being carried out between the 100ft. and 200ft. levels. About 50 tons per day is being broken and carted to the Central plant. The ore body is 14 feet wide and the value approximates 6 dwt. per ton.

This group of mines also appears to have an assured future.

The Blue Bird Gold Mine.—This small but phenomenally rich mine had a most successful year. The gold production amounted to 8,277 ounces by amalgamation only from 1,185 tons of ore, being an ex-

fraction of nearly 7 ozs. per ton. Treatment was carried out at the adjoining State Battery, and the average assay value of the tailings was 2 ozs. 3 dwt. 17 grs. per ton, making a total head value of over 9 ozs. per ton.

Ore reserves are estimated at 5,000 tons valued at 4 ozs. per ton.

The reef is on a flat underlay pitching to the north and the vertical depth of the deepest workings is approximately 120 feet. Values appear to be maintained underfoot.

Empress Gold Mine is situated to the north of the Blue Bird and is being developed with the object of intersecting the Blue Bird reef at depth, where it is anticipated that the northerly pitch of the values will take them into the Empress property.

Norseman Development's treated 3,965 tons for a return of 1,590 fine ounces of gold. Development consisted of 777 feet of driving, 35 feet crosscutting, 98 feet rising and winzing and 1,204 feet diamond drilling.

Yilgarn Goldfield.

This goldfield generally had another prosperous year in spite of the fact that two big mines in the Marvel Loch Gold Development No Liability, and Southern Cross United Limited, closed down permanently. The total tonnage treated amounted to 139,735 tons for a return of 70,015 ounces.

A pleasing feature of the activity of this field is the large number of successfully operating small plants, most of which, in addition to treating ore from their own mines, crush for the public.

Yellowdine Gold Development, Limited, is the most important mine on the field, treating during the year 47,175 tons of ore for a return of 30,041 fine ounces, an average yield of 12.74 dwt. per ton.

Development footages were as follows:—Shaft sinking 264 feet, driving 1,836 feet, crosscutting 624 feet, rising and winzing 337 feet and diamond drilling 5,151 feet.

A new development was opened up early in the year to the west of the main shaft, prospects at shallow depths being good. Further development, however, was not so satisfactory and the position is still obscure.

Edna May Amalgamated at Westonia produced consistently during the year, although not at full capacity. The 14,450 tons treated gave a return of 5,451 ounces of gold, an average yield of 7.54 dwt. per ton.

Development figures were:—Driving 1,340 feet, crosscutting 503 feet, rising and winzing 193 feet and diamond drilling 1,882 feet.

It is proposed to commence sinking a new shaft early in the current year, and, until this work is complete, production will probably be curtailed.

Ore exposures to date have been satisfactory, but it is considered that working from the present shaft is uneconomical, and the new shaft will be placed in a position calculated to be most convenient for future development and ore extraction.

New Yilgarn Gold Mine.—This mine, at Nevorla, previously known as The Banker, has had a moderately successful year in the face of difficulties caused by a large inflow of water. A Pomona pump was

installed and after unwatering the mine the inflow of water was sealed off by the introduction of cement under pressure.

The production of gold for the year was 1,980 fine ounces obtained from 4,024 tons of ore.

Since the sealing up of the water the battery has been working consistently.

The May Queen Mine at Marvel Loch has been a consistent producer of high grade ore, obtaining 1,377 ounces of gold from the treatment of 943 tons. This mine has its own treatment plant.

Marvel Loch Gold Development after producing 1,693 ounces from 11,810 tons of ore closed down permanently, the plant being dismantled and sold.

Edward's Reward at Edward's Find has been worked steadily throughout the year. Developments at the 250ft. level are reported to have opened up sulphide ore worth 10 dwt. per ton over a width of 4 feet.

A 5-head battery on the lease has been operating continuously, 1,412 tons having been put through for a return of 1,017 ounces of gold.

This mine should be a consistent producer.

The Nevorla Gold Mines, Limited, are marking time and keeping the mine unwatered while endeavouring to raise capital to finance a treatment plant to deal with their somewhat extensive ore reserves.

The Rising Sun at Bullfinch won 1,434 ounces from 3,754 tons, and a number of other small mines produced 500 ounces and upwards for the year.

Corinthian.—Big Bell Mines, Limited, took an option over this property and thoroughly sampled and tested it, but unfortunately results were disappointing and the option was abandoned.

A new find which may prove of some importance was made by Messrs. Carter and Hambleton in the Eennin district, about forty miles northerly from Bullfinch on the old Mt. Jackson road. An option was taken over the main leases by Yellowdine Gold Areas Company. Two shafts were sunk on the lode and drives put in at 100 feet depth. Both shafts and drives exposed quartz reefs averaging from 2ft. 6in. to 3ft. wide in high values. There appear to be two definite lenses picked up, each one about 80 feet in length, and the position is interesting. Trial crushings have been very satisfactory and it is understood that the company intends to instal a 5-head mill in the near future.

Evanston.—This district, which was a new find in 1937, is developing satisfactorily. A private battery was erected during the year, but was at first severely handicapped by the fact that the nearest water was at Pigeon Rocks, 20 miles distant, and that, consequently, it was necessary to cart water for treatment. The Water Supply Department, however, has since located water adjacent to the field, which is now available for milling. 1,568 tons were crushed during the year for a return of 1,275 ounces.

Mt. Margaret Goldfield.

The Sons of Gwalia, Limited.—This large mine, the most important producer between Kalgoorlie and Wiluna, maintained its usual standard of efficiency in mining and treating 138,203 tons for a gold production of 45,692 fine ounces.

Surface operations included the construction of new and modern store buildings and workshops, fire-

wood tramway extension, fire service extension and a composite alternator-compressor set which was under construction at the close of the year.

A new 8-inch air main was installed in the shaft, replacing the existing 6-inch main.

The underground development for the year included sinking the main incline shaft a further 169 feet, approaching the No. 30 level, 1,845 feet of driving, 573 feet of crosscutting and 1,345 feet of rising and winzing. Diamond drilling amounted to 1,635 feet. This work has opened up new blocks of ore well in advance of ore breaking and sufficient ore reserves are now in sight to keep the mill running at its present rate for six years.

Ventilation has been improved by moving the large exhausting fan from No. 27 to No. 29 level, and by stripping and reconditioning the Duffield Shaft.

The average number of men employed for the year was 381.

Lancefield (W.A.), No Liability.—The Lancefield Gold Mine at Beria showed a falling off in both tonnage and grade of ore treated. The tonnage milled was 101,176 as against 113,342 tons for the previous year. This is accounted for by a strike which caused the cessation of operations for several weeks. The gold production amounted to 29,612 fine ounces, the average yield per ton being 5.85 dwt.

Ore reserves increased by opening up Nos. 13 and 14 levels and sinking the inclined tunnel to the No. 15 level, where the lode has been cut. The belt conveyor in this arched tunnel is proving very efficient in handling the broken ore.

During the year a complete sluicing plant and hydraulic giant were installed to re-treat old tailings. Portions of the dump proved too hard for the "giant," and blasting operations became necessary.

The average number of men employed for the year was 280.

Cox's Find Gold Mine.—The Western Mining Corporation continued profitable operations on this Erlistoun property. Both the tonnage treated and average recovery showed an increase on the previous year. Comparative production figures for the past three years are worthy of special notice and are shown hereunder:—

	1936.	1937.	1938.
Tonnage treated	6,999	16,768	17,985
Return (fine ounces) ..	6,412	14,042	17,872
Yield per ton (dwt.) ..	18.32	16.75	19.87

The main shaft was carried down to the No. 4 level and the ore body opened up at this horizon shows a tendency to become more regular, at the same time maintaining its width and values.

In stoping, the system of square setting with mullock filling is followed. Mulga square sets proved unsatisfactory and towards the latter end of the year the use of sawn 8in. x 8in. oregon pine was introduced.

An average number of 116 men was employed.

The Gladiator Gold Mine, Limited, carried out development work for the year as follows:—Shaft sinking 101 feet, driving 639 feet, crosscutting 289 feet, rising and winzing 278 feet and diamond drilling 426 feet. The shaft was sunk to the No. 6 level and the ore body opened up at that horizon.

Ore reserves reported on the 30th June, 1938, were estimated at 52,000 tons valued at 8.37 dwt. per ton, and a treatment plant has been installed with a capacity of 2,000 tons per month, which commenced crushing in December.

The plant is provided with two Diesel engines of 300 and 100 h.p. respectively, coupled to generators. The ore is tipped into a 200-ton steel bin, whence it is fed to the primary crushers. It is then taken by conveyor to the fine ore bin and fed to a 10-head, 1,250 lb. stamp mill. Coarse screens are used in the battery and the product passes to ball mills operating in closed circuit with a classifier. The free gold is recovered on corduroy strakes and the residues are cyanided.

Employment should be found for about 80 men with the plant operating at full capacity.

The King of Creation was closed down after a little prospecting and development. A tribute was let, but results were not satisfactory.

Of the smaller mines on this goldfield the most regular producer is the Hill End at Murrin, which produced 427 ounces from 950 tons of ore. The owners have erected a 5-head mill and during the year installed a cyanide plant. Some public crushing is done at this battery.

A number of other small plants have been erected and prospecting activities generally are comparatively brisk, the gold production, apart from the mines mentioned, totalling nearly 9,000 ounces for the year.

North Coolgardie Goldfield.

Riverina Gold Mines, Limited, continued production at the rate of about 1,250 tons per month. The total tonnage crushed was 15,812 and the gold won amounted to 5,166 ounces, an average extraction of 6.53 dwt. per ton.

New plant costing £10,000 has been installed, but did not run as smoothly as anticipated, with the result that full time was not worked for the year. This mine gave employment to 92 men.

The Edjudina Gold Mines, Limited, at Porphyry, ceased operations owing to inability to raise capital for plant reconstruction and further development. A tribute party took some payable crushings from this property, which were treated at the Yarri State Battery.

The Paget Gold Mines of Edjudina were closed down for practically the whole year, pending financial reconstruction. Towards the end of the year a bank guarantee was given by the Government to assist in carrying out a systematic development policy with the object of bringing the mine into production as soon as possible. Indications are that this group has reasonable prospects of developing into a large producer.

The Lady Shenton Gold Mines, No Liability, had a disappointing year, developments being poor. A recovery of 3,931 fine ounces was obtained from the treatment of 9,295 tons of ore, a yield per ton of 8.46 dwt. The development for the year consisted of 86 feet of shaft sinking, 604 feet of driving, 563 feet of crosscutting, 552 feet of rising and winzing and 1,554 feet of diamond drilling.

First Hit Gold Mine, No Liability, in producing 5,728 ounces from 7,794 tons of ore, had a good year,

although the production was 1,100 ounces below that of 1937. The pipe-like lodes vary in size and dip, but the advancement of the bottom levels has proved their continuation at depth. The mine still has the appearance of a good small producer. The average number of men employed was 45.

Mt. Ida Gold Mines.—This group of mines, consisting of the Timoni and the Forrest Belle at Mt. Ida, commenced production during the year, but operations were considerably hampered by plant trouble and insufficient capital to carry out essential development work. Endeavours were being made at the end of the year to raise sufficient capital to finance the necessary development and plant alterations.

The New Callion Gold Mine, at Davyhurst, recommenced operations, the plant consisting of a dry crushing Krupp mill, strakes and cyanide plant. The dry mill is being converted to the wet process. This mine appears to have a considerable amount of ore developed of good and regular grade over payable widths and has a reasonable chance of being a regular producer for some years to come.

Prospecting in this goldfield has been active, especially at Morley's Find. This new find had an excellent opening year, the gold production totalling 3,781 ounces, of which 1,701 ounces were dollied and alluvial gold, while the remaining 2,086 ounces were obtained by amalgamation from 814 tons of ore.

East Murchison Goldfield.

The Emu Gold Mines, Limited, at Agnew, in the Lawlers District, brought their 4,000 ton per month plant into full operation during the year, and since May have been producing over 1,100 ozs. per month. The total gold production for the year was 11,952 fine ounces from 48,370 tons of ore treated, an average extraction of 4.94 dwt. per ton.

Development work included 1,318 feet of driving, 373 feet crosscutting and 539 feet rising and winz-ing. In addition, reconditioning of the main shaft was commenced during the latter part of the year and will be continued until the shaft timber is completely replaced.

The mine employed an average of 120 men and ore extraction was carried out by shrinkage methods.

This mine should continue regular production over a period of years. The ore reserves were estimated in June, 1938, at 111,000 tons, valued at 5½ dwt. per ton.

Wiluna Gold Mines, Limited, in treating 594,739 tons for a return of 105,307 fine ounces of gold, an average yield of 3.54 dwt. per ton, again lost a little ground as far as the grade of ore treated is concerned. A vigorous development and exploratory policy was responsible for 271 feet of shaft sinking, 18,815 feet of driving and crosscutting, 4,681 feet of rising and winz-ing and 37,086 feet of diamond drilling.

The main shaft was completed to the 2,150ft. level and serviced to the 2,000ft. level. In the southern section of the mine, an internal shaft was completed to the 2,600ft. level, whence it is proposed to test the lode at depth by diamond drilling.

A magnetic survey of the southern area was completed during the year by the Northern Australian Geological and Geophysical Survey.

The Bulletin shaft was sunk to the 1,270ft. level and serviced to the 1,200ft. level, and extensive exploratory work has been accomplished by diamond drilling between the main workings and the Bulletin leases.

Certain modifications have been put in hand in the roasting section of the treatment plant to permit of better control of the roasting conditions.

The mill, throughout the year, treated an average of 58,000 tons of ore per month, including ore from the Moonlight Wiluna Gold Mines, Limited.

In the smelting section, one blast furnace has been in continuous operation throughout the period, for an average monthly throughput of 4,000 tons of gold-bearing material. Consideration is being given to closing down this section of the plant.

In December 400 men were employed on the surface and 527 underground.

The latest ore reserve estimates show approximately three years' mill supply at an average head value of 4.3 dwt. per ton.

Moonlight Wiluna Gold Mines, Limited, produced steadily throughout the year, increasing the tonnage treated to 132,407 tons and the gold output to 35,972 fine ounces. Treatment operations were carried out at the plant of Wiluna Gold Mines, Limited.

Development carried out included 271 feet of shaft sinking 3,505 feet driving, 319 feet crosscutting, 2,134 feet rising and winz-ing and 6,993 feet diamond drilling. The Adelaide shaft was advanced to a total depth of 1,145 feet, while the No. 4 level at the 830ft. horizon was completed, and the No. 5 level opened up at a depth of 1,030 feet. Driving at No. 5 level off winzes was almost completed, but no connection was made through to the Adelaide shaft.

Two No. 1½ Richardson ventilation fans and one 8-stage pump were installed underground.

The average number of men employed was 169, 50 on the surface and 119 underground.

The latest estimate to hand of ore reserves on this mine is 400,000 tons at an average value of 6.2 dwt. per ton.

Yowanmi Gold Mines, Limited, which commenced mining and treatment operations on oxidised ore in 1937, brought their sulphide plant into production in the early part of the year and treated during the twelve months under review 75,160 tons for a return of 20,396 ounces of gold.

A vigorous development policy was pursued, the work done embracing 272 feet of shaft sinking, 2,764 feet driving, 1,306 feet crosscutting, 2,425 feet rising and winz-ing and 8,984 feet of diamond drilling.

The capacity of the plant is now rated at 10,000 tons per month, but that output has not yet been attained. The maximum monthly output for the year was 8,268 tons in July.

The ore reserves at the end of October were estimated at 200,000 tons, averaging 8 dwts. of gold per ton.

The average number of men employed for the year was 84 on the surface and 180 underground, a total of 264.

Murchison Goldfield.

Ingliston Consols Extended.—This mine has been under option to a London syndicate, and the policy of the management for the past year has been to keep the mine producing at a minimum cost, and carry out necessary development work. Both tonnage and grade of ore produced fell off somewhat for the year.

The tonnage treated and gold won amounted to 23,385 tons and 3,430 ounces respectively, the recoverable grade of the ore being 2.93 dwt.

The total development amounted to 1,125 feet and employment was found for 34 men.

Triton Gold Mines, No Liability, brought their enlarged plant into operation and are now mining and treating 9,000 tons per month. The main shaft was continued to the 1,227ft. horizon and develop-

ment was carried out at all levels. New lode intersections were made by crosscutting at the 925ft. and 1,050ft. levels, the lode maintaining normal width and value at these horizons.

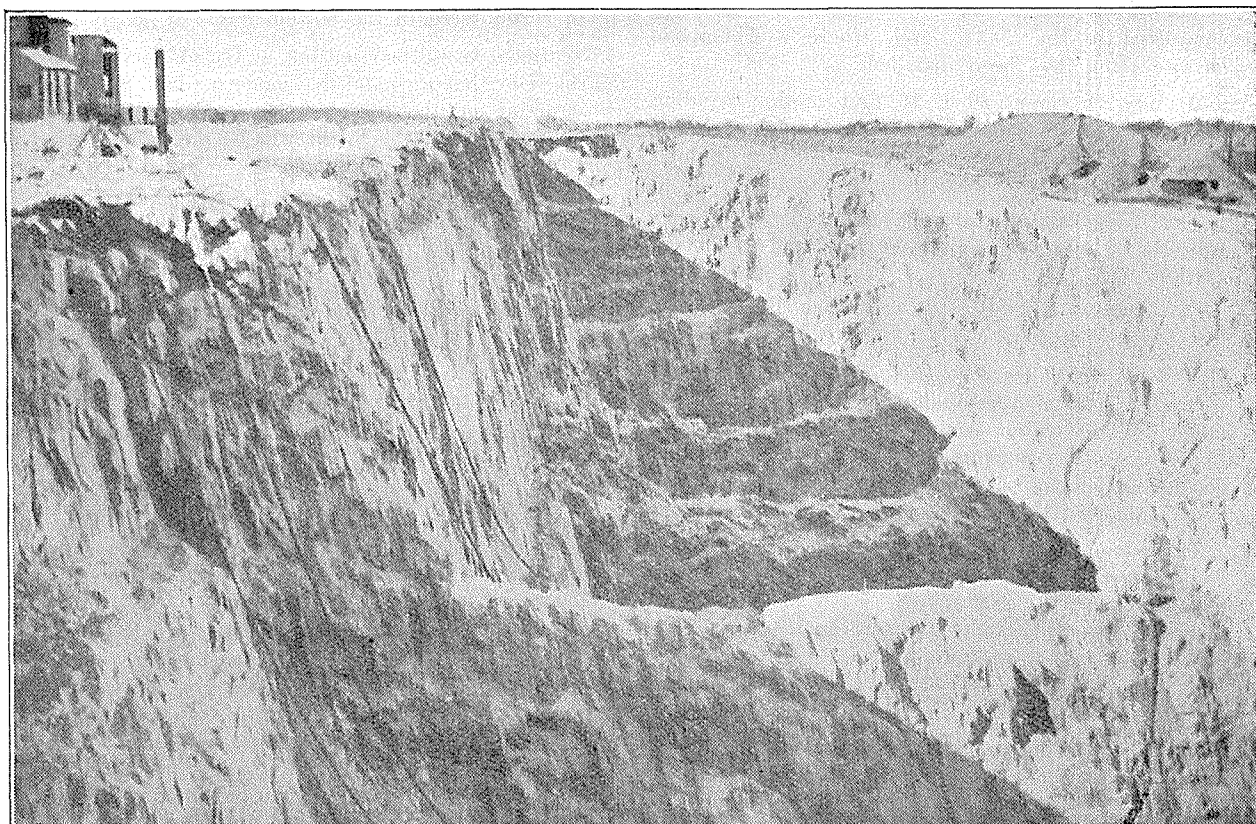
A new skip loading station was excavated and equipped at a depth of 1,094 feet and is now in operation.

Development footages for the year comprised 163 feet shaft sinking, 2,405 feet driving, 513 feet crosscutting, 1,956 feet rising and winzing and 1,870 feet diamond drilling.

Ore treated totalled 108,878 tons, yielding 34,437 ounces of gold, an average recovery of 5.96 dwt. per ton.

An additional Diesel alternator unit of 380 K.V.A. was installed in the power house.

Ore reserves stand at about 300,000 tons of 7 dwt. ore.



General View of Open Cut Workings at Big Bell Mine, showing pillars between "Glory-holes."

Big Bell Mines, Limited, during their first complete year of operation, thoroughly vindicated all preliminary estimates as to tonnage treated, grade of ore available and costs, all of which have proved conservative. In treating 400,473 tons for a return of 70,537 fine ounces of gold, an average yield of 3.52 dwt. per ton, they became fifth on the list of the State's gold producers, or fourth if the State Batteries are not included.

Development work for the year comprised 118 feet of shaft sinking, 2,044 feet driving and 1,627 feet of rising and winzing. The main shaft was sunk to the No. 3 level, where a plat was cut at a depth of 433 feet below the shaft collar. Glory holes from No. 9 to No. 17 inclusive are now opened up and ore is being drawn from all of them.

A ventilating fan of 24,700 cubic feet per minute capacity, driven by a 15 h.p. motor, was installed on No. 2 level, and ventilation conditions are now very good.

A new Belliss and Morcombe 2,000 cubic feet air compressor, powered by a 400 h.p. motor, was installed in the main power house.

In the mill section various minor changes and adjustments were made, including a 1,000 cubic feet low pressure Ingersoll Rand compressor for air agitation, an oil fired roasting furnace, reverberating type, for drying precipitates, amalgam barrel and low pressure blower in the smelter house.

The wells continue to give a satisfactory flow of water, the average monthly consumption being 10,650,000 gallons. Since pumping commenced some 165,000,000 gallons of water have been drawn from

the wells without appreciably lowering the water levels.

The layout of the surface plant, office buildings and dwellings of this mine is most pleasing to the eye and the arrangements made for the comfort and well-being of staff and workmen are highly commendable.

The latest ore reserve estimates to hand show 3,500,000 tons of ore averaging 3.7 dwt. per ton.

Mount Magnet Gold Mines, Limited, in mining and treating 59,761 tons of ore for a yield of 7,639 ounces of gold, have the distinction of profitably mining and treating the lowest grade ore mined in the State, the average value recovered being 2.56 dwt. per ton.

Development for the year included 28 feet shaft sinking, 1,154 feet driving, 187 feet crosscutting, and 631 feet rising and winzings.

The unwatering of the St. George main shaft was completed to the 200ft. level, where a Thompson electric pump has been installed.

A May Brothers' 30 x 10 first motion winding engine has been purchased to replace the smaller winder on the St. George main shaft and foundations for its erection have been completed.

The average number of men employed for the year was 91, including 44 on the surface and 47 underground.

Ore reserves are estimated at 325,000 tons averaging 4 dwt. per ton.

Hill 50 Gold Mine, No Liability, carried out a somewhat extensive campaign of underground diamond drilling with a considerable degree of success in proving the continuation of the ore bodies, in depth and laterally. The prospects of the mine are much enhanced by these results.

The ore mined and treated amounted to 24,424 tons for a return of 5,569 ounces of gold, a yield of 4.56 dwt. per ton.

Apart from diamond drilling, only 297 feet of development were carried out.

Plant additions for the year included a 350 cubic feet compressor powered by a 114 h.p. Ruston Diesel engine, a 25 k.w. alternator powered by a similar engine, and a 30 x 10 first motion winding engine.

The Mount Magnet-Boogardie area is generally very busy. Prospecting is active and numerous rich crushings have been put through the Boogardie State Battery. Some of the small mines, such as Edward Carson, Swan Bitter (Broken Bond), Black Cat and Neptune are opening up nicely and show promise of permanency.

Yalgoo Goldfield.

Rothsay Gold Mine produced 3,085 ounces of gold from 15,135 tons of ore mined. Comparatively little development was carried out and the future of the mine appeared precarious at the close of the year.

King Solomon's Mines.—Big Bell Mines, Limited, have taken an option over this property at Gullewa and propose to carry out exploratory work, not only on the working reef, but also on a series of parallel ore bodies, from which some high grade ore has been from time to time extracted. This mine produced 1,127 ounces of gold for the year from 2,831 tons of ore.

Payne's Find district showed increased activity for the year, producing 3,793 ounces from 5,965 tons of ore. The principal producers in this area were the *Carnation*, with 1,633 fine ounces from 2,584 tons, and *Marigold* with 1,502 ounces from 2,542 tons.

Pilbara Goldfield.

In the Marble Bar district, prospecting was again active and the total yield from the district was 12,208 ounces from the treatment of 14,719 tons of ore.

Comet Gold Mines, Limited, in treating 4,996 tons for 6,563 fine ounces of gold, an average yield of 26.27 dwt. per ton, proved the mainstay of the district, tonnage and yield approximating those of the previous year.

Development comprised 118 feet driving, 477 feet crosscutting (including a new adit from the foot of the hill), 83 feet rising and winzings and 1,473 feet diamond drilling. Good values and widths were again encountered in the bottom level.

Treatment is still carried out at the old plant near Marble Bar, but an extensive modern plant is under construction on the Halley's Comet lease itself. It is anticipated that this plant will be put into operation early in the current year.

This organisation has secured the adjacent McKinnon leases after carrying out an extensive programme of prospecting and diamond drilling. A plan for the active development of these leases is now being formulated and should be put into operation without delay.

In the Bamboo Creek area, about six small mines continue profitable production of good grade ore.

Nullagine District.—Prospecting in this district has been more active owing to the fact that a good water supply was located by boring at 20 Mile Sandy. Simpson's Battery was moved to this site from Mosquito Creek, where its operations were hampered by lack of water, and is now in a position to run continuously.

Blue Spec Gold Mine.—The operations of this mine were also restricted by water shortage, and the plant designed to treat the antimonial ore ran only spasmodically. During the latter part of the year, a bore was put down, with Departmental assistance, and a good flow of water was located at a distance of about half a mile from the mine. It is intended to sink a well at this site and provide a pumping plant and pipe line to the mine.

An option has been taken over this property by Consolidated Gold Areas, Limited.

Some high grade ore has been obtained from this mine and the results of this venture will be watched with interest. There is a long belt of antimonial gold-bearing ore in this area, and the success of this undertaking would have a tendency to interest other operators in the district.

COAL MINING.

A satisfactory year has been completed on the Collie field, with a production of 604,792 tons of coal, valued at £375,083. This is an increase in tonnage of 51,282 tons and in value of £34,639 over the previous year's figures.

The average number of men employed increased slightly from 723 to 737, of whom 605 were employed underground and 132 on the surface.

The individual tonnages and output of the various mines were as follows:—

Mine.	Tons.	Value. £
Proprietary	203,755	133,609
Co-operative	97,382	59,712
Cardiff	115,030	64,244
Stockton	104,965	62,952
Griffin	83,660	54,565

Development has been encouraging and satisfactory programmes for future work have been laid out.

A considerable amount of trouble is still experienced owing to the faulting of the coal seams, and development plans have frequently to be modified when a fault is encountered. In the majority of cases it is possible to work round the faults and recover lost faces with a minimum of stone work. This procedure, although it entails a certain loss of time and extra haulage and pumping, is considered more economical than prospecting the farther side of the fault in country.

At the *Proprietary Colliery* water coming in along the fault planes has given rise to some trouble, as the electric power was not sufficient for the necessary pumping plant to handle the inflow. It is therefore proposed to instal an underground sub-station to which the electric current will be transmitted at high tension and where it will be stepped down for use on the underground machinery. Plans have been submitted for this work, which should be in operation at an early date, with a consequent reduction of costs and speeding up of development.

Co-operative.—The main dips in this colliery are standing on an up-throw fault of unknown displacement. A stone drive will be put through this fault and the position of the coal located by boring upwards. This work has been hampered to date by a considerable inflow of water at the fault and insufficient stowage space for the stone debris. A three-inch pipe line is nearly completed to the bottom of the dip and stowage places for the debris are being excavated.

Cardiff.—Extensions of haulage facilities in this mine have been completed and the output may now be increased if required.

Stockton.—Hand boring is still being carried out on this mine with satisfactory results. The prospects are good and the life of the mine has been considerably extended.

Griffin.—Preparations are in hand at this colliery to electrify the whole of the mine plant, a transmission line from the Collie Power Station for that purpose being near completion. An underground sub-station is in course of construction, to which current will be transmitted at high tension and thence transformed to direct current for use in the mine. The cable for this purpose is already in position.

Industrial Matters.—There have been no stoppages during the year, all differences having been settled by a Board of Reference.

MINERALS OTHER THAN GOLD AND COAL.

The total value of minerals produced other than gold and coal showed an improvement during the year, the total value being £156,177 as against £140,791 in 1937.

Antimony concentrates were again produced at the Wiluna Gold Mines' plant as a by-product of the treatment of antimonial gold ores. This was the only reported source of this mineral for the year, the value of the total production being £9,196.

Arsenic, also wholly produced by the Wiluna arsenic plant, reached a total of 3,999 tons valued at £71,982. The corresponding 1937 figures for this mineral were 2,054 tons worth £36,972.

Asbestos production showed a definite increase during the year, mainly owing to activities on the crocidolite deposits of the Hamersley Range. Early in the year, a large number of prospectors, encouraged by the attractive prices offering for this mineral, rushed to the field and in a short time had produced several hundred tons of high grade fibre. Owing, however, to lack of organisation of the local market, the length of time necessary to wait for returns for fibre marketed overseas, high cost of production and lack of capital on the part of the producers, the great majority of the prospectors were forced to sell at unpayable prices and had to abandon the venture. The few remaining producers have continued successfully marketing small shipments.

A local company, Australian Blue Asbestos Mines, No Liability, secured several leases in Wittenoom Gorge and is endeavouring to arrange finance to erect a small treatment plant and develop the property. In the meantime, trial shipments are being mined and sent abroad. Good prices are offering overseas for this fibre.

An Adelaide company has taken over a considerable area in Yampire and Dale Gorges, but their future policy is as yet unknown.

Under the present method of production, *i.e.*, breaking out visible asbestos and hand treating the product, only the highest grade fibre can be shipped. With a suitable treatment plant, however, all grades of fibre can be produced, and the extent of the deposits warrants the fullest investigations.

Chrysotile.—A plant which had previously been erected at Nunyerri was during the year moved and re-erected at Lionel for the treatment of the chrysotile deposits in that locality. It is understood, however, that this venture did not prove satisfactory and that the plant is to be removed to the Hamersley Range blue asbestos field.

The total reported production of asbestos for the year was 121 tons, valued at £5,314. The value of exports was £17,711, compared with £10,306 during the previous year.

Bismuth.—A find of high grade bismuth ore was reported from the Gascoyne area. This is being investigated.

Felspar.—The felspar quarries in the Coolgardie district worked consistently throughout the year, employing an average of 12 men. The value of the product exported to Melbourne for the year totalled £10,431.

Iron.—The Yampi Sound Mining Company had in progress extensive preparations for the export of iron ore, but as the result of the action of the Commonwealth Government in placing an embargo on the export of iron ore from Australia, the whole project, which would have materially increased the prosperity of the north-western portion of the State, has been abandoned.

A certain amount of exploratory work is still being carried out at the expense of the Commonwealth Government to test the extent and value of the deposits.

Magnesite.—An application for a magnesite area at Bulong was made by the Broken Hill Proprietary, Limited, and developments will be watched with interest.

Mica.—There is no record of any production of this mineral for the year, but it is understood that several trial parcels have been shipped overseas from Derby, Yinnietharra and Northampton districts. Some high quality mica has been found, but some of the parcels were unsatisfactory on account of lack of experience in the preparation of the product. Some small amount of trading in processed mica (*i.e.*, cut to standard dimensions) has been done with local consumers.

The amount of sheet mica, excluding that in imported manufactured articles, imported into this State is small, amounting to only about £100 in value for 1938. This fact would indicate that for the present, at all events, the great bulk of any mica produced must be exported. Good prices are available in London for properly dressed sheets, especially of the clear and slightly stained quality.

Scheelite.—Some mining for scheelite has been carried out on the North Coolgardie Goldfield at Comet Vale. The mineral is crushed with a 5-head battery and concentrated and graded on a Willfey table. There is some associated gold, but scheelite recovery is the main objective of the plant.

Silver, produced entirely as a by-product of the refining of gold, totalled 271,346 fine ounces, valued at £28,852, an advance of 90,784 ounces and £8,256 respectively on the 1937 production.

Tantalite.—Tantalite, Limited, operating in the Wodgina district of the Pilbara Goldfield, again was responsible for the great bulk of this mineral produced in the State for the year. There were 17 men employed by this company, and they are carrying out alluvial work as well as operations on the pegmatite dykes. There is some prospecting activity in the vicinity of Wodgina, but little tantalite is found outside the leases held by the company.

At Greenbushes a small percentage of tantalite has been separated from the tin concentrates produced by the Vulcan Tin Mines, Limited.

Tin.—Greenbushes Tin, Limited, are installing a dredge at Greenbushes for the purpose of treating extensive areas of low grade tin-bearing ground. Systematic sampling by means of bores has indicated that this might prove a payable proposition. A dredge was secured from Victoria and at the end of the year was in course of re-assembling on the ground. The estimated quantity of ground proved is 650,000 cubic yards, containing 1.15 lbs. of tin per cubic yard.

The Vulcan Tin Mines, Limited, are operating a sluicing plant on leases adjoining those of Greenbushes Tin, Limited. The ground worked has a much

higher tin content and the production is in the vicinity of 50 tons of concentrate per year. This is the most active producer in the district, although Barrymore and party, operating a smaller and more primitive plant, have steadily produced throughout the year.

The total production of tin concentrates for the year was 68 tons valued at £7,421.

Vermiculite.—Several deposits of this useful mineral have been located, the best quality being from the Bulong and Ravensthorpe districts. An area was taken up at Bulong and a trial shipment sent to Melbourne for testing. Although this mineral, which expands to many times its original bulk when heated, has a number of useful applications, such as insulation for heat, electricity and sound, ornamenting porcelain tiles, etc., it is doubtful whether its market value is sufficient to make mining and long haulage a payable proposition.

CONCLUDING REMARKS.

The continued expansion of the gold mining industry has been of the utmost value to the State.

During the year under review the tonnage of ore treated reached the record total of 3,759,720 tons and the value of the gold won £10,409,928 was also a record for this State for all time.

While this happy result is due to some extent to the increased output of the more important mines, it is also pleasing to note from the table at page 34 that four new names appear on the list of mines producing over 5,000 ozs. of gold.

It is reasonable to anticipate that the State's output will be maintained and increased yet again during the year 1939.

The comparative importance of the gold mining industry in the export trade of the State is made clear from the following figures, kindly supplied by the Government Statistician:—

	1937	1938
	Value in	Value in
	Australian	Australian
	Currency.	Currency.
	£A.	£A.
Gold Exported ..	8,743,755	10,363,023
Wheat Exported ..	3,459,295	4,890,039
Wool Exported ..	3,449,236	3,333,549

I shall conclude by again expressing 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 has also assisted materially in the compilation of this report and the Inspectors in supplying much of the information contained in it.

I also wish to express my thanks for the help kindly given by all other officers of the Department.

RICHARD C. WILSON,
State Mining Engineer.

APPENDIX No. 1.

MINING DEVELOPMENT EXPENDITURE.

				£	s.	d.					£	s.	d.			
Advances Outstanding, 31st December, 1938—							Interest paid prior to 1938							26,921	5	10
Advances authorised prior to 1938	...	...	...	243,730	4	5	Interest paid during 1938	...	...	...	190	3	2
Advances authorised during 1938	...	...	...	5,835	0	0					27,111	9	0
				249,565	4	5										
Principal Moneys Advanced—							Interest outstanding at 31st December, 1937							9,166	15	4
Prior to 1938	...	...	...	220,162	3	11	Interest outstanding at 31st December, 1938	...	...	...	9,725	15	10
During 1938	...	...	...	5,209	18	4	Principal Moneys Advanced	...	...	...	225,372	2	3
				225,372	2	3										
Principal Moneys Repaid (including Sale of Securities)—							Less Principal Moneys repaid							58,286	0	11
Prior to 1938	...	...	...	57,428	15	1	Less Bad Debts written off	...	...	...	151,823	1	6
During 1938	...	...	...	857	5	10					210,109	2	5
				58,286	0	11										
Bad Debts Written Back and Amounts Transferred—							Principal outstanding at 31st December, 1938							15,262	19	10
Prior to 1938	...	...	...	151,603	1	6	Interest outstanding at 31st December, 1938	...	...	...	9,725	15	10
During 1938	...	...	...	220	0	0							
				£151,823	1	6					£24,988	15	8			

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, 14th April, 1939.

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 1938.

Examinations for Certificates.

April Examination.

No applications were received for the April examination, and no meeting of the Board was held in that month.

October Examination.

Four candidates submitted themselves for examination in October, one taking the First Class and the others the Second Class examination. At the meeting of the Board on the 8th November, it was decided that the First Class papers and two of the Second Class papers warranted First and Second Class Certificates of Compe-

tency, respectively, being issued to these candidates, but that one Second Class candidate had failed to obtain the requisite number of marks to enable the Board to grant a certificate.

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,
District Inspector of Mines, Collie (Member).

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: ARITHMETIC.

Wednesday, 26th October, 1938: 9 a.m. to 11 a.m.

- (1) By hand mining the output of a mine gives 19 per cent. of house coal, which sells at 31s. 6d. per ton, 38 per cent. of kitchen coal selling at 23s. per ton, and 43 per cent. of slack selling at 9s. per ton. After coal cutting machines are introduced the percentages of the different classes of coal are found to be 28, 39 and 33 per cent. respectively and the additional cost of mining is 6½d. per ton. Find the net gain or loss to the company per ton of output caused by introducing the machines. (Possible Marks, 17.)
- (2) It is desired when working bord and pillar to leave 68 per cent. of the coal in pillars. If the bords are 6 yards wide, and the cut throughs 5 yards wide with 44 yard centres, what will be the width of the pillars between the bords? (Possible Marks, 16.)
- (3) A cutting in stone is 198 feet long, the sides of the cutting are vertical and the width of the cutting is 10 feet. The depth of the cutting at the commencement is 6 feet and the end of the cutting is 20 feet. The contract price is £3 10s. 6d. per lineal foot. What is the cost per cubic yard? (Possible Marks, 17.)
- (4) Find the cost of gravelling a path 4 feet 6 inches wide surrounding a rectangular lawn 117 feet by 54 feet with gravel 3 inches deep at 8s. per cubic yard. (Possible Marks, 16.)
- (5) If 55 per cent. of coal came out of bords and headings and 17½ per cent. of the pillar coal is lost during extraction, how many tons have been got from the "whole" and "broken" respectively out of a total area of 250 acres with a 5 feet 6 inch seam? (A cubic foot of coal equals 82 lbs.). (Possible Marks, 17.)
- (6) Two seams of coal having a dip of 1 in 5½ (1 vertical to 5½ horizontal) are 46 yards apart vertically from the floor of the upper seam to the roof of the lower seam. What will be the length of a level cross measure drift between the two seams? (Possible Marks, 17.)

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: GEOLOGY.

- (1) Set out the geological history of some Australian coal-field with which you are familiar. Draw a geological section illustrating this. (Possible Marks, 20.)
- (2) State what geological phenomena have probably occurred when the following characteristics are noted in coal-seams:—
- The dip of the seam either remains constant or begins to steepen while the coal shows signs of crushing and finally terminates against a rock face.
 - The floor maintains its general dip but the coal shows signs of thinning by the gradual encroaching of the roof on the coal. A short distance further on the seam resumes its original thickness.
 - Numerous shaley partings appear in the coal and increase in quantity in a certain general direction while the texture of rock in the roof and floor becomes coarser. (Possible Marks, 25.)
- (3) Describe briefly the following structures sometimes found in coal seams:—Monocline, trough fault, reverse fault, pitching antiline. Illustrate the first three by sketches. (Possible Marks, 15.)
- (4) Give a list of the rock types which you would expect to see in a possible coal-bearing locality, and mention the chief fossils usually found in association with West Australian coal deposits. (Possible Marks, 20.)
- (5) Classify the various coal types according to their main chemical and physical properties. (Possible Marks, 20.)

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: MACHINERY.

Wednesday, 26th October, 1938: 3 p.m. to 5 p.m.

- (1) An incline is being driven down in a seam dipping 1 in 6 and is now 1,800 feet long. Water at the rate of 200 gallons per minute flows into the incline at a point 1,200 feet from the top and below this point the inflow of water is 60 gallons per minute. Describe the equipment of pipes and pumps that you would instal for raising the water to the top of the incline, and for keeping the face clear for the work of advancing the incline. The type of power is open to choice. (Possible Marks, 17.)
- (2) Sketch what you consider a good arrangement of balance jig for lowering coal from headings advancing to the rise. (Possible Marks, 16.)
- (3) Describe an electrically operated winch applicable for hauling coal from branch dips to main haulage rope and state the power required to raise 8 skips of gross weight of 6 tons on a grade of 1 in 4 at a speed of 300 feet per minute. (Possible Marks, 16.)
- (4) State what experience you have had in connection with electrical machinery, and the precautions to be observed in relation to and working of this power in the underground workings of a mine. (Possible Marks, 17.)
- (5) What is the difference between the action of a three throw ram pump and a centrifugal pump in raising water? State the good and bad features of each type considered as pumps for use in collieries. (Possible Marks, 17.)
- (6) Show by sketches how you would mount a screen 20 feet long and 4 feet wide so as to enable it to shake or reciprocate lengthwise. Show also the mechanism for producing the shaking. (Possible Marks, 17.)

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: MINING OF COAL.

Thursday, 27th October, 1938: 10 a.m. to 1 p.m.

- (1) Describe fully how you would prove an unexplored coal field of 5,000 acres by means of bore holes. Say how many bore holes you would put down, and what records you would keep. As an example give imaginary results and calculate therefrom the direction and angle of dip. (Possible Marks, 25.)
- (2) Describe with sketches the general surface arrangements you would require for the sinking of a shaft 18 feet diameter finished through several fiery seams of coal to a depth of 600 yards, the strata being very lightly watered. Give the principal dimensions, also a code of signals you would adopt, and say what special precautions you would take when shot-firing. (Possible Marks, 25.)
- (3) Describe clearly the operations necessary to drive a tunnel or drift in stone requiring blasting. Give sketches showing positions of shot holes for a tunnel 12 feet wide by 6 feet high. (Possible Marks, 25.)
- (4) How would you support your main roads in the following circumstances?
 (a) When side pressure is heavy.
 (b) Where the floor is soft.
 (c) Where the roof is friable or crumbly.
 Give the dimensions of timber or other material used. (Possible Marks, 25.)
- (5) A large down throw fault running east and west is met with in two different headings in the workings of a coal seam dipping from north to south. What steps would you take to prove the extent of the dislocation and what data would be valuable with which to compare the strata below the fault? In which heading would you make your provings to interfere as little as possible with the opening out south of the fault? (Possible Marks, 25.)
- (6) What are the principal factors that have to be taken into account in deciding the width of barriers necessary to retain water in old workings with safety? (Possible Marks, 25.)
- (7) It is found that the proportion of large coal being made in a seam under your charge is too low. What reason can you give for such a state of affairs, and what suggestions can you make to reduce the amount of small coal? (Possible Marks, 25.)
- (8) From a main level in a seam dipping 1 in 3 an incline has to be driven on the full dip. A direct rope haulage has to be used with a set of 15 skips. Describe with simple sketches three methods of layout which can be used at the top of the incline to get the set from the incline on to the level expeditiously. (Possible Marks, 25.)

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: SURVEYING.

Thursday, 27th October, 1938: 2 p.m. to 4 p.m.

- (1) Describe how the following adjustments to surveying instruments are made:—
- (a) In the case of a Transit Theodolite, to cause the line of collimation or sight to be at right angles to the horizontal axis of the telescope.
- (b) In the case of a Dumpy Level, to make the telescope and spirit-level perpendicular to the vertical axis. (Possible Marks, 40.)
- (2) Complete the following levelling data and show how to check the computations:—

Back Sight.	Int. Sight.	Fore Sight.	Rise.	Fall.	Reduced Level.	Distance.
10·21					100·00	0 ch.
	8·16					1 ch.
	7·14					2 ch.
9·26		3·10				3 ch.
	5·40					4 ch.
	9·21					5 ch.
		6·17				6 ch.

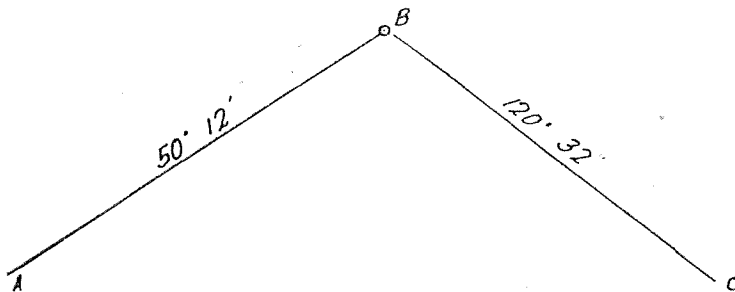
Draw a profile section and calculate the gradient of a line joining the two end points of the section. Use a vertical scale of 10 feet to 1 inch and a horizontal scale of 1 chain to 1 inch. (Possible Marks, 30.)

- (3) Calculate the bearing and distance of the line joining stations iv. and i. in the following traverse:—

Station.	Bearing.	Distance.
i. — ii.	20° — 10'	200 lks.
ii. — iii.	97° — 00'	320·1 "
iii. — iv.	190° — 15'	230·6 "
iv. — i.		

Station iv. is 50 feet above station i., what is the length of an inclined drive between these two points, and what is its angle of inclination? (Possible Marks, 35.)

- (4) In the sketch below it is proposed to join the two traverse lines *AB* and *BC* by a curve with a 15 chain radius. What is the length of the tangents to this curve, and what is the value of the deflection angle? (Possible Marks, 35.)



- (5) State what precautions you would take in using surveying instruments involving the use of the magnetic needle in underground surveying. Show how to convert magnetic bearings into true bearings when the magnetic variation is:—(a) 15° W., (b) 4° — 30' E. (Possible Marks, 30.)

- (6) What general type of information is required to be shown on the mine plan of a colliery? (Possible Marks, 30.)

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: VENTILATION AND DANGEROUS GASES.

Friday, 28th October, 1938: 10 a.m. to 1 p.m.

(1) A fan is working at its maximum and is circulating 150,000 cubic feet of air per minute, but the working faces a mile away are only getting 40 per cent. of it. What is the probable trouble and how would you improve matters? (Possible Marks, 25.)

(2) Describe and show by sketches how you would ventilate a single exploring heading driven forward to a distance of say 300 yards in advance of the workings without in any way obstructing the air current or reducing the efficiency of the ventilation in the rest of the workings. (Possible Marks, 25.)

(3) It is desired that a ventilation survey of an extensive mine be made. State how you would proceed to do this; what instruments you would use; what observations would be made, and what precautions are necessary to ensure accuracy. (Possible Marks, 25.)

(4) Ventilate the accompanying plan, having due regard to haulage. Show main haulage roads, air crossings and doors. (Possible Marks, 25.)

(5) Under what various circumstances is a cavity in the roof of a mine in which the strata above the seam gives off fire-damp likely to contain explosive gas although free from it under normal conditions? (Possible Marks, 25.)

(6) Write down the chemical symbols, give the Atomic weight, and describe the principal properties of Fire-damp, Carbon-dioxide, Carbon-monoxide, and the constituents of the atmosphere, and state in what respect the atmosphere differs chemically from the other gases named. (Possible Marks, 25.)

(7) Describe the first indications of spontaneous combustion underground, also state what precautions are necessary for the safety of workmen when engaged dealing with an active fire. (Possible Marks, 25.)

(8) While a shaft ventilated by means of air pipes and a small auxiliary blowing fan is being sunk a bed of fissured sandstone is encountered, from which fire damp is given off in such quantity as to overcome the ventilation and fill the shaft with explosive gas.

(a) How would you deal with the explosive gas in the shaft?

(b) Supposing the flow of fire damp were permanent, how would you deal with it after you had cleared the shaft? (Possible Marks, 25.)

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: COAL MINES REGULATION ACT, 1902-1926.

Friday, 28th October, 1938: 2 p.m. to 4 p.m.

(1) What are the Regulations governing means of signalling in coal mines? (Possible Marks, 22.)

(2) What are the provisions of the Act relating to the notice to be given in respect of accidents occurring in mines? (Possible Marks, 21.)

(3) What conditions must be observed when firing shots on a main haulage road? (Possible Marks, 22.)

(4) Under what circumstances would you withdraw workmen from a mine or part thereof? (Possible Marks, 21.)

(5) Give the General Rules relating to the use, construction and examination of safety lamps. (Possible Marks, 21.)

(6) What procedure is necessary for the establishment of Special Rules at a coal mine? (Possible Marks, 21.)

(7) What inspections in and about a Colliery have to be made and recorded? (Possible Marks, 22.)

*The Coal Mines Regulation Act, 1902-1926.*EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER
MANAGER OR OVERMAN.

Subject: ARITHMETIC.

Wednesday, 26th October, 1938: 9 a.m. to 11 a.m.

- (1) The length of a self-acting incline is 325 yards. The inbye end of the incline is 68 feet above the outbye end. Calculate the gradient. (Possible Marks, 17.)
- (2) A pair of miners fill 10 skips of coal, the weight of coal in each skip being 18 cwt. 3 qrs. 14 lbs. The rate of payment is 3s. 6d. per ton. After a deduction of 35 lbs. of dirt has been made from each skip, how much will the men receive as wages? (Possible Marks, 17.)
- (3) The area of a rectangle is 1,323 square feet, and the length is three times the width. Give the dimensions of the rectangle. (Possible Marks, 16.)
- (4) A week's output of 7,560 tons is got from solid and pillar workings in equal proportions. The total amount paid for hewing was £1,212 15s. What are the respective tonnage rates if pillar coal is 3d. per ton less than solid coal? (Possible Marks, 17.)
- (5) Find the value of 128 tons 15 cwt. 3 qrs. 24 lbs. of galvanised roofing iron at £16 6s. 8d. per ton. (Possible Marks, 16.)
- (6) Add the undermentioned areas, and express your answer in square yards:—
- | | | | | | | | | |
|----|-------|---|-------|----|-------|----|---------------|---|
| 15 | acres | 3 | roods | 39 | poles | 29 | square yards. | |
| 11 | „ | 2 | „ | 17 | „ | 14 | „ | „ |
| 9 | „ | 1 | „ | 19 | „ | 11 | „ | „ |
| 7 | „ | 2 | „ | 28 | „ | 9 | „ | „ |
- (Possible Marks, 17.)

*The Coal Mines Regulation Act, 1902-1926.*EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER
MANAGER OR OVERMAN.

Subject: COAL MINES REGULATION ACT, 1902-1926.

Wednesday, 26th October, 1938: 11 a.m. to 1 p.m.

- (1) What are the provisions in the Coal Mines Act as to travelling roads? (Possible Marks, 25.)
- (2) What are the various regulations as to shot firing and use of explosives underground? (Possible Marks, 25.)
- (3) What are the several distances between manholes which must not be exceeded, and what are the circumstances to which these distances apply? (Possible Marks, 25.)
- (4) What are the provisions of the Act concerning sanitation and change house? (Possible Marks, 25.)
- (5) What means of signalling are required for working shafts? (Possible Marks, 25.)
- (6) What precautions are required when approaching old workings containing accumulations of water? (Possible Marks, 25.)

*The Coal Mines Regulation Act, 1902-1926.*EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER
MANAGER OR OVERMAN.

Subject: ROADWAYS.

Wednesday, 26th October, 1938: 2 p.m. to 5 p.m.

- (1) Write a report on the different methods of hauling coal underground from the working face to shaft bottom. State the advantages and disadvantages of each method. (Possible Marks, 25.)
- (2) State fully the precautions you would take, both in the working faces and on the roadways to reduce as far as possible accidents due to falls of roof and sides. (Possible Marks, 25.)
- (3) Describe fully the necessary preparations for the installation of a "main and tail rope" system of haulage for a roadway 400 yards long. The roof is heavy in places and there are two slight curves on the roadway to be negotiated. (Possible Marks, 25.)
- (4) Owing to the soft nature of the floor in a travelling road of a mine, continued trouble is experienced in keeping the road in a fit state. Can you suggest any method to overcome this difficulty? (Possible Marks, 25.)
- (5) What points have to be kept in view in making your permanent main roads for haulage and ventilation underground and afterwards in maintaining them? (Possible Marks, 25.)
- (6) How would you proceed to clear away a heavy fall on a level roadway. Give sketches showing how you would keep yourself secure as the work proceeded. (Possible Marks, 25.)

*The Coal Mines Regulation Act, 1902-1926.*EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER
MANAGER OR OVERMAN.

Subject: MINING OF COAL.

Thursday, 27th October, 1938: 10 a.m. to 1 p.m.

- (1) State fully what is likely to occur when working or extracting pillars irregularly under a heavy roof. (Possible Marks, 28.)
- (2) Your main level in an important section of the mine has struck a down throw fault of approximately 16 feet, and the working faces on the rise side are rapidly approaching the fault. How would you proceed to develop beyond the fault so that your output could be maintained? Answer fully. (Possible Marks, 29.)
- (3) What are the principal sources of coal dust underground and what means would you adopt; firstly, to reduce its production generally; secondly, to render a coal dust explosion either improbable or limited in extent? (Possible Marks, 29.)
- (4) Describe briefly the method of working coal by:—
(a) Longwall.
(b) Bord and pillar.
Under what circumstances would you adopt the first system? (Possible Marks, 28.)
- (5) Set out a small district working a seam 6 feet thick with a good roof and floor. Show full details. (Possible Marks, 29.)
- (6) In the longwall method of working, what are the respective reasons for and against a straight face and a stepped face? Give an illustration of each, showing the packs and timbering. (Possible Marks, 29.)
- (7) What are the advantages to be derived from systematic timbering? Describe with sketches the various systems you are acquainted with. (Possible Marks, 28.)

*The Coal Mines Regulation Act, 1902-1926.*EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER
MANAGER OR OVERMAN.

Subject: VENTILATION AND DANGEROUS GASES.

Thursday, 27th October, 1938: 2 p.m. to 5 p.m.

- (1) To what purposes are the Barometer, Thermometer, Hygrometer and Anemometer respectively applied in connection with coal mining? Give a short description of each instrument. (Possible Marks, 25.)
- (2) State the chemical composition and properties of air, fire-damp and carbonic acid gas. What means would you adopt to detect the presence or absence of the two latter in the air of a mine? (Possible Marks, 25.)
- (3) Ventilate the accompanying plan with due regard to haulage, etc. (Possible Marks, 25.)
- (4) Describe minutely how you would proceed to remove fire-damp from a large area of workings which has, owing to some special cause, become completely filled with that gas. (Possible Marks, 25.)
- (5) Sketch in full detail the particulars of an air door, showing how it is opened and closed. (Possible Marks, 25.)
- (6) A ventilator, making 100 revolutions per minute, produces a 2 inch water gauge in a certain mine. What water gauge would it produce in the same mine when making 150 revolutions per minute? (Possible Marks, 25.)
- (7) Specify the various means that can be adopted for increasing the quantity of air passing through any given mine with extensive workings, and state which is the most economical, and why. (Possible Marks, 25.)
- (8) Describe, step by step, in minute detail, how you would proceed to take a Marsant safety lamp with two gauzes to pieces, clean it, charge it, put it together again and test it for safety. (Possible Marks, 25.)

APPENDIX No. III.

Mines Regulation Act, 1906.
(Regulation 17A.)

EXAMINATION FOR CERTIFICATE OF COMPETENCY AS UNDERGROUND SUPERVISOR.

Subject: MINING.

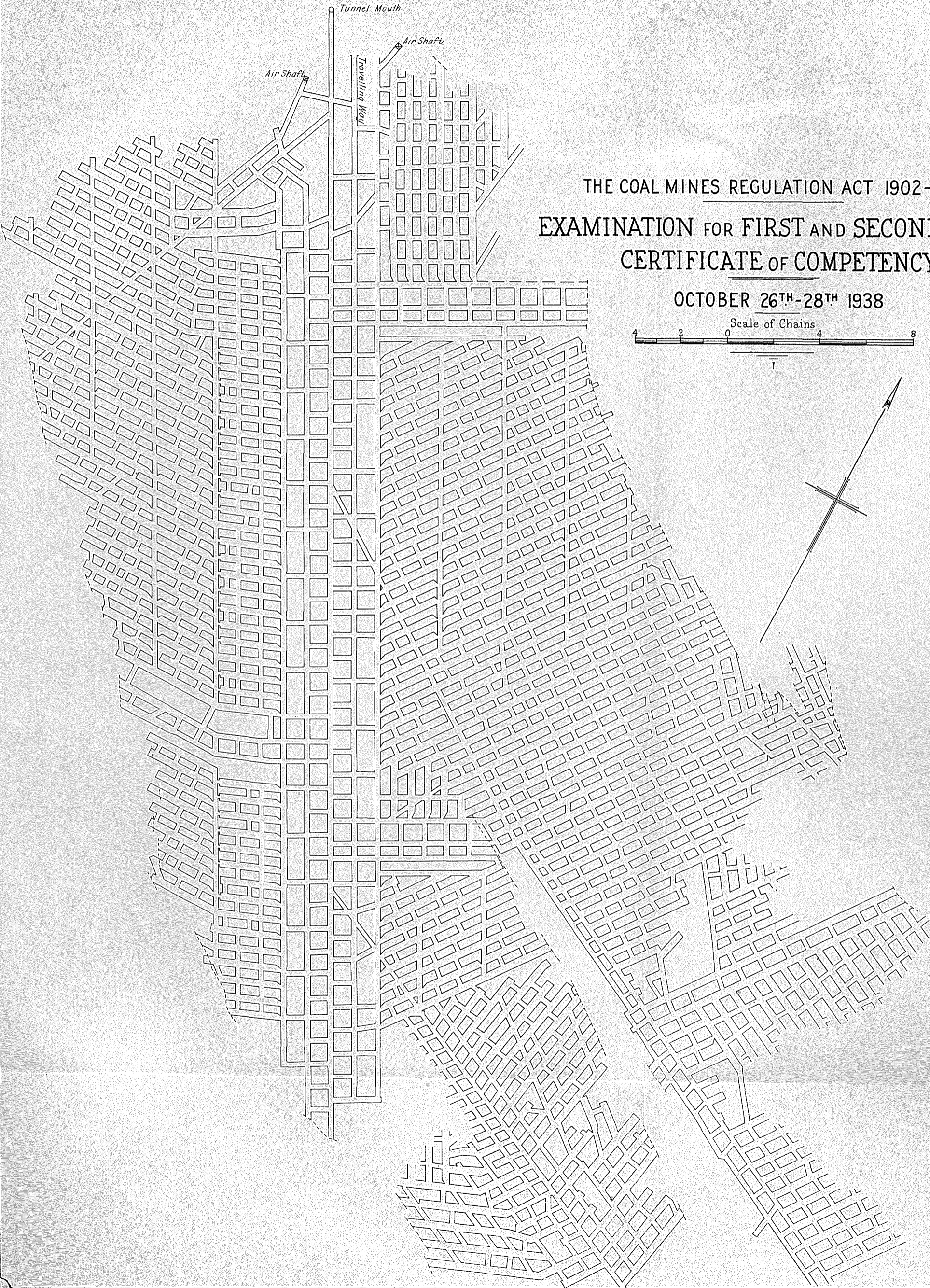
24th May, 1938.

Time allowed Three hours.

EIGHT questions only to be answered. All questions are of equal value.

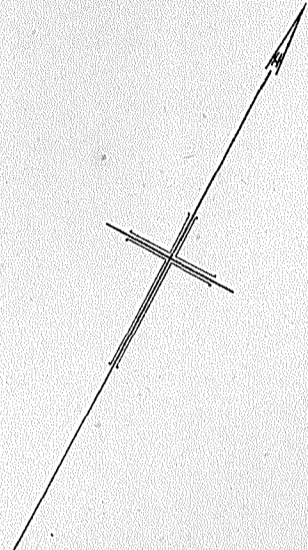
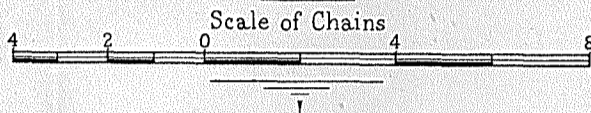
Candidate should illustrate with sketches, where possible.

1. Give the different methods of stoping with which you are acquainted. Under what conditions would you use each method? Whom would you hold responsible for safe working conditions in the stope during working hours?
2. Describe the general methods of timbering levels—
 - (a) In soft and hard ground.
 - (b) In wide or narrow ore bodies.
3. A three compartment shaft is down 200 feet, and it is decided to crosscut and drive levels each way. How would you ventilate the workings and what precautions would you take to avoid accidents from the accumulation of fumes?
4. A winze is down 80 feet and rock drills are in use for boring. A man has become overcome with fumes whilst bogging out. What steps would you take to rescue him?



THE COAL MINES REGULATION ACT 1902-1926
EXAMINATION FOR FIRST AND SECOND CLASS
CERTIFICATE OF COMPETENCY

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5. What are the sources of dust in mines, and what precautions would you take to keep the air free from dust? Show how you would ventilate a winze, stope, and drive.
6. A drive is being taken in hard ground, 7ft. x 5ft. What type of rock drill would be suitable? Show the position of the holes in the face, and how should they be charged and fired.
7. How should a stope be worked in oxidised ground with both back and walls very bad standing?
8. How would you sink a three-compartment shaft a lift of 100ft. from the 700ft. level, timber it, and open out the plat? What steps would you take to insure the safety of the men working in the shaft?
9. Describe the method an old level which has fallen in should be picked up and reconditioned.
10. State what you know about—
 - (a) Blasting powder.
 - (b) Gelignites.
 - (c) Detonators.
 - (d) Fuse.
 - (e) Cartridges.
 How should explosives be stored, distributed, and handled?
11. How would you sink a winze to a depth of 80 feet? Explain the equipment to be used. How would you safeguard the winze-sinkers' health?

Mines Regulation Act, 1906.
(Regulation 17A.)

EXAMINATION FOR CERTIFICATE OF COMPETENCY AS UNDERGROUND SUPERVISOR.

Subject: MINING LAW.

24th May, 1938.

Time allowed One and a half hours.

SIX questions only to be answered.

All questions are of equal value.

1. What provision does the Mines Regulation Act, 1906, make for ventilation and removal of dust from development ends and winzes? What are the duties of dust and ventilation officers?
2. When more than one charge is to be exploded, what method of firing is prescribed— (a) in winzes, (b) in drives, (c) in stopes? Describe this system briefly. How may fuses be lit, and how may they not be lit?
3. Describe the three types of main magazines permitted by the Mines Regulation Act, 1906, and also the distributing magazine with special reference to their construction and location. What quantities of explosives may be stored in each?
4. For what purposes may men be employed on a mine on Sundays? Under what conditions may exceptions be made?
5. Under what conditions may cyanide tailings be used for filling underground?
6. State briefly the sanitary provisions that must be made underground.
7. What safety devices must be provided on cages used for raising and lowering men? How and when must these devices be examined and tested?
8. State what you know of the testing of winding ropes and the keeping of the ropes in good working condition.

Mines Regulation Act, 1906.

(Regulation 17A.)

EXAMINATION FOR CERTIFICATE OF COMPETENCY AS UNDERGROUND SUPERVISOR.

Subject: MINING.

11th October, 1938.

Time allowed Three hours.

Eight questions only to be answered.

All questions are of equal value.

Candidates should illustrate with sketches, where possible

1. Tailings which had been used to fill a stope, broke through into the level below, causing about 50 feet of timbered drive to collapse. How would you re-condition the drive?
2. Describe how you would sink, equip and timber a small vertical prospecting shaft. How would you provide for ventilation when cross-cutting or driving from the shaft?
3. A double track drive for a main haulage is to be driven through moderately heavy ground. Describe, with sketches, how you would bore and fire the face and how you would timber the drive.
4. An ore-body, 500 feet long, and 10 feet wide, is nearly vertical. The walls are strong, and the upper levels have been filled. The level has been driven at 800 feet. Describe how you would stope out the whole block of ore between the 800 and 700 feet levels, keeping the 700 feet level open.
5. Outline all the methods you know used to minimise dust underground. Which do you consider the best method and why?
6. A vertical three-compartment shaft is to be sunk from 1,000 feet to 1,500 feet, and ore is to be hauled from above the 1,000 feet level during sinking. Give a full description of the method of sinking the shaft, equipment to be used, and safety precautions to be adopted. How would you timber the shaft if the ground were good standing ground?
7. Describe fully shrinkage, flat-back, and rill stoping. What conditions would govern the adoption of any particular method and why? What are the advantages and disadvantages of each method?
8. At what speed does fuse burn? How is its burning rate tested? What causes misfires and how would you treat a misfire? Explain fully the system of cartridge firing.
9. You are instructed to commence sinking a winze between two levels. Give full details showing how you would commence operations, with an account of the necessary equipment for commencing and continuing operations. How would you provide for ventilation of the winze? How would you keep the winze free from water if in wet ground?
10. Give brief descriptions of:—
 - (a) Testing of safety grips on cages.
 - (b) Testing of hoisting ropes.
 - (c) Construction and correct use of venturi blowers.
 - (d) The duties of a shift boss.
 - (e) Storage and transport of explosives underground.

Mines Regulation Act, 1906.

(Regulation 17A.)

EXAMINATION FOR CERTIFICATE OF COMPETENCY AS UNDERGROUND SUPERVISOR.

Subject: MINING LAW.

11th October, 1938.

Time allowed One and a-half hours.

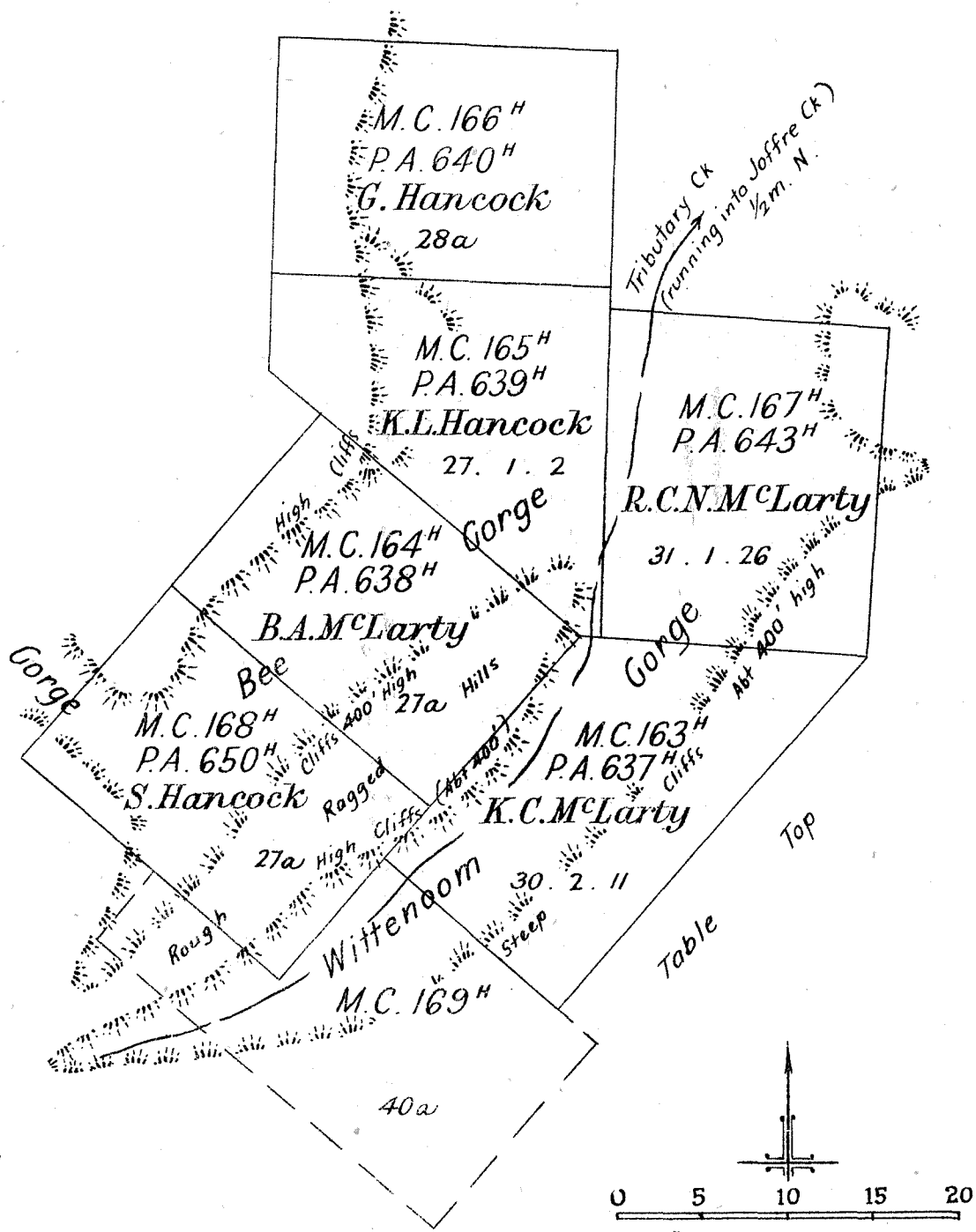
All questions to be answered.

All questions are of equal value.

1. State the provisions of the Mines Regulation Act, 1906, regarding lighting of fuses, method of firing charges, and the time for blasting.
2. What sanitary provisions must be made underground?
3. In connection with the ventilation of underground workings, state what conditions must exist as regards:
 - (a) Percentage of carbon dioxide in the air.
 - (b) Temperature.
 - (c) Air currents.
4. What are the provisions of the Mines Regulation Act, 1906, with regard to change houses?
5. How should ladders be fixed in a shaft? State briefly when and how winding ropes must be examined.
6. What provisions must be made for removing dust from development ends? What are the duties of dust and ventilation officers?

PLAN OF MINERAL CLAIMS AT HAMERSLEY RANGE

Surveyed by F. G. Medcalf



APPENDIX No. IV.

REPORT ON HAMERSLEY RANGE BLUE
ASBESTOS.

By John S. Foxall, B.E. (Syd.),
Assistant State Mining Engineer.

19th July, 1938.

Hamersley Range Blue Asbestos.

On my recent visit to the Hamersley Range district accompanied by Inspector G. Matheson, I made a detailed examination of the workings in Wittenoom Gorge, a plan of which, together with Bee Gorge, is attached. The plan is made from field notes prepared by Mr. Surveyor F. G. Medcalf, who recently surveyed Mineral Claims 163H-168H inclusive.

General Description.

Ascending a steep declivity eastward from about midway along the western boundary of M.C. 167, the ledge on which the principal workings exist was reached at a point some 150 to 200 feet vertically above the creek bed. The last 12 to 15 feet was ascended by scrambling up a cleft in the face of a vertical cliff.

This ledge is almost perfectly flat and has been cleaned down to a width varying from 3 to 20 feet. The asbestos here appears in two horizontal seams, about 4 feet apart. The bottom seam consists of a practically unbroken ribbon of asbestos varying in width from 1½ in. to 2 in., all long fibre. This can be followed for a distance of about 30 chains. The top seam is about 12 inches thick and contains a number of veins of asbestos with fibre lengths varying from ½ in. to 1 in.

Towards the southern boundary of M.C. 163H the deep gorge appears to terminate abruptly in a cliff, half-way across which the wide ribbon has been worked. After reaching this point it was necessary to descend to the creek bottom and scale, by means of a rope, a precipice about 60 feet high. Above this precipice the workings were continued on the western side of the gorge, until the wide ribbon of asbestos disappears into the floor of the gorge, some three or four chains upstream from the cliff. At this point the upper layer of this seam has widened out to a thickness of 2 feet, with lenticular veins showing fibre from ¼ in. to 2 in. in length.

In addition to the seam described above, there exist two other parallel seams of asbestos, one about 20 feet above and the other 20 feet below the working seam. I examined these at one or two accessible points, and the top seam showed fibre up to 2 inches in length, while the bottom one showed two ribbons about 2 feet apart with ½ in. to ¾ in. fibre. It is difficult to say whether these seams would be payable or not as they have not been opened up sufficiently for a reliable inspection to be made.

From the eastern side of the gorge, all three seams may be seen for the full length of the western side, but they are inaccessible for close inspection excepting at the cliff across the creek, where the asbestos in the working seam appears to be of better quality, if anything, than on the eastern side.

Geological.

In the immediate vicinity of the asbestos deposits, the stratification of the rock appears to be as follows:—

- Dolomite—18 in. to 2 ft.
- Jasperoid Rock—6 in. to 9 in.
- Ironstone Casing—½ in. to 1 in.
- Asbestos—1½ in. to 2½ in.
- Ironstone Casing—½ in. to 1 in.
- Banded Quartzite.

Working.

The working to date has been confined to the main ribbon of long fibred material, as the hand dressing of the short fibres would be too costly under the present primitive conditions. The ironstone casing is very hard and very strongly attached to the fibre and it is a day's work for a man to clean from 1 to 2 bags (of 100 lb.) by hand knapping.

No actual underground work has been done. To date it has been possible to remove the overburden and get at the main asbestos ribbon. This method, however, has advanced in most places as far as is compatible with safety, as it is not permissible to undercut the cliff to any extent.

As it is probable that larger scale operations will commence in the near future, regular inspections will be necessary to see that safety precautions are observed.

If larger scale operations are to be undertaken, a certain amount of experimental work will be necessary in order to finally decide on the best and most economical method of mining.

Although to all appearances the deposit seems to be enormous, yet it is not known how far the asbestos extends into the face of the cliffs, and it is impossible at this juncture to give even an approximate estimate of reserves.

It is certain that, in mining, it will be necessary to leave a large proportion of pillars. In this the operations will bear some resemblance to coal mining. The proportion to be left cannot be estimated until such time as the deposit is opened up, and the nature of the ground tested. Many of these pillars may possibly be eventually won by packing behind them with the mullock which will form the greater part of the rock broken during mining operations. Until some experimental work is done, the quantity of fibre lost in pillars cannot be estimated.

Before entering into any contract to supply regular quantities to consumers, a certain amount of blocking out will be necessary in order to secure regularity of production.

Certain grading tests will be required to ascertain the percentages of different length fibre that can be anticipated, and the treatment of rock mined from development would be, I think, the only reliable indication of the amount of fibre in the blocked out ore.

The method of handling ore and materials in this particular locality would doubtless be some sort of flying fox, to transport the ore to the plant and material to the miners on the cliff side.

Transport will also be an initial problem. At present donkeys are used to transport the bags of fibre to a point outside the gorge whence it can be handled by motor transport, but the provision of a passable road will be a necessity if major operations are to commence. Government assistance will doubtless be sought later in regard to this matter.

The Australian Blue Asbestos Company, N.L., has purchased M.Cs. 163H, 164H, and 167H and has taken up M.C. 169H and are considering commencing immediate operations. It is not known at present what their exact intentions are, but in my opinion they would be wise if for the present they considered themselves in the light of a development and exploration company, installing a small plant for the treatment of their development ore, and developing and blocking out future ore reserves whilst making tentative marketing arrangements for the future.

Although it is impossible to make an estimate of reserves, I am confident that there is sufficient fibre in this gorge alone to warrant preparations for large scale mining operations, provided that a market can be found for the product at reasonable prices.

I also visited Yampire Gorge, but owing to rain setting in, which made climbing very dangerous, and promised to make the road to Mulga Downs impassable, I returned without an examination of this or Dale Gorge. From descriptions received, however, and samples of asbestos seen from these two localities, I have no reason to disbelieve that the deposits there are similar to that at Wittenoom Gorge.

Good floaters of long fibre have also been found as far as 30 miles eastward from Yampire Gorge, which leads to the belief that there are other as yet undiscovered deposits in the Hamersley Range.

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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 the 31st December, 1938.

The year has been an eventful one as, in addition to the tonnage crushed being a record one, the value of the output since the inception of the system exceeded the ten million mark in November.

Details of the output since inception are as follows:—

	1928.	1936.	1937.	1938.
Tons Milled ...	16,271	102,086	102,800	108,966
Tons Cyanided ...	15,474	110,543	110,263	103,175
	<u>31,745</u>	<u>212,629</u>	<u>213,063</u>	<u>212,141</u>

Production at Par—

By Amalgamation ...	...	...	6,671,517·09
„ Sands ...	...	...	1,315,706·93
„ Slimes ...	...	...	265,266·11
„ Residues ...	...	...	10,531·72
Total at Par ...	...	...	<u>£8,263,071·85</u>

Gold Premium—

By Amalgamation ...	...	...	1,382,145·41
„ Sands ...	...	...	441,913·99
„ Residues ...	...	...	197·98
Total Australian Currency ...	...	...	<u>£10,087,329·23</u>

Tons of Tin Ore Milled—

Production:			
By Black Tin ...	...	...	93,833·96
„ Residues ...	...	...	572·20
			<u>£10,181,735·39</u>

Exclusive of three leased batteries, 20 departmentally owned plants crushed 108,966 tons of ore, compared with 108,300 tons in the peak year, 1935, and 16,271 tons in the low record year of 1928.

VALUE OF PRODUCTION.

2,278 parcels of prospectors' ore, averaging 47·83 tons per parcel, were treated for 59,489·3 ounces of bullion recovered by amalgamation, estimated to contain 50,427·05 ounces of fine gold, worth £446,751 (A). In addition, our tailing plants produced bullion worth £140,275, making a total yield of £587,026 (A), a record, and one which brings the State Batteries into fourth position amongst the producers in the State, the above yield being exceeded by Lake View and Star Group, Wiluna Gold Mines and the Great Boulder Proprietary.

The total yield in fine ounces was 73,253·2 as against 60,031·4 in 1937.

VALUE OF ORE PER TON TREATED.

108,966 tons crushed yielded 50,427·1 ounces fine gold by amalgamation, equal to 9 dwts. 6·1 grs. per ton and valued at £1 19s. 3d. The average value of tailing produced was 4 dwts. 4·5 grs. worth 17s. 9d., a total value of 57s. per ton with gold at £4 4s. 11½d. per ounce.

The average head value was therefore 13 dwts. 10·5 grains, against 12 dwts. 20 grains in the previous year.

The exceptionally high returns of large tonnage crushed by the Blue Bird Company at Norseman is responsible to a large extent for the high average value of ore treated.

ESTIMATED PERCENTAGE RECOVERY.

The whole of the tailing produced was not treated and slightly over 3 per cent. was untreatable, but, allowing the average extraction obtained at all tailing plants, viz. 76 per cent., to apply to the tailing the estimated recovery is as follows:—

Head Value—13 dwts. 10·5 grs.			
			%
By Amalgamation ...	9 dwts. 6·1 grs.	=	68·86
„ Tailing Treatment ...	3 dwts. 4·38 grs.	=	23·68
Total Extraction ...	...	=	<u>92·54</u>

RECEIPTS AND EXPENDITURE.

Revenue from all sources was £124,179 11s. 11d. as against £121,589 in 1937. Expenditure was £112,557 0s. 9d. compared with £112,386 14s. 5d. in the previous year.

Milling revenue per ton dropped slightly but the cost per ton decreased considerably. Tailing treatment costs showed a slight increase but revenue was correspondingly greater. Comparative results shown later in this report set out the position clearly.

The receipts exceeded the expenditure by £11,612 11s. 2d. (see Synopsis later in report).

MILLING.

Excluding Mt. Sir Samuel, Linden and Darlot Batteries (leased batteries), and Jimble Bah, which crushed no ore and was dismantled during the year, one 20-head, five 10-head and fourteen 5-head batteries were in operation.

A comparison of the stamp hours run is as follows:—

	1937.	1938.
Hours run, including stops ...	615,575	621,365
Hours run, excluding stops ...	552,645	553,720

2,278 parcels of ore were treated, averaging 47.83 tons per parcel, as against 2,245 and 45.75 tons per parcel in 1937.

The tonnage milled, 108,966, exceeded the previous year's figure by 6,126 tons.

Batteries crushing over 5,000 tons, with tonnages in parentheses were—Kalgoorlie (20,372); Ora Banda (11,437.5); Coolgardie (10,457); Peak Hill (7,226.25); Meekatharra (6,809.50); Cue (5,933); Boogardie (5,925.50); Payne's Find (5,445.75); Marble Bar (5,128). See Schedules I. and III.

Kalgoorlie increased its tonnage from 15,277 tons in 1937 to 20,372 and this is the first time in our history that one battery has crushed more than 20,000 tons in a year.

Ora Banda mill crushed 11,437 tons, a notable increase over the 9,335 tons treated in the previous year.

Stamp Duty.

The efficient nature of our plants is reflected in the following figures:—

	1937.	1938.
Tons per Stamp	4.46	4.72

Corduroy Strakes.

Most of the larger companies use strakes for the recovery of the free gold so as to eliminate mercury from their grinding circuits and some prospectors have had the idea that this method would be preferable to amalgamation in the box and the use of copper plates.

Strakes were tried during the year after the plates at Mt. Ida on an ore containing an appreciable amount of iron pyrite and the result proved conclusively that the very small amount recovered was derived from the finer grinding in the Berdan pan of the concentrates recovered on the strakes and the recovery was not commensurate with the cost of the operation.

Cost per ton.

The milling cost per ton dropped from 13s. 5.7d. in 1937 to 12s. 10.9d. This is the lowest figure since 1919.

Kalgoorlie, with a cost of 9s. 9.1d. per ton has the best figure and the highest cost was at Bamboo Creek, viz. 20s. 5.8d.

These isolated places, like Bamboo Creek, where there is insufficient ore to keep the mill running full time, are very expensive and are responsible for the high average cost of the system.

Revenue per ton.

Revenue per ton was 9s. 1.9d., as against 9s. 3.2d. in the previous year, and it will be seen that a large proportion of the ore is crushed by time.

Encouragement to do so was given when it was decided during the year that the maximum charge for crushing by time could not exceed 10s. 6d. per ton, the charge made for crushing on a tonnage basis.

TAILING TREATMENT.

No treatment was undertaken at St. Ives or Jimble Bah, but all other tailing plants were in operation. Nineteen plants treated 103,175 tons, with a head value of 4.03 dwts., the average residue value being 0.96 dwts. and the extraction 76.13 per cent.

The call was £67,477 at 84s. 11½d. per ounce, and the recovery, inclusive of an estimated recovery from slags £700, £67,533, with premium the value of the gold cleaned up amounted to £140,275. Percentage extractions ranged from 84.67 per cent. to as low as 60.31, due to the non-amenability of the tailing.

I am pleased to report that practically the whole of the tailing at Mt. Ida, which contains appreciable quantities of copper, was treated and customers paid on a 70 per cent. basis. This is only the second year of treatment and speaks well of the staff handling this material.

At Marble Bar, where no tailing was treated for many years, 3,376¾ tons were purchased at ordinary rates from 5,128 tons crushed and the amount paid to prospectors will be approximately £9,000.

The head value of tailings treated was very close to the 1936 figure and considerably higher than that of 1937, due to the very high results from the Comet Mine at Marble Bar in 1936 and the Blue Bird at Norseman for the year under review. Comparative details are as follows:—

Year.	Tons Treated.	Head Value.	Residue Value.	Extraction.	Value of Call at 84s. 11½d. per oz.	Value Recovered.	Value, including Premium, Recovered.
		dwts.	dwts.	%	£	£	£
1938	103,175	4.03	.96	76.17	67,477	67,533	140,275
1937	110,263	3.62	.90	75.13	63,664	63,465	129,543

Though all plants show slight shortages or surpluses over call it is interesting to note the closeness of the call and recovery figures for the system and speaks well for the officers in charge. I venture to say few, if any, privately owned plants could approximate these results.

The extraction of 76.17 per cent. is approximately 1 per cent. above the previous year's figure and is to be expected with a higher head value but the percentage of refractory tailing treated has considerably increased.

At Payne's Find 5,432 tons of difficult semi-sulphide material, with a head value of only 1.86 dwts. was treated, giving an extraction of 62 per cent., whilst at Peak Hill 5,062 tons were cyanided with a head value of 1.65 dwts.

Value of tailing produced.

Schedule 5 attached shows the tonnage of tailing above the purchaseable minimum of 2 dwts. 8 grs. called payable, and that below this figure and refractory or untreatable at each battery. The tonnage is based on 90 per cent. of the tonnage crushed.

Totals are as follows:—

	Tons.	Head Value. Dwts. Grs.	%
Payable	51,898·5	6 9	52·89
Unpayable	43,103	1 10	43·95
Untreatable due to cop- per	3,111	4 20	3·16

It will be noted that approximately half the tailing produced averages only 1 dwt. 10 grains, or contains too much copper to treat.

The fact that only 3.16 per cent. could not be handled is highly satisfactory.

Cost and revenue per ton.

The cost of treatment rose from 7s. 9.7d. in 1937 to 8s. 2.1d., due to increase in the basic wage, and larger tonnages treated of semi-refractory tailing and increased tonnages handled at remote plants like Marble Bar and Bamboo Creek.

Receipts rose from 13s. 5.8d. to 14s. 4.7d., due to the higher valued tailing handled, especially at Norseman.

Comparative Synopsis of Results at State Batteries for Twelve Months ended 31st December, 1937 and 1938.

	1937.			1938.		
	Tonnage.	Expenditure per Ton.	Revenue per Ton.	Tonnage.	Expenditure per Ton.	Revenue per Ton.
Milling	102,800·25	s. d. 13 5·7	s. d. 9 2·2	108,966	s. d. 12 10·9	s. d. 9 1·9
Tailing Treatment ...	110,263	7 9·7	13 5·8	103,175	8 2·1	14 4·7

Receipts and Expenditure.

	Tonnage.	Expenditure.	Revenue.	Profit.	Loss.
Milling	108,966	£ s. d. 70,323 19 10	£ s. d. 49,926 9 4	£ s. d.	£ s. d. 20,397 10 6
Tailing	103,175	42,206 11 7	74,245 5 7	32,038 14 0	...
Tin Treatment ... ..	...	26 9 4	7 17 0	...	18 12 4
Less Loss ... ..	...	112,557 0 9	124,179 11 11	32,038 14 0	20,416 2 10
Net Profit ... ..	...	...	...	20,416 2 10	11,612 11 2

CARTAGE SUBSIDIES.

Details of assistance to prospectors both at State Batteries and privately owned mills are as follows:—

Year.	Tons Crushed.	State Batteries.			Private Batteries.		Total.
		Tons Claiming Subsidy.	Percentage Ore Crushed.	Amount Paid.	Tons Claiming Subsidy.	Amount Paid.	
1936 ...	102,086	43,946	% 43·05	£ s. d. 12,416 2 6	13,541	£ s. d. 3,648 13 0	£ s. d. 16,064 15 6
1937 ...	102,800	30,625	29·8	11,202 16 0	8,786	2,900 8 6	14,103 4 6
1938 ...	108,966	29,599	26·2	12,481 7 7	6,745	2,593 12 7	15,075 0 2

In 1936 when the old subsidies were in force subsidies amounting to £16,064 19s. 6d. were paid on 43.05 per cent. of the 102,086 tons crushed. With the new subsidies now being paid during 1938 the expenditure was £14,745 0s. 2d. on 26.2 per cent. of the 108,966 tons crushed. The amount paid to State Battery customers was approximately £1,200 more than in 1937, but that to private mills fell by a corresponding amount and the total figures for the last two years are very close, viz., £14,103 4s. 6d. and £14,945 0s. 2d.

ERECTION AND RECONSTRUCTION.

The following are details of work done and charged to Capital Account.

Wiluna.—The old cast iron battery frame was replaced with a new timber frame. Frenier pump and sampler house receiving attention, whilst a concrete floor was laid round the battery, and a new blacksmith shop erected.

Meekatharra.—New sills and battery frame and thorough overhaul of plant and shaft pump completed. Also new stables were erected.

Norseman.—Complete overhaul, which included replacement of old Tangye gas engine with a reconditioned engine of the same type, rebuilding and enlargement of engine room, moving of scrubber water tank, and new battery frame. Erection of prospectors' room and removal of sampler house and overhaul of weighbridge and precipitation house.

Mt. Ida.—Electrical equipment has been installed at the battery water supply, thus replacing the McDonald 8-10 fuel oil engine. A start has been made on new tailing plant. Two new vats 18ft. by 4ft., together with ramp, have been installed.

Sandstone.—Similar electrical equipment for water supply has been installed. Motors being placed on the Crossley and Lister wells.

Payne's Find.—Electrical equipment has also been installed at this battery.

Kalgoorlie.—Two new 18ft. x 4ft. vats were installed and the employees' change house enlarged.

Marble Bar.—Is at present being increased from 5 to 10 head and new tailing plant provided. This work should be completed about the end of January.

Boogardie.—Prospectors' room erected.

An analysis of the expenditure is as follows:—

General Loan Fund—		£	s.	d.	£	s.	d.
Wages	...	3,751	5	2			
Government Utilities	...	4,729	1	4			
Other	...	3,313	10	4			
					11,793	16	10
Assistance, Gold Mining—							
Wages	...	216	10	4			
Government Utilities	...	254	1	0			
Other	...	144	2	9			
					614	14	1
Total	...				£12,408	10	11

STAFF.

Movements during the past year were as under.

Bamboo Creek.—J. Chegwidien, leading hand at Meekatharra, after returning to that battery from Yarri, is now at Bamboo Creek.

Meekatharra.—A. E. Hepworth took his leave in January and in October was relieved by E. Speering, who is now in charge of this plant.

Ora Banda.—A. E. Hepworth is now in charge of this battery having relieved T. E. Prosser who went into hospital in October.

Cue.—W. J. Weekley resumed duty at this plant after taking his leave early in the year.

Laverton.—A. H. Cook had his leave, together with sick leave, and later three months' leave without pay and resigned from the service at the end of the year, F. J. Breustedt taking over this and Yarri batteries.

Payne's Find.—P. F. Hogg, who had been relieving at Wiluna and Yarri, relieved F. J. Breustedt at this plant in October.

Yalgoo-Warriedar.—L. E. Thompson relieved F. J. Breustedt of the management of these batteries in October and G. Macfarlane went to Yalgoo to assist him as assayer at the end of November.

Peak Hill.—Bain Hogg relieved E. J. Speering at this plant in October.

ADMINISTRATION.

	£	s.	d.
Salaries	3,030	11	2
Inspection, including Salary of Inspector	1,036	4	0
Workers' Compensation	2,270	13	6
Postage		80	0
Printing	182	14	1
Sundry Fares, etc.	208	13	0
	£6,808	15	9

SUMMARY.

The tonnage crushed, namely 108,966, was a record and the cost of crushing the lowest since 1919 despite the increased cost of wages, etc.

The output for the system passed the ten million mark during the year and the yearly output approximately £600,000, also constituted a record and placed the system in fourth place amongst the State's producers. The average value of the ore treated was slightly higher and the estimated extraction was 92.54 per cent.

The average head value was 13 dwts. 10 grains and the average residue 0.98 dwts.

52.89 per cent. of the tailing produced exceeded 2 dwts. 8 grains in value, 43.95 per cent. averaged 1 dwt. 10 grs. per ton and 3.16 per cent. contained too much copper to treat.

CONCLUSION.

Before closing my report I would like to thank the staff, both at Head Office and in the fields, for the very excellent work they have done and the economies effected as is shown by the lower cost of administration, and the continued decrease in the cost of crushing.

Many of the 2,278 parcels treated were complex and the majority of the parcels now forthcoming are of a schistose nature, requiring careful handling of tailing.

At almost all plants the percentage of copper in the tailing treated is increasing, making the treatment more difficult, especially in the clean up.

Our plants are now in excellent condition and are availed of freely by companies in their initial stages of development.

Owners are reaping the benefit of the increased efficiency when crushing by time and the concession granted during the year, providing that the maximum cost of time crushing shall not exceed 10s. 6d. per ton, the cost of crushing by the ton, permits all owners to book by time without the risk of finding it more expensive than on the tonnage basis.

Since the first of July owners have been paid at the rate of £4 4s. 11½d. per ounce as against the £4 per ounce charged since the inception of the system and still paid by all private treatment plants. This concession will cost the Department approximately £5,000 per annum.

The erection of an up-to-date 10-head plant, equipped with rockbreaker bins and self-feeders, at Marble Bar will materially assist this district where the ore available has been more than our old plant was capable of handling, resulting in congestion and hardship to owners and business people, and at the same time will reduce the cost of crushing considerably.

D. F. BROWNE,
Superintendent of State Batteries.

28th April, 1939.

SCHEDULE 1.

Return showing Tons Crushed, Gold Yield by Amalgamation, Average per ton in Shillings, and Total Value without Premium for Year ended 31st December, 1938.

Battery.	Tons Crushed.	Gold Yield Bullion.	Value per ton, in Shillings and Pence.	Total Value without Premium.
Bamboo Creek	2,702	ozs. 1,382·85	s. d. 36 10·2	£ 4,978·26
Boogardie	5,925·50	4,047·75	49 2·2	14,571·90
Coolgardie	10,457	4,715·05	32 5·6	16,974·18
Cue	5,933	4,143·15	50 3·3	14,915·34
Kalgoorlie	20,372	6,017·35	21 3·2	21,662·46
Laverton	4,671	2,196·50	33 10·3	7,907·40
Marble Bar	5,128	2,578·85	36 2·5	9,283·86
Meekatharra	6,809·50	3,806·15	40 3	13,702·14
Mt. Ida	3,834·25	2,016·80	37 10·5	7,260·48
Norseman	4,405·50	10,345·75	169 1	37,244·70
Ora Banda	11,437·50	5,936·70	37 4·5	21,372·12
Payne's Find	5,443·75	3,951·50	52 3·1	14,225·40
Peak Hill	7,226·25	1,585	15 9·5	5,706
Sandstone	3,427·75	1,329	27 11	4,784·40
Warriedar	1,993·50	741·30	26 9·3	2,668·68
Wiluna	3,351·25	1,397·40	30 0·3	5,030·64
Yalgoo	2,306·50	1,232·75	38 5·7	4,437·90
Yarri	3,222·50	1,975	44 1·5	7,110
Youanmi	319·25	90·45	20 4·8	325·62
	108,966	59,489·30	39 3·4	214,161·48

SCHEDULE 2.

Tailings Treatment for 1938.

Battery.	Tonnage.	Yield.	Value.	Premium.	Total.
Bamboo Creek	2,429	Fine ozs. 595·44	2,529·682	2,818·770	5,348·452
Boogardie*	6,801	1,339·99	5,690·912	6,252·704	11,943·616
Coolgardie	10,060	1,137·22	4,914·767	5,351·873	10,266·640
Cue	4,274	1,053·68	4,475·086	4,986·300	9,461·386
Kalgoorlie	18,570	2,071·71	8,798·622	9,658·429	18,457·051
Laverton	5,720	678·69	2,882·453	3,123·777	6,006·230
Marble Bar	3,150	1,086·57	4,614·682	5,066·906	9,681·588
Meekatharra	5,230	797·83	3,388·497	3,786·440	7,174·937
Mt. Ida	3,872	541·49	2,298·448	2,501·968	4,800·416
Norseman	4,470	2,377·10	10,095·523	11,152·967	21,248·490
Ora Banda	11,205	1,483·55	6,300·599	6,857·198	13,157·797
Payne's Find	5,432	331·41	1,407·498	1,568·927	2,976·425
Peak Hill	5,062	316·82	1,345·566	1,495·266	2,840·832
Sandstone	3,330	416·64	1,769·474	1,967·408	3,736·882
Warriedar	2,136	216·69	920·244	984·037	1,904·281
Wiluna	3,510	635·28	2,698·183	2,887·519	5,585·702
Yalgoo	2,580	145·90	616·683	679·670	1,296·353
Yarri	3,600	401·20	1,703·957	1,904·564	3,608·521
Youanmi	150	45·63	193·800	198·746	392·546
	101,581	15,672·84	66,644·676	73,243·469	139,888·145
*Boogardie Residues	1,594	44·55	189·200	197·979	387·179
	103,175	15,717·39	66,833·876	73,441·448	140,275·324

SCHEDULE 3.

Return showing Number of Parcels treated and tons crushed at State Batteries for Year ended 31st December, 1938.

No. of Parcels Treated.	Battery.	Tons Crushed.	Yield by Amalgamation, Bullion.		Yield by Amalgamation, Fine Gold.		Gross Contents of Tailings on 100% (including Refractory), Fine Gold.		Total Contents of Ore, Fine Gold.		Average per ton, Fine Gold.	Gross Value, per ton.
			ozs.	dwts.	ozs.	dwts.	ozs.	dwts.	ozs.	dwts.	dwts. grs.	£ s. d.
54	Bamboo Creek	2,702	1,382	17	1,172	3	762	17	1,935	0	14	8
145	Boogardie	5,925·5	4,047	15	3,431	2	1,837	0	5,268	2	17	19
231	Coolgardie	10,457	4,715	1	3,996	15	1,566	6	5,563	1	10	15
174	Cue	5,933	4,143	3	3,511	19	1,767	18	5,279	17	17	19
439	Kalgoorlie	20,372	6,017	7	5,100	13	3,222	11	8,323	4	8	4
139	Laverton	4,671	2,196	10	1,861	18	727	10	2,589	8	11	2
117	Marble Bar	5,128	2,578	17	2,186	0	1,911	0	4,097	0	15	23
86	Meekatharra	6,809·5	3,806	3	3,226	6	1,348	10	4,574	16	13	11
77	Mt. Ida	3,834·25	2,016	16	1,709	11	738	3	2,447	14	12	19
134	Norseman	4,405·5	10,345	15	8,769	13	3,145	18	11,915	11	54	2
193	Ora Banda	11,437·5	5,936	14	5,032	6	1,719	16	6,752	2	11	19
39	Payne's Find	5,443·75	3,951	10	3,349	13	497	5	3,846	18	14	3
71	Peak Hill	7,226·25	1,585	0	1,343	11	557	15	1,901	6	5	6
84	Sandstone	3,427·75	1,329	0	1,126	18	745	10	1,872	7	10	22
40	Warriedar	1,993·5	741	6	628	8	527	9	1,155	17	11	14
52	Wiluna	3,351·25	1,397	8	1,184	10	840	19	2,025	9	12	2
90	Yalgoo	2,306·5	1,232	15	1,044	19	293	14	1,338	13	11	15
103	Yarri	3,222·5	1,975	0	1,674	3	557	14	2,231	17	13	20
10	Youanmi	319·25	90	9	76	13	58	8	135	1	8	11
2,278	Totals	108,966	59,489	6	50,427	1	22,826	3	73,253	4	13	11

Average tons per parcel 47·83.
 Average yield by amalgamation (fine gold), per ton 9 dwts. 6·1 grains.
 Average value by amalgamation, per ton £1 19s. 3d.
 Average yield of tailings per ton (fine gold) 4 dwts. 4·5 grains.
 Average value of tailings per ton 17s. 9d.

SCHEDULE 4.

Direct Purchase of Tailings.

Battery.	Tons Purchased.	Amount Paid for Tailings.		Amount Paid a/c. Premium.	
		£	s. d.	£	s. d.
Bamboo Creek	1,589	1,373	4 1	1,339	15 4
Boogardie	3,615½	2,775	4 4	3,626	5 4
Coolgardie	5,022	1,841	4 5	2,023	19 3
Cue	3,926½	3,335	11 8	2,974	19 0
Kalgoorlie	7,956½	3,691	13 3	3,124	17 1
Laverton	1,991¼	947	5 4	1,138	4 11
Marble Bar	3,376¾	4,402	3 8	2,954	7 6
Meekatharra	4,584	1,842	19 0	1,313	0 11
Mt. Ida	2,919¼	1,444	18 7	1,324	4 0
Norseman	2,723	6,733	2 8	6,714	2 8
Ora Banda	4,563	1,920	18 11	3,208	14 9
Payne's Find	162½	138	9 4	146	4 8
Peak Hill	1,254½	322	2 7	292	11 8
Sandstone	1,627	613	19 2	526	1 1
St. Ives	...	...	...	29	7 0
Warriedar	781¼	419	4 8	464	19 5
Wiluna	1,612¾	733	14 2	1,852	5 9
Yalgoo	696½	189	9 10	312	9 11
Yarri	1,580¼	735	14 11	711	17 3
Youanmi	134½	74	3 4	568	1 10
Totals	50,115½	33,535	3 11	34,586	9 4

SCHEDULE 5.

Return showing Tailings Payable and Unpayable and Gross Contents for Year ended 31st December, 1938.

Battery.	Tailings Payable.		Tailings Unpayable.		Refractory Tailings.		Totals.	
	tons.	ozs. dwts.	tons.	ozs. dwts.	tons.	ozs. dwts.	tons.	ozs. dwts.
Bamboo Creek	1,790·5	638 10	641·25	48 1	...	...	2,431·75	686 11
Boogardie	4,169·25	1,568 13	1,152	84 13	...	...	5,321·25	1,653 6
Coolgardie	5,063·75	1,104 17	4,221·25	294 12	36	10 5	9,321	1,409 14
Cue	3,496	1,422 10	1,804·25	154 4	77	14 8	5,377·25	1,591 2
Kalgoorlie	8,615	2,233 18	9,693·75	664 9	9	1 19	18,317·75	2,900 6
Laverton	1,831	437 6	1,962·75	139 17	410·25	77 12	4,204	654 15
Marble Bar	2,655	1,493 4	452	34 12	1,590	192 2	4,697	1,719 18
Meekatharra	4,644	1,104 2	1,311	101 2	120	8 10	6,075	1,213 14
Mt. Ida	2,478	556 10	993	102 16	26	5 0	3,497	664 6
Norseman	3,068	2,760 5	897	71 1	...	...	3,965	2,831 6
Ora Banda	4,657	1,134 17	5,621	412 19	...	...	10,278	1,547 16
Payne's Find	136	58 2	4,763	389 9	...	...	4,899	447 11
Peak Hill	2,105	314 9	4,508	187 11	...	...	6,613	502 0
Sandstone	1,685	405 15	1,071	93 11	317	171 13	3,073	670 19
Warriedar	854	217 8	542·75	27 15	397	229 11	1,793·75	474 14
Wiluna	2,216	693 11	756	63 6	...	...	2,972	756 17
Yalgoo	639	115 0	1,332	94 3	105	55 3	2,076	264 6
Yarri	1,662	401 5	1,228	97 8	24	3 6	2,914	501 19
Youanmi	134	38 4	153	14 7	...	...	287	52 11
Totals	51,898·5	16,698 6	43,103	3,075 16	3,111·25	769 9	98,112·75	20,543 11

SCHEDULE 6.—MILLING AND TIN.

Statement of Receipts and Expenditure for Year ended 31st December, 1938.

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	2,702	172 11 2	1,377 2 1	709 14 7	2,259 7 10	16 8·6	256 9 8	252 6 10	2,768 4 4	20 5·8	1,636 5 9	12 1·3	.....	1,132 18 7
Boogardie	5,025·5	268 7 2	1,919 18 7	693 19 6	2,882 5 3	9 8·7	293 4 4	342 11 0	3,518 0 7	11 10·5	2,561 7 9	8 8·8	.....	956 12 10
Coolgardie	10,457	416 9 10	2,352 3 9	1,931 11 0	4,700 4 7	8 11·8	527 9 7	467 0 10	5,694 15 0	10 10·7	4,931 5 8	9 5·1	.....	762 9 4
Cue	5,933	311 7 2	1,175 17 2	780 12 2	2,267 16 6	7 7·7	343 7 3	417 17 3	3,029 1 0	10 2·5	3,015 16 0	10 1·9	.....	13 5 0
Darlot	.....	.....	46 8 3	0 7 10	46 16 1	.....	.....	.....	46 16 1	.....	13 7 6	.....	13 7 6	.....
Jimble Bar	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	92 4 9	.....	45 8 8	.....
Kalgoorlie	20,372	791 9 5	3,188 0 0	3,880 13 3	7,860 2 8	7 8·6	661 12 0	1,418 0 10	9,939 15 6	9 9·1	8,303 4 2	8 1·8	.....	1,636 11 4
Laverton	4,671	359 15 2	1,330 13 2	530 17 2	2,221 5 6	9 0·9	236 4 10	267 5 0	2,724 15 4	11 8	2,343 4 9	10 0·4	.....	381 10 7
Linden	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	57 6 3	.....	56 12 8	.....
Marble Bar	5,128	553 0 1	2,063 13 2	830 0 11	3,446 14 2	13 5	223 0 4	373 16 5	4,043 10 11	15 6·9	2,513 10 10	9 9·6	.....	1,530 0 1
Meekatharra	6,809·5	426 19 9	1,974 6 3	1,517 5 4	3,918 11 4	11 6·1	246 5 4	578 5 3	4,743 1 11	13 11·2	2,732 15 4	8 0·3	.....	2,010 6 7
Mt. Ida	3,834·25	10 13 3	1,725 7 2	1,192 2 11	2,928 3 4	15 3·3	575 7 3	320 11 6	3,824 2 1	19 11·3	1,939 12 9	10 1·4	.....	1,884 9 4
Mulline	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	137 0 0	.....	137 0 0	.....
Mullwarrie	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30 0 0	.....	30 0 0	.....
Mt. Sir Samuel	.....	.....	3 4 3	7 5 0	10 9 3	.....	.....	.....	10 9 3	.....	17 0 6	.....	6 11 3	.....
Norseman	4,405·5	308 15 6	1,926 4 0	1,017 16 0	3,252 15 6	14 9·2	136 8 0	353 19 4	3,743 2 10	16 11·9	2,329 14 9	10 6·9	.....	1,413 8 1
Ora Banda	11,437·5	403 9 1	2,705 13 6	2,178 10 4	5,287 12 11	9 2·9	624 6 0	698 0 11	6,609 19 10	11 6·7	4,450 18 9	7 9·4	.....	2,159 1 1
Payne's Find	5,443·75	284 2 11	2,128 3 11	720 3 9	3,132 10 7	11 3·9	415 0 8	389 19 5	3,937 10 8	11 3·9	2,778 15 3	10 2·5	.....	1,158 15 5
Peak Hill	7,226·25	355 7 6	2,285 9 7	763 13 9	3,404 10 10	11 4·4	284 3 0	419 14 4	4,108 8 2	11 4·4	2,624 6 10	7 3·1	.....	1,484 1 4
Sandstone	3,427·75	306 15 3	1,341 0 6	527 1 7	2,174 17 4	12 8·2	309 3 10	326 1 2	2,810 2 4	16 4·7	1,721 5 10	10 0·5	.....	1,088 16 6
St. Ives	.....	.....	49 11 10	0 7 0	49 18 10	.....	.....	.....	.....	.....	0 3 6	.....	.....	52 17 10
Warriedar	1,993·5	218 5 6	798 19 9	318 15 4	1,336 0 7	13 4·9	430 17 3	129 0 9	1,895 18 7	19 0·3	1,024 18 9	10 3·4	.....	870 19 10
Wiluna	3,351·25	198 3 0	823 19 11	376 16 6	1,398 19 5	8 4·1	246 16 6	355 7 11	2,001 3 10	11 11·3	1,754 19 9	10 5·6	.....	246 4 1
Yalgoo	2,306·5	243 15 3	821 13 0	388 9 7	1,453 17 10	12 7·3	162 12 10	180 19 1	1,797 9 9	15 7	1,184 17 2	10 3·3	.....	612 12 7
Yarri	3,222·5	266 11 10	1,210 0 2	502 16 1	1,979 8 1	12 3·4	219 6 6	296 14 7	2,495 9 2	15 5·8	1,542 9 5	9 6·8	.....	952 19 9
Youanmi	319·25	34 11 2	195 14 5	88 2 1	318 7 8	19 11·5	110 10 5	99 9 8	528 7 9	33 1·5	189 17 4	11 10·8	.....	338 10 5
Tin Plant—	108,966	5,930 10 0	31,443 4 5	18,957 1 8	56,330 16 1	10 4·7	6,302 5 7	7,690 18 2	70,323 19 10	12 10·9	49,926 9 4	9 1·9	289 0 1	20,686 10 7
Greenbushes	.....	.....	13 15 7	.....	13 15 7	.....	.....	12 13 9	26 9 4	.....	7 17 0	.....	.....	18 12 4
Total	108,966	5,930 10 0	31,457 0 0	18,957 1 8	56,344 11 8	.....	6,302 5 7	7,703 11 11	70,350 9 2	.....	49,934 6 4	.....	289 0 1	20,705 2 11
Total Loss	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	289 0 1
														£20,416 2 10

SCHEDULE 7.—TAILING TREATMENT.

Statement of Receipts and Expenditure for Year ended 31st December, 1938.

Battery.	Tonnage Treated.	Expenditure.										Receipts.		Profit.	Loss.
		Management.	Wages.	Assays.	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.	£ s. d.
Bamboo Creek	2,429	139 13 6	638 7 1	65 19 9	293 6 3	1,137 6 7	9 4.3	88 14 9	94 12 2	1,320 13 6	10 10.4	2,507 19 1	20 7.8	1,187 5 7	....
Boogardie	8,395	268 7 3	1,479 12 3	280 12 0	764 1 9	2,792 13 3	6 7.8	91 4 4	288 13 10	3,172 11 5	7 0.9	5,721 19 11	13 7.5	2,549 8 6	....
Coolgardie	10,060	293 19 4	1,612 2 10	236 11 8	1,109 5 0	3,251 18 10	6 5.5	....	342 4 6	3,594 3 4	7 1.7	6,669 18 0	13 1.9	3,075 14 8	....
Cue	4,274	100 14 2	896 19 9	59 14 0	618 9 3	1,675 17 2	7 1.6	64 16 7	184 16 7	1,925 10 4	9 0.1	4,164 6 10	19 5.8	2,238 16 6	....
Kalgoorlie	18,570	281 14 2	3,028 10 7	311 10 6	1,670 2 8	5,291 17 11	5 8.3	5 5 0	742 17 11	6,040 0 10	6 6.1	11,719 8 2	12 7.5	5,679 7 4	....
Laverton	5,720	136 19 2	904 16 9	270 5 6	576 8 2	1,888 9 7	6 7.2	11 15 0	197 9 0	2,097 13 7	7 4	4,070 8 0	14 2.7	1,972 14 5	....
Marble Bar	3,150	269 1 3	1,007 7 5	102 3 0	307 6 8	1,685 18 4	10 8.4	36 0 0	129 7 7	1,851 5 11	11 9.1	2,452 15 4	15 6.5	601 9 5	....
Meekatharra	5,230	244 1 7	1,006 10 3	115 16 5	504 19 4	1,871 7 7	7 1.8	77 9 5	230 1 7	2,178 18 7	8 3.9	4,374 0 2	16 8.7	2,195 1 7	....
Mt. Ida	3,872	237 4 8	736 10 11	254 4 9	493 2 1	1,721 2 5	8 10.6	129 12 1	132 19 7	1,983 14 1	10 2.9	3,032 9 8	15 8.4	1,048 15 7	....
Norseman	4,470	290 0 2	891 19 2	175 8 7	620 18 9	1,978 6 8	8 10.2	27 4 5	210 6 11	2,215 18 0	9 10.9	6,441 0 2	28 9.8	4,225 2 2	....
Ora Banda	11,205	300 3 11	2,385 6 5	164 10 7	1,346 10 0	4,196 10 11	7 8	199 2 8	420 9 4	4,816 2 11	8 7.1	7,200 4 6	12 10.2	2,384 1 7	....
Paynes Find	5,432	192 5 8	767 4 10	97 13 10	576 13 3	1,633 17 7	6 0.1	....	179 15 7	1,813 13 2	6 8.1	2,735 9 10	10 0.8	921 16 8	....
Peak Hill	5,062	269 16 2	878 0 8	62 7 2	542 3 2	1,752 7 2	6 11	142 5 9	178 14 0	2,073 6 11	8 2.3	2,201 0 4	8 8.3	127 13 5	....
Sandstone	3,330	145 13 4	814 11 8	133 3 6	350 16 2	1,444 4 8	8 8	79 9 6	117 14 8	1,641 8 10	9 10.3	2,444 11 5	14 8.1	803 2 7	....
Warrardar	2,136	18 16 11	354 15 1	79 6 2	295 12 3	748 10 5	7 0.1	21 5 10	65 16 4	835 12 7	7 9.4	1,029 19 11	9 7.6	194 7 4	....
Wiluna	3,510	92 14 2	795 17 6	86 4 10	381 11 5	1,356 7 11	7 8.7	26 3 11	152 13 0	1,535 4 10	8 8.9	3,228 7 0	18 4.7	1,693 2 2	....
Yalroo	2,580	68 6 9	534 14 8	103 18 5	383 12 5	1,090 12 3	8 5.4	270 9 6	124 8 8	1,485 10 5	11 6.1	862 12 5	6 8.2	....	622 18 0
Yarri	3,600	66 1 0	648 8 1	164 18 11	502 3 9	1,381 11 9	7 7.5	39 16 5	134 1 10	1,555 10 0	8 7.7	2,276 12 1	12 7.7	721 2 1	....
Youanmi	150	6 14 9	23 18 9	....	23 18 1	54 11 7	7 3.3	....	15 0 9	69 12 4	9 3.3	137 2 9	18 3.4	67 10 5	....
Head Office	103,175	3,422 7 11	19,405 14 8	2,764 9 7	11,361 0 5	36,953 12 7	7 1.9	1,310 15 2	3,942 3 10	42,206 11 7	8 2.1	73,270 5 7	14 2.4	31,686 12 0	622 18 0
	....	....	....	....	....	....	....	....	....	....	....	975 0 0	....	975 0 0	....
	3,422 7 11	19,405 14 8	2,764 9 7	11,361 0 5	36,953 12 7	1,310 15 2	3,942 3 10	42,206 11 7	74,245 5 7	14 4.7	32,661 12 0	622 18 0
Total Profit	622 18 0	£32,038 14 0

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DIVISION IV.

Annual Progress Report of the Geological Survey of Western Australia for the Year ended 31st December, 1938.

The Under Secretary for Mines.

I have the honour to submit for the information of the Hon. the Minister for Mines my report on the operations of the Geological Survey for the year 1938.

STAFF.

Some changes of staff took place during the year. Mrs. G. Blatchford, B.A., Technical Assistant, resigned on the 8th of January. The position of Technical Assistant was abolished and Miss V. Russell was appointed as a senior typiste to carry out the clerical portions of the duties formerly performed by the Technical Assistant, the remaining duties of a technical nature being undertaken by the Government Geologist, Mr. Outtrim, and other members of the staff when not in the field.

Mr. F. G. Forman, Government Geologist, was awarded a Commonwealth Fund Service Fellowship tenable at Harvard University, Cambridge, Massachusetts, U.S.A., and left Western Australia on August 23rd to take up studies in the Department of Geology at Harvard University. I was appointed as Acting Government Geologist during his absence.

No other changes took place, and up to August the staff consisted of the Government Geologist, four field geologists, a senior typiste, a junior clerk and a messenger. Subsequent to August, the number of field geologists was reduced to three as a result of my appointment as acting Government Geologist.

FIELD WORK.

Re-Surveys of Goldfields.

Regional geological surveys of portions of the Yilgarn and Mt. Margaret Goldfields which were either commenced or were in progress during 1937 were continued during the year. One of the main objects of the re-surveys is an attempt to establish the relationship between broad geological structure and the location of main mining centres. Initial work on these lines was carried out in the southern portion of the Yilgarn Goldfield during 1935 and 1936 and was reasonably successful, and it is pleasing to be able to record some success for the work being undertaken in the Mt. Margaret Goldfield.

The economic significance of the results of this class of work lies in the use which can be made of the facts when ultimately established, in the search for new possibly auriferous areas which may be soil-covered and difficult to prospect.

In the course of this regional work all working mines and mineral deposits are examined with the

object of ultimately compiling information for publication in Bulletin form, while much appreciated geological help is afforded individual mine owners by the field officers during the course of their work.

Iron Ore Survey.

As a result of the embargo placed on the export of iron ore from Australia during the year a Commonwealth-wide stocktaking of the iron ore resources of Australia was proposed by the Commonwealth Government, the work to be undertaken by the various State Geological Survey Branches of the Mines Departments and paid for by the Commonwealth.

The work done in this State up to the end of November consisted of an extensive surface sampling campaign and a topographical and geological survey of the Koolyanobbing deposits situated about 30 miles N.N.E. of Southern Cross in the Yilgarn Goldfield. This investigation was commenced by Mr. H. A. Ellis, and subsequently handed over to Mr. R. A. Hobson.

Structural and genetic surveys of the other main known iron deposits of the State will be carried out during the coming year.

Proposed Field Work for 1939.

The re-surveys of the northern portion of the Yilgarn Goldfield and portion of the Mt. Margaret Goldfield are not yet completed, and the continuation of field work in these areas is contemplated.

As the iron ore survey is to be continued, Mr. Hobson will be placed in charge of the field work in connection with it, and additions to the field staff will be necessary to carry out the existing programme in the Mt. Margaret and Yilgarn Goldfields and also the iron ore survey.

Transport.

Two 15cwt. Dodge utility trucks are in use in the field, one being allotted to each field party. There are usually two geologists in each party working from the one camp, and the division of the work is such that it becomes necessary for the two geologists to be working in widely separated parts of the area being investigated. Experience of this arrangement of transport over the last three years has shown that a stage is reached in the work at a very early period when one geologist has to spend a considerable portion of his working time travelling to set down and pick up the other geologist. It is impossible to avoid this state of affairs when one vehicle has to serve

two geologists, and there is an urgent necessity both in the interests of safety and efficiency, for the provision of two additional utilities for use in the field.

Details of the field and office activities of the staff are as follow:—

F. G. Forman, Government Geologist.

In addition to administrative and routine duties, Mr. Forman attended, as a member, meetings of the Executive Committee of The North Australia Survey in Melbourne in January and July.

In April he visited the country in the vicinity of Cardabia Station north of Carnarvon to investigate and report on the possibilities of obtaining artesian water in that area, and in June he inspected the progress of field work in the northern portion of the Yilgarn Goldfield.

A considerable volume of work was also attended to by Mr. Forman during the latter part of the first half of the year in connection with the proposed iron ore survey of the State, and towards the end of June in company with Dr. Woolnough, Commonwealth Geological Adviser, he visited Koolan and Cockatoo Islands, Yampi Sound, to inspect iron deposits there.

On August 23rd Mr. Forman left the State en route to Harvard University, U.S.A., to take up geological studies there under the terms of a Commonwealth Fund Service Fellowship awarded to him during the year.

H. A. Ellis, Geologist.

From January 10th, on his return from annual leave, to March 22nd, Mr. Ellis was engaged on duties in connection with the preparation of material for last year's annual report, the proof reading of the typescript of Bulletin 97, the preparation of field plans and equipment for the survey of the northern portion of the Yilgarn Goldfield and inspection and report on Vulcan Tin Mines, Ltd., Greenbushes. During this period he accompanied the Government Geologist to Eradu on an inspection of coal deposits there, and also made an inspection and report on some copper deposits at Arrino.

From March 22nd to August 15th he was in the field in charge of the field party carrying out the regional geological survey of the northern portion of the Yilgarn Goldfield. From June 20th onward of this period he was in charge of the investigations being made into the Koolyanobbing iron deposits. On August 23rd Mr. Ellis took over the duties of Acting Government Geologist and in that capacity, in addition to administrative and routine duties, made visits to the field parties operating at Koolyanobbing and in the Mt. Margaret Goldfield.

An inspection and report for departmental purposes was made on Paget Gold Mines of Edjudina, Limited, towards the end of October. In November he prepared and delivered a broadcast talk on "How the Geologist can Aid Industry."

While in the Yilgarn Goldfield he visited Evans-ton's Find to report on the possibilities of obtaining domestic and battery water supplies at that centre.

R. A. Hobson, Geologist.

From January to the middle of April Mr. Hobson was engaged in preparing those portions of the annual report dealing with his 1937 field work, in making preparations for continuing the field work already

commenced late in 1937 in the Laverton district, and attending to various duties at Head Office during the absence of the Government Geologist.

From the middle of April to the middle of August he was in the Laverton district in charge of the field work being carried out there, and on the withdrawal of Mr. H. A. Ellis from the field to head office during August, Mr. Hobson was transferred to Koolyanobbing to take over the control of the geological and topographical survey of the iron ore deposits at that centre.

On the completion of the field work at Koolyanobbing at the end of November, Mr. Hobson returned to Perth where he was engaged up to December 19th in preparing various reports resulting from the year's field work.

Mr. Hobson commenced his annual leave late in December.

R. S. Matheson, Geologist.

From January to the middle of March Mr. Matheson was engaged in compiling reports on mines examined by him during the 1937 field season, in acquiring information necessary for the re-survey of the northern portion of the Yilgarn Goldfield and in carrying out miscellaneous office work.

From late in March to the middle of August he was in the field in the Yilgarn Goldfield carrying out geological surveys of mines and assisting in the regional geological mapping of the northern portion of the Yilgarn Goldfield.

From the middle of August to the end of September, Mr. Matheson was with the field party engaged in the re-survey of portion of the Mt. Margaret Goldfield, and in the course of his work there made a geological examination of the Eristoun Gold Mine, Cox's Find.

From the beginning of October to mid-December, he was at head office engaged on various duties connected with the preparation for publication of Bulletins Nos. 97, 98 and 99. During this period he also compiled reports on mines which he examined during the 1938 field season as well as carrying out miscellaneous office work.

Mr. Matheson commenced his annual leave late in December.

K. R. Miles, Geologist.

From January to the latter part of March Mr. Miles was engaged at head office in a petrological examination of rocks collected from the Laverton district during the 1937 field season, the preparation of reports for the 1937 annual report, drafting work, the compilation of base maps, and the collection of other survey information in connection with the re-survey of portion of the Mt. Margaret Goldfield.

From March 22nd to the end of November he was continuously engaged in field work in the Mt. Margaret Goldfield. For a considerable portion of this period Mr. Miles was in charge of the field party as a result of the withdrawal of Mr. Hobson from the area to take over the iron survey field work.

During December Mr. Miles was at head office doing drafting work and preparing progress reports in connection with the year's field work.

Mr. Miles commenced his annual leave late in December.

PUBLICATIONS.

The only publication issued during the year was the Annual Progress Report of the Geological Survey for the year 1937.

The following Bulletin is in the hands of the Printer:—

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 prepared and are awaiting authority to print:—

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.

The information contained in these Bulletins is of the greatest value when it can be made available to the mining community as soon as possible after it is compiled, and it is to be hoped that all three Bulletins will be published during the coming year.

SERVICE TO THE GENERAL PUBLIC.

During the course of a year many hundreds of inquiries, both personal and written, for information on geological matters, are attended to by the Government Geologist and other members of the staff who happen to be in the office at the time. Petrological determinations are made on specimens submitted, and information is freely given to intending prospectors. It is satisfactory to be able to record that these services are much appreciated by those receiving them.

It should also be placed on record that mine-owners, leaseholders, and prospectors generally show an appreciation of the advice and general help offered them by the field officers in the course of their mine examinations and general field work in the areas in which they are operating.

Not infrequently, the field officers are able to offer to those new to the arts of prospecting and mining of small ore deposits, suggestions which save them much useless work, and in the course of the examination of numerous mines it becomes obvious how much this service is needed.

Keenness in field work, engendered by a desire to satisfactorily solve the many problems of geological structure met with in the course of their field investigations, has been manifested by the field officers during the year, and under the somewhat arduous conditions attached to camp life in the Eastern Goldfields, it is not easy to maintain this state of efficiency. I desire to record my appreciation of the quality of the work done by the field officers and also to state that the office staff have given good service.

Mr. I. F. Outtrim, junior clerk, who has had some training in geology, has attended to many inquiries

of a technical nature since the office has been without the services of a trained technical assistant.

The reports which follow place on record the results of the work done by the various members of the staff, except that carried out for purely Departmental purposes.

H. A. ELLIS,

Acting Government Geologist.

30th December, 1938.

ARTESIAN AND SUB-ARTESIAN WATER
POSSIBILITIES ON CARDABIA STATION,
NORTH-WEST DIVISION.

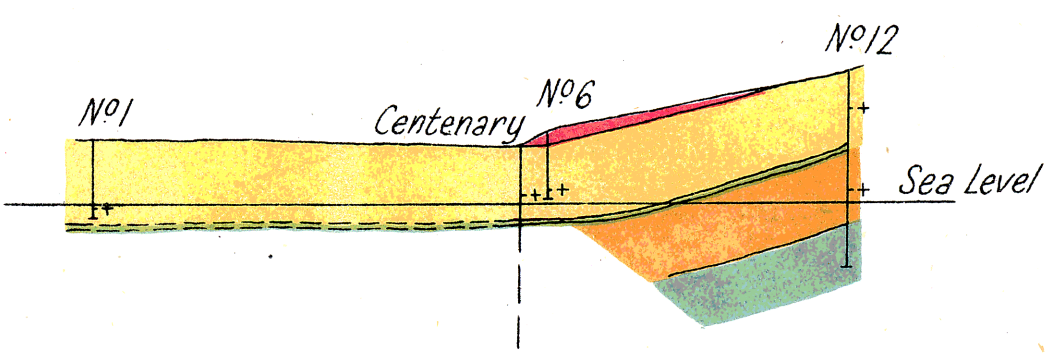
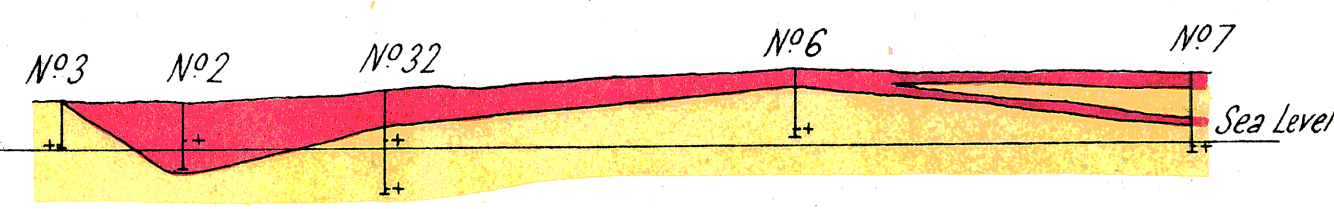
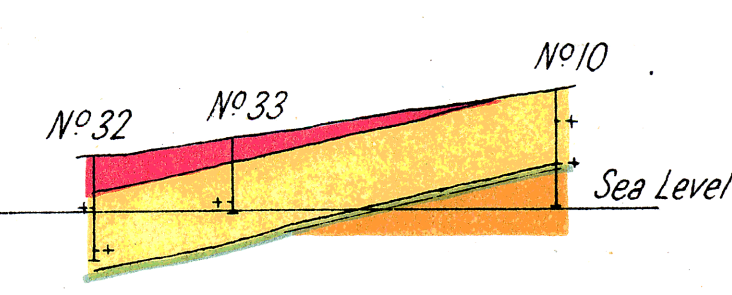
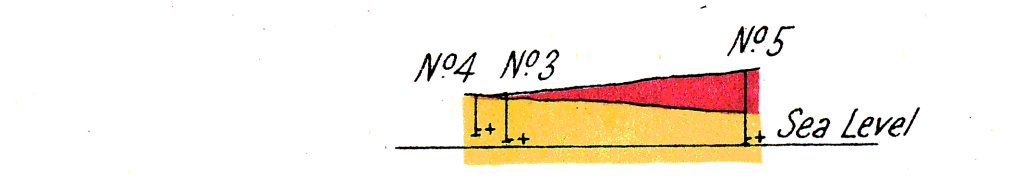
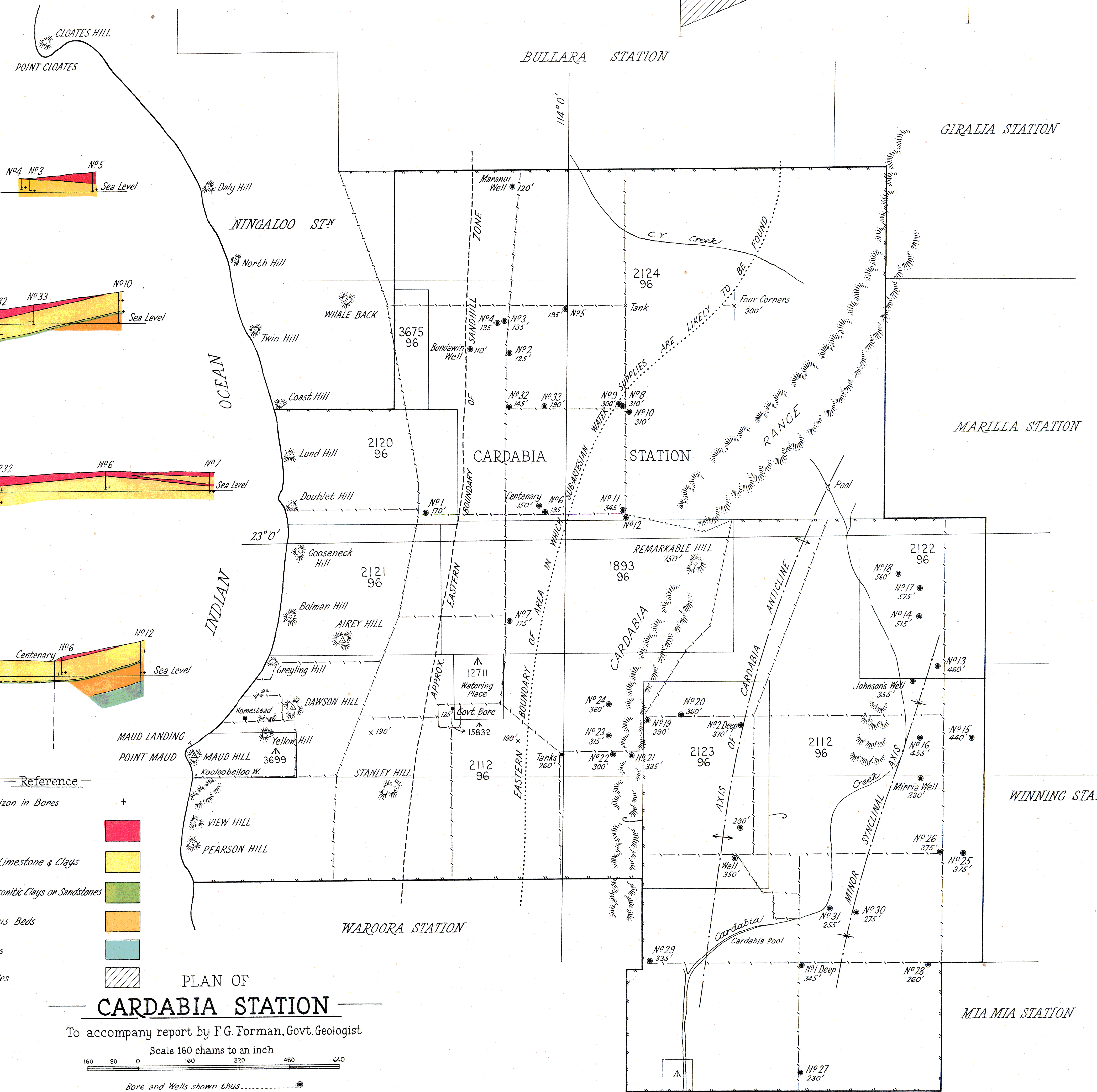
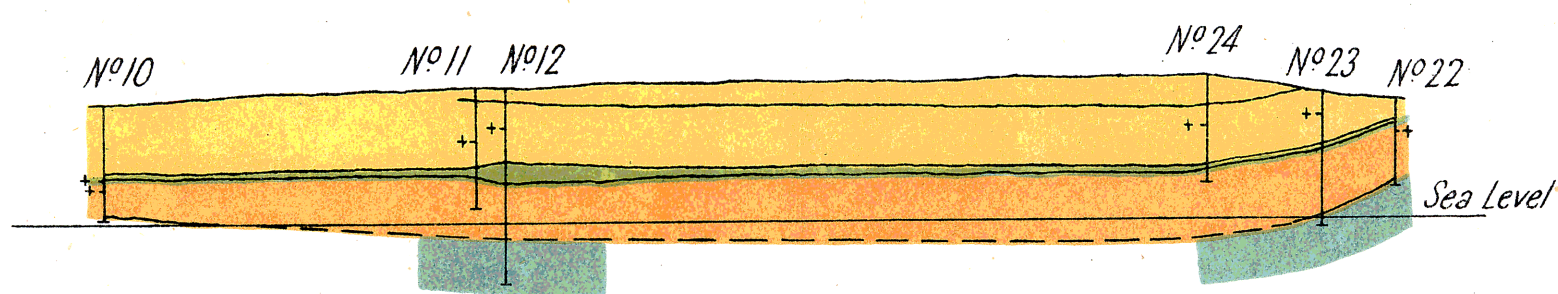
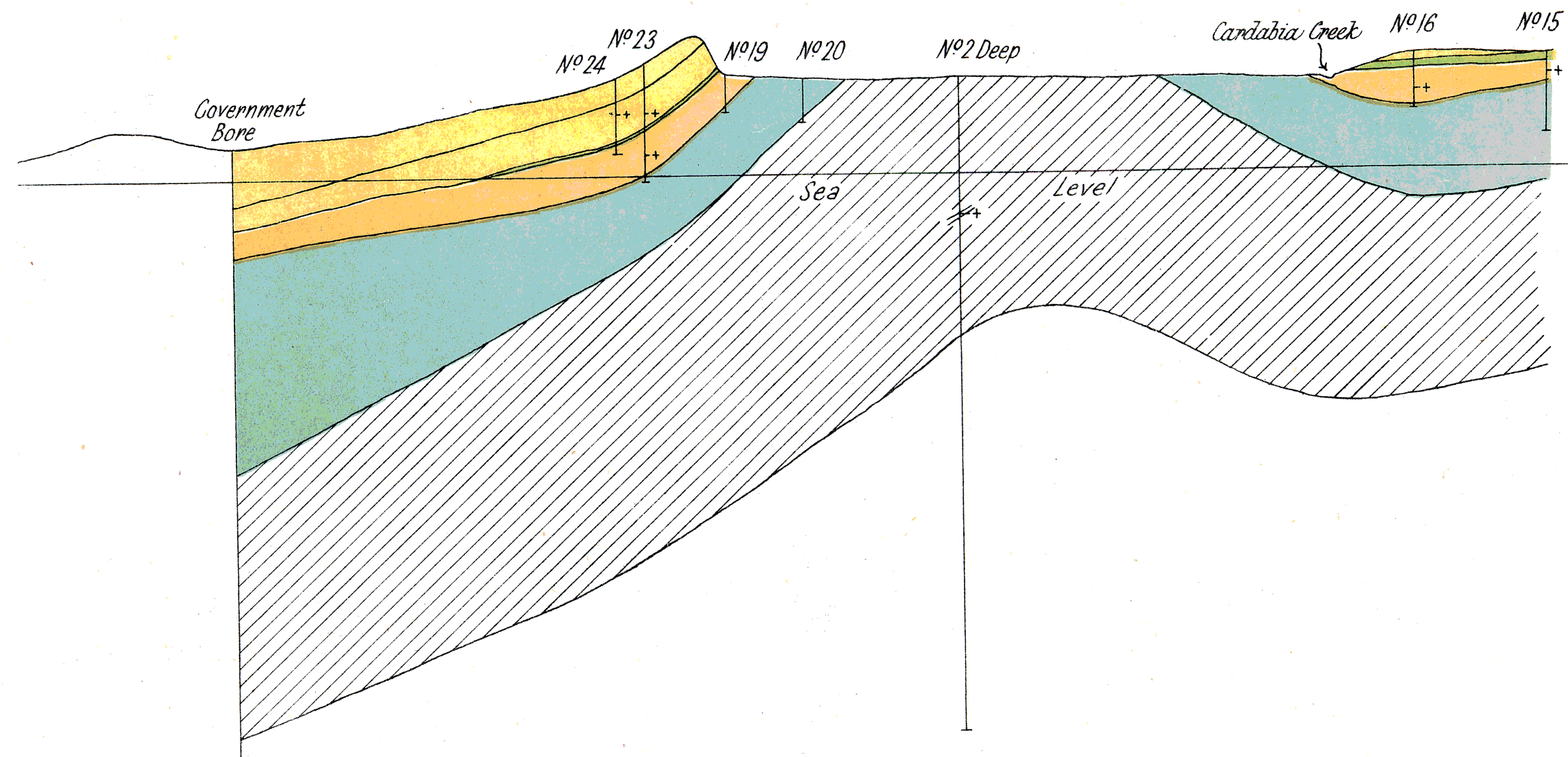
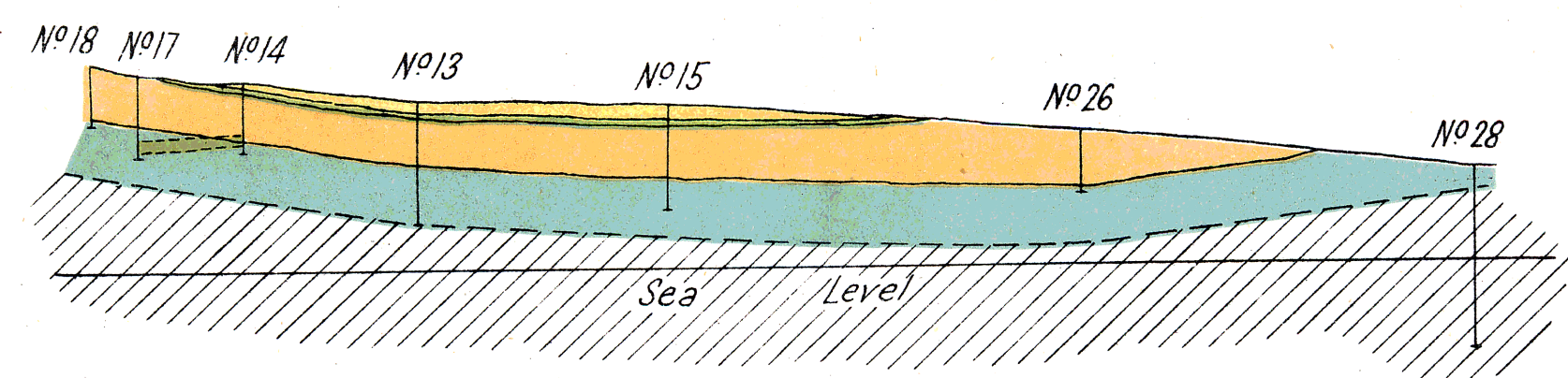
(By F. G. Forman, B.Sc., Government Geologist.)

Cardabia Station is situated about 125 miles north of Carnarvon adjacent to the coast. The homestead is situated close to the Indian Ocean about one mile from the landing near Point Maud.

Except for a coastal strip about six miles wide which is occupied by sandhills of Sub-Recent and Recent origin, the whole of Cardabia Station is underlain by rocks of Cretaceous age. Over the greater part of the area occupied by the Cretaceous rocks the geological succession and structure is clearly revealed by frequent outcrops, but the sandhills in the coastal zone effectively mask the underlying bed-rock, which is presumably a westward extension of the outcropping Cretaceous rocks to the east and make it impossible to elucidate the structure of the coastal strip by surface examination.

A study of the Cretaceous outcrops and the logs of the various bores which have been put down from time to time reveals the following generalised succession:—

Top.	THICKNESS.
Red clays or shales and limestone ...	105 feet in No. 5 bore.
Yellow calcareous clays with limestone bands and hard white polyzoal limestones with bands of yellow clay. (The red beds mentioned above may be a local variation of these beds. See logs of Nos. 2, 7 and 33 bores.)	About 200 feet as measured in the section between Nos. 10 and 33 bores.
Green glauconite clay, sandy clay or sandstones with Ammonites and coprolites. (Absent in No. 10 bore where this bed is reported as replaced by light coloured clay with limestone rubble.) Bores 8 and 9 in the same vicinity have, however, cut the green clays, in their normal position	10 feet as measured in bores Nos. 8 and 9. Also seen outcropping at House's mound east of No. 18 bore.
Light coloured clays and marls or light grey shales carrying <i>Inoceramus</i> . Reported in some bore logs as fawn coloured clays carrying <i>Inoceramus</i>	100 feet in No. 10 bore. 140 feet in bores on eastern side of Cardabia Range near Winning Station Boundary.
Blue puggy shales	150 feet thick in bores on east side of Cardabia Range. Increasing in thickness westwards to 800 feet in the Government bore.
Mainly black shales with a Belemnite zone near the top and sand or sandstone at base	1,000 feet and increasing in thickness westwards.

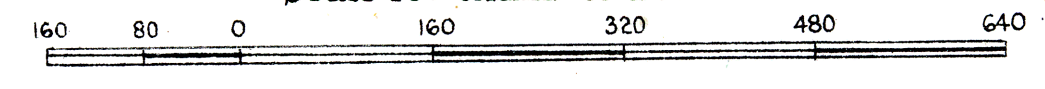


- Reference
- Water Horizon in Bores +
 - Red Beds
 - Polyzoal Limestone & Clays
 - Green Glauconitic Clays or Sandstones
 - Inoceramus Beds
 - Blue Shales
 - Black Shales

PLAN OF
CARDABIA STATION

To accompany report by F.G. Forman, Govt. Geologist

Scale 160 chains to an inch



Bore and Wells shown thus Height above sea level by Aneroid, in feet = 365'

Vertical Scale: 500 feet = 1 inch

A detailed study of the various outcrops would enable the Cretaceous rocks to be divided up into a greater number of stages with distinct lithological characters and fossil contents, but the subdivision given above is sufficient for the purpose of discussing the water problems of the area and it is considered that further subdivision in a report of this nature would be an unnecessary complication.

The Cretaceous rocks everywhere exhibit low dips and on the eastern side of Cardabia Station they have been thrown into a broad anticlinal fold. The axis of this fold strikes in a N.N.E.-S.S.W. direction and passes close to the site of No. 2 deep bore. The denuded western limb of the anticline is well exposed in the long line of hills known as the Cardabia Range, and in the vicinity of Remarkable Hill a very complete section of the strata from near the base of the *Inoceramus* beds to and including the greater part of the polyzoal limestone beds can be seen. The rocks of the eastern limb of the fold form a belt of high country made up of a series of disconnected low hills close to the eastern boundary of Cardabia Station. The outcrops on the eastern limb are discontinuous and scattered but are sufficiently frequent with the help of information available from bore logs in this locality to indicate that the geological section is broadly identical with that exposed in the Cardabia Range. The central or axial portion of the fold has been deeply eroded, so that, in the bed of Cardabia Creek the blue and black shales of the lower part of the Cretaceous Series are extensively exposed and elsewhere are met with at very shallow depths in bore holes and wells.

To the west of the Cardabia Range, the rocks continue to dip to the westward wherever they are exposed to view. Unfortunately, the sandhill country, which occupies the whole of the coastal strip, masks from view the structure of the underlying rocks on the western portion of the property, and it is, therefore, impossible to say definitely how the rocks behave in the coastal area. Cross sections drawn between bores which have been put down on the western side of the Cardabia Range indicate, however, that the dip of the rocks does not increase beyond that observed in the Cardabia Range. It is possible that the rocks may continue to the westward with a uniform dip so that the depth to any particular horizon will steadily increase towards the west in the coastal strip. The dip may flatten out and the strata eventually become horizontal, in which case the depth to any particular horizon will remain uniform as the coast is approached. There may be a reversal of dip of which there is some evidence in at least one place (the vicinity of Nos. 2, 3 and 4 bores). In this case the depth to a particular horizon would decrease towards the west. What the actual conditions are can only be determined by putting down several trial bores in the coastal section, after the sinking of which, fairly accurate predictions of the depth to a particular bed could be made.

From a study of the logs of the bores which have already been put down it appears that the principal shallow water bearing horizons lie in the clays and marls which constitute the *Inoceramus* zone. Poor supplies of good quality water have been met with in this zone in Bores Nos. 8 and 9 and Nos. 22 and 23. These supplies were found near the top of the zone. Good supplies of good quality water have been met with lower in the same zone, in Bores Nos. 5, 6 and 7.

The water obtained in Bores Nos. 14 and 17 on the eastern limb of the Cardabia anticline also comes from the *Inoceramus* zone, but the succession in the locality is abnormal as a band of glauconitic greensand which carries the water occurs near the base of the *Inoceramus* zone.

A sandy zone at the base of the blue and black shales of the lower part of the Cretaceous Series constitutes an important artesian water horizon. It is in fact, the most important artesian water horizon throughout the North-west Artesian Basin and has been tapped in scores of artesian and sub-artesian wells throughout the pastoral country north of Hamelin Pool. The flow from the Government Bore, that which was originally struck in the Centenary Bore and which has since failed, and the sub-artesian supplies obtained in the Cardabia No. 1 and No. 2 deep bores all come from the deep artesian zone at the base of the Cretaceous Series. The depth of this horizon is over 1,000 feet everywhere on Cardabia Station, its closest approach to the surface being along the axis of the Cardabia anticline where it has been tapped by the Nos. 1 and 2 deep bores at a depth of a little over 1,000 feet. At both these sites only sub-artesian supplies have been obtained, as the surface of the ground at the bores is well above the rest level of the artesian supply. The depth to the artesian water horizon in the Government Bore and the Centenary Bore is respectively 2,275 feet and 2,374 feet. This marked increase in depth as compared with the Nos. 1 and 2 deep bores is due partly to the thickening towards the west of the lower part of the Cretaceous Series, but principally to the westerly dip of the beds on the western limb of the Cardabia anticline.

Artesian water could be obtained by sinking bores to the base of the Cretaceous Series anywhere along the coastal strip, as the surface elevations over the whole of the western section of Cardabia Station is below the rest level of the water in the artesian horizon. It would, however, be necessary to sink to greater and greater depths as the coast is approached, owing to the thickening of the strata and the westerly dips.

The sub-artesian horizons of the *Inoceramus* zone lie at comparatively shallow depths throughout the central and western portion of Cardabia. They are almost everywhere at a depth of less than 500 feet below the surface and it seems likely that they will be found at much the same depths throughout the coastal strip. As explained earlier, however, this will depend on the structural behaviour of the rocks and no definite information can be given until several exploratory test bores have been put down.

A number of bores which have already been sunk, mainly those along the western slope of the Cardabia Range and those close to the eastern boundary of Cardabia Station have either failed entirely to strike water, or obtained only seepages of good water or moderate supplies of water unsuitable for stock. In all cases, the failure is due to the bores being located too close to the outcrop of the water-bearing beds in the Cardabia Range or to the outcrop of the same beds in the eastern limb of the Cardabia anticline.

A line has been drawn on the accompanying map showing what I consider to be the eastern boundary of the area from which useful supplies of water can confidently be expected. The whole of the country

east of this line is not worth the expense of boring owing to the water-bearing beds being too close to the outcrop and consequently carrying only small supplies of good water or moderate supplies of bad water. On the eastern side of the line the volume of water circulating in the beds is insufficient to flush out any salt which was an original constituent of the sediments making up the Cretaceous Series.

An examination of the map will show that No. 10 Bore which yields a good supply of good water lies on the eastern side of the boundary line. The most likely explanation of the finding of good water in this bore is that it was sunk close to the bed of a fairly large creek which runs to the westward from the Cardabia Range and consequently the water-bearing horizon which has been tapped in No. 10 Bore has been well fed by soakage from the creek bed at its outcrop somewhere to the east.

No doubt a number of successful bores could be obtained on the eastern side of the line and close to it by choosing favourable sites for sinking a bore close to a creek bed which cuts throughout the water-bearing horizons at their outcrop to the eastward.

It would, however, be a very uncertain matter and it is not considered advisable to go to the expense of putting down bores on the eastern side of the line indicated.

The selected site for a bore at the Four Corners east of No. 5 Bore is also on the eastern side of the boundary line. There is, therefore, doubt as to whether suitable water would be met with at this site. In this case, I have considered that the sinking of a bore is justified because of the peculiar suitability of the site for watering four paddocks from the one point. It cannot be said that the site is particularly favourable but there is some chance of obtaining useful supplies. If the Four Corners site fails to obtain good water, the next best alternative is to sink a bore about 2½ miles north, close to the bed of C.Y. Creek, where water will probably be obtained owing to the water-bearing beds probably being well supplied at their outcrop in the upper reaches of the creek. The second alternative would be a bore put down about 2½ miles west of the Four Corners which lies westward of the line marking the boundary of good sub-artesian supplies.

Any site to the south of the Government bore should strike good supplies of water, and this remark applies equally to the whole of the coastal strip. It might be objected that shallow sub-artesian water was not reported in the log of the Government Artesian Bore, but it seems probable that the drillers who had as a definite objective the artesian horizon at the base of the Cretaceous Series, did not bother to mention any shallow water horizon lying within three or four hundred feet of the surface.

On the meagre evidence available it seems probable that the depth to the main sub-artesian horizons in the *Inoceramus* zone should be met with in bores throughout the coastal country on Cardabia Station at depths of probably less than 500 feet. (In all cases of exploratory boring the work should not be abandoned until it is certain that the blue shales underlying the *Inoceramus* zone have been penetrated, as until this occurs there is always a possibility of cutting a useful water-bearing bed.)

A study of the bores already put down indicates that the water horizons cut do not always lie in the same position in the *Inoceramus* zone. Sometimes

the water occurs near the top of this zone, sometimes near the bottom. A probable explanation of this fact is that the water-bearing beds are lenticular and do not extend uniformly over the whole area. For this reason no statement has been made as to the depth of water-bearing beds below the top of the *Inoceramus* zone. The safest rule to follow would appear to be to bore for the *Inoceramus* zone which is usually easily identified by the numerous shell fragments which are scattered throughout, and to continue boring until the main body of the underlying blue shales is penetrated before abandoning a bore-site as hopeless. Until the blue shales are penetrated, there is always a chance of cutting a useful water-bearing bed.

REPORT ON THE VULCAN TIN MINE, GREENBUSHES.

(By H. A. Ellis, B.Sc., A.O.S.M., Geologist.)

Introduction.

The Vulcan Tine Mine is situated in the north-eastern corner of Mineral Claim No. 4, known as the "New Caledonian" Lease, situated on a flatly undulating spur between Bunbury and Westralian Gullies on the south side of the main Greenbushes-Bridgetown road, some two miles south-east by south from Greenbushes Townsite.

The mine is operated by a Perth company known as Vulcan Tin Mines, Limited, mining operations being carried out by the hydraulic sluicing of a weathered, kaolinised tin-oxide and tourmaline-impregnated zone of granitised schist and associated pegmatite dykes. The maximum dimensions of the working cut are approximately 260 feet in length, 195 feet in width and 35 feet in depth. The disintegrated tin-bearing material is elevated from the bottom of the open-cut as a pulp by a gravel pump and passed through sluice boxes in which the tin-oxide concentrate is recovered by the normal sluice-box process.

Since the commencement of production by the present company on February 4th, 1937, approximately 41 tons of tin concentrates, of an average metallic tin content of nearly 57 per cent. valued at £5,707 10s., have been won up to the end of January, 1938. The approximate volume of the ore treated for this return is 16,900 cubic yards, giving an average value of 5.39 lbs. of concentrates, containing 57 per cent. of metallic tin per cubic yard. Operations are at present (January, 1938) suspended owing to a shortage of water, and the necessity for additional equipment to enable sluicing to be carried out under a higher nozzle pressure than is at present in use.

The limits of the tin bearing formation at present being worked are known definitely at one point only, namely, in a tunnel driven through the eastern wall of the open cut in a north-easterly direction.

As a result of an inspection of the mine workings and leases made by the writer during the period January 18th-26th, 1938, it was found that the only practical means of determining the extent of the payable tin-bearing formation was by a series of boreholes sunk with a percussion drilling plant in which the shoe of the casing can be kept in advance of the face of the drilling bit.

Topography and Geology.

The area in which the company's holdings are situated is one of gentle slopes of general low relief, and

GEOLOGICAL MAP

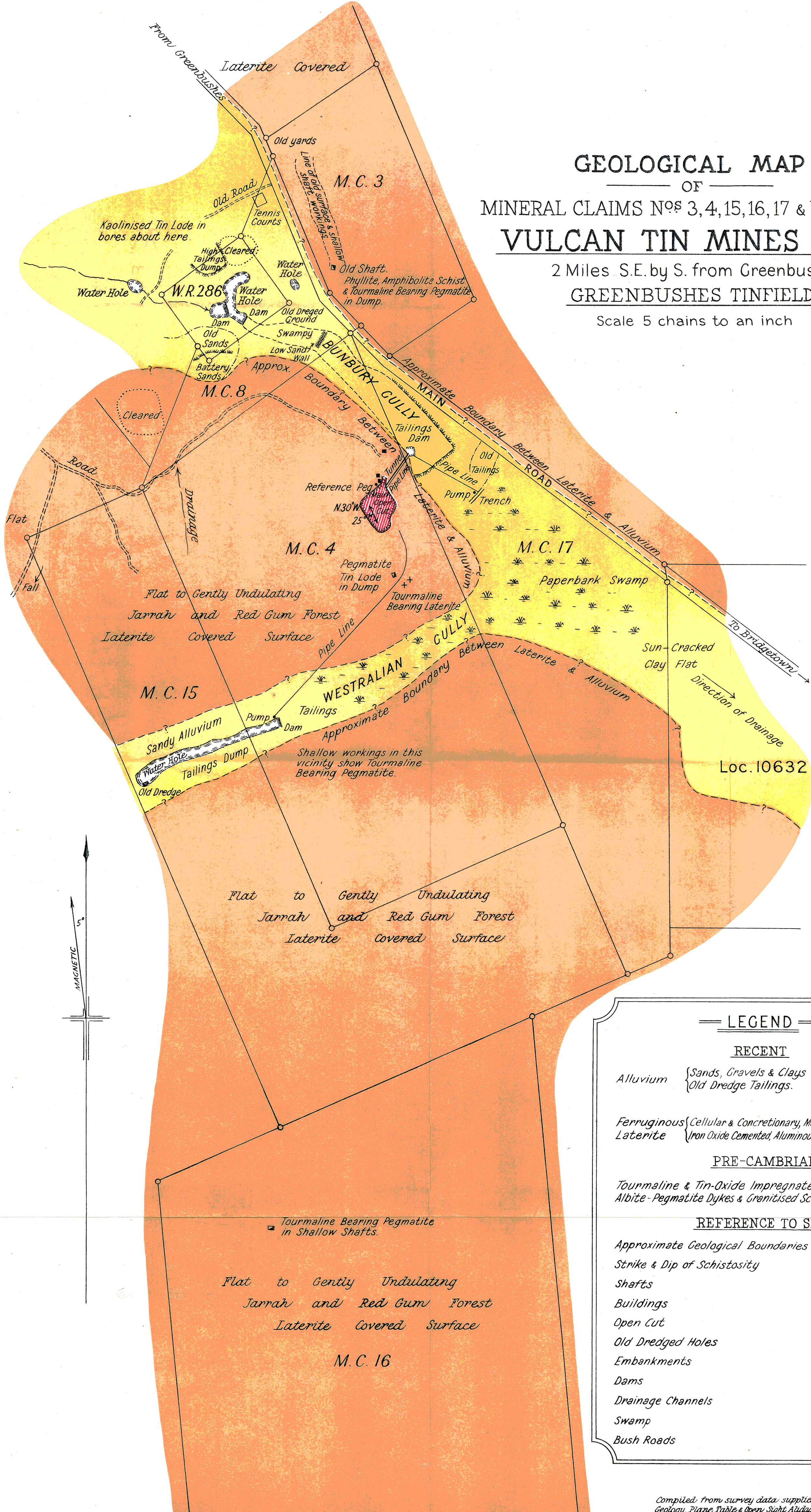
OF

MINERAL CLAIMS Nos 3, 4, 15, 16, 17 & W.R. 286

VULCAN TIN MINES LTD.

2 Miles S.E. by S. from Greenbushes
GREENBUSHES TINFIELD

Scale 5 chains to an inch



— LEGEND —

RECENT

Alluvium	{ Sands, Gravels & Clays Old Dredge Tailings.	
Ferruginous Laterite	{ Cellular & Concretionary, Massive Iron Oxide Cemented, Aluminous in places.	

PRE-CAMBRIAN

Tourmaline & Tin-Oxide Impregnated Albite-Pegmatite Dykes & Granitised Schists.	
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REFERENCE TO SIGNS

Approximate Geological Boundaries	- - ? - - ? -
Strike & Dip of Schistosity	N. 30° W 25° ↘
Shafts	
Buildings	
Open Cut	
Old Dredged Holes	
Embankments	
Dams	
Drainage Channels	
Swamp	
Bush Roads	

Compiled from survey data supplied by Mines Dept.
Geology, Plane Table & Open Sight Alidade Traverses by H.A. Ellis, Jan. 1938.

falls within the the 760 to 920 feet contours of the contoured geological map of Greenbushes contained in G.S.W.A. Bulletin 32. It forms part of the headwaters of a southerly trending drainage system of the Blackwood River. The narrow alluviated valleys of Bunbury and Westralian Gullies cross the leases in a general south-easterly and easterly direction respectively, and, with the exception of these valleys, the entire area is thickly timbered with jarrah and red-gum forest, and is covered with ferruginous laterite of varying thickness, which completely obscures the underlying rock.

There are no natural outcrops of bed-rock which can be definitely recognised, and a conception of the nature of this rock can only be gained from places such as the open cut of the main workings, and the dumps of shallow shafts.

In the dump of the old main shaft, situated in the south-western portion of Mineral Claim No. 3 near the main road, some pieces of fresh looking quartz-hornblende schist and tourmaline-bearing pegmatite may be seen, while further to the north-west along a line of old shallow surface workings extending in this direction, pieces of soft, weathered, purple phyllite and weathered mica-schist occur in the dumps.

The rock exposed in the open cut at the main mine workings on Mineral Claim No. 4 is a highly felspathic, decomposed, quartz mica schist showing marked schistosity, striking N. 30° W., and dipping W. 30° S., at an average dip of 35°. This rock grades imperceptibly, in parts of the open cut, into what appears to be a massive kaolin formation, with or without granular quartz. The whole rock mass is liberally impregnated with black tourmaline, ranging in size from irregular patches, some 6 inches across, down to specks so small as to be only just recognisable. It is in this combined schistose and massive kaolinised rock that black tin-oxide occurs in payable quantities, irregularly disseminated throughout the mass.

A tunnel driven in a north-easterly direction through the eastern wall of the tin-bearing formation passed through a red clayey formation devoid of quartz and mica. This material represents the weathered portion of a rock type, the nature of which cannot be determined on present available evidence.

On the old Cornwall leases, a short distance S.E. of Greenbushes Townsite, in pieces of diamond-drill bore-core lying near the old workings, fresh amphibolite schist similar to the greenstone schists of the eastern goldfields may be seen in contact with fresh albite-pegmatite dykes.

Several exposures in road cuttings and old dredge holes, within a radius of six miles of the area under discussion, consist of hornblende schist, biotite schist, fine grained biotite granite and migmatites.

The general line of the known tin-bearing lode formations passes through the workings on M.C. 4 in a general direction of N. 30° W. up Bunbury Gully, through the old Cornwall workings and on to the old "White Lode" area, south of the Greenbushes railway station. Along this line rich alluvial ground has been worked in the past, and it is also from this locality that most of the lode-tin has been mined. From information supplied by old miners on the field, most of the lode formations dipped to the west.

Considering all the available evidence outlined above, it would appear that the underlying rocks of the Greenbushes Tinfield consist of metamorphic crystalline rocks of both a basic and acid composition, comprising a belt of unknown width, with a general north-north-westerly trend and a westerly dip. This belt has been intruded by one or more granite magmas, and has undergone granitisation marginally, and in zones within itself, resulting in the formation of replacement gneisses and schists and migmatites.

The main workings on M.C. 4 are considered to be in a zone or belt of replacement gneiss and schist of unknown width, the economic importance of which is due to an accompanying introduction of tin-oxide into the schistose rock with associated tin-oxide and tourmaline-bearing pegmatite masses. As previously mentioned, this zone has a known length of some three miles in a general N.N.W. direction.

The evidence at present available tends to support the conception that the open-cut on M.C. 4 is situated near the southern end of this zone, and that the country to the south of Westralian Gully contains only narrow zones not yet shown to carry workable concentrations of tin-oxide.

The several shallow shafts on the old "Ironclad" leases south of Westralian Gully are considerably to the west of the general strike of the main zone, and, although they show the presence of tin and tourmaline bearing pegmatites in the dumps, the small extent of the old workings suggests that deposits similar in nature to that at the open cut do not exist in this direction, or that, if they do, their presence has not yet been revealed by surface prospecting.

It would be possible for the strike of the main zone to swing round in the direction of these old workings; in fact, such a swing in strike would be in keeping with the shape of several small north-pitching dragfolds seen in exposures in localities some distance away from the present open cut, as these small folds indicated that some of the schistose rocks of the tinfield formed part of the western limb of a north-pitching anticline.

It would, however, be mere presumption on the meagre evidence available in the field to consider that the tin-bearing zone being worked in the open cut on M.C. 4 had a southerly continuation on the south side of Westralian Gully. The question of the northerly continuation of the formation and conditions associated with tin-oxide deposition can be taken as proved, since either tin-oxide or tantalite have been mined at intervals from M.C. 4 to just south of the Greenbushes railway station along the line of the formation. The manner of distribution of the tin-oxide throughout this belt is not accurately known, but present indications are that certain parts of it contain rich irregular concentrations as well as finely disseminated cassiterite scattered through a considerable bulk of rock. In all occurrences so far known, the matrix of the tin-bearing material consists either of albite pegmatite (the "Cornwall" leases) or a massive or schistose mixture of kaolin, mica, and quartz with abundant tourmaline.

The old workings on M.C. 3 (known as the "Lost and Found" lease) suggest that the bulk of the tin oxide was obtained in the past from alluvial deposits associated with the laterite, and from narrow decomposed pegmatite dykes, forming a stock-work in

phyllites and amphibolite schist. There is no indication in these old workings of the existence of a wide mineralised and granitised zone similar to that exposed in the open cut on M.C. No. 4, and the deposits of M.C. No. 3 can be best regarded as forming a band of narrow pegmatite dykes parallel in strike to the main belt to the west.

The several shallow shafts on the other claims indicate the existence there of tin and tourmaline-bearing pegmatite dykes, but the amount of work done on them gives no clue as to the extent of these deposits. There is ample scope for surface prospecting in the vicinity of these old workings, and in the portions of the leases situated away from the known workings the presence of tourmaline in the ferruginous laterite can be considered a favourable indication of the possible presence of tin-oxide.

The Main Workings.

The main workings of Vulcan Tin Mines, Ltd., are situated in the north-eastern portion of M.C. No. 4 on a flatly undulating laterite and forest-covered spur between Bunbury and Westralian Gullies, on the south side of the Greenbushes-Bridgetown road, some two miles south-east by south from Greenbushes Townsite.

Black tin-oxide is being obtained from a soft, highly decomposed, schistose and massive kaolinised rock of granitic composition, mined in an open cut by hydraulic sluicing methods, the disintegrated rock being elevated from the open cut as a pulp by gravel pump and passed over sluice boxes in which the tin-oxide is recovered.

The site of the present open cut and the surface immediately surrounding it was the scene of alluvial and lode mining carried out spasmodically since about the year 1899. The alluvial mining consisted of the collection of tin-bearing alluvial material shed from the soft kaolinised lode material and covering laterite, and its subsequent treatment by washing. The lode mining consisted of small open cuts and shallow shafts sunk in rich concentrations of tin-oxide and the subsequent treatment of the puggy lode material in various classes of treatment plant, none of which appears to have been able to successfully treat the difficult lode material. A combination of Huntington mills, cone classifiers and Wilfley tables was noted in one old plant, and the equipment used by the owner of the lease who was operating it immediately prior to the present owners consisted of a 6-foot Chilean mill and sluice box.

The main treatment difficulty lies in the very high content of kaolin in suspension in the pulp, necessitating the use of large quantities of water in the sluice boxes to effect efficient saving of the fine tin-oxide.

The open cut has a maximum length of 260 feet, is 195 feet wide and 35 feet deep in its deepest part. The sides of the cut show a thickness of from two to four feet of ferruginous laterite capping a weathered kaolinitic formation, which shows both a massive and schistose structure in various parts. The general strike of the schistosity is N. 30° W. and the average dip 35° W. 30° S., with a tendency for the dip to steepen as the western side of the cut is approached. The weathered schistose exposures consist essentially of kaolin, quartz and muscovite mica, with a liberal impregnation of tourmaline frequently arranged parallel to the schistosity. They also carry

black tin-oxide scattered through them in a very fine state of division. In all probability this weathered schistose material represents a replacement schist formed by a process of granitisation of a pre-existing rock type whose original nature cannot be determined. Grading almost imperceptibly into the schistose material are masses of almost pure kaolin carrying more or less tin-oxide and tourmaline, either with or without small lenses or irregular patches of massive, jointed quartz or granular quartz. Muscovite mica in plates up to 2 inches square occurs unevenly through the whole formation, while occasional crystals of beryl, about 1 inch across, were seen.

The manner of occurrence of the patches of granular quartz in the more or less massive kaolin, and the presence of thin quartz veins cutting the planes of schistosity of the schistose rock, is very similar to that seen in granitised zones bordering greenstone belts in the Eastern Goldfields, and points to the occurrence of this process in the rocks exposed in the open-cut.

The eastern wall of the formation is met in a tunnel driven N.E. from the bottom of the open-cut, and consists of an iron-oxide stained clay without noticeable quartz, mica, tourmaline or tin-oxide. The other limits of the formation are not known, although definite evidence is available that it extends for at least 160 feet north, 160 feet west and 500 feet south of the present north, west and south limits of the open-cut, and that it is tin-bearing in these localities.

Dish samples taken and washed by the writer from a number of points in the walls and floor of the open-cut all showed traces of tin-oxide, together with ilmenite. The tin-oxide appears to be disseminated throughout the entire kaolinised formation in a fairly fine state of division, pieces as big as a wheat grain being occasionally seen. Much of the first grade concentrate consists of pieces of tin-oxide of smaller dimensions than this, while the second grade has some very fine tin-oxide, almost a powder, in it.

Crystals of cassiterite up to $\frac{3}{4}$ inch across are reported as having been found in the workings, but recognisable crystals are rare in the heavily tourmalinised kaolinitic formation which constitutes the lode.

Irregular masses of black tourmaline and some partially formed crystals of the same mineral up to six inches across occur, and the formation is liberally impregnated with irregularly shaped masses of tourmaline of smaller dimensions, the finest of which are in the nature of a fine powder.

Local concentrations of tin-oxide in the form of irregularly shaped shoots of comparatively small dimensions are reported to have been worked in the area now occupied by the open-cut by previous leaseholders. No doubt similar rich shoots have been encountered in the course of hydraulic sluicing operations by the present owners, and other shoots can be reasonably presumed to exist in the formation under the floor and behind the walls of the present workings.

No information is available as to the depth to which the weathered kaolinised material extends below the bottom of the present workings, and, since the depth of the oxidised zone determines the limits of the present method of working the mine, this in-

formation is important and must be secured if any large scale mining operations are contemplated. With the information at present available a useful estimate of this depth cannot be made; it will be found more practicable to gain this information from bore holes.

Production.

Mines Department records show that between 1899 and 1934 some of the ground now held as M.C. 4 produced approximately 69 tons of tin-concentrates. It is impossible to determine whether or not this production came from an area now occupied by the open-cut, but it is almost certain that a large portion of it was actually produced from rich shoots of tin-oxide found in the formation now being worked by Vulcan Tin Mines, Ltd.

A more definite production figure is that of the recent owner, H. Paterson, who, according to Messrs. Lindsay and McKay, tin buyers of Greenbushes, produced about 9½ tons of concentrates, of about 60 per cent. metallic tin content, during the period July, 1935, to June, 1936, from ore taken from the open-cut now being worked.

In these production figures no yardage or tonnage is given, and the grade of the ore cannot, therefore, be ascertained. A complete record of the production by Vulcan Tin Mines, Ltd., was made available by the company, and the following is an analysis of the figures:—

Date commenced production	4th February, 1937.
(Production figures to end of January, 1938.)	
Total tonnage of First Grade Concentrate	35 tons 13 cwt. 1 qr. 25 lbs.
Total tonnage of Second Grade Concentrate	4 tons 19 cwt. 3 qr. 16 lbs.
Total Production	40 tons 13 cwt. 1 qr. 13 lbs.
Average Assay Value of Total Concentrate Production	57.04% metallic tin.
Average Assay Value of First Grade Concentrate	59.65% metallic tin.
Average Assay Value of Second Grade Concentrate	38.46% metallic tin.
Market Value of Production	£5,707 10s.

In order to arrive at some approximate estimate of the quantity of material treated for this return, a quantity survey of the open-cut was made by the writer, whereby the total cubic content was obtained. This amounted to approximately 24,900 cubic yards. From a sketch plan and longitudinal section of the open-cut, as it was prior to the commencement of operations by Vulcan Tin Mines, Ltd., an approximate cubic content of 8,000 cubic yards was obtained from the very meagre information available on the plan. This estimate has had to be made on insufficient information, and must be regarded as roughly approximate only.

It would appear then that a volume of approximately 16,900 cubic yards of lode material has been treated by Vulcan Tin Mines, Ltd., for a return of 40 tons 13 cwt. 1 qr. 13 lbs. of tin-oxide concentrate, containing 57.04 per cent. of metallic tin. This is equivalent to a recovery of 5.39 lbs. of tin concentrate per cubic yard of material treated.

The difficulty of treatment brought about by the high suspended kaolin content in the pulp in the sluice boxes makes it almost certain that some appreciable quantity of concentrate has found its way into the tailings dumps. These have not been sampled, and consequently an estimate of the total weight of

tin concentrate per cubic yard and the percentage recovery figures of the treatment process cannot be determined.

Nevertheless, the value of 5.39 lbs. of recovered concentrates per cubic yard is a very satisfactory one, and prospects are favourable for the existence of large quantities of similar grade lode material beyond the present limits of the open-cut workings.

Future Development.

The manner of occurrence and the physical nature of the tin-bearing lode material makes possible the application of mining methods usually employed in working alluvial deposits, and from a practical point of view the deposit must be regarded as if it were an alluvial deposit.

In hydraulic sluicing or dredging processes it is necessary to be able to treat large volumes, and the treatment plant and water supply at present available is not capable of doing this. Before considering the enlargement of the plant and the provision of a better water supply it is essential to establish the existence of adequate ore reserves, and this can only be done in the present case by a thorough boring campaign.

The limits of the workable ground are determined by the depth of the material amenable to the present treatment processes and by the length and width of the mineralised zone. The occurrence of tin-oxide in lode or reef formation is notoriously irregular, and in the present case this fact will materially influence the setting out of bore sites.

At present, the limits of the payable tin-bearing material being worked in the open-cut are known in one point only, and it is not possible to form even the remotest estimate of its extent. To secure this information it is suggested that a series of suitably located cased bore-holes be drilled with a percussion drilling plant capable of keeping the shoe of the casing in advance of the drilling bit, and also capable of withdrawing the case on the completion of the hole.

In view of the fact that the tin-oxide may occur in any portion of the hole and that the whole of the material must be treated to recover it, it may not be necessary to record the concentrate from less than 15 feet sections of the borings. It will be necessary to carry the bores down to the limit of the lode material which is sufficiently soft to enable it to be mined by the methods at present in use.

The concentrates from the 15-foot sections should be carefully saved and individually weighed, after which they could be bulked and submitted for assay for metallic tin. All computations should be made on a metallic tin content, because the concentrates cannot be obtained absolutely free from ilmenite or possibly tantalite and columbite. By this means a value in terms of metallic tin will be obtained for a section of the lode, the volume of which is represented by the product of the area of the cutting end of the casing-shoe (using the external diameter of the shoe if this has a bevelled edge) and the depth of the hole.

The boring campaign should be carried out under the supervision of a geologist, who would be in the position to locate bores additional to the lines set out below, using the information obtained from these bores.

Starting from the known tin-bearing deposit of the open-cut, and utilising the general direction of strike of the schistose lode material, the initial bores could be advantageously placed as follows:—

- (a) The first line to be drilled at about 20-foot intervals in a direction of 240° true bearing from the most westerly part of the open-cut.
- (b) The second line could be started in the same direction from a point situated about 100 feet on a bearing of 330° true bearing from the centre of the north-western bank of the open-cut. By drilling at 20 feet intervals in both directions (240° and 60° true bearing, respectively) the width of the tin-bearing formation will be established here.

According to the results obtained from these two lines of holes the distance between the lines of holes themselves can be adjusted to meet the circumstances when extending the campaign further to the north.

- (c) Using the most southerly point of the open cut as a starting point two preliminary lines of holes at 20-foot intervals along lines 100 feet apart should be drilled across the southerly continuation of the formation in the same direction as for the northern lines.

In drilling these holes it will be best to determine the lateral limits of the formation by working outwards first to the east and then to the west from a centre line. The lines of these proposed bore sites are shown on the attached plan.

No boring difficulties are anticipated, and the footage drilled per shift should be high in this class of country. It will be essential for the boring contractor to keep an adequate supply of water on the bore site, and to provide a sluice box with sides sufficiently high to prevent the splashing over of the sludge as it is tipped from the sludge-pump into the box. This sludge will have a high content of suspended kaolin in it, and a reasonably large vessel should be provided at the end of the sluice box to take the outflow from the box and provide an opportunity for fine tin-oxide to settle below the lip of the overflow.

It is obvious that with no knowledge of the probable limits of the tin-bearing formation, a useful estimate of the number of holes required to prove a large volume of material cannot be made. The prospects of the present workings certainly warrant the provision of at least £1,000 for boring purposes, but until several lines of holes are drilled, no estimate of the probable amount of ground this expenditure would prove can be made.

Water Supply.

The present water supply drawn from old dredged channels, now forming water holes in Bunbury and Westralian Gullies, and from a trench in Bunbury Gully below the tailings dam, is inadequate for the present treatment plant in the summer months. During the winter months ample water is available from these sources.

An immediate improvement in these supplies could be made by ring-barking the jarrah and red-gum forest on the catchments of these two gullies, and additional supplies could be obtained from a group

of wells sunk at the junction of Westralian and Bunbury Gullies.

If the deposit is shown by boring to be extensive, then a water supply adequate for the requirements of a larger plant is necessary, and this could probably be best obtained by constructing a dam across Westralian Gully.

CONCLUSIONS.

(1) Mining operations carried out in the open cut on M.C. 4 show that tin-bearing lode material of a minimum average value of 5.39 lbs. of tin concentrate per cubic yard has been won from approximately 17,000 cubic yards of material treated by Vulcan Tin Mines, Limited, between February, 1937 and January, 1938.

(2) Records of production from an area which can be reasonably presumed to have included the present site of the open cut indicate that approximately 78 tons of tin concentrate was obtained from the formation prior to the commencement of operations by Vulcan Tin Mines, Limited.

(3) The sides and bottom of the present workings carry tin-oxide finely disseminated through the lode material, and hand bores reveal the presence of the tin-bearing formation at distances of up to 140 feet north, west and south of the present limits of the workings. There is no information at present available as to the limits of the tin-bearing zone.

(4) The manner of occurrence of the tin-oxide in the formation and the favourable geological structure, together with the proved occurrence of tin-bearing material, at intervals, for approximately three miles to the north-northwest, suggest the distinct possibility of the existence of an extensive tin-bearing formation on M.C. 4, both to the north and south of the present workings.

(5) Tin-bearing reefs and lodes, unlike gold deposits, are not subjected to surface enrichment by chemical processes, and the occurrence of further rich shoots of tin-oxide may be anticipated in the un-oxidised rock below the downward limits of the weathered material at present being worked.

(6) A prospecting boring campaign is necessary to prove the extent of the deposit, and the results obtained from mining operations to date amply justify the expenditure of at least £1,000 on this work.

(7) The various known occurrences of tin-bearing pegmatites exposed in shallow workings on the other mineral claims of the company's holdings require further prospecting before an estimate of their value can be formed. On present indications, they do not appear to have the possibilities of the deposit at present being worked on M.C. 4.

Plans.

The following plans accompany this report:—

- (1) Geological Map of Mineral Claims Nos. 3, 4, 8, 15, 16 and 17, and W.R. 286. Scale 5 chains = 1 inch.
- (2) Plan of open-cut, Mineral Claim No. 4, showing lines of proposed boresites. Scale 100 feet = 1 inch.

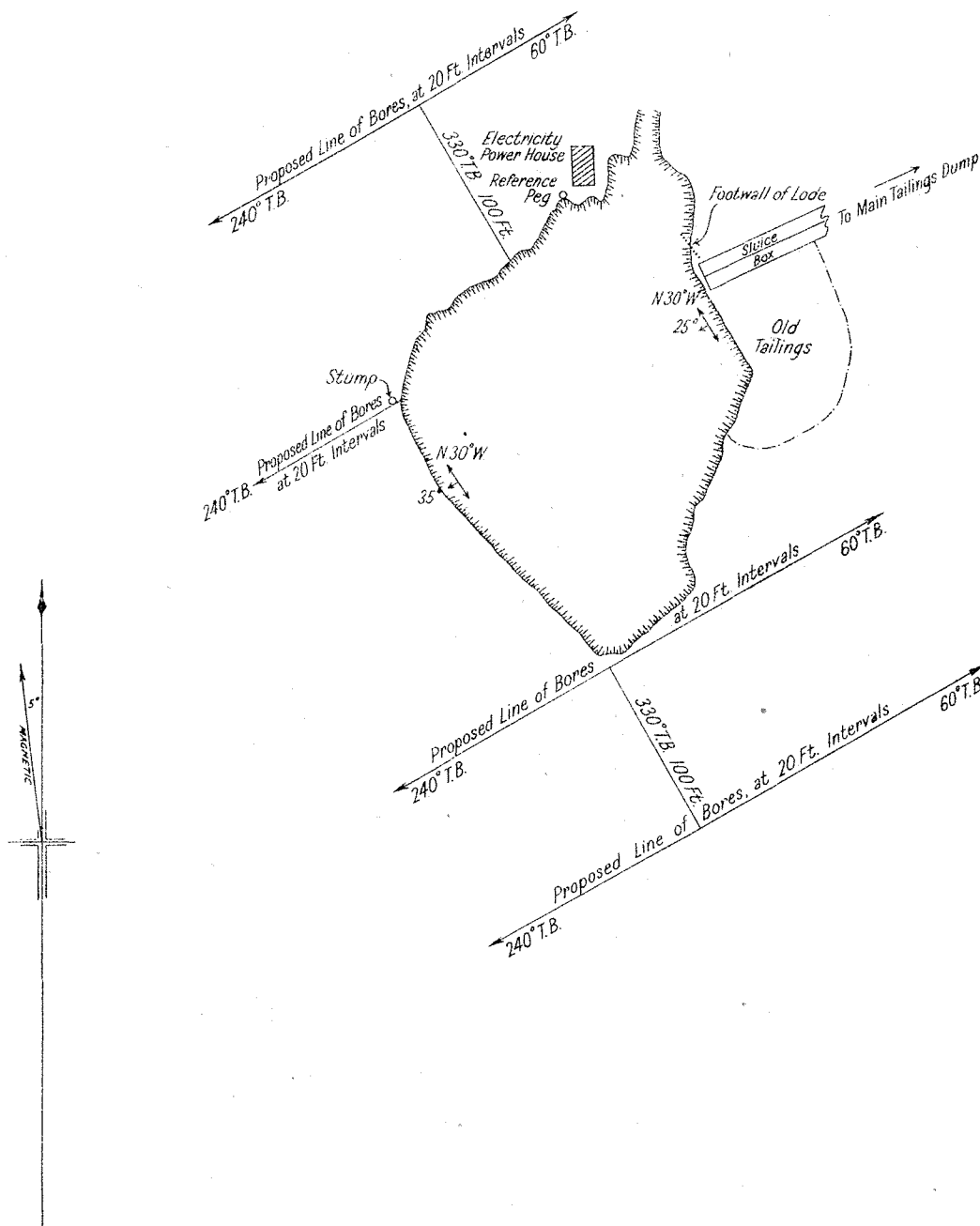
Photographs.

A series of photographs of the open-cut and rock formations exposed therein has been added to the Departmental collection.

PLAN OF
OPEN CUT-MINERAL CLAIM N^o 4
VULCAN TIN MINES LTD.

2 Miles S.E. by S. from Greenbushes
Showing Proposed Line of Bore Sites
GREENBUSHES TINFIELD

Scale 200 feet to an inch



PROGRESS REPORT ON THE GEOLOGICAL SURVEY OF THE YILGARN GOLDFIELD (NORTH OF THE GREAT EASTERN RAILWAY).

(By H. A. Ellis, B.Sc., A.O.S.M.)

Field work on this area was commenced late last year and was continued this year from March 22nd to the middle of June when an interruption was caused by the concentration of work on the Koolyanobbing Iron Ore deposits.

Mr. R. S. Matheson was in the field with the writer and undertook the detailed investigations of the mining groups as well as assisting in the regional mapping when opportunity afforded.

The regional mapping was carried out by the writer, and up to the middle of June, the external boundaries of the Greenstone Series, as well as the boundaries of some of the more distinct lithological types forming part of this Series, were delineated as far north as a line passing through the Sisters Trigonometrical Station (H.K. 7) and the Radio Mine, about five miles north of Bullfinch townsite. A considerable area of granitic and gneissic country lying to the east and west of the greenstone belt extending between Southern Cross and Colreavy was traversed, and in the Koolyanobbing district Mr. Matheson carried out a plane-table triangulation survey of about 150 square miles of country in which only a very small amount of survey data was available on existing plans.

The following mining groups were examined by Mr. Matheson and his reports appear elsewhere in the Annual Report:—

- The Hope's Hill Group,
- The Pilot Group,
- The Copperhead Syndicate (Bullfinch Group),
- The Koolyanobbing Group.

Several geological features of importance in the interpretation of the major geological structure have been recognised and mapped, and it is now possible to indicate the approximate position of the axis of the major anticlinal cross-fold comparable in order of magnitude with the major synclinal crossfold occurring between Nevoria and Burbidge in the southern portion of the goldfield.

The regional pitch of the structure southward from Southern Cross is steep to the south-east, and between Southern Cross and a point situated a short distance north of Corinthian there is a length of about twelve miles of country in which changes of pitch from north-west to south-east occur, and in which are situated, in addition to many small gold occurrences, the Hope's Hill, Pilot, and Corinthian mining groups.

North of Corinthian the regional pitch is to the north-west, with minor reversals of pitch. This regional pitch to the north-west is maintained at least as far north as the Sisters Trigonometrical Station, the northern limit of the detailed regional mapping so far carried out.

The axis of a major anticlinal crossfold must, therefore, pass through the Greenstone Series somewhere between Southern Cross and a little north of Corinthian.

On the other side of the structure, namely, the jaspilite horizon in the Greenstone Series as exposed at Koolyanobbing which is traceable with breaks, from Bullfinch south-eastward through Southern Cross, Marvel Loch, Nevoria and then in a northerly

direction through Palmer's Find, Yellowdine Lake and north-westward from Koolyanobbing, there is evidence which points to a spot about eight to ten miles south-east of Trig. Station M.Y. 1 as being the locality of a change in regional strike associated with the existence of a cross-fold. On the western shores of Lake Barlee in this vicinity the jaspilite horizon can be seen extending southward to Yellowdine Lake with a regional strike approximating to the north. To the northward the jaspilites assume a regional strike of nearly north-west, and for a considerable length of this north-westerly striking portion of the jaspilites the regional pitch is to the north-west, and the major drag-folds indicate that the beds are forming the eastern limb of a northerly pitching antiline.

The axis of the major anticlinal crossfold can be reasonably presumed to pass through the major structure in a north-easterly direction from a point somewhere between Southern Cross and Corinthian to a point about eight to ten miles south-east of Trig Station M.Y. 1 at Koolyanobbing.

This anticlinal crossfold, together with the synclinal crossfold at Nevoria, has caused the gradual convergence of the jaspilite horizon in a southerly direction and the convergence of the structure lines in a general northerly direction demanded by this interpretation of the major structure, can be seen to be taking place northward from the line of the axis of the anticlinal crossfold.

A synclinal crossfold is surely being approached as we proceed in a general northerly direction from Bullfinch, but field work has not yet been undertaken in this direction.

A band of metamorphosed erosion sediments and fine grained basic tuffs in which quartzites, phylites, pebble conglomerates, and garnetiferous amphibolite schist are prominent, has been traced north-westwards to Bullfinch townsite from the northern shore of Lake Koorkoordine immediately west of the point where the Southern Cross-Hope's Hill road crosses the lake. At present, this Series of rocks of predominantly sedimentary origin is thought to be a stage in the Greenstone Series, as no evidence of repetition of the beds by folding has so far been found. If they represented a portion of the White-stone Series which had been preserved as an infolded synclinal remnant, repetition of the beds in a direction at right angles to the strike should be able to be detected. A careful search for this feature was made without success, and it certainly seems at present that these beds form part of a unilateral structure at least as far north as Corinthian.

Anthophyllite schist and tale associated with a coarse-grained amphibolite showing a pegmatoid development occur as parallel bands on the western side of the metamorphosed sedimentary band and are traceable for many miles north-westward from the shore of Lake Koorkoordine.

The formation of replacement gneisses and micaeous schists as a result of metasomatic replacement of the marginal areas of the Greenstone Series by granitic material is well shown in the exposures near the eastern boundary of the Greenstone Series between Hope's Hill and Corinthian. Unfortunately, the rocks are too deeply weathered to provide a suite of typical specimens for petrological and chemical investigation, but the field evidence supporting the conception of granitisation is very strong in this locality.

PROGRESS REPORT ON THE GEOLOGY OF
AN AREA IN THE VICINITY OF LAVER-
TON AND MORGANS—MT. MARGARET
GOLDFIELD.

(R. A. Hobson, B.Sc. (Hons.).)

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INTRODUCTION.

During 1917 and 1918 regional geological mapping was undertaken by Clarke in the Leonora-Duketon district, and the maps published on a scale of 4 miles to an inch.¹ Prior to this, and mostly before 1908, various mining centres had been examined by members of the Geological Survey Staff. In late 1937, the writer, with Messrs. Matheson and Miles, commenced field work in the vicinity of Beria. The object was to carry out geological work of a similar nature to that then only recently completed in the Yilgarn Goldfield. It was intended to cover a smaller area than that broadly mapped by Clarke, and to include more detailed work in the vicinity of active mining centres. Particular emphasis was to be given to the structural aspect of the work, as it had already been found² that there was a relationship between geological structure and gold deposition.

FIELD WORK.

Field work was commenced by Mr. R. S. Matheson on 4th October, 1937, at the Lancefield Gold Mine. On 28th October he was joined by Mr. K. R. Miles. During the 1937 field season, these two officers completed the examination of the Lancefield Gold Mine, the country in its immediate vicinity,³ and commenced the mapping of the jaspilites in the vicinity of Laverton and Beria. After Mr. Matheson's departure on 25th November this latter work was continued by Mr. Miles. The writer joined the field party on 2nd November, and field work was continued until 17th December. In addition to making a broad examination of the country the writer reported upon the King of Creation Gold Mine.⁴

Field work was resumed by Mr. Miles on 26th March, 1938, and he continued with the mapping of the jaspilites in the vicinity of Laverton and to S.W. He was joined by the writer on 21st April. On 4th August the writer was withdrawn to take over work at Koolyanobbing in connection with the

iron survey, and Mr. Miles continued with both the jaspilite mapping and the broader geological mapping. During the period 18th August to 29th October, Mr. Matheson was also in the district, and in addition to mapping the jaspilites to the S.E. of Laverton, also made an examination of the Eristoun Gold Mine at Cox's Find.

As a result of the work outlined in the previous two paragraphs 2,000 square miles of country have been mapped on a scale of one mile to an inch. It is worthy of record that this includes the accurate mapping of all jaspilite outcrops. The Lancefield Group (including the Lancefield Gold Mine), the Gladiator Group⁵ (including the Gladiator Gold Mine), the King of Creation Gold Mine and the Eristoun Gold Mine⁶ have been examined, and appropriate maps and plans prepared.

During the 1938 field season the work was severely handicapped by the lack of adequate transport—only one utility being provided. Had an additional utility truck been provided, appreciably more country would have been mapped.

MAPS AND PLANS.

The broad scheme of work followed during the course of the Yilgarn Survey⁷ has been used. Broad geological mapping has been done on a scale of one mile to an inch, and recorded on Lands Department lithos. numbers 137, 138, 139, 144, 145, 146 and 172. During the course of the field work it was found that the one mile to an inch lithos. contained too much irrelevant detail to be suitable for base maps, and accordingly base maps, showing only survey information, were prepared from these lithos. Jaspilite mapping has been done for the most part using a plane table and telescopic alidade, and intersection and resection methods on a scale of 20 chains or 40 chains to an inch.

GENERAL GEOLOGY.

The principal rocks of economic importance are those of the Greenstone Complex. This consists of a highly folded series of basic lavas, tuffs, agglomerates, epidiorites, coarse-grained greenstones (probably intrusive), with fairly frequent thin bands of erosion sediments. Of the erosion sediments the most useful for structural purposes are the jaspilites, which form conspicuous outcrops, and which are continuous along their strike for many miles. The Greenstone Complex is invaded by a Granitic Series, consisting of granite, gneiss and acid dykes of various types, including the auriferous quartz veins. This is, in turn, intruded by dolerite dykes, which are, however, not of very frequent occurrence. Overlying all these unconformably, are rocks of much more recent origin—glacial erratics, siliceous and ferruginous laterite, soil and alluvium. As elsewhere in the Western Australian Goldfields soil and alluvium extend over large areas, and effectively cover much geological detail. During the course of the geological mapping soil covered areas, in which the underlying rocks could not be reasonably inferred from the soil, are mapped as soil.

¹ P. 90.

² P. 87.

³ Ellis, H. A., Progress report on the geology and mines of the Yilgarn Goldfield, Annual Progress Report of the Geological Survey for the year 1935, p. 19.

¹ Clarke, E. de C. The field geology and broader mining features of the Leonora-Duketon district, Western Australia, Geological Survey Bulletin No. 84, 1925.

² Ellis, H. A. Progress report on the geology and mines of the Yilgarn Goldfield, south of the Great Eastern Railway, Annual Progress Report of the Geological Survey for the year 1936, p. 31. Also—The geology of the Yilgarn Goldfield, south of the Great Eastern Railway, Geological Survey Bulletin 97 (in press).

³ Matheson, R. S., Lancefield Gold Mine Mt. Margaret Goldfield; Miles, K. R., Lancefield Group—Report on "Beria Main Lode," G.M.L. 2216T, Mt. Margaret Goldfield, Annual Progress Report of the Geological Survey for the year 1937, pp. 14 and 20.

⁴ Hobson, R. A., King of Creation Gold Mine, Mt. Margaret Goldfield, Annual Progress Report of the Geological Survey for year 1937, p. 12.

So far no sedimentary series, corresponding to the Whitestone Series of the Yilgarn Goldfield, has been found. It was thought that an outcrop of chiasolitic rock, occurring 2½ miles S.E. of the late Childe Harold Gold Mine, might be portion of such a series. This outcrop forms a low hill, approximately one mile by half a mile, and is completely surrounded by alluvium. Geological mapping has not yet been continued southward from here, so that it is not known if there are any further outcrops of this rock. It occurs in a broad synclinal fold, and would therefore be in a stratigraphic position similar to the Whitestone Series. Mapping to the S.W. of Morgans in an area where there is another large synclinal fold, has not revealed any extent of sedimentary rocks. The small outcrop referred to above is therefore, for the present, best regarded as merely another sedimentary band in the Greenstone Complex.

The following is put forward as a tentative rock classification, subject to expansion and alteration as the work proceeds:

RECENT.

Soil, alluvium, siliceous and ferruginous laterite.

AGE UNKNOWN.

Glacial erratics.

PRE-CAMBRIAN.

Dolerite dykes.

Granitic Series: granite, gneiss, pegmatite and aplite dykes, porphyry dykes of various types, quartz reefs.

Greenstone Complex: lavas, tuffs, agglomerates, epidiorites, coarse-grained greenstones (probably intrusive) with thin bands of erosion sediments. Includes the jaspilites.

In the paragraphs preceding the above table, a very brief summary of the geology has been given. In the following paragraphs it is not intended to give a more detailed account of the general geology, but only to draw attention to certain features.

Soil and alluvium.

Large portions of the area under examination are covered with a reddish brown to yellow sandy soil, and a spinifex and stunted mallee vegetation. In these areas typical sand dunes frequently occur. Immediately south of Mt. Windarra, and also 2 miles S.S.W. of J.R. 33 soil of this type is seen to be blown against jaspilite ridges, and sometimes through gaps in the ridges. Almost without exception no rock outcrops occur in areas covered with soil of this type. The writer has, however, seen small outcrops of granite, and at one place soil of this type is seen to overlie a much weathered granite exposed in a break-away. Areas with this type of soil and vegetation are regarded as being covered with transported soil, which obscures the underlying geology. Other areas of sandy soil, but with mulga vegetation and scattered small outcrops of granite or gneiss are regarded as overlying granite and/or gneiss.

Alluvium covers very extensive portions of the country, and is readily recognised by the absence of outcrops, the flat nature of the country and the vigorous growth of the vegetation.

Glacial erratics.

These were first seen by the writer, who knew of their existence in the district, on the Beria-Cox's Find road, about 8 miles from Beria. Their presence in the district was recognised by Clarke,⁹ and later by Talbot,¹⁰ who may have seen the boulders referred to above. They have now been recognised in the vicinity of Beria and Morgans.

No faceted boulders have been found, but flattened boulders are of frequent occurrence. A big variety of rock types is found, many of which are recognised in the district. A collection of boulders has been made, and should make an interesting petrological study.

Granitic Series.

A striking feature of the Mt. Margaret Goldfield, to one who has recently been in the Yilgarn Goldfield, is the almost complete absence of pegmatite dykes. Except for minor occurrences of pegmatite at granite "rocks" no pegmatite was seen by the writer or his colleagues.

Porphyry dykes are particularly abundant, while aplite dykes are of frequent occurrence. Porphyry dykes may be either sheared or massive, and at least some are of pre-gold age. The quartz reef at the Gladiator Gold Mine occurs at some levels in a porphyry dyke.¹¹ It is considered probable that the sheared dykes and the massive dykes are, for the most part, of the same age, and that the difference is merely one of degree. However, some massive fresh looking dykes, e.g., the one cutting through lavas and agglomerates on the Mt. Weld Station road, 6 miles S.S.E. from Laverton, is probably of a later age. Various types of porphyry are known to exist, but no petrological examination of specimens has yet been made. All are intrusive into rocks of the Greenstone Complex.

Greenstone Complex.

The Greenstone Complex consists of a highly folded series¹² of basic lavas, tuffs, agglomerates, epidiorites, coarse grained greenstones, with fairly frequent relatively thin bands of erosion sediments. The most interesting and important of the erosion sediments is the jaspilite, which is the subject of a separate report by my colleague, Mr. K. R. Miles. Throughout the area there are fairly numerous bands of graphitic schist which can sometimes be traced for some distance along their strikes. There are also isolated occurrences of more massive graphitic rocks, sometimes containing chiasolite or andalusite, and at one place a rock believed to be a greywacke. These bands of metamorphosed sediments vary in width from a few feet, as for example in the vicinity of Laverton, to over half a mile at Murrin Murrin.

Good exposures of lava are to be found in the deeper mines, and on low rounded hills, which are of frequent occurrence. Less frequently lavas and agglomerates form fairly conspicuous hills. Small and much weathered exposures of greenstone schist are frequently to be found in areas which at first sight appear to be completely soil covered.

⁹ Clarke, E. de C., op. cit., Bulletin 84, p. 37.

¹⁰ Talbot, H. W. B., personal communication to Government Geologist.

¹¹ P. 90.

¹² For a description of the structural geology refer to a report by Mr. Miles on page 92.

A very coarse grained greenstone, forming fairly conspicuous outcrops, is believed to be intrusive into the other rocks of the Greenstone Complex, but no evidence has yet been obtained to indicate whether it occurs as sills or is transgressively intrusive.

Because of the general paucity of outcrops it is very unlikely that it will be possible to sub-divide the Greenstone Complex on the maps. Distinctive varieties of greenstone are, however, being indicated.

It is proposed to continue field work in this area during the 1939 field season.

REPORTS ON SOME MINING GROUPS IN THE YILGARN GOLDFIELD.

(North of the Great Eastern Railway.)

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

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PILOT GROUP.

YILGARN GOLDFIELD.

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

GENERAL INFORMATION.

The Pilot Group is situated on the western side of the Southern Cross-Bullfinch railway, approximately $6\frac{1}{4}$ miles from Southern Cross, and is $1\frac{1}{4}$ miles W.S.W. from the 6-mile peg on the main road between these two centres.

At the time of inspection (May-June, 1938), there were two existing leases, "Pilot" G.M.L. 3414 and "Exonia" G.M.L. 3483 both under the control of T. J. White and W. J. Heydon, and prospecting was being done in the old workings on the late "Colleen Bawn" G.M.L. 2544.

The present lessees of the "Pilot" G.M.L. 3414, first pegged the ground in December, 1932, but official records show that gold was discovered in this vicinity in the year 1909.

A 5-head battery and cyanidation plant is in operation on the "Pilot" mine, but only on rare occasions it is 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.

There are adequate supplies of morrel, gimlet and salmon gum in the vicinity, which are suitable for mining purposes.

It is impossible to determine accurately the total production from this group, as some production may be included under "sundry claims" in the Hope's Hill official grouping, but a study of the official figures shows that 12,075.20 tons of ore have been treated yielding 6,739.86 fine ozs. of gold, and specimens total 17.81 fine ozs.

GENERAL GEOLOGY.

The group is situated in an area of highly metamorphosed interbedded, greenstones, jaspilites and erosion sediments, which are presumably of Pre-

Cambrian age and the country grades eastwards into replacement gneiss of granitic origin. The rocks are sheared and contorted, but have a general north-west strike and steep dips varying from 70° N.E. to 70° S.W.

A geological subsurface map of the area, on a scale of 5 chains to 1 inch, has been compiled, and it will be included in a later publication dealing with all the mining groups in the northern portion of the Yilgarn Goldfield.

Greenstones.—Metamorphosed basic lavas and tuffs constitute the major portion of the greenstones. The lavas are dark greenish in colour, and dense to medium-grained varieties occur. They are often amygdaloidal, and exhibit only a rude schistosity.

The tuffaceous rocks are distinguished from the lavas by their greyish-green colour and their greater schistosity.

Anthophyllite Schist.—A band of this rock 15 chains wide, occurs 45 chains south-west of the leases. It is believed to be a pre-folding, ultra-basic sill. It is yellowish to grey in colour, and is everywhere associated with chromite-bearing ironstone and cellular quartz, which are believed to be its decomposition products. The anthophyllite schist is regarded as a component of the greenstones, and it would probably be green in colour, if it could be seen in a fresh state.

Irregular masses of intrusive, coarse-grained, greenstone are associated with the anthophyllite schist in a few places.

Jaspilites.—Two main beds of jaspilite, approximately 16 chains apart, are present in the area, and there is some suggestion that these may be the same bed repeated by folding on a north-west-south-east axis.

The western bed occurs fairly continuously throughout the group forming a sinuous outcrop line. In places along its strike, two or more outcrop lines appear, and this is thought to be due to the presence of dragfolds.

The eastern bed is poorly represented, and can be best seen in the vicinity of the "Pilot" workings. To the north-west it is obscured by a thick overburden, while to the south-east it becomes almost completely granitised.

Erosion Sediments.—A band of metamorphosed erosion sediments, 10-15 chains wide, and consisting of quartzites and grey garnetiferous phyllites, occurs $\frac{1}{4}$ mile south-west of the workings. Numerous flows of amygdaloidal basic lava are interbedded with the erosion sediments, and are of necessity mapped with them.

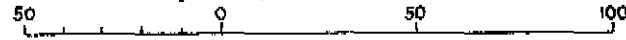
At the time of inspection it was impossible to be certain whether these erosion sediments were a synclinal remnant of the Whitestone Series, or only a sedimentary band in the Greenstone Series. It is hoped that this point will be elucidated by future fieldwork.

Gneiss.—The gneiss is granitic in composition, and in the area mapped, is believed to have been formed by the replacement of greenstones. Owing to the mode of origin of the gneiss, its boundary with the greenstone is not sharp. A zone of intermediate rocks occurs between the greenstone proper and gneiss proper.

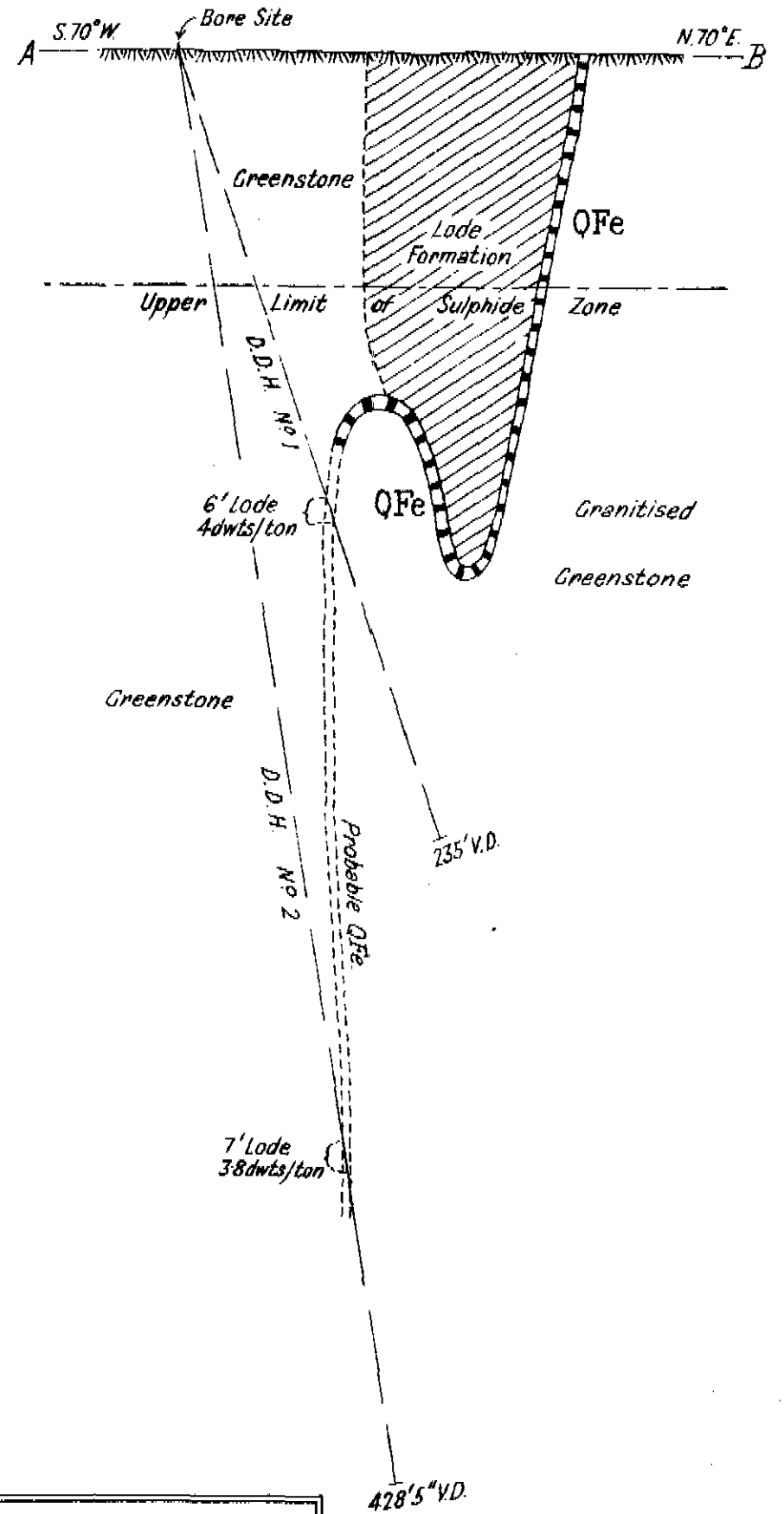
PLAN OF WORKINGS PILOT G.M.—G.M.L. 3414

YILGARN GOLDFIELD

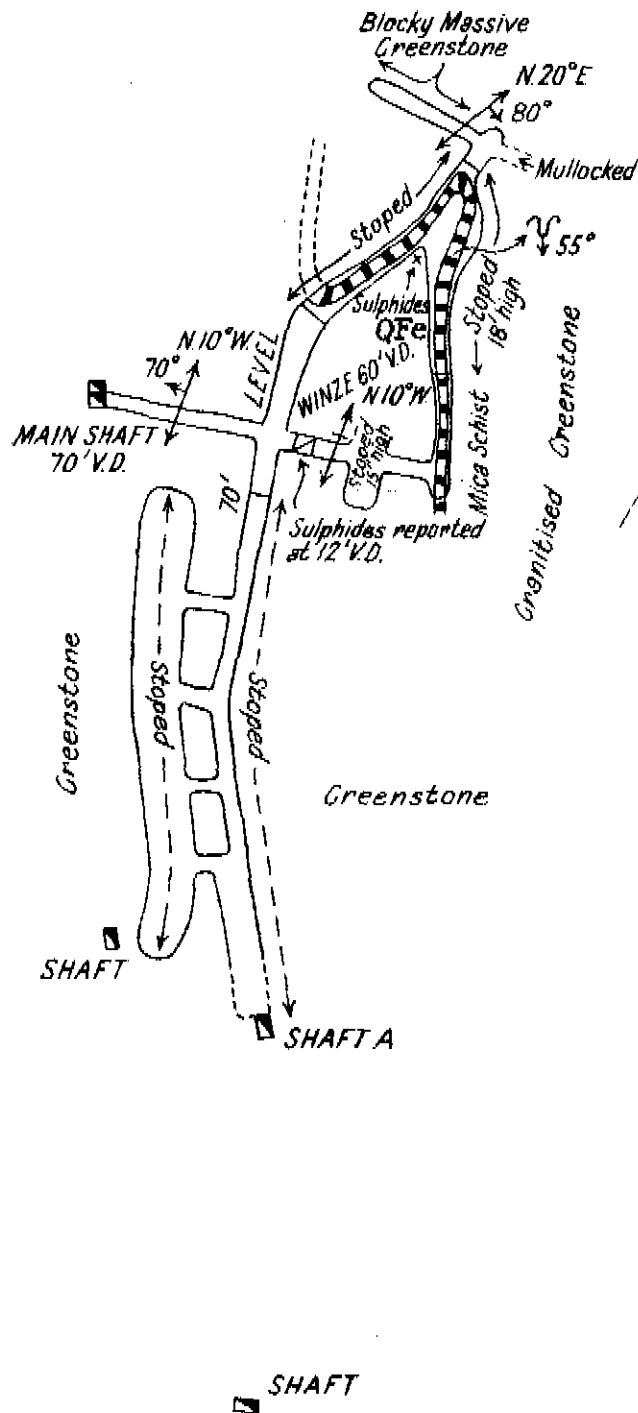
Scale 50ft. to an inch



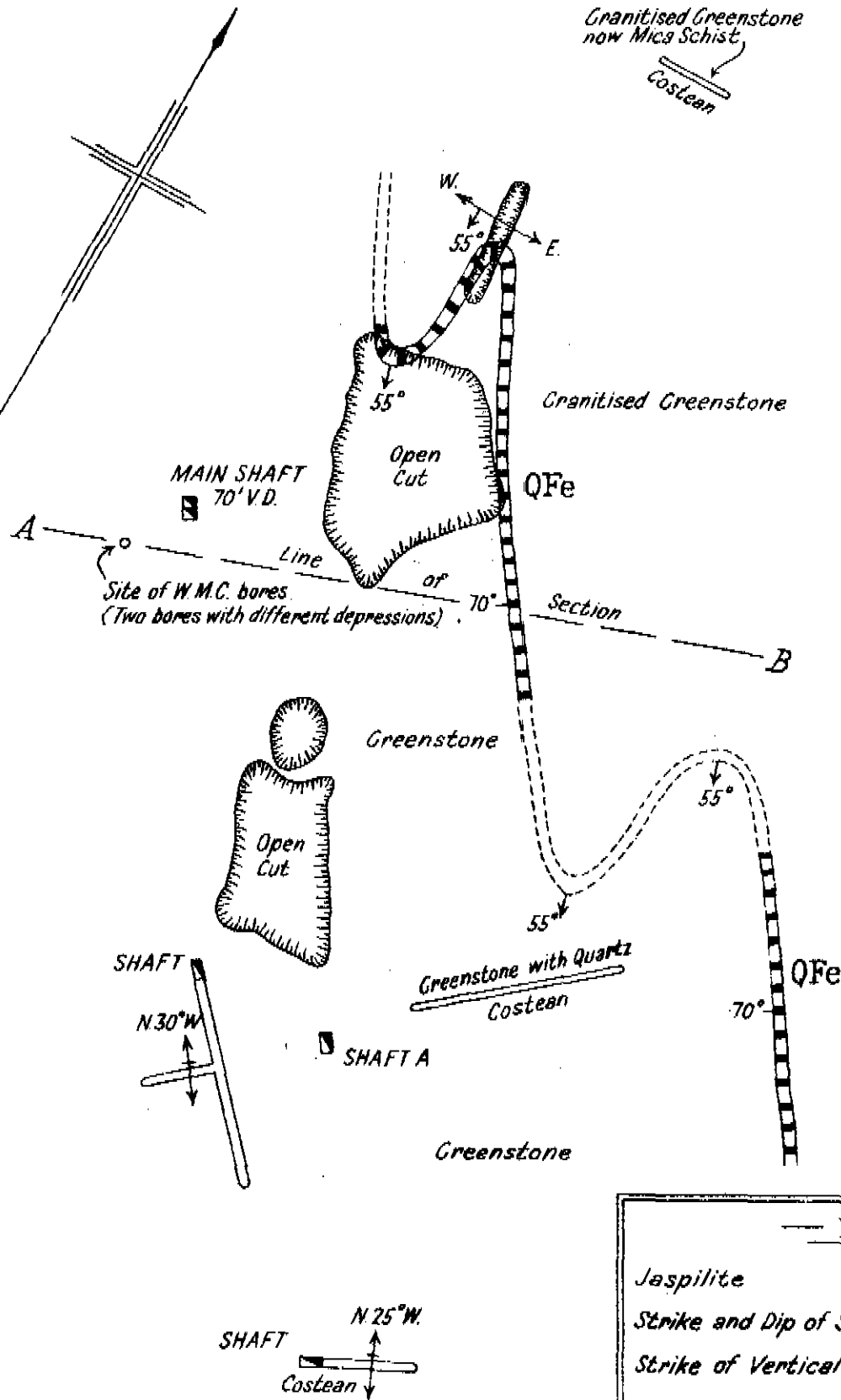
— TRANSVERSE SECTION —



— PLAN OF 70FT LEVEL —



— SURFACE PLAN —



— REFERENCE —	
Jaspilite	—x—QFe—
Strike and Dip of Schistosity	N 10° W ↘ 70° V
Strike of Vertical Schistosity	N 10° W ↔
Dragfold showing direction and angle of pitch	↘ 60°

Geology by R.S. Matheson.
Compass & Tape Survey by R.S. Matheson.
Geological Survey of Western Australia 1938.

Structure.—The group is on the northern extension of the Southern Cross belt of country, which has been determined from previous mapping, to be situated on the western limb of a large anticline folded on a north-west-south-east axis. The eastern limb of this anticline embraces the Koolyanobbing belt of country.

From a study of the dragfolds in the jaspilites, it will be seen that they pitch 55° S. in the vicinity of the main workings, while north-westerly pitches prevail at the north-west and south-east ends of the area. This reversal in pitch was brought about by another system of folding with an approximately east-west axis, and is generally referred to as cross-folding. Gold deposition appears to have occurred close to the axis of this crossfold.

Normal faulting, with a displacement of approximately 5 chains, has taken place at the south end of the area, and milky-white quartz reefs occur along the line of the fault. The faulting appears to be post-gneiss in age because of the displacement of the greenstone-gneiss boundary, but this interpretation is open to question. Granitisation frequently ceases at a definite horizon, and it is probable that pre-gneiss faulting would not materially affect the process.

THE MINES.

"Pilot" G.M.L. 3414 and "Exonia" G.M.L. 3483.

At the time of inspection (May-June, 1938), mining activity was confined to the "Pilot" lease.

The ore body consists of greenstone lode material with quartz veins and stringers, which has been mined sporadically over a length of 225 feet and a width of 70 feet, between the surface and the 70 feet V.D. level. Payable values occur erratically through this block of country, and the limits of the ore shoots are ill-defined. The actual mined portions of the lode formation can be seen on the accompanying plans. (Plate V.).

The available ore has practically been stoped out between the surface and the 46 ft. V.D. level, and at the time of inspection overhand stoping was in progress in the south-east workings at the 70 ft. level. The jaspilite has also been mined in places, where ore shoots occurred.

The workable ore is limited in depth by the sulphide zone, which begins at approximately 70 feet V.D. from the surface. Values are said to occur in the sulphide zone, but there are no facilities for the treatment of such ore at the mine, and a loss is incurred if the sulphide ore is sent to Kalgoorlie for treatment. Specimens of the sulphide-bearing ore were submitted to the Government Chemical Laboratory for mineral determination and the sulphide present proved to be marcassite.

All the known ore shoots are either in, or stratigraphically above the jaspilite, and they bear a close relation to its structure.

The structural control is best understood by taking the lode formation as a whole, rather than the individual ore shoots. By referring to Plate V., it will be seen that the jaspilite has been folded into west, antilinal limb, dragfolds, which pitch 55° S.S.E., and the lode formation is confined to the syndinal trough of the north-western of these two dragfolds. Because of this, the ore shoots in the mine are expected to have a south south-east pitch, although it

was impossible to observe the pitch of the shoots in the workings. Greenstone occurs stratigraphically above the jaspilite, and mica schist, believed to be an intermediate stage in the granitisation of the greenstone, predominates below it.

The production figures given below have been taken from the official records and are complete to 31st July, 1938.

Ore Treated.	Gold Therefrom.
11,665 tons.	2,004.06 fine ozs.
Sands.	2,819.73 fine ozs.
Total 11,665 tons.	4,823.79 fine ozs.

Some of the production from the sands shown above, may possibly be from public crushings carted from elsewhere, but it is reported that a large percentage of the gold in the "Pilot" ore is recovered by cyanidation.

RECOMMENDATIONS AND CONCLUSIONS.

1. The workings have not yet penetrated ground water level, and this fact along with the erratic distribution of the values, suggests a secondary origin for the majority of the lode material. It is not intended to imply that lode material will be entirely absent below ground water level, but there will be a marked decrease in lode material due to the disappearance of the secondary enriched portion, and any that remains will be in the proximity of the auriferous quartz veins and stringers.

2. Because of the poor extraction obtained from the treatment of sulphide ore at the mine, there is obviously a close association between the gold and the sulphides.

3. Diamond drilling to test the downward continuation of the lode formation, has been done by the Western Mining Corporation, who at one time held an option over this property. Two bores were drilled on the same site (see plan), and all the available information concerning these bores is tabulated below.

Bore No.	Angle of Depression.	True Bearing.	Bore Depth.	Remarks.
1	$71^{\circ} 31'$	70°	235' V.D.	6ft. lode at 140ft. Recovery value, 4.1 dwts. gold per ton.
2	81°	70°	428' 5" V.D.	7ft. lode at 330ft. Recovery value, 3.8 dwts. gold per ton.

From a study of the section accompanying this report (Plate V.), it will be seen that diamond drilling has not been done to the best advantage. The bores do not intersect the main lode formation, which has pitched away to the south above them, and the values that were intersected probably occur in the downward continuation of the western leg of the dragfolded jaspilite. Owing to this error in the selection of the bores, the nature of the lode formation at depth is still unknown.

4. The southern dragfold shown on the plan has been inferred from fragmentary evidence. The displacement of the outcrop line, and the absence of

faulting in the mine workings, makes this inference fairly conclusive however. It is feasible therefore, to expect other ore shoots in the synclinal trough of this dragfold, and prospecting for them is strongly recommended.

Other shoots of ore may also exist in similar structures, north-west or south-east along the strike of the jaspilite.

Late "Colleen Bawn" G.M.L. 2544.

These old workings were being prospected in June, 1938, but owing to their dangerous state they were not examined by the writer.

From information received, the ore body appears to have been a series of rich quartz reefs, parallel with the enclosing greenstone country, which were lenticular both horizontally and vertically. The reefs have been stoped out to ground water level, reported to be 90 feet V.D. from the surface. The ore shoots pitch to the south-east, and their lensing out coincides with a change in strike or dip, which suggests the presence of gentle folding. Shearing is more intense near the ore channel, and the greenstone is represented by talc schist.

This line of workings is approximately 16 chains south-east of the "Pilot" workings, and the official production figures show that to July, 1938, 410.20 tons of ore had been treated yielding 1,916.07 fine ozs. of gold, and specimens totalled 17.81 fine ozs.

KOOLYANOBGING GROUP.

YILGARN GOLDFIELD.

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

GENERAL INFORMATION.

Koolyanobbing is situated on the north-western side of Lake Seabrook, approximately 30 miles north-east of Southern Cross. The distance by road between these two centres is slightly greater however, being about 40 miles.

The Koolyanobbing belt of country extends north-west from Lake Seabrook for a distance of 22 miles, but mining activity is confined to the country in the immediate vicinity of Trig. M.Y. 1. At the time of inspection (July-August 1938), mining was in progress on "Chadwick's Reward" G.M.L. 3514 and the late "Golden Wishbone" G.M.L. 3581, and prospecting was being done on the late "Rainbow" leases.

Gold was discovered in this locality in 1904, by a Mr. Chadwick of Southern Cross, but the area has never attained importance as a gold mining centre.

Iron, copper and gypsum also occur in the district.

The main Koolyanobbing range contains some high grade lenses of iron ore,* which show promise of being of economic importance.

Copper carbonates are reported in several places, but no deposits of economic value have been disclosed.

Gypsum deposits are being worked on the south-eastern shore of Lake Seabrook, immediately opposite the Koolyanobbing Range. The gypsum is

* A detailed survey of the iron deposits at Koolyanobbing, by the Geological Survey of Western Australia, has just been completed. (November, 1938.)

crystalline, and has been built up into dunes by the action of wind blowing across the surface of the lake.

A two-head battery, with no cyanidation plant, is in operation on G.M.L. 3514, and it crushes all the ore mined at Koolyanobbing.

Water for domestic purposes is obtained from an excavated tank, 36 chains west of the late "Rainbow" leases, which has a capacity of 50,000 gallons. After rain, domestic water can also be obtained from rock holes at Condenser Rocks and Flat Rocks, but the supply is small. Water for mining purposes is obtained from the underground workings on G.M.L. 3514, ground water level being 138 feet V.D. from the surface.

A thick forest of morrel, salmon gum and gimlet, which are suitable for mining purposes, covers the area.

The official production returns show that to the 31st December, 1937, 1,958.05 tons of ore were treated, yielding 1,022.64 fine ounces of gold, and alluvial gold totalled 0.26 fine ozs.

GENERAL GEOLOGY.

A geological map, on a scale of 40 chains to 1 inch, embracing 13 miles of the main range, and an area of 150 square miles, has been compiled, and is available for inspection at the Geological Survey Office.

The area is composed of rocks of the Greenstone Series, consisting of interbedded basic lavas, agglomerates, tuffs and jaspilites, which are intruded by biotite granite, and quartz porphyry dykes. The greenstone belt has a maximum width of 5 miles, and grades eastward and westward into granitic gneiss of replacement origin. All the rocks are presumably of Pre-Cambrian Age.

The general strike of the country is N. 40° W. and the dip varies from 50° N.E. to vertical. The country has been highly folded and the dragfolds have a general pitch 50°-80° N.W., but a temporary reversal in the direction of pitch occurs near the north-west end of the area mapped. An interpretation of the folds shows that Koolyanobbing is on the east limb of an anticline.

The main range is composed of contorted jaspilite and is very conspicuous, attaining a height of 400 feet above the general level of the country in some places. Another prominent line of hills occurs along the western gneiss-greenstone boundary, and granitic quartz forms the backbone to these hills.

Koolyanobbing is believed to be the northern extension of the Mt. Palmer† belt of greenstone.

THE MINES.

"Chadwick's Reward" G.M.L. 3514.

This lease is situated 2¾ miles south-east of Trig. M.Y. 1.

A plan‡ of the accessible underground workings on a scale of 50 feet to 1 inch has been compiled.

According to the official production returns, to the 30th April, 1938, 990.05 tons of ore were mined from this lease for the recovery of 497.24 fine ozs. of gold.

† Ellis, H. A., G.S.W.A. Bull. No. 97.

‡ Plan not published.

Two parallel quartz reefs, striking N. 30° W. and dipping 65-75° N.E. with the schistosity of the enclosing greenstone country, have been mined on this lease. The western reef has been the main ore body.

Main Reef.—The reef is very lenticular in nature, and is reported to have had an average width of 1 foot. The average length of the ore shoot is 130 feet, and it has been practically stoped out between the surface and ground water level, 146 feet V.D. from the top of the dump. The workings were only partially accessible, and for this reason the details of the workings are meagre. The pitch of the ore body is not definite, but appears to be to the north-west. This is probably correct, however, since the regional pitch in this vicinity is to the north-west.

Eastern Reef.—The reef is very lenticular in nature and is reported to have had an average width of 6 inches. The only work on this reef is at the 117ft. level, where it has been driven on for 136 feet and overhand stoped for 50 feet. Overhead and underfoot the reef was apparently an unpayable proposition.

Structure.—The country rocks are gently folded on an axis pitching 70° N.W. and the structure appears to have had some control over quartz deposition. The quartz lenses occur in the synclines (or downfolded portions), and the quartz pinches to a stringer over the anticlines. This control is noticeable at the 117ft. and 143ft. levels. The lessees should not overlook the fact that this control may also occur vertically. Owing to a large portion of the workings being inaccessible, an investigation along these lines was impossible at the time of inspection (July, 1938).

Recommendations and Conclusions.

1. There is reported to be a 200ft. level on the main reef, but it was under water at the time of inspection, and could not be examined. Owing to an increase in mining costs due to pumping water, and a slight decrease in the values, the reef cannot be worked profitably at this level. This information was supplied by the lessees. The mine therefore has no prospects at depth.

2. The lessees have overlooked the possibility of the ore shoot having a north-west pitch, and a north-west drive at the 143ft. level is recommended. This is the only prospecting warranted on the known ore bodies.

3. Lateral prospecting for the occurrence of parallel ore bodies may be done to advantage.

4. The tailings dump should be thoroughly sampled to see if the erection of a cyanidation plant is warranted.

Late "Golden Wishbone," G.M.L. 3581.

This lease is situated 3½ miles south-east of Trig. M.Y. 1.

The lease was forfeited in 1936, but was being worked as a prospecting area at the time of inspection (July 1938). To the time of forfeiture, 339 tons of ore were treated for the recovery of 203.89 fine ozs. of gold.

The ore body on this lease consists of a mass of small quartz lenses, which strike N. 30° W. and dip 50-60° N.E., with the enclosing kaolinised greenstone

country. The shoot has been mined on three levels, by means of an underlay shaft, to a vertical depth of 107 feet. The shaft underlies at 50 degrees to the 38ft. V.D. level, where the dip steepens to 65 degrees.

The shoot has an average length of 12 feet and an average width of 4 feet, and has been stoped out between the surface and the 78ft. V.D. level. The shoot was being mined between the 78ft. and 107ft. levels at the time of inspection. The ore body pinches to a stringer in both the north-west and south-east faces of the drives throughout the workings, but is 4 feet wide underfoot at the 107ft. V.D. level. The gold is reported to have had an erratic distribution throughout the quartz, indicating secondary enrichment. The pitch of the shoot is steep to the south-east.

The country rock is kaolinised throughout the workings, and is believed to be decomposed, partly granitised, sedimentary greenstone. Some barren quartz veinlets, transverse to the strike of the country, are present in the workings.

Recommendations.

1. The shoot should be stoped out to ground water level, as an enrichment may occur at that level. Ground water is expected to be encountered at approximately 140 feet V.D. from the surface.

2. Values are reported to have been best, where the flatter dip occurred, that is, between the surface and the 38ft. V.D. level. In the course of mining the shoot to ground water level the prospectors should watch for any flattening in dip as it may mean an increase in values.

3. A shoot of these dimensions will not be worth mining below ground water level, unless the gold content increases considerably.

4. Lateral prospecting for parallel ore bodies should not be overlooked.

Late "Rainbow" Leases.

These old leases are situated 3 miles north-east of Trig. M.Y. 1.

Prospecting was being carried out on these leases at the time of inspection, but the underground workings were inaccessible. Some of the workings have been described by Blatchford* in Bulletin No. 71. The ore bodies have been quartz reefs with lenticular habit, parallel to the schistosity of the enclosing country. The country has been extensively granitised, consisting of alternate bands of greenstone and gneiss.

HOPE'S HILL GROUP.

YILGARN GOLDFIELD.

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

The main leases at this group are situated on a prominent ridge approximately 4½ miles north-west of Southern Cross.

* Blatchford. T. G.S.W.A. Bull. No. 71, p. 188.

No mining operations were in progress at this group at the time of inspection (May, 1938) and the underground workings were all inaccessible. The main Hope's Hill G.M., which closed down in July, 1905, has been reported on, however, by Gibson* and Montgomery. Montgomery states that—

The lode is a very large low-grade ore body, striking N.W. and S.E., which has been worked extensively on the surface by open-cutting, and underground down to the 160 ft. level, below which it became unprofitable to work. There are four levels, the lowest being 300 or 350 feet below the surface. The ore body has been driven along for about 1,800 feet at the 160 ft. level, has been taken out in places as large as 30 feet in width, averaging probably between 15 and 20 feet wide.

The lode occurred on the footwall side of a large barren quartz reef, which is parallel with the enclosing country, striking N. 35° W. and dipping 70° S.W. The lode consisted of "Alternating seams of rubbly quartz, with much kaolinic material, pale-coloured tale schist, and brown chlorite schist," according to Saint Smith.†

From a study of a geological map of country in the vicinity of the workings, which was compiled by the writer, the lode is seen to occur between two parallel jaspilite bands, which are interbedded with greenstones. The jaspilites are contorted, and the shape of the dragfolds suggests the two beds are in reality one bed repeated by synclinal folding on a north-west, south-east axis. Also there are reversals in the direction of pitch of the dragfolds indicating the presence of crossfolding. At the north-west end of the main open cut the dragfolds pitch 30° S.E., and at the south-west end they pitch 65° N.W., so that ore deposition has occurred very close to the intersection of the axes of the two systems of folding. As a result of the broad geological mapping, the Hope's Hill mining centre is shown to be on the western limb of a major anticline with a north-west-south-east axis.

The country rocks grade eastwards into replacement gneiss of granitic origin. The granitisation process actually commences on the footwall of the large barren quartz reef, and the mica schists and quartzites, which occur between the greenstone proper and gneiss proper, are partly granitised greenstones and jaspilites respectively. All the rocks are presumed to be of Pre-Cambrian age.

The official production returns for this group, to the 31st December, 1937, are as follows:—

Alluvial.	Dollied and Specimens.	Ore Treated.	Gold Therein.
fine ozs.	fine ozs.	tons.	fine ozs.
5.04	107.13	125,435.07	35,649.23

and Westley's cyanidation plant recovered 106.93 fine ozs. of gold from the treatment of sands.

A fuller report will be written later, when the writer has time at his disposal to refer to all previous literature on this mining centre.

* Gibson, C. G. G.S.W.A. Bull. No. 17, p. 23.
Montgomery, A., Report on the Mines of the Yilgarn G.F., 1908, p. 26.

† Saint Smith, E. C. G.S.W.A. Bull. No. 49, p. 160.

COPPERHEAD SYNDICATE.
BULLFINCH.
YILGARN GOLDFIELD.
(By R. S. Matheson, B.Sc.)

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GENERAL INFORMATION.

The leases controlled by the Copperhead Syndicate are situated on a ridge approximately 1 mile north-east of the Bullfinch townsite, and they embrace the workings of the late Bullfinch Pty. (1919), Ltd. The following leases were being held by the syndicate at the time of inspection (April, 1938):—

"Copperhead" G.M.L. 3345, "Copperhead Deeps" G.M.L. 3378, "Copperhead Central" G.M.L. 3836, "Copperhead South" G.M.L. 3660, "Copperhead West" G.M.L. 3826, "Easter Gift" G.M.L. 3337, "Frances May" G.M.L. 3400, "Goldfinch" G.M.L. 3397, "Rising Sun" G.M.L. 3350, "Jupiter" G.M.L. 3458, "Aisla Joan" G.M.L. 3819 (3463 on the posts).

Gold was first reported from this locality by C. Jones, the working partner of a prospecting syndicate formed by D. L. Doolette, whose application for mining leases was lodged at the Warden's Court, Southern Cross, on 29th December, 1909. The early crushings were extremely rich in gold content and a phenomenal mining boom resulted. From the time of its discovery to 1920, the mine was a consistent producer, but since that time mining operations have been very spasmodic. At the time of inspection (April, 1938), underground work was being done mainly by tributary parties.

A 10-head battery and cyanidation plant is in operation on the mine, and it is available for public crushings.

Morrel, salmon gum and gimlet are abundant in the vicinity of Bullfinch, and are used for fuel and mining timber.

Water for domestic and mining purposes is obtained from the Southern Cross-Bullfinch pipeline, which is a branch line from the main Eastern Goldfields Water Supply Scheme. The ground water is very saline, and original ground water level in the main shaft, is reported to have been 268 feet V.D. from the surface.

According to the official production returns, the production from the ground now held by the Copperhead Syndicate to 31st July, 1938, is 195,292.67 fine ozs. of gold from the treatment of 521,642.35 tons of

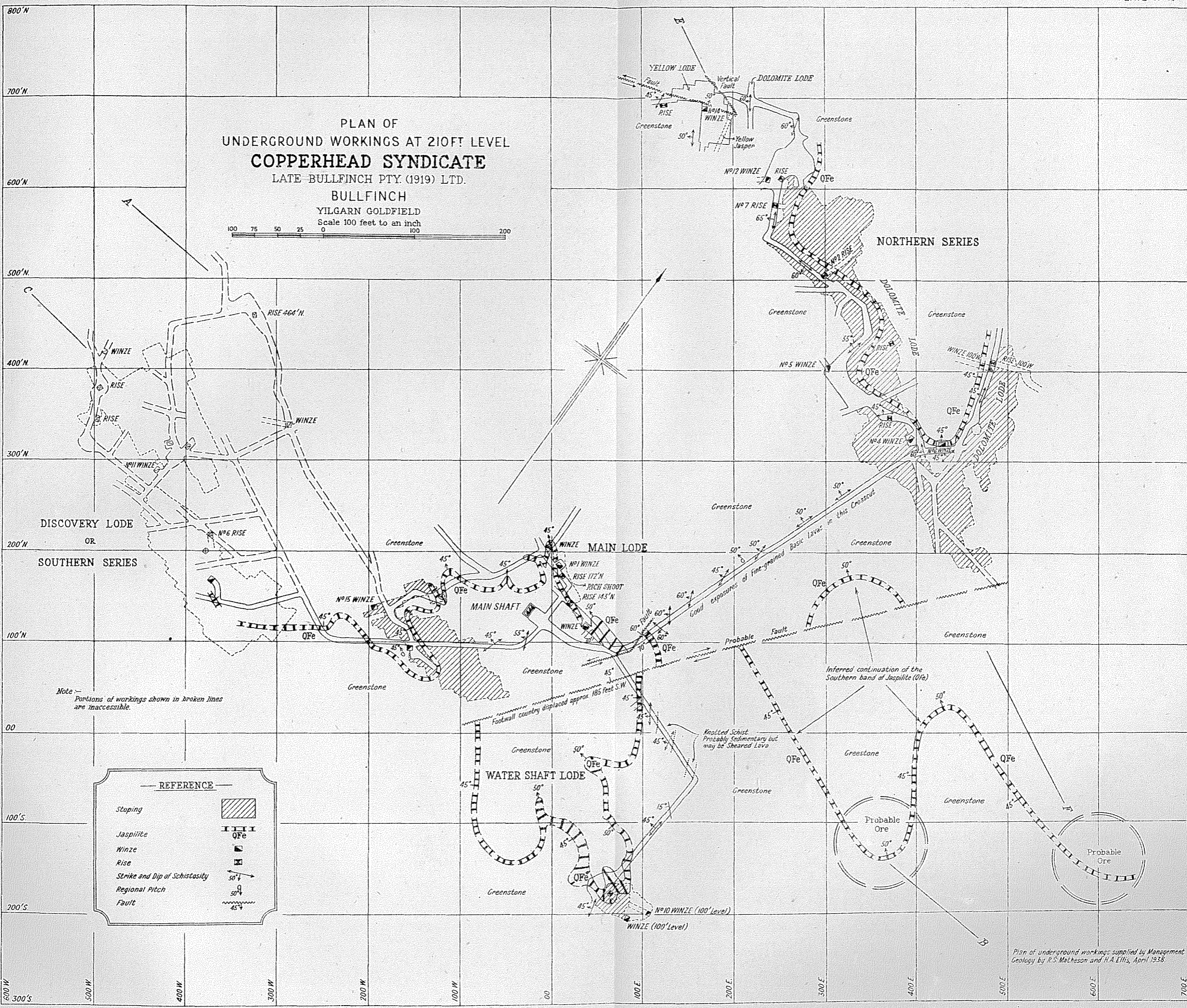
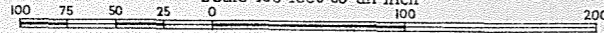
PLAN OF UNDERGROUND WORKINGS AT 210FT LEVEL COPPERHEAD SYNDICATE

LATE BULLFINCH PTY. (1919) LTD.

BULLFINCH

YILGARN GOLDFIELD

Scale 100 feet to an inch



NORTHERN SERIES

DISCOVERY LODE
OR
SOUTHERN SERIES

MAIN LODE

WATER SHAFT LODE

Note: Portions of workings shown in broken lines are inaccessible.

REFERENCE

- Stoping
- Jaspilite
- Winze
- Rise
- Strike and Dip of Schistosity
- Regional Pitch
- Fault

Plan of underground workings supplied by Management Geology by R.S. Matheson and H.A. Ellis, April 1938.

ore, and specimens total 64 80 fine ozs. The Copperhead Cyanide Plant has produced 10,033.99 fine ozs. of gold from the treatment of sands, which is not included in the above figures, and some of the gold has undoubtedly come from this property, but it is impossible to determine the amount.

Retreatment of the old tailings was in progress at the mine at the time of inspection, and 1 dwt. gold per ton is reported to be recovered by cyanidation.

The geological investigations at the mine were considerably hampered, as the only accessible underground workings were portions of the Nos. 1, 2 and 3 levels. The mapping of the geology in the underground workings was done in collaboration with Mr. H. A. Ellis.

GENERAL GEOLOGY.

The leases are situated in an area of highly metamorphosed, interbedded, greenstones, jaspilites and erosion sediments, which are presumably of Pre-Cambrian age, and the country grades eastwards into replacement gneiss of granitic origin. The rocks are contorted, and have a general strike N.N.W. and a general dip 60° W.S.W. Outcrop conditions are good, except in the immediate vicinity of the workings, where drifted tailings cover the surface.

A geological subsurface map of the area, on a scale of 5 chains to 1 inch has been compiled, but it will be published at a later date.

Greenstones.—Metamorphosed, basic lavas, tuffs and probably greywackes constitute the greenstones.

The basic lavas have a fairly wide distribution, and there are two varieties, which show marked differences in hand specimen. The lavas occurring stratigraphically above the main jaspilite band, are hard, fine to medium grained rocks, which have a dark greenish colour and often a rude schistosity. This type of lava forms good outcrops, and can be seen underground at the No. 2 level, in the crosscut from the main shaft to the dolomite lode. Stratigraphically below the jaspilite, the lavas are soft, highly sheared rocks, which are from all appearances talc schists. The talc schist is greenish-grey in colour, and decomposes more readily than the other variety of lava, but is more resistant to weathering than the tuffaceous rocks. The weathered surface is often pitted, and this is thought to be due to the weathering out of amygdulæ.

The remainder of the greenstones is composed of highly sheared rocks, which are predominantly dark grey in colour, and which often have a noticeable banding. In contrast to the reddish brown decomposition product of the talc schist, these rocks weather to yellow and purplish schists. These rocks are believed to be of sedimentary origin, and to be tuffs and/or greywackes.

Jaspilites.—Between the surface and the No. 2 level the weathering of the country rocks has been extensive, and the jaspilite appears mainly as a rock composed of alternate bands of quartzite and iron oxides (hematite, limonite and magnetite). In some places in this zone however, owing to leaching by surface waters, the iron oxides are absent, and the jaspilite is represented by a white friable quartzite.

At the No. 2 level, where the action of weathering is diminishing, the jaspilite changes to a laminated rock, with alternate bands of quartzite and ferromagnesian (amphiboles and pyroxenes), which can only be distinguished with difficulty from the enclosing greenstones.

The jaspilite is believed to be a metamorphosed sediment.

Metamorphosed Erosion Sediments.—The metamorphosed erosion sediments do not have a wide distribution in the area mapped, and the only occurrence of them is in a costean approximately 24 chains south-easterly from the south peg of G.M.L. 3819. They consist of grey to purple phyllites, and are believed to be a thin band in the Greenstone Series.

Gneiss.—The gneiss has been formed by the replacement of greenstones by granitic material, during a period of granitic intrusion. The replacement origin for the gneiss is substantiated, by the occurrence of a marginal zone of rocks, which are intermediate in composition between greenstone and gneiss, and by the parallelism of the gneissosity and schistosity of the gneiss and greenstone respectively.

THE ORE BODIES.

Three types of ore bodies have been mined on this property: jaspilite lodes, yellow lodes and dolomite lodes.

Jaspilite Lodes.—The accompanying plan* (Plate VI.) shows the distribution of the jaspilite at the No. 2 level, and the structure outlined by the jaspilite on this level persists throughout the mine.

The ore bodies of this type are mainly confined to the southern band of jaspilite shown on the plan, and have been formed by the mineralisation of the jaspilite and the injection of auriferous quartz veins presumably emanating from a granitic magma. The quartz veins have penetrated the jaspilite where it was fractured, sheared and contorted during folding. The ore shoots occur mainly in the crests and troughs of the dragfolds, and are generally absent in the limbs. The best values are reported to occur in the vicinity of the quartz veins and stringers. The occurrence of paint gold in fractures in the lode is suggestive of secondary enrichment, and the ore bodies will probably diminish in size and decrease in values below ground water level (260ft. V.D.). Actually, mining of this type of ore body ceases at the No. 3 level. The lessees report that mining of this class of ore has been discontinued between the Nos. 3 and 5 levels, not because the values have become unpayable, but because the ore has become highly mineralised with sulphides, for which there are no facilities for treatment at the mine.

The sulphide zone commences at about the No. 2 level (210ft. V.D.) but the workings on the sulphide ore at this level could not be examined due to bad air. The Nos. 4 and 5 levels were still under water, and were also inaccessible. Blatchford† states however, that the sulphides are galena, and various sulphides of iron, chiefly pyrites, but probably some marcasite and pyrrhotite.

The ore bodies locally known as the "Discovery Lode" or "Southern Series," the "Main Lode" and the "Watershaft Lode" are all mixtures of jaspilite and yellow lode material.

Yellow Lodes.—The main ore bodies of this type occur stratigraphically above, and in proximity to, the ore bodies in the southern band of jaspilite. There are a few exceptions to this however, for instance the yellow lode exposed in the workings off

* A surface plan and a plan of the No. 1 level, have also been compiled, and are available at the Geological Survey Office.

† Blatchford, T. G.S.W.A. Bull. No. 71, p. 81.

the New Shaft at the north-west end of the dolomite lode, which appears to be in no way associated with jaspilite. The yellow lodes exist only above ground water level, and consist of secondary enriched decomposed greenstone schist, which is intersected with auriferous quartz veins and stringers. As is expected of a lode of secondary origin, the shape of the ore bodies is very irregular and the distribution of the values erratic. Yellow replacement jasper frequently occurs with the yellow lode material.

The auriferous quartz veins and stringers probably persist below ground water level, but have been too small to be worked profitably.

The yellow lodes owe their name to their appearance near the surface, but they gradually become green in colour as ground water level is approached.

Dolomite Lode.—This ore body consists of a mixture of granitic quartz and dolomite, which is associated with minor amounts of greenstone lode material. It occurs on the stratigraphic footwall of the northern band of jaspilite, and is locally known as the "Northern Series." The dolomite was not present in the lode in the oxidised zone, appearing first at approximately 120 feet V.D. from the surface, and this is due to leaching by surface waters. According to Blatchford*:

"The lode from the 100ft. level upwards, and to a depth of 20 to 30 feet below the level, consists of a mixture of ferruginous clayey lode material partially cemented together, with irregular masses of jasper, the whole ore body being traversed by narrow quartz veins. These veins are comparatively flat with a general north-west-south-east strike and an underlie to the north-east."

The dolomite lode appears to have been the most consistent ore body in the mine, and has been worked from the surface to the bottom level, 510ft. V.D. From a study of the plans of the mine, it will be seen that the ore body diminishes in size below ground water level, indicating that secondary enrichment has played some part in the formation of the ore body in the upper levels.

The sulphide zone commences at about the 210ft. level, and as in the case of the jaspilite lodes, the sulphides have a close association with the gold.

An analysis† of a specimen of the dolomite lode from the 210ft. level gave the following result:—

G.S.M. 1/826.	G.S.L. 8886D.
SiO ₂	15.83
Al ₂ O ₃	0.29
Fe ₂ O ₃	0.11
FeO	4.86
MnO	0.27
MgO	17.21
CaO	27.64
Na ₂ O	0.18
K ₂ O	0.06
H ₂ O hyg.	0.06
H ₂ O comb.	0.80
TiO ₂	0.02
Co ₂	31.99
P ₂ O ₅	0.07
Fe ₂ S ₃	0.48
Cr ₂ O ₃	nil.
V ₂ O ₄	0.04
	99.91

* Blatchford, T. G.S.W.A. Bull. No. 71, p. 80.

† Vide G.S.W.A. Bull. No. 71, p. 80.

Gold—15 grs. per ton. Sp. gr.—2.94. Analyst. H. Bowley.

The chief constituents are dolomite, about 55.2 per cent.; Calcite, about 14.3 per cent.; actinolite, about 25 per cent.; with smaller amounts of pyrrhotite and probably serpentine, albite and quartz.

The boundaries of the ore body in the underground workings are not sharp, as carbonation extends beyond it into the adjacent country.

The occurrence of isolated "horses" of greenstone within the lode, substantiates the belief that the lode has been formed by metasomatic replacement.

Owing to the attitude and size of the ore body, and the broken nature of the adjacent country, some difficulty was experienced in mining the lode, and square set stoping was resorted to.

STRUCTURE.

Broad Geological Structure.—Detailed mapping in the vicinity of Bullfinch has shown that the country has been folded into the form of a syncline, which pitches 45° N.W., and is overturned to the north-east at 70 degrees. The structure is clearly outlined by the southern jaspilite band. This syncline has been shown by areal mapping to be situated on the western limb of a large anticlinal fold, with a north-west-south-east axis.

No reversals in the pitch of folds were noted in the vicinity of the Bullfinch leases, the pitches being constantly to the north-west, so that the mine is not situated on a crossfold axis. At the Corinthian group of mines, approximately 10 miles south of Bullfinch, the regional pitch is to the south-east, so that there is at least one crossfold between the two centres, but it is impossible to determine with accuracy the position of its axis. This crossfold may have had some influence on ore deposition at Bullfinch.

Structural Control of Ore Deposition.—The rocks between, and including the two jaspilite bands, have been the most favourable for the deposition of gold. This is partly due to their composition, but mainly to their structure. From a study of the accompanying plan it will be seen that gold deposition has occurred in isolated places in the favourable host rocks, and these areas of mineralisation are related to the geological structure. Viewing the zone of mineralisation broadly, it will be seen to have taken place in the trough of the pitching syncline outlined by the southern jaspilite band. Numerous dragfolds are present in the trough of the syncline, and ore deposition is mainly confined to the crests and troughs of these minor folds. The ore bodies are everywhere fairly close to one or the other bed of jaspilite, and the jaspilites have probably acted as the means of access for the gold bearing solutions.

The dolomite lode occurs in the trough of a pre-existing synclinal dragfold, and has been formed by the metasomatic replacement of greenstone country on the stratigraphic footwall of the northern jaspilite band.

Faulting.—Three post-gold faults, which have caused considerable difficulties in mining, and prevented a previous understanding of the geological structure, were mapped in the workings.

Two of these faults are shown on the plan of the No. 2 level (Plate VI.), and they can be conveniently described together. The faults strike north-easterly and dip 45°-60° N.W. The footwall country of the

southern fault has been displaced approximately 185 feet south-west, and is clearly shown on the accompanying plan. In order to indicate the faulting more clearly, and show where further ore bodies may exist, the probable position of the jaspilite in unexplored country has been inferred. The northern fault has displaced the "rich shoot" at its southern end approximately 30 feet north-east, and work was in progress on this section of the lode between the two faults at the time of inspection.

The third fault is seen best in the workings off the New Shaft at the north-west end of the dolomite lode, but is also intersected in the workings at the No. 2 level. Yellow lode, associated with replacement jasper, has been mined on the footwall of this fault, and the difficulty of locating the continuation of this ore body on the hanging wall, has arisen from the fact that the fault is parallel to the schistosity of the country for a considerable amount of its exposed length. The fault strikes north-easterly and dips 50°-60° N.W. The ore body has been located on the hanging wall of the fault at the 100ft. and 210ft. levels, and prospecting for it should be done at the 150ft. level.

In the square setting at the 200ft. level a fault striking north-westerly appears to branch off the north-east striking fault, and although it was impossible to determine the displacement on this subsidiary fault, the writer is fairly certain that as a result of faulting the block of country between the two faults has been displaced to the south-west. The difficulty of interpretation is due to the presence of folding, as well as faulting, in this vicinity.

DIAMOND DRILLING.

Two underground diamond drill bores are indicated on the plan of the No. 3 level, but unfortunately no information concerning them was available.

1. Recommendations and Conclusions.

From the evidence available there is good reason to believe that the southern jaspilite band has an extension, which up to the present time (April, 1938) has not been prospected. This extension is shown on the plans* of the Nos. 1 and 2 levels, and also on the 5 chain to 1 inch geological subsurface map, where its boundaries are indicated by dotting.

Prospecting for further occurrences of jaspilite lode material and for yellow lode material is strongly recommended in this area, especially above ground water level (260ft. V.D.). This area is covered by the tailing dump, and diamond drilling, either from the surface or underground, would probably be the best method of prospecting. Several bores would be necessary to prospect the area thoroughly.

2. In the vicinity of the New Shaft, owing to faulting, folding and the highly oxidised condition of the country, it has been extremely difficult to follow the ore bodies. The true nature of the faulting is not properly understood, but, as mentioned above, it is very probable that as a result of faulting, the block of country between the two faults has been displaced to the south-west.

The yellow lode material, which has been mined at the 100ft. level and 210ft. level, should be encountered at the 150ft. level by crosscutting in a westerly direction from the north-west end of the workings.

* Only the plan of the No. 2 level accompanies this report.

The possibility of parallel ore bodies occurring on the hanging wall of the yellow lode should not be overlooked.

3. At the No. 2 level, prospecting north from the crosscut connecting the square setting to the north-west end of the main dolomite lode is warranted.

If the assumption that folding has occurred here is correct, a prospecting drive commenced 60 feet from the square setting should become a crosscut as the work proceeds. A dolomite lode may be encountered in this direction.

4. Between the two faults off the south-east end of the "rich shoot" at the No. 2 level, jaspilite lode material with quartz veins is being mined. Because of its position between the two faults the length of the ore body is limited, as will be proved by driving on the ore body. Provided that ore is still in the face when the southern fault is encountered, then the west leg of the water shaft jaspilite should be investigated, because it is the continuation of the ore body, and has been displaced by faulting.

5. At the No. 1 level, in the most western synclinal trough of the Water Shaft jaspilite, typical yellow lode has been mined, and this ore body may exist in the same structural position at the No. 2 level. If the values were good at the No. 1 level, the prospecting of this structure should be carried out.

6. A crosscut north, from the vicinity of the No. 2 rise in the workings on the dolomite lode at the No. 2 level (see Plate VI.) also has possibilities of locating other ore bodies. This cross-cut should be continued until it intersects the continuation of the eastern leg of the dolomite lode.

7. The ore bodies in the sulphide zone should be thoroughly tested, to see if the erection of a plant, for the treatment of such ore, is warranted.

8. Approximately $\frac{3}{4}$ mile north-west of this property, the jaspilite is contorted into another large fold, and it is the extension of the western leg of the southern jaspilite band. The synclinal trough of this fold warrants prospecting.

ERLISTOUN GOLD MINE. COX'S FIND. MT. MARGARET GOLDFIELD. (By R. S. Matheson, B.Sc.)

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PLANS.

	Opposite Page
Plate VII.—Underground Geological Map of the Erlis- toun Gold Mine, Cox's Find (Scale— 50 feet to 1 inch)	88

GENERAL INFORMATION.

The Eristoun Gold Mine is situated on a low rise approximately 41 miles north of Laverton, but the distance by road is slightly greater. The Eristoun

townsite is approximately $4\frac{1}{2}$ miles N.N.W. of the mine, and Mt. Clarke is 1 mile to the west.

The ground was first pegged by E. A. Cox, J. Esereet and G. W. Cox on the 20th May, 1935, and it has since proved to be one of the most important discoveries in recent years. The Western Mining Corporation acquired an option over the find almost immediately after its discovery, and finally exercised the option in December, 1935.

At the time of inspection (September, 1938), the company held G.M.Ls. 2345T, 2353T, 2348T, 2349T, 2346T, 2406T and 2407T embracing an area of approximately 163 acres, and G.M.Ls. 2368T, 2357T, 2351T and 2356T were under option.

A 10-head battery, ball mill and cyanidation plant is in operation on the mine, and is reported to treat an average of 1,500 tons of ore per month.

Mulga is the predominant type of vegetation and is unsuitable for mining purposes except as fuel, but the company has resorted to the use of fuel oil as a means of creating electrical power to work the plant.

Owing to the nature of the country rock, and the shape and attitude of the ore body, square set stopping is resorted to, which necessitates the use of large quantities of timber. Salmon gum and oregon are being used for square setting, and costs are consequently high.

Water for mining purposes is obtained from the underground workings, ground water level being 95 feet V.D. from the surface.

Water for domestic purposes is obtained from some old workings approximately 3 miles south of the main lease, G.M.L. 2345T, and is at present (September, 1938) being carted. A pipeline is in the course of construction, however, and in the near future domestic water will be pumped to the mine.

According to the official production returns, from the time of discovery to 21st August, 1938, the mine produced 33,197 fine ozs. of gold from the treatment of 35,821 long tons of ore.

It is reported that the tailings contain 1.1 dwts. gold per ton, which is not recoverable by cyanidation.

The writer is indebted to the management for information concerning the now inaccessible portions of the mine, and for copies of the mine plans.

GENERAL GEOLOGY.

There was not sufficient time at the writer's disposal during this visit to allow for the compilation of a geological map of the country surrounding the mine, but this is contemplated later.

A brief reconnaissance of the area was carried out however, and it is composed of contorted, interbedded greenstones, meta-sediments and jaspilites, which are presumably of Pre-Cambrian Age. Quartz porphyry dykes are reported in the area but were not seen. The rocks have a general strike N. 10° - 15° W. and dip of 60° E. Except for the jaspilites, the rocks are highly decomposed at the surface, and appear as yellow, brown or purplish schists. A hard, brown capping often overlies the outcrops.

The mine is situated between two jaspilite bands approximately 10 chains apart, which persist for some distance north and south. Although these two bands

of jaspilite have not actually been traversed, they are believed to be the bands which occur in the same relative positions at the "Westralia Tasmania" Group and the "Midas" Group, which are respectively $2\frac{1}{2}$ and $4\frac{1}{2}$ miles north of the Erlistoun mine. From the top of the brace at the Erlistoun mine these groups appear to be in a straight line, and are probably situated in the same favourable horizon throughout. Dragfolds are frequent in the jaspilites, especially the eastern band, and reversals in pitch occur indicating the presence of crossfolding. In the vicinity of Cox's Find the dragfolds pitch 45° south-easterly, while north-westerly pitches prevail at the "Westralia Tasmania" Group. The axial planes of the dragfolds are everywhere overturned to the west. It is believed that crossfolding has played an important role in gold deposition, and that various finds are located where the axes of crossfolds intersect the favourable horizon.

There is a noticeable convergence and brecciation of the two jaspilite bands approximately $\frac{1}{2}$ mile north of the late "Westralia Tasmania" which is probably near a crossfold axis, and this convergence suggests that the two bands of jaspilite are in reality one band repeated by folding on a north north-south south-east axis.

It is hoped that these ideas may prove of some value for future prospecting in this area, but it must be borne in mind, that only one type of crossfold may bring about gold deposition. For instance, an antinormal crossfold may be more favourable than a synclinal crossfold or vice versa.

THE COUNTRY ROCKS.

The rocks described hereunder are only those exposed in the underground workings.

Greenstones.—The greenstones are decomposed throughout the workings and are believed to be metamorphosed basic tuffaceous rocks. They occur interbedded with the erosion sediments but are distinct from them. Between the surface and the No. 3 level the greenstone is in a highly decomposed state and consists of a mixture of white, yellow, brick red and brownish puggy material. On the No. 3 and 4 levels the greenstone is in a slightly fresher state, and appears as a cream coloured schist, with black streaks which may be due to the presence of biotite.

Metamorphosed Erosion Sediments.—These consist of grey phyllites and graphitic schists occurring as a narrow band, interbedded with the greenstones. These rocks do not suffer greatly from weathering, and their appearance is practically the same throughout the mine. This sedimentary horizon appears to have been the means of access for the gold-bearing solutions.

THE ORE BODY.

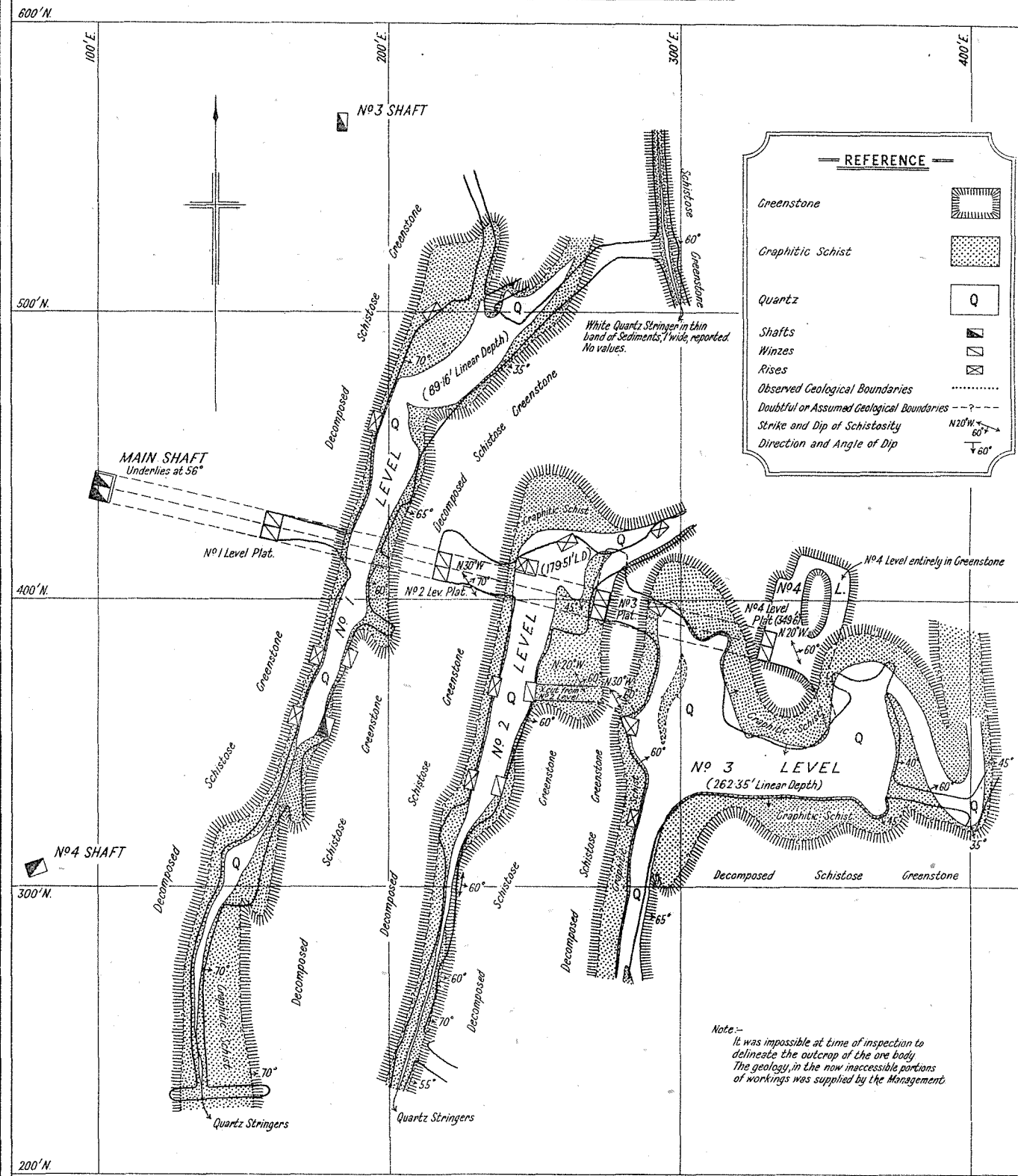
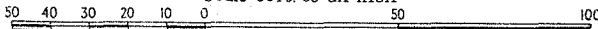
The ore body at the Erlistoun mine is a bluish-grey vuggy quartz reef, which is intersected by a network of white quartz veinlets. It is confined to a contorted band of metamorphosed erosion sediments consisting mainly of graphitic schist, and is roughly parallel to the band in strike and dip. At the No. 1 level (74.75 feet V.D.) the ore body has a general strike N. 20° E. and a general dip of 60° E.S.E., while the pitch is 45° in a direction S. 40° E. At lower levels, however, owing to the folding becoming more complicated, there is no general strike or dip.

UNDERGROUND GEOLOGICAL MAP

OF
ERLISTOUN GOLD MINE

COX'S FIND
MT MARGARET GOLDFIELD

Scale 50ft. to an inch



REFERENCE

- Greenstone
- Graphitic Schist
- Quartz
- Shafts
- Winzes
- Rises
- Observed Geological Boundaries
- Doubtful or Assumed Geological Boundaries
- Strike and Dip of Schistosity
- Direction and Angle of Dip

White Quartz Stringers in thin
band of Sediments, 1' wide, reported.
No values.

No 4 Level entirely in Greenstone

No 3 LEVEL
(262 35' Linear Depth)

Note:-
It was impossible at time of inspection to
delineate the outcrop of the ore body
The geology in the now inaccessible portions
of workings was supplied by the Management

At the time of inspection stoping was in progress at the No. 3 level (217.10 feet V.D.), the No. 1 level and the No. 2 level (148.60 feet V.D.) having practically been stoped out, and crosscutting to intersect the ore body was being carried out at the No. 4 level (289.30 feet V.D.). The quartz is reported to contain good values throughout, and has only been left where its width has become too narrow to be worked profitably.

It is reported that both the bluish-grey and the white quartz are auriferous, but the gold occurs mainly in the bluish-grey variety. The values are said to be fairly uniform, but enrichments occur at the footwall of the main synclinal portion of the ore body. This portion of the ore body was extremely rich at the No. 3 level.

That secondary enrichment has played some part in the formation of the ore body is suggested by the occurrence of gold in cross fractures above ground water level (95 feet V.D.). The graphitic schist is much more pervious to water than the greenstone country, and during crosscutting to the ore body at the Nos. 3 and 4 levels, there was a considerable make of water when the graphitic schist was encountered.

Mineral Associations.—Sulphides occur abundantly in the quartz at the No. 3 level, and are reported to have first been noticed in the ore body at 130 feet V.D. from the surface. As a result of determinations carried out by the Government Chemical Laboratory on specimens of the sulphide-bearing quartz, the sulphides were found to be entirely pyrite with only traces of chalcopyrite.

It is reported, however, that galena occurs in the ore body near the local enrichments, but does not have a wide distribution.

The sulphides are said to cause no treatment difficulties, the assay values agreeing closely with the plant returns. This suggests that little, if any of the gold, is in solid solution in sulphides.

The graphitic schist in proximity to the ore body is highly mineralised with sulphides, and the absence of payable values in it, is further evidence for the belief that there is practically no association between the gold and sulphides, in this manner.

Structure.—As is pointed out in the section of the general geology, the broad geological structure in the vicinity of Cox's Find, will only be determined after further geological mapping, but the find is expected to be in some way related to crossfolding.

With regard to the geological structure in the underground workings (see Plate VII.), the ore body conforms approximately to the shape of a folded band of graphitic schist. The folding becomes more evident with depth and is very pronounced at the No. 3 level. This is suggestive of a change in pitch, but investigations show that no change in pitch has occurred. An interpretation of the folding of the ore body at the No. 3 level, shows that it is a minor fold on the eastern limb of an antiform, pitching 45° south-easterly, and having an axial plane overturned 50°-60° to the west.

Apart from the folding of the ore body, fracturing has taken place and three main sets of fractures are developed. Two of the sets are approximately parallel to the schistosity and cleavage respectively, and the third is roughly horizontal.

Mode of Origin.—The area originally consisted of horizontal, interbedded, greenstones and erosion sediments, which were later subjected to folding. Simultaneously with or subsequently to the folding there was a period of granitic intrusion associated with mineralisation. Due partly to the composition and partly to the inherent structure, the graphitic schist band was the more favourable host rock, and ore deposition occurred therein by means of metasomatic replacement. The replacement was only partial and variations in the amount of replacement occur both vertically and horizontally. This accounts for the occurrence of "horses" of graphitic schist within the quartz, and the greenstone as walls to the ore body in some places. The bluish-grey colour of the majority of the quartz, is also due to the fact that the replacement of the graphitic schist has been incomplete.

The network of white quartz stringers through the ore body, are thought to have been formed by the refusion of portion of the original quartz, and its intrusion into fractures which occurred in the quartz when the area was subjected to another set of forces.

RECOMMENDATIONS AND CONCLUSIONS.

1. Prospecting for parallel ore bodies is recommended and they should be looked for north-westerly and south-easterly from the main ore body. Underground diamond drilling would probably be the best method of attack, and the east-west section of the ore body at the No. 3 level would be the best point to commence operations.

2. Prospecting along the strike of the graphitic schist band is also warranted, as other folds containing ore shoots may exist. Owing to the mode of origin of the ore body, other reefs may or may not outcrop.

The main ore body offers scope for prospecting north along the strike, at the Nos. 1, 2 and 3 levels. In the extreme eastern workings at the No. 3 level a quartz reef with unpayable values strikes in a northerly direction into the wall, and this should be followed as other folds, containing ore shoots, may occur along the strike. The syncline immediately to the west of these eastern workings at the No. 3 level, contains good values, and by projecting this structure back along the pitch, it will be seen that it has been unexplored at the Nos. 1 and 2 levels. This position is obvious at the No. 2 level, and at the No. 1 level, this structure will probably be found where the main reef joins the thin quartz stringer at the north end.

3. The prospects of the ore body persisting for a considerable depth were very promising at the time of inspection (September, 1938). The replacement of the graphitic schist by auriferous quartz was becoming more complete with depth, and the values showed an improvement. This is a particularly pleasing feature, as ground water level is now passed, and the increase in values cannot be attributed to secondary enrichment.

4. What influence the major structure will have on the life of the ore body, is at present problematical.

GLADIATOR (LATE AUGUSTA) GOLD MINE.

MT. MARGARET GOLDFIELD.

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

The Gladiator Gold Mine is situated some 4 miles due west of Laverton. The company at present operating this mine holds a mining reserve which includes G.M.Ls. 2212T, 2213T, 2128T and T.A. 85T, the workings of the late Augusta G.M.

The rocks in the vicinity consist of fresh fine-grained greenstone lavas (probably typical trachyandesites), medium-coarse grained greenstone or epidiorite, and decomposed greenstone schists (probably sheared greenstones).

Running through the area in an approximately north-south line with a broad arc facing eastward, are four roughly parallel bands of highly ferruginous banded jaspilite, each dipping 60° - 70° E. Of these bands, which range from 8 to 14 chains apart, the two western lines are most continuous, and are traceable over a total length of about 90 chains. The two eastern bands, consisting of greatly folded, broken and irregular lenses, cannot be followed for much further than half a mile. About 45 chains to the south-west of the main shaft is a bold ridge, 14 chains long, of highly contorted jaspilite, enclosed by G.M.L. 1868T, late "Monarch." This ridge is running in a north-easterly direction about 35° to the line of the parallel bands, and is apparently the middle limb of a sharp dragfold which at its northern extremity pitches steeply N.E., and at its southern end steeply to the south.

To the north all the jaspilite bands disappear under a wide expanse of alluvial soil, while to the south the western-most line, after a break of about 70 chains, is traceable in an approximately continuous line for many miles south of the mine. The Gladiator G.M. is situated on the westernmost jaspilite line. This "line" appears to consist of two or more parallel bands varying in width from 10 to 100 feet and closely folded together in some places.

Broadly speaking, the rock on the western side of this line is of the fine-grained greenstone type while that on the eastern side is the coarser grained epidiorite.

Both the greenstone and the jaspilites have been intruded by later dykes of fine-grained quartz porphyry which has here and there been sheared to a "felsite." Gold-bearing quartz veins have been later introduced into all of the above rock types.

THE ORE BODIES.

There are two lodes, the Main Lode which had been worked prior to the mine being taken over by the present company, and the West Lode, which has been located since that date (1931) and was, at the time of inspection (June, 1938) in course of development.

The Main Lode.

This consists of a quartz reef varying in width from 6 inches to 5 feet, which occurs running longitudinally through an 80ft. wide band of jaspilite. The jaspilite has been intruded by quartz porphyry

which in the upper levels runs in a number of parallel bands or tongues following its strike and dip. In the lower levels the number of these tongues is reduced to two. In places this porphyry has been sheared to a soft felsite. The quartz, which has later intruded the jaspilite and porphyry is frequently to be found following the contact of these two rocks.

The jaspilite, at its contact with the quartz, is mineralised and here usually carries fair values.

Where the quartz lode forsakes the jaspilite contact and cuts through the felsite (or porphyry), as can be seen on following the lode down from the No. 3 (280ft.) level through the No. 4 to the No. 5 (450ft.) level, the values invariably drop. The quartz appears to have formed in tension cracks in the jaspilite and greenstone. In places the lode has a marked "herring-bone" structure, i.e., numerous roughly parallel vertical veinlets may be seen emerging on both sides of, and approximately at right angles to, the central "back bone" of the quartz reef.

Stoping has been carried out extensively in the upper levels, down to about 350 feet. At the time of inspection the Main Lode had been opened up over a payable length of about 450 feet on the No. 5 (450ft.) level and the main shaft was being sunk in preparation for development on the No. 6 (600ft.) level.

Surface boring has located a further extension of the Main Lode at approximately 750ft. V.D. A longitudinal section showing the stoping at present completed suggests a northerly pitch for the values, but the writer has been assured that only the richest parts of the lode have previously been worked and that moderate values for the most part extend throughout the length of the lode. There are, however, reported to be two richer shoots of ore on the No. 3 level, one at approximately 50 feet south of the main shaft which pitches steeply to the south and another about 80 feet north of the main shaft pitching steeply to the north.

The West Lode.

This lode consists of quartz in bleached and mineralised fine-grained greenstone. It is situated on the western or footwall side of the Main Lode. The quartz reef is very irregular in width and varies from thin stringers up to lenses 3-4 feet wide. Slight bleaching and mineralisation of the greenstone extends over a width of 12 to 15 feet.

The lode runs in the direction of N. 17° E. making an angle of 35° - 40° with the Main Lode. It was first found on the No. 3 (280ft.) level where it was opened up for a distance of about 320 feet south of the main shaft. The lode dips very steeply to the east (80° - 85°), steepening to almost vertical at the south end of the mine. On the No. 5 level it has been opened up for a length of about 480 feet and the quartz here appears rather more regular. At the time of inspection the northern end of this level (at about 200 feet north of the main shaft) ceased in quartz porphyry, a dyke which here cuts the lode, and runs approximately east and west. It appears probable that by piercing the porphyry dyke, a northern continuation of the lode should be located. No free gold was to be seen in the quartz of this lode which will probably prove to be rather spasmodic and low in value.

PRODUCTION AND GENERAL REMARKS.

A previous investigation of this mine, then the Augusta, G.M.L. 371, was made in 1905 by C. G. Gibson (Bull. No. 24, pp. 21-22). Prior to that time the lease was the property of the Golden Rhine G.M. Co. It had been worked by them from 1897-1903, during which time Mines Department records show that 15,497.5 tons of ore were treated for an average yield of 14.2 dwts. per ton. From 1905 to 1911 production was continuous, 12,969 tons yielding an average of 21.1 dwts. per ton. No production is recorded from 1911 to 1913, but from 1913 to 1915, and from 1916 to 1920, figures show that 4,883.51 tons of ore were crushed for a total of 1,655.55 ozs. of gold including 21.61 ozs. of specimen gold. The average yield for this period is thus 6.6 dwts. per ton. The average grade of ore produced since 1897 is then 13.96 dwts. per ton, but this includes a number of very rich patches found in the upper level only.

The present company put through several trial crushings at the State Battery, Laverton, early in 1938, the details of which according to official returns are as follow:—

	Ore treated. tons.	Gold therefrom. fine ozs.	Grade dwts. per ton.
February, 1938 ...	109.25	11.15	...
March, 1938 ...	122.50	25.72	...
March, 1938 ...	205.25	60.83	...
	<u>437.00</u>	<u>97.70</u>	<u>4.46</u>

Minerals in the ore associated with the gold, which is usually in a very fine state, are quartz, pyrite, pyrrhotite, with small quantities of calcite in the bleached lodes. Graphite frequently occurs on the contact walls of the jaspilite; and the greenstone, where it lies in contact with jaspilite, frequently shows a narrow chloritic schistose zone.

Water level is at approximately 180-200 feet V.D.

Since the writer's inspection in June 1938 the company has completed the erection of a 10-head battery and cyanidation plant, and has now commenced production (December, 1938).

RECOMMENDATIONS AND CONCLUSIONS.

It appears certain that the management will have to depend almost entirely upon the Main Lode for its payable ore—at least in the earlier stages of production. The grade of ore in the West Lode, probably will prove, on the average, to be very low and the values irregular in occurrence. No obvious structural control for the presence of the ore bodies has been noted. The jaspilite band which lies immediately east of the Gladiator line and which parallels it so closely, could well bear further investigation, by drilling, for the presence of further parallel lodes. The fact that prospecting at various times has shown traces of gold there rather supports this suggestion. There appears to be no obvious geological reason for suggesting that the Main Lode channel may not prove to extend further, both south and north of the points to which it has so far been developed.

THE MARY MAC GOLD MINE, G.M.L. 2261T, LAVERTON.

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

The following notes are the result of a brief inspection of the Mary Mac G.M. made in September, 1938:—

The Mary Mac G.M.L. 2261T, is situated on a strong ridge of highly dragfolded and very ferruginous banded jaspilite which runs in a direction slightly west of south from Laverton. The lease is about 110 chains south of the town, its northern boundary passing about 2 chains south of Enniskillen Trig., J.H.R. 16. The country on both sides of the jaspilite ridge is a sheared and decomposed greenstone.

The main shaft underlays at about 60° E. which is the dip of the jaspilite at this point. There are two levels—the upper (No. 1) at about 150' on the underlay and the lower (No. 2) at about 200' (underlay depth).

The lode material consists of mineralised jaspilite and stringers of quartz and, in places, thin wedges of sheared greenstone enclosed in the highly folded jaspilite. The dragfolds have a vertical or steep northerly pitch for the most part. The values follow no defined lode channel or wall, and workings so far appear to have been confined to the oxidised zone above the water table.

The lower level consists of a winding drive extending for about 200 feet north of the main shaft. The upper level extends for approximately 400 feet north of the main shaft, following the jaspilite throughout, and about 600 feet south of the main shaft to the water shaft. A crosscut just south of the main shaft cuts through the jaspilite-greenstone contact and runs westward for about one hundred feet in greenstone.

Preparations have been made to break out ore of good value on the No. 1 level at approximately 300 feet south of the main shaft. Here the lode material consists of jaspilite and decomposed greenstone schist, folded into a number of broad noses which pitch away steeply in a direction slightly south of east. Values up to 15 dwts. per ton are reported here.

A considerable amount of stoping has been carried out both north and south of the main shaft, above the No. 1 level. The water table is at about 180' V.D.

According to Mines Department records production at this mine was continuous from 1909 to 1913 during which period 4,756.5 tons of ore yielded 2,566.17 ozs. of gold at an average grade of 10.8 dwts. per ton. Since 1913 there is no record of any further mining activity here.

From 1934 to April, 1938, however, retreatment of tailings on this lease has produced 1,678.26 ozs. of gold.

At the time of inspection (September, 1938), preparations were being made for the erection of a small mill and treatment plant, and a gas producer was then being installed.

No large bodies of quartz nor any extent of small veins were noticed. Apparently the mine has not been opened up to any extent below water level, but the spasmodic distribution of values, in crumbly jaspilite, and the lack of definition of apparent lode channel,

rather suggests that there has been considerable surface secondary enrichment and a sharp drop in values may be expected where the lode enters the zone of sulphides below the water table.

NOTES ON THE GEOLOGICAL STRUCTURE OF PORTION OF THE MT. MARGARET GOLDFIELD.

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

An examination of air-photos of different portions of the Mt. Margaret Goldfield furnished evidence for the conclusion that the Laverton-Morgans district would prove an area of which an interpretation of the geological structure could readily be obtained. This idea has been fully borne out after a field season of areal and detailed geological mapping.

A description of the general geology of the area under consideration will be found elsewhere (page 78). In brief, it appears to consist essentially of a thick series of basic lava flows, tuffs and agglomerates, and (probably intrusive) coarse-grained greenstones, interbedded in which are a number of horizons of thin, acid-sedimentary rocks. This series of basic, predominantly igneous, rocks and thin sedimentary bands, has been tentatively called the Greenstone Complex. It has been intruded and replaced in a number of localities by masses of granite and/or gneiss. In areas reasonably suspected of overlying this rock type, outcrops are generally poor and structural information is almost completely lacking.

THE BROAD GEOLOGICAL STRUCTURE.

As was found in the re-survey of the South Yilgarn Goldfield in 1935-36, the key to the elucidation of the major geological structure—and also some of the minor folding—was provided by a study of the distribution of the thin sedimentary layers in the Greenstone Complex. These are represented by banded ferruginous quartzites, or jaspilites, and blue-grey graphitic slate, described elsewhere (page 79).

An illustration of the structure of that portion of the Mt. Margaret Goldfield which has been mapped up to the end of the 1938 field season (December, 1938) is provided in Plate VIII. This structure-contour plan represents the outlines of three distinct sedimentary horizons, which on the eastern (Laverton) side of the area, are represented by jaspilite beds. The Mt. Crawford-Laverton line marks a fairly continuous jaspilite zone, and the Lancefield-Euro line is traceable as a discontinuous line of outcrops of jaspilite running from a little north of Lancefield to the north shore of Lake Carey. The Gladiator-Mt. Jumbo horizon of jaspilite runs in an almost continuous series of outcrops from Gladiator down through Mt. Margaret and Morgans, and up to Waihi.

The Windarra-Ajax horizon consists of a fairly continuous jaspilite line running southerly from Windarra to about 5½ miles south of Mt. Ajax, where it swings westward. Its north-westerly continuation is represented by a few broken outcrops only. North of a point 10 miles due east of Mt. Korong, all trace of this horizon is lost in a wide expanse of granite and/or gneiss.

The contour line immediately west of Morgans-Waihi represents the outcrop of a fairly continuous band of graphitic slate and jaspilite which probably constitutes the same sedimentary horizon as the Lancefield-Euro and the Mt. Crawford-Laverton beds. The same horizon is also probably represented by a short line of graphitic slate which runs in a direction slightly east of north through Murrin Murrin.

West of Murrin Murrin the structure line which passes through Mt. Flora indicates the approximate position of a broken line of jaspilite outcrops, which have not yet been mapped in detail. North of Mt. Flora, and both north and west of Waihi, are extensive areas of granite and/or gneiss.

The rocks of the Greenstone Complex have undergone primarily two sets of folding, the axes of which lie approximately at right angles to each other. This folding is reflected in the distribution of the rock types in the area.

In the first system the axes of folding trend north-north-west and south-south-east, swinging further west in the northern portion of the area so far mapped, and they represent a series of parallel anticlines and synclines. As indicated by a constant fairly steep regional dip to the east throughout the area, these folds are almost uniformly overturned towards the west. Two of the major folds in this system form a more or less isoclinal anticlinorium and synclinorium on the eastern side, while there is a third broadly asymmetric synclinorium or major synclinal fold on the western side. This axis of the major anticlinal structure, swings from S.W. to S.S.W. from a point 9 miles west of Mt. Windarra to 5 miles east of Mt. Margaret, and thence probably continues southwards down the centre of Lake Carey. The axis of the eastern major syncline passes southwards between Mt. Crawford and Lancefield and through Laverton along a line which runs through a point approximately 3 miles east of Childe Harold. The axis of the western major syncline probably runs from a little east of Monument Hill to a point approximately 3 miles east of Yundamindera.

The second system of folding which is superimposed upon the first, consists of a series of cross-folds whose axes run approximately E.N.E.-W.S.W., and which have produced changes in strike in the rocks of the Greenstone Complex, resulting in the broad curving, and the convergence and divergence of the lines of the jaspilite outcrops as illustrated by the structural lines in Plate VIII.

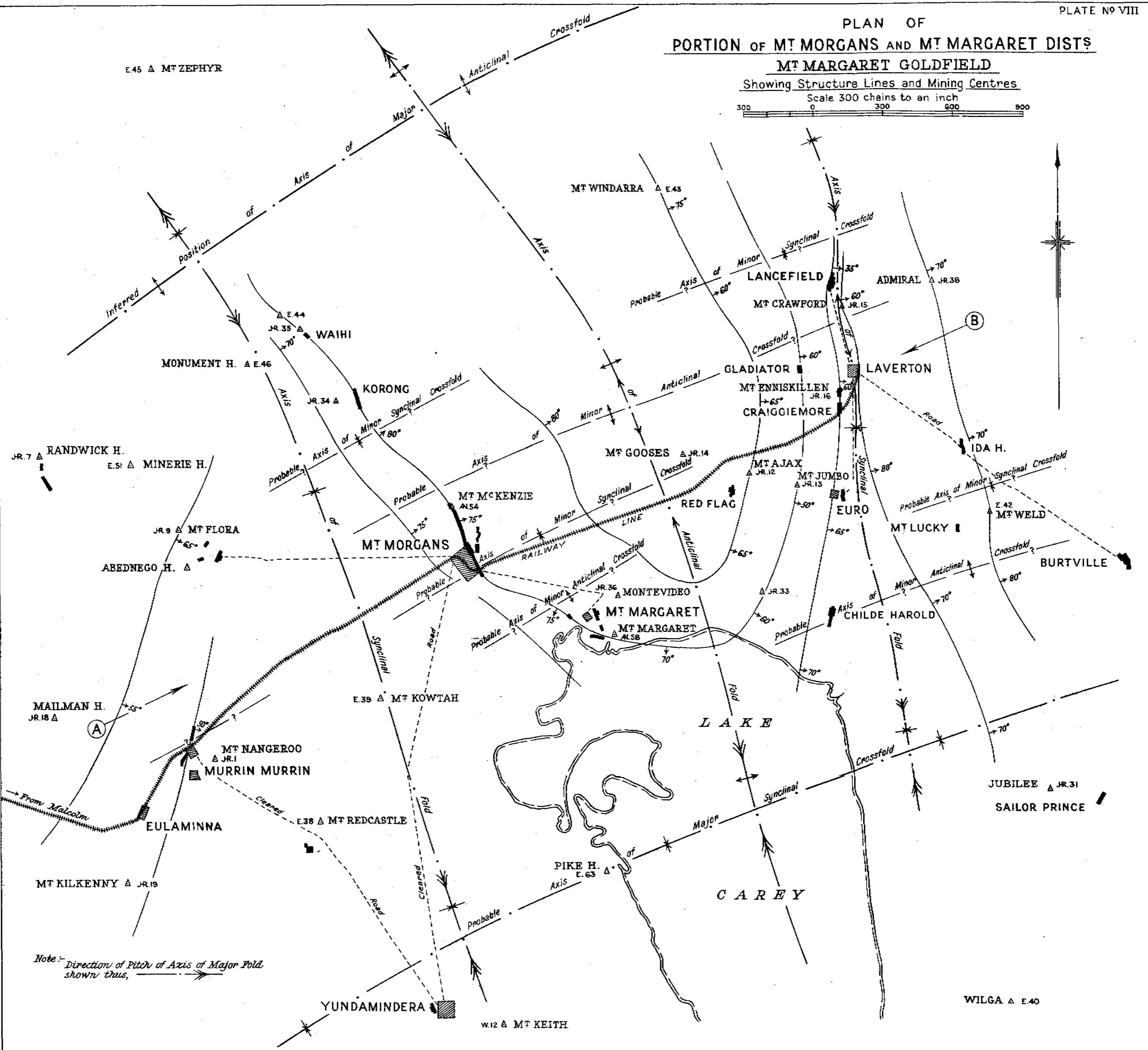
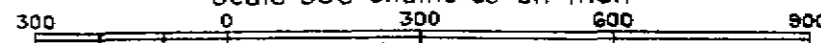
The most striking feature of this structure-contour plan lies in the two central concentric structure lines which form a wide belt sharply curved to form a rather flattened double parabola, with convexity facing southwards in the vicinity of Mt. Margaret, where it shows a steep southerly dip. The regional southerly dip at Mt. Margaret thus becomes the pitch of the major anticlinal structure. This structural pattern represents portion of that which is produced by the imposition of a broad east-west synclinal crossfold upon a major anticline whose axis lies approximately north and south, and is overturned steeply to the west.

The complete structure would show a second flattened parabolic curve with convexity and dip to the north in such a position as to be diametrically opposite the first, at some distance south of Mt. Margaret.

PLAN OF PORTION OF MT MORGANS AND MT MARGARET DIST^S MT MARGARET GOLDFIELD

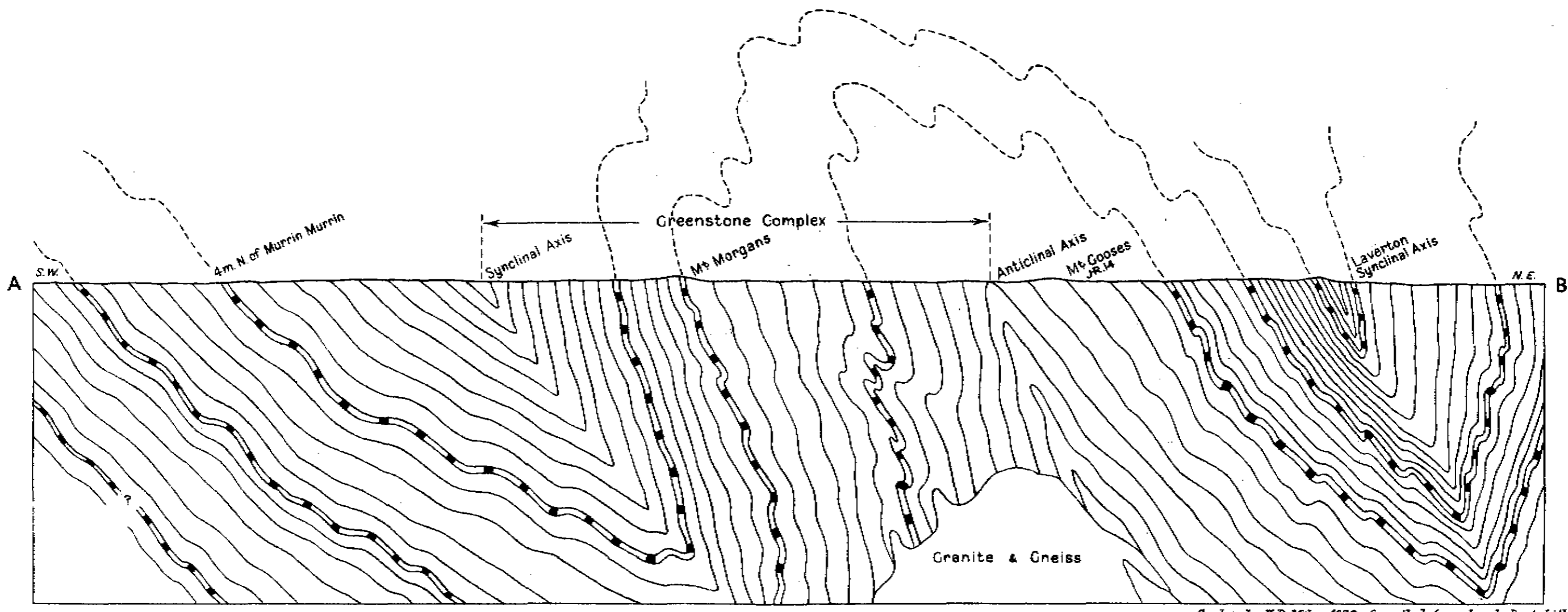
Showing Structure Lines and Mining Centres

Scale 300 chains to an inch



Note: Direction of Pitch of Axis of Major Fold shown thus,

DIAGRAMATIC SECTION ALONG LINE A-B



The axis of the synclinal crossfold would lie somewhere between the reversed parabolas. It is anticipated that future mapping will disclose the presence of portions, at least, of this opposed structure, but the record will probably prove to be rather incomplete due to lack of outcrops in the alluvial covered flats of Lake Carey.

Now, the broad synclinal east-west crossfold has produced reversals in pitch not only in the axis of the central major anticlinal structure, but has also in the axes of the two lateral major synclines. The result of super-imposing one synclinal fold at approximately right angles upon another is to produce a divergence in the structure lines. Such a divergence of the structure lines on opposite sides of the N.-S. synclinal axes is seen to exist, in going south from Lancefield to Childe Harold and from Monument Hill to Mt. Kowtah.

A line representing the position of the axis of this major synclinal crossfold has been drawn, tentatively, running in an east-north-easterly direction from a point 3 miles north of Yundamindera through Pyke Hill, to about 6 miles south of Burtville. Further mapping in the southern part of the district will, no doubt, establish the exact position of this axis.

The distribution of the structure lines near Monument Hill suggests a probable maximum convergence somewhere north of this point. This fact, and general observations of the distribution of jaspilite horizons in the country north of Laverton, not yet mapped, indicate the presence of a major anticlinal crossfold. In Plate VIII. the axis of such a crossfold is represented as passing through a point about 6 miles north of Monument Hill, and running in an east-north-easterly direction. There is no evidence at present as to the exact position or orientation of this axis, however, and it has been included merely further to illustrate the writer's conception of the general structure of the area.

THE MINOR GEOLOGICAL STRUCTURE.

Enclosed in the major N.N.W.-S.S.E. anticline and syncline, there are many smaller folds with axes parallel to them, but none of a size sufficiently large to show up on a plan of the scale of 300 chains to an inch, have so far been recognised. These small dragfolds usually have a steep variable pitch which may show reversals in direction from southerly to northerly, over short distances. Such reversals in pitch of the axes of N.N.W.-S.S.E. folds infer the presence of minor east-west crossfolding, or buckling. There is a certain amount of evidence of the presence of a number of these minor crossfolds.

The broad undulations of the structure lines on the western side of the major central north-south anticline produced by alternating convergence towards and divergence from the central north-south axis, are reflected in some cases by broadly similar undulations of the same respective horizons on the eastern side. This is exactly what we would expect to find in the plan of an overturned anticline upon which has been super-imposed a number of minor synclinal and anticlinal crossfolds. At a point about 1 mile north of Mt. McKenzie is the centre of a structural curve with convergence to the east. The same curvature is seen in the structural horizon immediately east of this. Such a curvature could only be produced by the action of an anticlinal crossfold upon the overturned western limb of the major anticlinal struc-

ture. On the eastern side of the central anticline, the Windarra-Ajax structure line curves broadly with convexity facing east at a point about 10½ miles south of Mt. Windarra. This means that the axis of the minor anticlinal crossfold probably passes through this point. This axis probably crosses the Lancefield-Euro and the Mt. Crawford-Laverton horizons at a point ½ mile or so south of Mt. Crawford, where the latter structure line shows a westerly convergence towards the Laverton synclinal N.-S. axis. Corroborative evidence of this anticlinal crossfold is found in a regional northerly pitch at the Lancefield G.M., the presence of steep south-pitching dragfolds in the jaspilite outcrops between Mt. Crawford and Laverton, and, on the western side, the occurrence of strong southerly pitches in the dragfolds between Morgans and Mt. McKenzie.

A curvature of the structure line to the westward, at Morgans, and at a point about 2 miles south of Korong, suggests the presence of two parallel minor synclinal crossfolds lying on opposite sides of the anticlinal crossfold already described. The axis of the Morgans crossfold appears to run in an east-north-easterly direction towards Laverton. No decisive evidence of the presence of this synclinal crossfold on the Laverton side of the area, can be obtained. The axis of the Korong crossfold probably runs parallel to the others. On the eastern side, the presence of a slight westerly curvature of the Windarra-Ajax structure line, at a point about 5½ miles south of Mt. Windarra, and the occurrence of steep southerly pitches in the jaspilite outcrops immediately south of Windarra, with pitches to the north at Lancefield, point to the existence of a continuation of the Korong synclinal crossfold at somewhere about 2 miles north of Lancefield. Corroborative evidence of crossfolding from the distribution and direction of pitch of dragfolds in jaspilite beds throughout this district, is not particularly conclusive, however, as the angles of pitch of the axes of the dragfolds are usually very steep (from 65° to 90°), and reversals of direction over distances of only a few yards are quite common.

A further set of undulations in the structure lines between Mt. Margaret and Morgans, reveals the probable presence of another minor anticlinal crossfold whose axis runs from about 3 miles north of Mt. Margaret Trig., in the direction of Mt. Jumbo. Here also, direct evidence of this crossfold can only be found on the western limb of the major anticlinal structure.

A marked reversal in the pitch of the N.-S. axes of dragfolds was seen on the Admiral-Mt. Weld jaspilite line on the eastern side of the area. For several miles south of Mt. Weld the dragfolds in jaspilite outcrops all pitch steeply to the north. Further northwards, towards Ida H., the few recognisable pitches were predominantly southerly, indicating the possible presence of a minor synclinal crossfold whose axis passes, probably, about a mile north of Mt. Weld; and a corresponding anticlinal crossfold at some point south of this. At about 3 miles south of Mt. Weld the structure line curves westward towards the major synclinal N.-S. axis, and the axis of the anticlinal crossfold probably passes through this point in the direction of Childe Harold. This structure is not, however, particularly well reflected in the distribution of the structure lines to the immediate westward.

Thus it appears that there is a certain amount of evidence for at least two, and possibly three, minor synclinal crossfolds—which, of course, infers the presence of their corresponding antilinal crossfolds—on the eastern and the western limb of the central overturned structure within the major crossfolding system, between Childe Harold and Mt. Windarra. In all probability the axes of these minor crossfolds extend from west to east right across the area under consideration, but evidence in proof of this fact is very inconclusive. The “wave length” of these minor crossfolds, that is, the distance between any two points in the same phase, is approximately 8 miles.

Probably there is a great deal of still smaller-scale cross-buckling within these minor folds, but poor exposures and lack of underground workings make it almost impossible to obtain sufficient evidence for their elucidation.

THE RELATIONSHIP OF GOLD DEPOSITION TO GEOLOGICAL STRUCTURE.

Though mining activity in the Laverton, Morgans and Murrin districts has undergone a revival in the last few years, there are in existence very few new mines which have reached such a stage of development, that an underground examination might be expected to provide clues as to the minor structures in which they are situated. Most of the older centres such as Ida H., Childe Harold, Euro, Burtville and Mt. Margaret are almost deserted, and their underground workings inaccessible. Consequently, it is impossible to arrive at any specific conclusions as to the effects of isolated geological structures upon the production of gold bearing formations in the different mining centres.

However, a study of the distribution of the mining centres in relation to the geological structure of the area as it has been interpreted in Plate VIII., reveals one or two interesting facts.

Firstly, there appears to be a definite grouping of the mining centres along certain parallel lines which run in an approximate E.N.E.-W.S.W. direction, i.e., parallel to the axes of major and minor crossfolding. The actual position of the centres in relation to the axes of minor crossfolds varies considerably, but in some cases important mining centres appear to lie on or close to these axes. Very possibly the distribution of gold in many centres has been controlled by still smaller scale structural features which have not been revealed in Plate VIII.

Another interesting point that may be noted is that in many cases the mining centres appear to be associated with the jaspilite horizons in the Greenstone Complex.

It appears probable, then, that localisation of gold deposition in this area has been to a certain extent controlled by the crossfolding structures. As to whether the major crossfolds are those of prime importance, and if so, whether certain portions of these folds are more favourable for the introduction of gold solutions than others, it is as yet impossible to say. Similarly if the distribution of gold is controlled primarily by the minor crossfolds, it may later be possible to prove that certain phases of these folds, such as, some parts of the crests of anticlines, or the troughs of synclines, or certain portions of the limbs are the most favourable for the introduction of auriferous solutions.

Though a certain amount of field data has already been obtained, considerably more evidence, both in this and other goldfields, will be required to satisfy these very important questions.

NOTES ON THE BANDED JASPILITES OF THE MT. MORGANS-MT. MARGARET DISTRICT.

MT. MARGARET GOLDFIELD.

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

To even the most disinterested traveller from Morgans to Laverton one of the noticeable features of this part of the Mt. Margaret Goldfield should certainly be the numerous low broken ranges and long ridges, frequently topped by ragged knife edges of naked rock, whose bare outlines stand out in marked relief from the flat red mulga-strown plains, and the low rounded dull-brown, greenstone hills.

These ridges usually consist of one or two steeply dipping beds of a variety of banded iron-bearing quartzite, to which has been given the name of “Jaspilite” (better known on the goldfields as “Jasper”). The high content of quartz—a chemically inert mineral—in the jaspilite beds, and its fine texture, has generally resulted in these beds having resisted the agents of weathering far more successfully than the surrounding rocks.

Consequently they are usually to be found outcropping as long narrow sinuous ridges, which stand up above the general level of the country. Several of these long broken lines have been traced over distances of 20 miles and more.

Detailed mapping in the Laverton-Morgans district has established the fact that there are three, possibly four, distinct horizons of these jaspilite beds. These “horizons” are not usually represented by the one continuous bed of jaspilite, but more often consist of several separate bands or beds, which vary in thickness from 2-3 chains down to a few inches. A band may sometimes lens out, its place often being taken by another parallel band at some distance further along the general strike of the horizon. The bands are frequently tightly folded and contorted.

The general characters and the mode of origin of the jaspilite beds in the different horizons are essentially the same, but it appears that some at least of the horizons show certain distinctive characteristics, while in all of them can be seen, in different places, variations in composition, structure, texture, granularity and degree of alteration or decomposition.



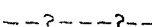


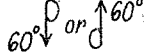
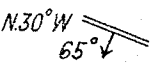
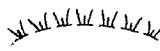
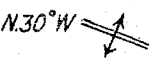
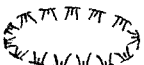
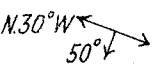

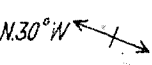

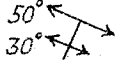

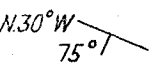
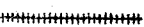
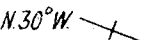
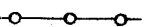
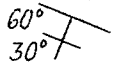
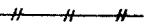
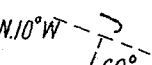
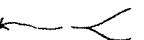
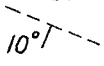

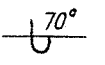



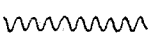
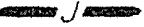
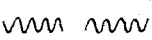
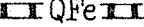
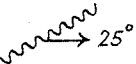

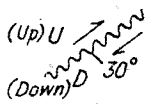

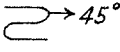

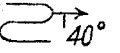

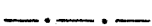








A most striking feature of the jaspilites is their remarkably uniform banding. This is usually due to parallel layers of dark (either brown, black or red) iron oxides alternating with white or grey bands of fine-granular quartz. These alternating layers, of widths varying from 1 inch down to fine hairlines, frequently show the remarkable continuity characteristic of “varve” structures in younger and less disturbed sedimentary deposits, and even in highly contorted and dragfolded portions of the jaspilite beds, contiguous individual layers are often traceable for many chains.

The jaspilites of this area may be divided into two groups: the Siliceous Jaspilites, or those which have a very low iron content; and the iron-bearing Jaspilites.

STANDARD SYMBOLS

As Adopted by G.S.W.A. 1935

PLATE NO IV

<i>Observed Geological Boundary</i>		<i>Top of Beds as indicated by Cross Bedding</i>	
<i>Doubtful or Assumed Geological Bdy.</i>		<i>Top of Beds as indicated by Gradation in Grain</i>	
<i>Outcrops with no observed Strike and Dip</i>		<i>Regional Pitch of Minor Folds</i>	
<i>Strike and Dip of Foliation in Granite</i>		<i>Bluffs and Breakaways</i>	
<i>Strike of Vertical Foliation in Granite</i>		<i>Open Cuts</i>	
<i>Strike and Dip of Schistosity</i>		<i>Costeans</i>	
<i>Strike of Vertical Schistosity</i>		<i>Dry Blown Areas</i>	
<i>Schistosity with Curving Dip</i>		<i>Roads or Tracks</i>	
<i>Strike and Dip of Bedding</i>		<i>Railways</i>	
<i>Strike of Vertical Bedding</i>		<i>Telegraph Lines</i>	
<i>Bedding with Curving Dip</i>		<i>Fences</i>	
<i>Strike and Dip of Jointing</i>		<i>Watercourses</i>	
<i>Strike and Dip of Fracture Cleavage</i>		<i>Form Lines</i>	
<i>Overturned Strata</i>		<i>Swamps</i>	
<i>Relative Direction of Shearing Movements</i>		<i>Quartz</i>	
<i>Fault</i>		<i>Jasper (not Jaspilite)</i>	
<i>Probable Fault</i>		<i>Jaspilite</i>	
<i>Pitch of Fluting on Fault</i>		<i>Main Shafts (Number of Compartments may vary)</i>	
<i>Fault Observed indicating Vertical and Horizontal Components of Movement.</i>		<i>Shafts</i>	
			<i>Accessible</i>
			<i>Inaccessible</i>
<i>Strike and Plunge of Dragfold</i>		<i>Winze</i>	
<i>Dip of Axial Plane in Dragfold</i>		<i>Rise</i>	
<i>Axial Plane of Large Fold</i>		<i>Cross-section of Crosscut or Drive approaching Observer</i>	
<i>Axis and Direction of Pitch of Major Fold</i>		<i>Cross-section of Crosscut or Drive receding from Observer</i>	
<i>Anticlinal Axis</i>		<i>Buildings</i>	
<i>Synclinal Axis</i>		<i>Elevation in Feet above General Level</i>	143'
<i>Direction in which Lava Flow Tops face</i>		<i>Elevation in Feet above Sea Level</i>	1312'
<i>Top of Beds as indicated by Cleavage and Bedding Relationships</i>		<i>Locality and Number of Specimen</i>	X 2/825

The former, of which the Mt. Crawford (JHR 15)-Lancefield lines (see structure-contour plan, Plate VIII.) are examples, consists essentially of a closely interlocking quartzite through which run narrow parallel pencil lines of darker material—probably finely divided graphite, or iron oxide. It frequently shows evidence of re-silicification, the result of intrusion by later quartz. This type has been seen to grade into the iron-bearing variety in a number of places, e.g., south of Mt. Crawford, at Mt. Weld (E 42), ½ mile south of the Gladiator G.M., etc.

In the iron-bearing jaspilites, which make up the bulk of the Jumbo (JHR 13)-Morgans, and Windarra (E 43)-Ajax (JHR 12) horizons, and portion of the Laverton-Euro line, the iron ore is usually present in the form of bands of either black, granular hematite, or brown-yellow amorphous limonite, the one often grading into the other.

At Mt. Windarra the iron-bearing bands are associated with a light-brown coloured platy mineral, probably an amphibole.

In two places jaspilite beds have been seen to grade, across the strike into pebble conglomerates.

At about one mile south of Mt. Windarra, the bed grades imperceptibly, eastward, into a coarse quartzite or grit containing narrow beds of highly sheared and lensed-out quartzite pebbles. At about 4 miles S.S.W. of Child Harold, where the Euro jaspilite line approaches Lake Carey, its eastern boundary passes into a coarse pebble rock of obviously sedimentary character.

Another rock type which is probably closely associated with the jaspilites of this district is a blue-grey graphitic slate, or phyllite, which frequently carries narrow lenses of banded quartzite very similar to a siliceous jaspilite. A well-marked horizon of this slate exists at about 1¼ miles west of the Morgans-Korong jaspilite line, and at Murrin Murrin, while

numerous narrow belts occur in greenstone schist, both east and south of Laverton.

About one mile west of Mt. Korong (J.H.R. 34) the blue-grey slate horizon is cut off by intrusive granite, and close to the contact, the slate has been converted into a micaceous chialtolite-bearing rock.

The jaspilites were very probably laid down under shallow seas in early Pre-Cambrian times, in the form of impure sandy beds, the detrital material of which being derived from the denudation of ancient land surfaces consisting of predominantly basic rocks.

There were at least three periods of sedimentation and probably four, or more, separated by periods of volcanic activity during which thick layers of basic lavas, tuffs and later, agglomerates were deposited in succession over the thin sedimentary beds.

STANDARD SYMBOLS

As adopted by The Geological Survey of Western Australia, 1935.

(Reference Note by H. A. Ellis.)

In Plate No. IV. of this report will be found a reference table explaining the conventional signs which are in use on geological plans prepared by officers of the Geological Survey since the year 1935.

A number of these signs have been adopted from the published plans of other Geological Surveys, particularly those signs having reference to structural features.

While each geological plan is always accompanied by a legend in which an explanation of those conventional signs used in its compilation is given, it has been thought desirable to reproduce in one plate, all the signs used.

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DIVISION V.

Annual Report of the Director of the Schools of Mines of W.A. for the Year 1938.

1.—KALGOORLIE SCHOOL OF MINES.

Enrolments.—The individual enrolment, exclusive of the correspondence Course, reached a maximum of 606 as compared with 617 during 1937. In the first term there were 523, second term 516, third term 401.

Correspondence Classes.—Correspondence classes in Metallurgy 1, Mining 1, Assaying 1, Mine Sampling, Mining 11 and Ore Dressing were continued.

The enrolments during the year in these classes were as follows:—

Metallurgy 1	7
Mining 1	11
Assaying 1	14
Mines Sampling	6
Mining 11	6
Ore Dressing	12

Some of these students sat for the ordinary examinations of the School while others sat for special examinations.

Revenue.—The revenue for the school year, not including Correspondence Class fees or Metallurgical Laboratory fees, was £1045.

The revenue from investigations conducted in the Metallurgical Laboratory amounted to £313. This was paid into the Metallurgical Laboratory Trust Fund to meet maintenance and incidental expenditure in connection with the Laboratory.

Staff.—The services of Mr. Compton, Lecturer in Geology, etc., were continued on loan to Spargo's Reward Gold Mine, during 1938. Mr. Beatson continued to carry out the duties of this officer during the whole of the year.

The only change in the Staff has been the temporary appointment of D. Burrows as Cadet vice A. O. Clauson who resigned in October to accept a position as a Junior Chemist with Kalgoorlie Foundry, Ltd.

All members of the Staff have carried out their duties conscientiously and I have pleasure in expressing my appreciation of their services.

Public Assays Department.—This branch of the work of the School has again been largely availed of by prospectors. The number of free assays and mineral determinations carried out during the year was as follows:—

Assays for gold and other metals ..	668
Mineral determinations	105

Although the services of the staff have again been available to the Gold Stealing Detection Staff of the Criminal Investigation Branch, the officers of that

staff have not availed themselves of these services as much as in former years, apparently preferring to entrust the work to local public assayers.

Metallurgical Laboratory.—During the year 34 applications for investigations into the treatment of ores and metallurgical products were received, 32 of which were completed and reports were issued on all completed investigations.

In connection with this work 1403 assays for gold have been carried out and 140 chemical analyses, not including routine tests for cyanide solutions.

The total revenue received in the form of fees for investigations has been £313 which has been paid into the Metallurgical Laboratory Trust Fund.

Additions to equipment have been made, both by the Commonwealth Council for Scientific and Industrial Research and by purchase out of the Trust Fund.

The extension of the Laboratory becomes more and more necessary partly to increase the accommodation available for equipment and partly to provide office accommodation for the Laboratory Staff.

The senior Research Metallurgist, Mr. W. G. Clarke, returned to duty in May after three month's long service leave.

At the beginning of the year, in consequence of alterations made to the Fitting Shop it became possible to provide the laboratory with increased assay office accommodation and a new balance room. This addition to accommodation has enabled the Metallurgical activities to proceed with a consequent increase in efficiency. To this section an assay balance of the latest type—a magnetic-damped prismatic reflecting balance—was added.

The Staff of the Laboratory have had a very large number of calls for assistance and advice on treatment problems from mill and cyanide operators all over the State and every effort has been made, short of actually visiting the treatment plants, which is seldom possible, to furnish the advice and information required.

In addition, the Principal on his trips round the goldfields as a member of the Board of Examiners for Underground Supervisors' Certificates of Competency regularly gives advice and information on treatment problems to operators of both small and large mills and treatment plants.

Equipment.—The equipment of the Fitting Shop has been increased by the purchase of a modern lathe and a small drilling machine and it is hoped that further lathes will shortly be provided. A planing machine has been very generously donated to the

School by Kalgoorlie Electric Tramways, Ltd., through its General Manager, Mr. W. H. Stanley. This will add greatly to the efficiency of the classes in Fitting and Turning. Further necessary equipment is a milling machine and a modern power hacksaw.

A compound steam engine and generator, which constituted portion of the equipment of the H.M.A.S. Australia has been purchased from the University and is now ready for installation in the engine-room.

Buildings.—The alterations to the old engine room were completed at the beginning of the year and the contractor has now commenced the building of a new drawing office, lecture room, and two staff offices. Alterations are also to be made to the jarrah class room to enable it to be used as a Mineralogical Laboratory.

Completion of the alterations to the lighting circuits is still necessary as is also the painting white of walls and ceilings in class rooms and laboratories.

WILUNA SCHOOL OF MINES.

Enrolments.—

	1st Term.	2nd Term.	3rd Term.
The Total Number of Students	92	86	80
The Total Number of Class Enrolments	154	135	130

The average enrolment was 139 compared with 123 in 1937.

Fees.—The fees received for the calendar year were £192 8s. 6d.

This amount is £10 14s. 6d. less than in 1937.

Buildings.—During the year negotiations were finalised for the erection of a Laboratory and the building was completed during November, 1938, too late for use by the classes, but it was utilised for Annual Examinations and as a study for students. The building consists of a Laboratory 30 x 30 well fitted out with cupboards, sinks and tables, etc. Drawing Room 20 x 20, Engine Room together with H.P., Lister Engine and four Store Rooms. The building is well fitted out and students in Chemistry, Physics, Drawing, Internal Combustion Engines, Electrical Work and Geology, etc., will, in the forthcoming year be well catered for.

Since the Branch was established in 1936, students and Instructors have been working very successfully under great difficulty.

New equipment has been ordered to fit up the Laboratory.

It is anticipated that an increase in the number of students will result from the erection of the new building.

The staff is wholly a part-time one at present, but it will be necessary, at an early date, to consider the question of appointing a full-time Lecturer.

J. F. LYNCH,
Director, School of Mines.

DIVISION VI.

Annual Report of the Inspection of Machinery Branch of the Mines Department for the Year 1938.

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, 1938, 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, 1938.

The number of inspections made of both boilers and machinery increased during the year. The total number of serious accidents was the same as for the two preceding years, but the number of fatal accidents was one less than in 1937. Four of the accidents, including one fatal, are also included in my report on the mining industry.

The financial position is again very gratifying as a credit balance of £1,538 11s. 5d. is shown.

Attention is drawn in Section I. to the necessity for wider powers to be given in the Act, which will ensure that competent persons only shall be permitted to instal steam boilers, and in Section II. for the necessity for an amendment of the Act in order to include air receivers of less than 5 cubic feet capacity, and in Section III. for the necessity for an amendment which will give wider powers for the control of the erection and maintenance of ammonia compressors.

RICHARD C. WILSON,
Chief Inspector of Machinery.

SECTION I.

Inspection of Boilers, New Construction, Maintenance, etc.

The total number of boilers registered (including various types of unfired pressure vessels, such as steam jacketed pans, sterilisers, digesters, vulcanisers, air and gas receivers, etc.) which were fit for use according to records, was 4,401 on 31st December, 1938, compared with 4,193 on 21st December, 1937, making a net increase of 208.

The total number of boilers added to the register during 1938 was 228, including 4 secondhand boilers transferred from other Australian States, 3 transferred from other authorities in this State, 1 which had been condemned but was reconditioned, and 220 new registrations. Of the latter, 18 were imported from the United Kingdom, 5 from United States of America, 50 from the Eastern States, 6 the origin of which has not been traced, and 141 made in this State. The number of boilers built in this State was

approximately 64% of the total of the new registrations, compared with 37% in 1937, 38% in 1936, 41% in 1935, 33% in 1934 and 14% in 1933. The types built in this State were Return Multitubular Stationary Underfired 8, Vertical Tubular 20, Locomotive 1, Cornish 23, Water Tube 20, Air Receiver 38, Gas Receiver 3, Steam Jacketed Vessel 9, Steam Hot Water Heater 1, Monteju 1, Vulcaniser 2, Digester 4, Steriliser 1.

The number of boilers removed from the register during 1938 was 20; of these 2 are being used at atmospheric pressure for heating water, 3 have been converted into oil tanks, 12 have been permanently condemned, 2 transferred out of the State, and 1 transferred to the jurisdiction of another authority in this State.

The number of thorough inspections increased by 48 or 21½% compared with 1937, and by 386 compared with 1928, an increase of 20% in ten years.

Inspections made under steam for which separate reports were submitted numbered 76, being 14 less than in 1937.

Boiler certificates issued during 1938 totalled 1,924, compared with 1,870 during 1937, an increase of 54.

The number of repair notices issued was 664 for 1938, an increase of 220.

Return No. 1—Showing Classification of Types of New Boiler Registrations for the Year ended 31st December, 1938.

Types.	Total.
Vertical Multitubular Stationary	5
Vertical Patent Tubular	30
Return Multitubular Stationary Underfired	8
Locomotive	1
Cornish	23
Water Tube	30
Digester	6
Saddle Back	6
Air Receiver	64
Gas Receiver	3
Vulcaniser	20
Steam Jacketed Vessel	21
Live Steam Hot Water Heater	1
Steriliser	1
Monteju... ..	1
	220
Imported from United Kingdom	18
Imported from United States of America	5
Imported from Eastern States	50
Imported from Unknown Sources	6
Made in the State of Western Australia	141
	220

Return No. 1—Showing Classification of types of new Boiler Registrations for the Year ended 31st December, 1938—continued.

Types.	Types.			Total.
	Return	Multitubular	Stationary Underfired	
Locomotive	8
Cornish	23
Water Tube	20
Vertical Patent Tubular	30
Air Receiver	38
Gas Receiver	3
Steam Jacketed Vessel	9
Hot Water Tank	1
Monteju	1
Vulcaniser	2
Digester	4
Steriliser	1
				141

Return No. 2—Showing Classification of Various Types of Useful Boilers in Proclaimed Districts on 31st December, 1938.

Types of Boilers.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Unproclaimed Areas.	Totals.	
				1938.	1937.
Lancashire	38	59	...	97	97
Cornish	106	496	...	602	583
Semi-Cornish	10	37	...	47	48
Vert. Stat.	296	358	...	654	655
" Port.	67	15	...	82	83
" Mult. Stat.	41	25	...	66	64
" " Port.	23	3	...	26	26
" Pat. Tubular	38	...	...	38	8
Loco. Rect. Firebox Stat.	79	65	...	144	143
" " Port.	246	71	...	317	317
" Circ.	141	8	...	149	150
Locomotive	75	44	...	119	121
Water Tube	155	123	...	278	244
Return Mult. Underfired Stat.	127	65	...	192	185
Return Mult. Underfired Port.	...	8	...	8	8
Return Mult. Int. Fired Stat.	38	13	...	51	50
Return Mult. Int. Fired Port.	2	...	...	2	2
Egg-ended and other types not elsewhere specified	56	17	45	118	107
Digesters	90	6	...	96	93
Air Receivers	421	380	...	801	736
Gas Receivers	4	...	...	4	4
Vulcanisers	250	11	...	261	241
Steam Jacketed Vessels	240	9	...	249	228
Total Registrations Useful Boilers	2,543	1,813	45	4,401	4,193
Total Boilers out of Use, 31st December, 1938	1,093	1,342	...	2,435	2,280

Return No. 3—Showing Operations in Proclaimed Districts during Year ended 31st December, 1938.

(BOILERS ONLY.)

	Districts worked from Perth.	Districts worked from Kalgoorlie.	Unproclaimed Areas.	Totals.	
				1938.	1937.
Total number of Useful Boilers registered	2,543	1,813	45	4,401	4,193
New Boilers registered during year	198	22	...	220	114
Boilers Reinstated	1	...	...	1	1
Boilers Converted	...	5	...	5	5
Boilers Inspected—					
Thorough	1,448	464	...	1,912	1,864
Working	72	4	...	76	90
Boilers Condemned during year—					
Temporarily	29	...	...	29	25
Permanently	11	1	...	12	37
Boilers sent to other States during year	2	...	...	2	2
Boilers sent from other States during year	3	1	...	4	3
Transferred to other Departments	1	...	...	1	3
Transferred from other Departments	3	...	...	3	1
Number of Notices for Repairs Issued during year	636	28	...	664	444
Number of Certificates Issued, including those Issued under Section 30 during the year	1,453	471	...	1,924	1,870

New Construction.

In my last report I mentioned that some small boilers, which were supposed to work at atmospheric pressure, had been sold to dairymen and others, but it was found, that although it was impossible to close the steam pipe, the actual working pressure was frequently 10 lbs. per sq. in. owing to the small diameter of the steam pipe. The largest of these boilers was 30in. long by 24in. diameter and the shell was only $\frac{3}{8}$ in. M.S. plate. The owners of these boilers had bought them in all good faith as being exempt from the provisions of the Act, so it was decided to permit them to have adequate mountings fitted, and inspection holes provided, so that a certificate could be granted for an authorised working pressure of ten pounds. One of these has been condemned after 12 months' use, owing to external and internal corrosion having reduced the shell, which was originally $\frac{3}{8}$ in. thick, by about 50%. The original working stress in the welded seam was only 960 lbs. per sq. in., but there was no margin left to allow for further corrosion. A life of 12 months was all that could be expected, except under exceptional circumstances. In some of the other Australian States, boilers used by farmers and dairymen are not subject to inspection, so that judging by some of the types which were being imported into this State, they have been supplied with unreliable and in some cases, dangerous boilers for sterilising purposes.

As all boilers in this State are subject to annual inspection, and there was a definite demand for small low pressure boilers at a reasonable price to suit the purse of the small dairy proprietor, some of our local firms have been permitted to build small welded boilers. About one dozen different designs have been tried; the diameter of the cylindrical shell of the largest so far put into commission has been 24 inches, and the minimum shell thickness $\frac{3}{8}$ in. The maximum stress in the longitudinal welded seam has not exceeded 3,600 lbs. per sq. in. for $\frac{1}{4}$ in. plate, 3,800 lbs. per sq. in. for 5/16in. plate, and 4,000 lbs. per sq. in. for $\frac{3}{8}$ in. plate. All these boilers will be subject to inspection at least once per year, so that some useful information may be obtained with regard to fusion welded seams in tension, under local conditions of manufacture and actual working.

Steam jacketed pans made of welded stainless steel are becoming popular for use in hospitals and other institutions. Several have been imported from other Australian States, and several have been made locally, which are a credit to the manufacturer for the neatness of the workmanship. As they are much easier to keep clean than copper pans, they will probably come into general favour in the near future.

Maintenance.

The acute water shortage in some of the towns in the Great Southern district has caused rapid deterioration of some boilers. Two Stationary Underfired Multitubular Boilers became overheated owing to the accumulation of scale or mud on the shell bottom. One was so badly distorted as to be hardly worth the cost of repair. The other will have to have the damaged part of the shell cut out, and a large patch fitted.

In spite of continued warnings and advice, some owners still fail to realise that extensive damage can be caused by the external wasting due to quite small leaks, if they are not attended to and stopped as early as possible. During the year repairs had to be made

to several boilers owing to wastage round manhole and handhole openings caused by slight leakage past the joint. In the case of some water tube boilers the repairs to the manhole cost quite an appreciable sum, to say nothing of the inconvenience caused while the boiler was out of commission for repair.

It was made evident during the year that some control should be exercised over the erection of small boilers. The owner of a large boiler generally employs competent persons to instal it, but in the case of small boilers used by dairymen, etc., many have been installed by persons who have no knowledge either of engineering, or of the provisions of the Inspection of Machinery Act. Some of these small boilers have been installed after the completion of the usual visit of the Inspector to the district in which they are working, and as long a period as six months may elapse before an Inspector can see how they have been installed, because owing to the distances involved, it is economically impossible to make special visits in most cases. There are also many unsuitable types of pressure gauges, safety valves, glass water gauge fittings, cocks, etc., being sold for use on small boilers and air receivers. The time has come for similar powers to be granted under the Inspection of Machinery Act to prevent the sale of unsuitable boiler fittings, as exist in regard to water taps, etc., used in connection with any Government water supply. The latter fittings cannot be used unless they have been passed and stamped, prior to sale.

SECTION II.

Explosions, Interesting Defects, etc.

A small copper vessel, $23\frac{1}{4}$ in. high x $13\frac{3}{8}$ in. dia x about 13 gauge, used at a pressure of about 15 lbs. per sq. in. for sterilising dressings in a country hospital, burst. The bottom tore away from the shell, and the upper portion, together with the drums containing the dressings, went through the ceiling. Luckily no person was injured. Two nurses had left the room in which the steriliser was kept only a few moments previously. The cause of the failure was partly faulty design: the radius of the dished bottom end was too great, also, the copper end plate had been overheated on previous occasions, due to an insufficient quantity of water having been put into the vessel before lighting the Primus burners. Arrangements have been made to inspect all such vessels in future and all that are defective will be replaced by sterilisers of a better design. The safety valve on the vessel which burst had a clear bore of only $\frac{1}{8}$ in. dia. This could easily become blocked by cotton wool, etc., and cause even a well designed vessel to burst through accumulation of pressure.

An unusual case of localised corrosion in a locomotive stationary rectangular firebox boiler took place apparently in a comparatively short period. The boiler was built in England in 1925 by a well known maker. It was in use on a saw mill for about four years, and after a period of idleness, it was used again on another saw mill for about three years, the only repairs found necessary being the renewal of several water space stays, but not more than is usual for this type of boiler when used for driving a saw mill. At the annual inspection in 1937 it was found that extensive corrosion of the fire box had occurred since the previous inspection. The owner was notified that the fire box would have to be withdrawn at the expiration of the certificate. When the firebox was

removed it was found to be so badly corroded that it could not be repaired, and a complete new firebox was procured from the makers. The rest of the boiler was in very good condition, with the exception of the smoke box tube plate, which was wasted at about the working water level. There was an unprecedented water shortage in this district at the time when the corrosion took place. This is a very serious matter on a timber mill, because in most cases all the engines are non-condensing. In normal years there is sufficient rainfall to ensure ample supplies of reasonably good feed water in the timber milling area throughout the year, which probably accounts for the fact that no attempt has ever been made to conserve the exhaust steam for feed purposes.

It is most unusual to find corrosion of any consequence in the steam space of a boiler, but last year two boilers had to be repaired because of this type of corrosion. One was a small locomotive type of a rather peculiar design installed on a steam waggon. The steam space corrosion was located near the smoke box end of the barrel at the extreme top, where the longitudinal seam is located. The other was a vertical boiler on an excavator in which both the shell and the vertical stays were severely corroded above water line, and the shell crown was also severely corroded, but the most extraordinary part was that there was very little corrosion on the uptake which is the part that usually wastes at the water line, even when other parts are unaffected. This boiler had only been in use for four years when all the vertical stays were reduced from $1\frac{1}{2}$ in. dia. to less than $\frac{1}{2}$ in. dia.; these were renewed, but 12 months later, the wasting of the shell crown and upper parts of the shell was so severe that no further certificate could be granted without extensive repairs.

An air receiver of less than 5 cubic feet capacity burst during the year, and although receivers under 5 cubic feet are exempt from the provisions of the Act, particulars were obtained for record purposes. This receiver was about ten years old. Both the shell and ends were made of $\frac{1}{8}$ in. plate, all seams were welded, but the penetration was very poor. Just prior to the accident, the receiver was pumped up to 145 lbs. gauge pressure. Some tyres were inflated, which reduced the pressure to 100 lbs. Shortly afterwards, the receiver burst round the connection of the shell to the bottom end. Unfortunately, the pressure gauge was destroyed and so could not be tested, but there is no reason to suspect that it was not reading correctly. This makes the third explosion of this type of vessel, of which we have received definite information, between 31st December, 1929 and 31st December, 1938, but there have been several others concerning which we have no definite details. An endeavour will be made to amend the Act next session to include all air receivers of over, say, 9 inches dia., working at over thirty pounds pressure per. sq. in.

SECTION III.

The number of useful groups of machinery on the register has increased by 1223 compared with the year 1937, and by 7932 compared with the year 1928. It may be of interest to note that in the last 10 years, the number of groups driven by steam engines account for .78 per cent. of the increase, by oil engines 16.8 per cent., by gas engines .62 per cent., by electric motors 81.5 per cent., and other types .3 per cent. The heading of oil engines includes those using petrol, or kerosene, as well as diesel types. If the diesel

types had been segregated it would have been possible to show how they had increased in popularity in the last ten years. I would be quite safe in saying that 90 per cent. of the increase in oil engines was accounted for by engines of the diesel type.

It is a great pity both from an economic and defence point of view that gas engines have not been used more, in preference to the diesel types, as the former use local fuel entirely, and the fuel for the latter is all imported.

The number of groups of machinery inspected during the year 1938 was 393 greater than during the previous year, and 5688 greater than in 1928, being an increase of slightly over 100 per cent. during the last ten years.

There were 21 fewer notices issued to owners dealing with the guarding or repair of machinery.

During the year, special attention was paid to ammonia refrigeration plants, and in a number of cases, the condenser coils and liquid ammonia receivers were found to be severely wasted, which gives further proof of the necessity for wider powers to be given under the Act for the control of the installation and maintenance of these plants, particularly when they are situated in restaurants and in buildings which are also used as shops and offices, etc.

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, 1938.

Classification.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals.	
			1938.	1937.
No. of Groups driven by Steam Engines	566	528	1,094	1,086
No. of Groups driven by Oil Engines	1,787	721	2,508	2,318
No. of Groups driven by Gas Engines	80	181	261	264
No. of Groups driven by Compressed Air	2	53	55	54
No. of Groups driven by Electric Motors	8,275	2,959	11,234	10,206
No. of Groups driven by Hydraulic Pressure	4	.....	4	5
	10,714	4,442	15,156	13,933

Return No. 5—Showing Operations in Proclaimed Districts during Year ended 31st December, 1938.

(MACHINERY ONLY.)

	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals.	
			1938.	1937.
Total registrations Useful Machinery	10,714	4,442	15,156	13,933
Total Inspections made	8,301	2,944	11,245	10,852
Certificates (bearing fees)	3,587	617	4,204	4,286
Certificates (steam without fees)	103	13	113	121
No. of Extension Certificates issued under Section 42 of Act .....	.....	.....	.....	.....
Notices issued (Machinery Dangerous)	396	12	408	429

The number of passenger lifts has increased by 12, or one less than the increase the previous year, but the number of goods lifts has not changed since 1936. The number of passenger lifts has increased by 77 since 1928, an increase of 77.7 per cent. in ten years.

During the year 17 permits were granted for the erection of, or reconstruction of lifts. Ten of the lifts for which erection permits were granted were completed before the end of the year. The erection or reconstruction of 19 lifts was completed during the 12 months.

No accidents to persons due to lifts were reported, and there were no mishaps of any importance in connection with lifts.

Return No. 6 showing Classification of Lifts on 31st December, 1938.

Type.	How Driven.	Totals.	
		1938.	1937.
Passenger ...	Electrically driven ...	175	163
	Hydraulically driven ...	1	1
Goods ...	Electrically driven ...	105	105
	Hydraulically driven ...	3	3
	Belt driven ...	4	4
		288	276

SECTION IV.

Prosecutions under the Act.

When investigating a case of the collapse of the flue of a small Cornish boiler owing to shortage of water, the Inspector found that the boiler had been under the care of an uncertificated person at the time the accident occurred. The boiler was of an old type with lap seams joining the rings of the flue tube, and a very serious accident was narrowly averted, as one of the lap seams over the fire was on the point of tearing away from the rivets when the overheating of the furnace was discovered and the fire drawn. The firm and the uncertificated persons who had acted on many occasions as boiler attendants were prosecuted and fined.

In another case an engine-driver was prosecuted and fined for being in charge of a winding engine although he was not the holder of a winding engine-driver's certificate. As this case occurred in a district where it was more convenient for the Inspector of Mines to prosecute, action was taken under the provisions of the Mines Regulation Act instead of the Inspection of Machinery Act.

SECTION V.

Accidents to Persons.

The Return No. 7 below includes only fatal accidents and those which caused the injured person to be incapacitated for a period of two weeks or more. Accidents caused by machinery, but which occurred in timber mills or on timber holdings, that are subject to the provisions of the Timber Industry Regulation Act of 1926 are not included.

The total number of persons injured by accidents due to boilers as defined, working machinery or power plants during 1938 was 29, which is the same as for the two previous years. This total includes 3 fatal accidents, which is 1 less than in 1937 and two less than in 1936. These figures include 4 accidents that occurred on mines, one of which proved fatal. These are also included in the report of the State Mining Engineer on the mining industry.

One fatal accident was caused by the flywheel of a two horsepower oil engine bursting. This engine was used to drive a portable circular saw bench. The flywheel had been fractured in several places and repaired by Tobin bronze welding. The accident occurred when the engine was being tried out after adjustments had been made to the timing and while it was running on no load. Owing to the repairs the

flywheel was probably out of balance, the engine was not on a solid bed, and possibly the governor was not correctly adjusted. The repair of a broken flywheel by any method is always a ticklish undertaking, and should only be attempted by an expert. In this case, it would have been the correct thing to have procured a new wheel: it was certainly not worth the risk to attempt to repair such a small wheel.

Another accident which might easily have proved fatal was caused by the bursting of a new emery wheel while it was being dressed to alter the shape of the face from square to rounded, so that it could be used to gullet a circular saw. The emery wheel which was about 12in. diameter by 1/2in. face was mounted on a spindle which usually was used for a small circular saw, and a piece of 4in. by 1in. hard wood was nailed across the gap in the table to act as a rest for the dressing tool. This board was close to the face of the emery stone but there was nothing to support the dressing tool at the side of the emery stone. From a broken piece of the stone it appears that the dressing tool must have jammed between the stone and the hardwood rest as soon as it was applied. The stone broke and one piece hit the injured person between the eyes. This accident occurred on an outback mine. The injured man was brought to Kalgoorlie by aeroplane, where an operation was performed on his nose, about 12 hours after the accident. His injuries were of such a nature that he was flown to Perth the next day, where he made a quick recovery under the circumstances. This accident shows that many people do not realise that emery wheels require to be treated with reasonable care and caution. Considering the number of home-made emery spindles which are fitted with inadequate flanges for holding the emery wheel that are found in use each year, it is surprising that there are not more accidents caused by the misuse of various types of emery and similar grinding wheels.

Return No. 7 showing Persons Killed or Injured by Boiler and Machinery Accidents in Proclaimed Districts during Year ended 31st December, 1938.

(Numbers within brackets denote fatal accidents.)

Class of Machinery.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Total.
Metal Working—			
Emery Wheel ...	...	1	1
Guttering Machine ...	1	...	1
Wiredrawing ...	3	...	3
Sawmilling and Wood-working—			
Circular Saw ...	2	1	3
Chain Morticer ...	1	...	1
General—			
Belting ...	...	1	1
Shafting ...	...	2 (1)	2 (1)
Sinking Winch ...	...	1	1
Sausage Machine ...	1	...	1
Conveyor ...	1	...	1
Unhairing Machine ...	1	...	1
Flywheel ...	2 (1)	...	2 (1)
Liquorice Machine ...	1	...	1
Fondant Beating Machine ...	1	...	1
Hoist ...	1 (1)	...	1 (1)
Stamping Machine ...	1	...	1
Fan ...	1	...	1
Robbin Winding Machine ...	1	...	1
Match-box Machine...	2	...	2

Return No. 7—continued.

Class of Machinery.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Total.
Printing (Rotary Press)	1	...	1
Trimming Machine ...	1	...	1
Gas Producer Explosion	1	...	1
	23 (2)	6 (1)	29 (3)

SECTION VI.

Engine-drivers' Examinations, etc.

For the third consecutive year there has been a decrease in the total number of certificates of all grades granted, but last year's total exceeded the average for the five years 1928 to 1932 by 200 certificates. The peak year was 1935, when the total was 646 certificates. This was due in part, to the revival in mining, causing an acute shortage of engine drivers, and also to the reduction in the qualifying period with regard to steam engine drivers' certificates, which was rendered necessary in order to relieve the situation caused by the shortage of winding engine drivers. The number of certificates of competency granted in Internal Combustion Engine-drivers declined by 71 during 1938, but the number granted was nearly 7 times as many as in 1928. The peak year was 1937 when 160 Internal Combustion Certificates were granted, which was two more than the total of all grades of certificates granted in 1928, and only 5 less than the average of the total certificates of all grades granted in the 5 years, 1928 to 1932 inclusive. There were 414 applications for certificates dealt with during 1938.

Examinations were held as follows:—Perth 4, Kalgoorlie 4, Leonora 2, Cue 1, Meekatharra 1, and Bunbury 1.

The Board was engaged for 15 days conducting examinations, 25 days in travelling and 39 days 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 1938, compared with 1937.

	Number Granted.	
	1938.	1937.
Winding Competency, including certificates issued under Regulation 40 and Section 60 of the Act ...	37	45
First Class Competency, including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act ...	9	6
Second Class Competency, including certificates issued under Regulation 40 and Section 60 of the Act ...	43	76
Third Class Competency, including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act ...	45	83
Locomotive Competency, including certificates issued under Regulation 40 and Section 60 of Act ...	5	14
Traction Competency, including certificates issued under Regulation 40 and Section 60 of Act ...	4	2
Internal Combustion Competency, including certificates issued under Regulation 40 and Section 60 of Act ...	80	160
Crain and Hoist Competency, including certificates issued under Regulation 40 and Section 60 of Act ...	8	9
Boiler Attendant Competency, including certificates issued under Regulation 40 and Section 60 of Act ...	115	90
Interim ...	...	...
Copies ...	8	4
Transfer ...	2	1
Totals ...	365	496

SECTION VII.

General, Staff, Mileage, etc.

One new electric winding engine was installed and one existing steam winding engine was converted to electric drive during the year, also a locally built electric winch was installed on an internal shaft.

In spite of the fact that some of the large Kalgoorlie Mines generate their own electric power, the monthly output of the Kalgoorlie Electric Power and Lighting Corp. has increased from about 1,000,000 units in 1933 to about 4,000,000 units in 1938.

Staff.—There were no changes in the personnel of the staff during the year.

Mileage.—The total mileage travelled increased by 6,965 miles. Of this, 1,000 miles by air is due to a special trip to Carnarvon, and 4,393 miles by water is due to the biennial inspection of the Wyndham Meat Works, which fell due in 1938, leaving an increase of 1,572 miles, which was travelled in the course of the usual annual and special inspections. (Return No. 9, see page 105, opposite.)

Revenue and Expenditure.—The revenue for 1938 was £95 0s. 10d. less than for 1937, but the expenditure was £168 1s. 6d. less, so that the profit for 1938 was £73 0s. 8d. greater than for 1937.

Return No. 10—Showing Revenue and Expenditure for Year ending 31st December, 1938.

REVENUE.				
	1938.		1937.	
	£	s. d.	£	s. d.
Fees for Boiler Inspections	2,809	14 5	2,778	13 6
Fees for Machinery Inspections....	5,322	19 8	5,144	4 10
Engine-drivers' Fees	501	13 0	752	9 0
Incidentals	72	6 3	126	6 10
Decrease—£95 0s. 10d.	8,706	13 4	8,801	14 2
EXPENDITURE.				
	1938.		1937.	
	£	s. d.	£	s. d.
Salaries	5,606	1 11	5,247	1 9
Incidentals	1,358	14 4	1,976	19 0
Engine-drivers	203	5 8	112	2 8
Decrease—£168 1s. 6d.	7,168	1 11	7,336	3 5
Profit—£1,538 11s. 5d.				

I desire to thank all those who helped in achieving the satisfactory results of the year's work. Valuable assistance has been given by officers in other Government Departments in this State, and also officers of the Government Departments of other States and the Commonwealth.

In particular I wish to thank all the officers of this Branch and the Mines Department for their hearty co-operation.

G. MOORE,
Deputy Chief Inspector of Machinery.

Return No. 9.—Showing Distances Travelled, Number of Inspections Made and Average Miles Travelled per Inspection for Year ended 31st December, 1938.

Areas Traversed.	Air Miles.			Rail Miles.			Road Miles.			Water Miles.			Total Miles.			Total Number Inspections.			Average Miles per Inspection.		
	1938.	As compared with 1937.		1938.	As compared with 1937.		1938.	As compared with 1937.		1938.	As compared with 1937.		1938.	As compared with 1937.		1938.	As compared with 1937.		1938.	As compared with 1937.	
		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.
Districts worked from Perth	1,000	1,000	...	429	...	273	48,837	2,962	...	4,426	4,393	...	54,692	8,082	...	9,821	323	...	5.57	.67	...
Districts worked from Kalgoorlie ... ..	...	...	...	...	...	...	21,272	...	1,117	...	...	...	21,272	...	1,117	3,412	104	...	6.23	...	.53
Totals	1,000	1,000	...	429	...	273	70,109	2,962	1,117	4,426	4,393	...	75,964	8,082	1,117	13,233	427	...	5.74	= Average All Districts, 1938.	
																			5.38	= Average All Districts, 1937.	
Increases or Decreases...	...	Increase, 1,000		...	Decrease, 273		...	Increase, 1,845		...	Increase, 4,393		...	Increase, 6,965		...	Increase, 427		...	Average Increase .36 mile per inspection.	

DIVISION VII.

Annual Report of the Chemical Branch, Mines Department, for the Year 1938.

The Under Secretary for Mines.

I have the honour to present, for the information of the Hon. Minister for Mines, my annual report for the year 1938.

Staff.—Only one change in staff occurred during the year. Mr. E. A. Rogerson, B.Sc., Temporary Chemist, resigned, and ceased duty in November, and his place was filled by the appointment of Mr. B. W. Stenhouse, B.Sc., in the following month.

Investigations for the Forests Department and Iron Ore Survey were in abeyance pending the appointment of temporary chemists to carry on the work.

Accommodation and Equipment.—The last major alterations to this building were completed in 1922, since when only a single small room (for toxicological work) has been added to it. As in all buildings that have grown from small beginnings, the arrangement of rooms is no longer a convenient one. With the increased staff in the last ten years, and wider scope of investigations, officers are cramped and hampered in their work. Furthermore, the crowding of other buildings round the laboratory has seriously reduced light and ventilation. Finally the installation of a large new machine laundry for the public hospital within 20 feet of our walls has resulted in the most serious vibrations, with consequent injury to our delicate measuring instruments. The matter of providing a new building on a site free from any interference with light or ventilation, and above all far distant from any source of present or possible future earth tremors, is an urgent one. Already two valuable balances have been destroyed, and it is impossible to keep any instrument in adjustment for any length of time. If matters are allowed to continue as they are very serious consequences may result, costing the Government far more than interest and sinking fund charges on a new building.

Nature of Analytical Work Done.—The total number of samples registered during the year was 6,036, practically the same as in the previous year, when the number was 6,004. The number of individual determinations was at least double this figure, as a large proportion of the samples are analysed for two or more constituents.

The samples received are classified in the accompanying table.

Table showing Source and Allocation of Samples.

Source Department, etc.	Section 1. Foods, Drugs and Toxicology.	Section 2. Mineralogy and Geo- chemistry.	Section 3. Agriculture and Water Supply.
Mines—			
State Batteries ...	22	1,190	3
Chemical Laboratory	42	85	5
State Mining Engineer ...	...	218	...
Under Secretary ...	2	4	1
Geological Survey	...	67	...
Explosives Branch	69	...	...
Health—			
Commissioner of Public Health ...	204	...	4
Hospitals ...	56	...	...
Agriculture ...	49	...	864
Public Works ...	9	1	133
Metropolitan Water Supply ...	17	...	732
Treasury—			
Government Stores	135	...	3
Police—			
Criminal Branch...	136	...	...
Liquor Inspection Branch ...	7	...	...
Factories ...	19	...	...
Forests ...	18	...	86
Chief Secretary's—			
State Saw Mills ...	60	...	...
State Hotels ...	4	...	1
State Insurance ...	3	2	...
Northern Australian Survey ...	...	869	...
Premier's—Fisheries	2	...	34
Commonwealth Director of Works ...	2	...	...
Local Governing Bodies ...	1	...	...
Main Roads ...	1	...	...
Dairy Produce Marketing Board ...	10	...	...
Education ...	...	...	1
Postmaster General ...	...	...	1
Public Pay ...	16	152	283
Public Free ...	9	399	5
Totals ...	893	2,987	2,156
Grand Total ...	6,036		

The most numerous groups of materials dealt with in each section were:—

SECTION I.	
Industrial toxicology samples	144
Criminal toxicology samples	138
Foods and condiments	120
Drugs and medicines	66
Powellised karri timber	60
Human milk	58

SECTION II.	
Gold ores and tailings	2,279
Copper ores	209*
Minerals for determination	173
Iron ores	99
Tantalum ores	33
Antimony ores	28†

* In addition 124 gold ores were assayed for copper.

† Also 18 lead and other ores were assayed for antimony.

SECTION III.	
Soil	701
Water	579
Sewage	541
Wheat	70
Sand (for concrete)	67
Fertilisers	57

The balance of the samples handled covered an extremely wide range, as did also the subjects on which advice was requested by Government officials and members of the public in person or by letter. No statistical record of the latter is possible, though it takes up a considerable proportion of the time of the four senior professional officers.

Parliamentary Vote for Chemicals, Apparatus and Books.—In my last annual report I drew attention to the inadequate Vote made available for these contingent expenses from 1931 onwards. During these years my Vote ranged from 18 to 53 per cent. below the standard of 1928-30. I am pleased to say that this year the Treasury has been a little more generous, so that the present Vote is only 12 per cent. below standard. Another small grant from the Commonwealth Metalliferous Fund enabled me to complete the purchase of books urgently needed for the mineralogical and geochemical section of our library. Recent text books and books of reference are still urgently required for the other sections of it.

One serious trouble we are experiencing is the loss of individual parts of technical journals owing to the Treasury embargo on binding, which has existed since 1931. Many of these parts are irreplaceable, and the cost of replacing those obtainable would go far towards paying for the binding of the volumes.

Foods and Condiments.—The number of these investigated was 120, which is considerably less than those dealt with last year. The materials examined were:—

Baking powder, bread, butter, cheese, chutney, essences, fish, flour, fruit (canned), honey, jam, jelly crystals, margarine, milk (fresh and condensed), pickles, sauces, vegetable (canned), and vinegar.

The number of these which failed to pass the regulations under the Health Act was unduly high. (See table in Mr. Hill's report below). Three bad cases were as follow:—

(1) A "sweet mango chutney" was found to contain only imperceptible traces of, if any, mango, the main constituents being apple, onion and tomato, with raisins, currants, cloves, salt, etc. (2) A locally made "Worcestershire" sauce

of inferior quality was being sold in second-hand bottles embossed with the name of an Eastern States manufacturer of high repute, and furthermore the quantity stated on the label was just double that actually contained in the bottle. (3) A line of "imitation lemon essence" was found to contain only a little over one-third of the quantity of the essential flavouring substance citral required by the regulation. This deficiency was confirmed by a sample from the bulk stock at the factory.

Samples of four different brands of "imitation essence of vanilla" were found to contain from 0.17 to 0.73 per cent. of vanillin, with 0.005 to 0.063 per cent. of coumarin, these two substances being the essential flavouring constituents. No limiting proportions of these compounds are stated in the relative regulation.

Early in the year Mr. H. E. Hill completed his vitamin-C. survey of local fruits, and published the results in the *Journal of the Royal Society of Western Australia* (Vol. XXIV., p. 103-6). The very high proportions found in a large yellow guava and a papaw, respectively 1.10 and 0.98 mg. per gramme, are noteworthy. Figures for other fruits agree closely with those found in other parts of the world, the richest common fruits being orange, mandarin, lemon and "banana passion fruit" (also known as taxonia).

Some further remarks on foodstuffs will be found under the heading "Food and Drug Advisory Committee."

Drugs.—The supply of anaesthetic ether to the Perth Public Hospital having improved very considerably, only 48 samples of this drug were examined during the year, only two of them failing to pass the British Pharmacopœia tests. Thyroid tablets were the least satisfactory drug examined, most of them varying considerably in one direction or the other from the stated amount of dry extract.

Food and Drug Advisory Committee.—This committee met several times and dealt with the following matters amongst others.

(1) Consideration was given to the drafting of a regulation to cover a chocolate sweetmeat specially compounded for consumption by persons suffering from diabetes.

(2) Consideration was also given to the advisability of drafting regulations to define "wholemeal bread" and "brown bread," in view of the very unsatisfactory state of affairs in regard to the first named revealed by a survey made in the previous year.

(3) The regulation dealing with butter was amended by removing the permission to use any preservative in it other than salt. Previously boric acid might be incorporated to the extent of 0.3 per cent.

(4) A request was refused which sought to have the words "acid phosphate" removed from labels covering baking powder made with that substance. This was on account of the large proportion of fluorine that had been found in certain commercial acid phosphates. Fluorine is a very undesirable constituent of foods or beverages.

(5) Pending further information it was decided not to add to the list of permitted preservatives the compound "n-butyl-p-hydroxybenzoate," which is on the world's markets under several trade names.

(6) "Fresh vegetables" were added to the list of foodstuffs in which arsenic must not exceed the equivalent of 1-100th of a grain of As_2O_3 per pound, and lead must not exceed 1-7th of a grain. This places vegetables on the same footing as fruit.

Industrial Hygiene.—Under this heading 56 samples of mine air were analysed for carbon monoxide, carbon dioxide and oxygen. These were taken in Kalgoorlie mines immediately after blasting in order to check the products of combustion of various explosives at present in use, particularly a number containing ammonium nitrate.

A series of small accidental explosions at a match factory was investigated, as well as the conditions in a projection chamber at a picture theatre, where the carbons were found to be compounded with cerium fluoride and sheathed in metallic copper.

The most important work done in this connection has been the examination for arsenic and lead of 144 specimens of urine, hair and nail clippings, derived from persons subjected to a lead and arsenic hazard in a district where arsenical gold ores are smelted with lead ore as a stage in the recovery of gold and white arsenic. The incidence of poisoning revealed is disquieting.

Criminal Toxicology.—With the exception of one case of attempted murder, cases of suicide were responsible for the 138 samples submitted for investigation. Some details will be found in Mr. Hill's report below.

Animal Hygiene.—Six specimens of livers were examined in connection with suspected metal deficiencies. Eleven specimens of viscera were analysed where accidental or intentional poisoning had occurred. In addition a number of arsenical cattle dips were analysed for As_2O_3 .

Routine Mineral Investigations.—The usual large number of tailings (1279) from the State Batteries were assayed for gold, 220 of them being umpire assays. An unusually small number of free prospecting assays were made, viz., only 145 gold assays, 32 iron assays and 22 each copper and tantalum assays, with 98 free mineral determinations (including advice as to quality and markets if any), and a few miscellaneous assays. For the North Australian Survey, Western Australian Section, we made the following assays: 644 for gold, 181 for copper, 25 for antimony, 15 for lead, and a few others for silver, iron, zinc, etc.

Mineral Investigations in the Field.—The only field work done was a mineral examination of the gold vein in the Rothsay G.M., and the adjacent rocks and veins. Considerable difficulty has been experienced in the past in extracting the gold from this ore. The ore going to the mill was found to consist of about equal parts of vein quartz and enclosing amphibolite. The only metallic minerals that could be detected in the quartz were chalcopyrite below water level and azurite, malachite and limonite above it. The associated gold bearing rock consisted largely of anthophyllite, passing outwards into actinolite and antigorite, the latter in places associated with highly chromiferous green opal. Films of copper carbonates were also found in the auriferous amphibolite. Only 0.065 per cent. of arsenic could be detected in the flotation concentrate. The apparent complete absence of ordinary pyrite from the sulphide ore now being worked is remarkable.

An unofficial visit to Gingin revealed a southward extension of the rich coprolite beds previously found on the westward slope of Poison Hill. It was accompanied by a secondary formation of dufrenite (iron phosphate) as it was further north.

Vermiculite.—This previously valueless mineral (or series of minerals) has come into demand in recent years because heat treatment converts it into a greatly expanded pile of scales with air films between, the whole possessing remarkable capacity for checking the transmission of sound and heat. Numerous enquiries have been received regarding the possibility of obtaining supplies of suitable quality from the State, where deposits have been known for many years past. Its market value depends upon (1) the extent to which it expands on heating, (2) the degree to which the expanded scales adhere to one another at isolated points of their circumference. No mineral has yet been raised in this State for the market, but suitable deposits appear to exist at Bulong and on the Fitzgerald River, and tests are now being made in England of their suitability.

Iron Ore Survey.—It was hoped to start the laboratory investigations in connection with this matter towards the end of the year, and some hundreds of samples from Koolyanobbing and Yampi have already accumulated in Perth. Nothing however has yet been done with them as finance for the laboratory investigation was not provided at the same time as that for the field surveys.

New Mineral Records.—Several occurrences have been noted of minerals of considerable rarity.

Bismuth Ores, Yinnietharra.—What appears to be an important find of carbonate ore (mixed bismutite, bismutospherite and bismite, with traces of native bismuth) has been made near the head of "No. 31 Creek," a right bank tributary of the Gascoyne River. A bulk sample of 300 lbs., showed on assay 58.5 per cent. of the metal, and found a ready market.

Tantalum Ore, Yinnietharra.—Close to where the bismuth was found, eight hundredweight of a black tantalum ore has been collected. Four pieces of this assayed respectively, tantalum oxide 48, 45, 23, 22; niobic oxide, 35, 37.5, 58, 58.5 per cent., the mean being Ta_2O_5 , 34.5; Nb_2O_5 , 47.2 per cent. The chief base is manganese, the mineral being classified as manganocolumbite, or possibly manganomossite, the tetragonal form of manganese niobate.

Columbite, Greenbushes.—From a tin concentrate obtained in Bunbury Gully seventeen per cent. by weight was extracted by electromagnets and found to be mainly ferro-columbite, assays showing Ta_2O_5 , 38.2; Nb_2O_5 , 36.4; SnO_2 , 5.8 per cent. The atomic ratio of tantalum and niobium in this concentrate is 1 to 1.58. In past years all the tantalum ore obtained here, with the exception of one small parcel, was very rich in tantalum and poor in niobium.

Scorodite, Richenda River, Evanston and Coolgardie.—This hydrous iron arsenate was found to be abundant in rich auriferous quartz on the Richenda River near Mt. Broome (Kim.). Very large drusy masses occurred also in an auriferous quartz vein at Evanston (Cen.). A few miles east of Coolgardie large dense masses of the same mineral with embedded remnants of arsenopyrite were found on the dump of an old gold mine, the masses assaying 8 dwts. of gold per ton.

Anthophyllite, Rothsay.—This uncommon amphibole (hydrous silicate of magnesium and iron) was found to be a common metasomatic replacement of the more normal calcareous amphiboles of the prevailing amphibolite within the auriferous lode channel of the Rothsay G.M.

Copper Arsenate, Station Peak.—A number of oxidised copper ores collected from the old Egina mine, four miles N.E. of Station Peak, were all found to contain an appreciable amount of arsenic, apparently in the form of an arsenate of copper. The richest ore assayed copper, 15.12; arsenic, 6.93 per cent. As no ore was available which had not been finely ground the exact mineral species could not be determined.

Metropolitan Water Supply.—The advisory committee, of which I am a member, met at regular intervals, and discussed all the factors governing the chemical and bacterial purity of the water supply. The abundant supply impounded in the new incomplete Canning reservoir late in the wet season makes this by far the most important source of water for the metropolitan district. A complete analysis made of this water in November shows that it contains the following potential salts:—

	Parts per Million.	Grains per Gallon.
Sodium chloride, NaCl ...	204	14.28
Magnesium chloride, MgCl ₂ ...	43	3.01
Calcium carbonate, CaCO ₃ ...	25	1.75
Magnesium sulphate, MgSO ₄ ...	18	1.26
Calcium sulphate, CaSO ₄ ...	14	.98
Sodium nitrate, NaNO ₃ ...	1	.07
Potassium, iron, aluminium, silica	traces	traces
Total solids ...	305	21.35
Hardness ...	97	6.79
Reaction, pH ...	6.9	

The reaction is modified by the cement linings of the delivery pipes, so that at the tap the pH is usually between 7.0 and 8.0. This is the most satisfactory supply the city has had for many years. It is no longer necessary to supplement it with deep bore water, but on the other hand additions can be made of the still better water available in much smaller quantities from the dam on Churchman Brook (total solids 166 p.p.m.) and Wongong Brook (total solids 183 p.p.m.).

Regular analyses are being made of the small seepages from the Canning Dam.

Metropolitan Sewerage.—The rapid extension of the deep sewerage system to the outer suburbs, and the development of a new system of digestion and sludge separation has led to a big demand for experimental and analytical work. Over 500 samples of factory waste liquors, mixed sewage at various stages, sludge, etc., were examined. A further survey for pollution of the ocean round the final point of discharge gave most satisfactory results. No detectable increase in oxygen absorption, phosphorus or nitrogen could be found beyond a very few hundred yards from the outlet. Owing to complete digestion and settling before discharge into the ocean no pollution with solid matter is possible. Bacteriological tests of the ocean made by the Government Bacteriologist were equally reassuring.

Country Water Supplies.—A large number of water samples, chiefly from wells and bores up to 150 feet in depth, are received each year from the Public Works Department, country road boards and

individual farmers and graziers. Organic pollution is rare except in the case of disused wells into which animals or reptiles have fallen. The chief bugbear is the excess of cyclic salts present in so many of them. From our point of view there is great difficulty in deciding when to condemn them utterly for all possible uses, and when to recommend them for domestic purposes, stock drinking or irrigation, and especially to decide what classes of stock and plants they are suited for.

Fertilisers.—Of the official samples taken by inspectors 21 out of 24 complied with the regulations regarding composition. The three that did not comply were all "blood and bone," one being excessively greasy, one low in phosphoric oxide, whilst the third was not sufficiently finely ground.

Cereals.—The materials registered under this heading were wheat, 70 samples; wheat flour, 52; wheat bran, 1; wheat pollard, 5; wheat bread, 4. The two most important samples were the F.A.Q. standard wheat for 1937-8, and flour obtained from it in an experimental mill. The figures for these are given in Mr. Hoare's report below. Most of the wheat samples were examined for the Department of Agriculture.

Departmental Committees.—Meetings of the following committees were regularly attended.

- Advisory Committee, Food and Drugs.
- Advisory Committee, Metropolitan Water Supply and Sewerage.
- Oils Committee of the Government Tender Board.

Publications.—The following papers were published by members of the staff:—

- Bowley, H.: Simpsonite (Sp. nov.) from Tappa Tappa, Western Australia. Jour. Roy. Soc. W.A. 25. In press.
- Hill, H. E.: The ascorbic acid content of some Western Australian fruits. Jour. Roy. Soc. W.A. 24, p. 103-6.
- Simpson, E. S.: Contributions to the Mineralogy of W.A. Series XI. Jour. Roy. Soc. W.A. 24, p. 107-122.
- Some new and little known meteorites found in W.A. Mineralogical Magazine, 25, p. 157-171.
- A second Australite observed to fall in W.A. Jour. Roy. Soc. W.A. 25. In press.
- Southern, B. L.: Copper bunticide standards. Jour. Aust. Inst. Agr. Sci. 4, p. 160-1.

EDWARD S. SIMPSON, D.Sc., B.E., F.A.C.I.,
Government Mineralogist and Analyst.
Perth, 20th February, 1939.

SECTION I.—FOODS, DRUGS AND TOXICOLOGY.

(By H. E. Hill, A.I.C., A.A.C.I.).

During part of the year, from April to October inclusive, whilst I was absent on leave, Mr. F. J. Malloch was in charge of the Section. Mr. J. C. Hood acted for a short period during the latter's illness.

The number of samples examined was 893, a falling off from the previous year, when 1,036 samples were examined. This is partly accounted for by the

shortage of staff, and consequent inability to accept more work. The chief classes of work performed were as follow:—

Foods.

The number submitted was 120. The majority of these samples were examined for the Government Tender Board in connection with the allocation of contracts and testing of supplies for Government institutions. It is frequently necessary to apply other tests besides the requirements of the Food and Drug Regulations to these samples, and to make comparisons with standard products on the market. Many of the samples of foods offered to the Government for its use, whilst complying with the minimum requirement of the Food and Drug Regulations, are nevertheless of distinctly poor quality. The same applies to other materials, such as polishes and cleaning materials, which frequently do not stand comparisons with other available, though somewhat higher priced, articles. A number of samples of butter, margarine and cheese were examined for the Dairy Products Marketing Board. The following table summarises the results obtained from some of the principal foods examined.

Foodstuff.	No. of Samples Received.	No. below Standard.	Remarks.
Vinegar	8	1	Deficient in malt.
Essences	9	3	Low citral or vanillin content.
Jelly Crystals ...	28	15	Flavours weak, low gelatine content and weak jellying power.
Cheese	7	...	...
Margarine	4	3	Presence of boric acid or added colouring matter, absence of starch, or excess acidity.
Fish	3	2	Incipient putrefaction.
Jam	5	2	Deficiency in soluble solids.
Tinned Fruit ...	4	1	Benzoic acid present.
Canned Peas ...	5	...	...
Pickles and Sauces	15	4	Excess water and indifferent flavour.

Proportion below standard, 35 per cent.

Drugs.

There was a falling off in the number of drugs and medicines examined during the year, 66 being received. Of these 48 were ethers tested for the Perth Hospital. The position regarding ether was much better than in previous years, only 2 samples failing to comply with the B.P. test for peroxides. Most of the other samples were examined for the Drug Officer in connection with Government supplies for hospitals. Five (5) samples of thyroid tablets all showed great deviations from the stated content of dry thyroid extract in each tablet, ranging from a deficiency of 30 per cent. in one case to excess of 20 to 85 per cent. in others. Other samples examined were, zinc and mercury ointments (4), two of which were improperly emulsified and deficient in mercury ammonium chloride respectively, and tonic wine, A.P.C. powders and tablets, zinc sulphate, and calomel, all of which were found satisfactory.

Toxicology.

Altogether two hundred and ninety-one (291) exhibits and specimens were examined in connection with several branches of toxicology. Of these, one hundred and thirty-eight (138) were related to human criminal poisoning or supposed poisoning cases, one hundred and forty-four (144) were in connection with industrial poisoning hazards, and nine were submitted with reference to animal poisonings.

The human poisoning and supposed poisoning cases numbered 47. The poisons found were as follow:—Cyanide 5 cases, strychnine 5, lysol or phenyle 3, iodine 2, arsenic, Paris green, mercury ammonium iodide, methylated spirit, Decicain (cocaine derivative), A.B.C. liniment, aloes and colocynth pills one each. In 25 cases negative results were obtained. Evidence was given at a number of inquests in connection with poisoning cases and advice and information given to the police. In one case of wilful criminal poisoning a quantity of sodium cyanide was placed in wine, which several persons drank. The accused stated at first that he had used alum as a practical joke, but later confessed to the wilful use of cyanide. The victims recovered. It was not ascertained how much of the wine had been taken, nor was a sample of it submitted for analysis, the remainder apparently being lost in the subsequent confusion when the accused tried to stab himself. The recovery of the victims may possibly have been due to the inhibitory effect on the cyanide of sugars in the wine (*vide* Taylor's Principles and Practice of Medical Jurisprudence 1934, II., 684).

There were fewer specimens than usual received in connection with animal poisoning cases. In nine (9) specimens received in connection with 7 cases, one case each of strychnine, Paris green and arsenic poisoning were detected, and the remainder were negative.

Industrial toxicology.—A record year was experienced in this field of work, one hundred and forty-four (144) specimens and materials being examined. This increased number was due mainly to the number of samples of urine, hair and nails received in connection with the exposure to lead and arsenic hazard of men employed on the Wiluna gold mines. Eighty-nine (89) specimens of urine were examined, most of them for lead and arsenic, and in addition 29 specimens of hair and nails were received. The majority of these samples were from men employed at Wiluna. The following table shows the range of the figures obtained:—

	Lead (Pb).	Arsenic (As ₂ O ₃).
	(Parts per million)	
Urine	nil to 0.75	0.07 to 3.75
Hair ... ..	...	nil to 3880.0
Nails ... ..	...	9 to 1250.0

In most cases where high results were obtained the patients were reported to be showing the symptoms of lead and/or arsenic poisoning.

A considerable amount of time has been spent in developing a reliable and accurate method for determining lead in urine. The minute amounts of lead involved—normal urines contain only 0.02 to 0.08 parts per million, and the urines of leaded subjects from 0.10 to 0.40 or more—the difficulties of the preliminary destruction of organic matter, and the fact that traces of lead are present in all laboratory reagents, have made progress rather slow. A satisfac-

tory and reasonably quick method has now been found by which results may be obtained in a day. The method involves wet destruction of the organic matter with the minimum amount of sulphuric and nitric acids, and a little perchloric acid, dithizone extraction in the presence of ammonium citrate and potassium cyanide at an adjusted pH of 9.0-9.5, followed by stripping of the excess dithizone, and comparison of the red colour of the lead complex with a similarity prepared standard lead solution of approximately equal tint.

Various materials have been examined in connection with industrial operations where risk to the health of workers was thought to exist. A number of cellulose spray paints were examined for lead compounds and poisonous solvents and thinners, and in addition the surfaces of respirators used by men operating with them were investigated. In one case the malaise and loss of weight experienced by an operative was attributable to the effect of the volatile solvents concentrated in the confined space in which the lacquer was being used. Amongst a number of lacquers used in the spray painting of motor vehicles, in two cases the presence of considerable quantities of lead compounds was proved. Tests of the pads of respirators used showed that they were effective in retaining lead, but it was pointed out that constant policing of the spray painting regulations is required in order to ensure that respirators are reasonably close fitting, are frequently cleaned and renewed, and are constantly worn during all spray painting operations. The use of leadless lacquers was advocated.

A report on the working conditions in the operating room of a city picture house was made by Mr. Hood, acting as an honorary inspector of factories, following a complaint by an employees' association. The complaint applied to houses where blue flame carbons are used. These carbons were found on analysis to be copper-sheathed, and to contain a core of cerium fluoride cemented with a silicate composition. During operation of the arc, and especially on making contact, a fume arises from the incandescent zone which forms a white deposit in the chamber unless led away by an efficient draught. This fume was found to consist of cerium compounds, with some fluorine and copper. Under certain conditions of inefficient ventilation the fume may be breathed by the operatives, who report a metallic taste in the mouth, and a feeling of nausea. As these symptoms are consistent with the ingestion of small amounts of copper, and in view of the known toxicity of fluorine compounds, recommendations were made for the improved ventilation of the operating boxes, and for the frequent removal of any deposit.

A number of tank waters, collected from roofs of buildings at a mining centre where the treatment of arsenical gold ore has recently been commenced, have been examined. This was to ascertain whether consumers of the water ran any risk of contracting arsenic poisoning, such as has been experienced elsewhere. Quantities indicating contamination were found, and samples of domestic supplies are being examined from time to time.

Spectrographic Analysis.—Owing to shortness of staff it was possible to devote only a little time to spectrographic investigations. A few livers of animals were examined for minor elements in connection

with various coastal diseases. A number of pine seedlings and needles were subjected to general spectrographic examination to see whether any mineral deficiency could be detected. Interesting results were obtained from seedlings from certain plantations, where a disease characterised by stunted growth, discoloration and altered pose of the needles was manifest. No response had been obtained to various combinations of nitrogen, phosphorus and potash, or certain minor elements. The spectrographic analysis made by Mr. Chapman showed considerably larger amounts of silver in the unhealthy than in the healthy pines.

Plant Products.—A vitamin C survey of some 41 Western Australian fruits was completed and the results published (Jour. Roy. Soc. W.A. XXIV. 1937-38, 103). The values found for the species of fruits which have been examined elsewhere were well in accord with other published results. Several fruits for which no data could be found were also examined.

Some work was done by Mr. Malloch on the fruit of the locally common zamia plant (*Macrozamia Fraseri* Miq.), parts of which are poisonous to cattle, with strong symptoms of gastro-intestinal irritation. The fruits consist of a hard seed or nut containing a starchy endosperm, surrounded when ripe and fresh by a thin fleshy layer of mesocarp with an orange red epicarp. Only the seeds were found to be poisonous, a toxic principle not precipitated by lead acetate, and not extracted by immiscible solvents being present. The fruit pulp surrounding the seeds contained 14 per cent. of a bright orange-coloured oil, which appears to contain a considerable amount of carotene, and closely resembles palm oil in its physical and chemical constants. Further work is being done on the subject.

Miscellaneous.—Various miscellaneous materials received included borings from karri railway sleepers treated with arsenic (60), human milks for infant health clinics (58), gases (56), limes (40), insecticides and disinfectants including 28 cattle dips (37); soaps, polishes and cleaning materials (27), petroleum products and supposed petroleum (18), liquors and beverages (16), explosives (12), as well as smaller numbers of widely diverse materials. The gases were examined for carbon monoxide, carbon dioxide and oxygen in connection with a lengthy series of analyses to assist the Chief Inspector of Explosives in an investigation into the products of combustion of commercial explosives, particularly ammonium nitrate explosives, used in mines.

An investigation into the cause of accidental ignition of matches at a match factory was made for the Chief Inspector of Factories. Mr. H. Sedgman, who made the investigation, reported that the probable cause was due to the presence of powdered organic dust such as wood dust on the trays used to transport the matches, and to extra drying due to machine breakdown, which may have rendered the match-head mixture unstable. Suitable recommendations designed to avoid future similar occurrences were made.

As in previous years, a considerable amount of information and advice has been given to Government departments and members of the public.

SECTION II.
MINERALOGY, MINERAL TECHNOLOGY
AND GEOCHEMISTRY.

(H. Bowley, F.A.C.I.)

Two thousand nine hundred and eighty-seven (2,987) samples were entered for examination during the year. This is an increase of 55 on the previous year's total. The number of individual determinations made was 4,243.

The main sources of these samples were:—State Batteries Branch, 1,190; North Australian Survey, 869; Free assays and determinations for the general public, 399; State Mining Engineer, 218; and public pay assays, etc., 152.

Gold Assays.—Of the 2,279 samples classified as gold ores, 1,177 were tailings samples from the State Batteries Branch for check and umpire assays, the latter totalling 220. The North Australian Survey was responsible for forwarding 644 gold ores, of which a large number were assayed for other metals as well. Two hundred and ten samples were received from the State Mining Engineer. Only 145 samples against 290 for the previous year, were assayed for gold under the free assay regulations.

Included in the 78 samples paid for were a number submitted by mining companies in order to determine the accuracy of their methods and equipment.

Copper Ores.—In addition to the 209 samples classified as copper ores, 124 gold ores and tailings were assayed for copper also. Of the latter, 111 were State Battery tailings samples, the estimation of the copper content being required for the purpose of ascertaining its effect on the extraction of the gold by cyanidation. One hundred and eighty-one samples were received from the North Australian Survey, the localities represented by them being Egina, Whim Creek, Westons and Glen Roebourne. The free assays for copper totalled 5 only. Of the samples examined the following are of interest.

An auriferous flotation concentrate from the Rothsay G.M., Rothsay, containing an appreciable amount of chalcopyrite assayed copper, 7.17; iron, 4.10; sulphur, 5.17 and arsenic, 0.065 per cent., with 2 ozs. 6 dwts. 17 grains of gold and 1 oz. of silver per ton.

A sample of ore from P.A. 150, 3½ miles S.E. of Mt. Amy (N.W. Div.), consisting of cuprite, limonite, chalcocite and anglesite, with quartz, malachite and small amounts of galena, pyrite and cerussite, contained copper, 20.4; lead, 13.10 per cent., with gold 1 oz. 4 dwts. 9 grains and silver 26 ozs. 9 dwts. per ton.

An average sample of the 21 copper ores from the Carlow Castle Copper Mine at Roebourne, submitted by the North Australian Survey, assayed copper, 5.34; sulphur, 2.47; arsenic, 1.21 and cobalt 1.18 per cent., with nickel a trace, and gold, 3 dwts. 13 grains per ton.

Arsenic was also present in appreciable quantities in the oxidised copper ores from the old copper mine at Egina, one sample, assaying 15 per cent. of copper, contained 7 per cent. of arsenic, present as brown and yellow arsenates of copper and iron, soluble in warm 5E hydrochloric acid. Unfortunately the only material available for mineralogical

examination had been crushed to pass a 10-mesh screen, and whilst it was possible to recognise and remove the associated malachite and azurite, it was impossible to recover sufficient of the arsenates in a pure form to permit of their identities being established.

Arsenical Ores.—In addition to the arsenical copper ores referred to above, arsenic was detected in a number of other samples examined during the year. The Marble Bar State Battery tailings were found to contain small amounts of this element. A gold ore from the Richenda River District (Kim. Div.) assaying 3 ozs. 3 dwts. 14 grains of gold per ton was composed of quartz and scorodite (hydrous ferric arsenate). Hydrous iron arsenates of undetermined composition were present also in gold ores from P.A. 1892 at Field's Find (S.W. Div.). Scorodite and arsenopyrite were the main constituents of an ore assaying 8 dwts. 20 grains of gold per ton from 4 miles east of Coolgardie. A vein in an auriferous quartz lode at Evanston (Cen. Div.) consisted of scorodite and common opal. A sulphide ore from Malone's Lease at Warriedar was found to contain arsenic, 12.61; sulphur, 9.13; lead, 5.98 and copper, 0.23 per cent., with gold 2 ozs. 10 dwts. per ton.

Antimony Ores.—Although only 28 samples were originally classified as antimony ores, it was found necessary to determine the antimony content of 18 ores classified under other headings. Of the total number of assays made, 25 were for the North Australian Survey on ores from Mallina and Peewah in the Pilbara district. In both cases the samples were obtained from the oxidised zones, the antimony being present as cervantite and stibiconite. Those from Mallina were quartzose ores carrying from a trace to 25 per cent. of antimony, and from a trace to 56 dwts. of gold per ton.

Stibnite and stibiconite were present in several samples of antimonial gold ores from P.A. 5289 at Mt. Jackson, one sample of which assayed antimony, 18.92 per cent., with gold 3 dwts. 16 grains, and silver 5 ozs. per ton.

A vughy quartz with sericite mica, antimony ochre and cerussite assaying antimony 3 and lead 1.8 per cent., with gold 19 grains, and silver 2 ozs. 11 dwts. per ton, was received from P.A. 150, 3½ miles S.E. of Mt. Amy (N.W. Div.). Another sample from the same locality, consisting of cerussite, limonite and antimony ochre, assayed lead, 46.61; antimony, 4.82, and copper, 0.65 per cent., with gold 1 oz. 11 dwts. 3 grains, and silver 6 ozs. 6 dwts. per ton.

Lead Ores.—Twenty-six lead ores were entered for examination, including 15 submitted by the North Australian Survey from Uaroo, and 5 by the State Mining Engineer. In all 59 lead assays were made during the year, made up of the 26 referred to above, and a number of samples containing lead submitted specifically for the determination of the other metals present in them.

A sample of lead ore from P.A. 150, 3½ miles S.E. of Mt. Amy assaying lead 27.96; copper, 0.72, and antimony, 0.18 per cent., with gold 5 dwts. 19 grains, and silver 3 ozs. per ton, contained a small amount of an undetermined brownish sulphato-phosphate of lead, iron and copper. The other minerals present were quartz, cerussite, anglesite, pyromorphite, malachite, chrysocolla and antimony ochre.

Galena and cerussite from Junction Station, East Kimberley, was associated with fluorite and a small amount of a greenish yellow mineral consisting of lead and antimony oxides. The whole ore assayed lead, 16 per cent.; gold, trace; and silver, 26 ozs. per ton.

Bismuth Ores.—A parcel of detrital bismuth ore weighing 298 lbs. avoird. from a new find west of Morrissey Hill in the North-West Division, was found to consist mainly of bismuth carbonates and quartz, with a little mica, feldspar, limonite and traces of native bismuth and beryl. It assayed 58.48 per cent. of metallic bismuth.

Iron Ores.—Ninety-nine iron ores were examined during the year.

Samples were analysed from a deposit situated near Mt. Goldsworthy, Ellarine Hills, North-West Division, roughly estimated to contain at least four million tons of ore above the general level of the surrounding plain country. Fourteen official samples taken at intervals of 200 ft. along the strike averaged iron 64.23; manganese, 0.56; sulphur, 0.09; phosphorus, 0.096; silica, 3.02; alumina, 1.42; water \pm , 2.07 per cent.

A number of samples representative of the various types of iron ore at Koolyanobbing Range were submitted by the Government Geologist for mineralogical examination.

Molybdenum Ores.—Eighteen samples of the Mt. Mulgine molybdenum bearing ore were assayed for the company engaged in examining and sampling these deposits. It is to be noted that none of the samples submitted showed any evidence of the presence of tungsten.

Tantalum Ores.—There was an appreciable reduction in the number of tantalum ores submitted for assay during this year, 24 being received as against 86 for the previous 12 months.

The mineral species and the localities represented by the samples received were—

Manganocolumbite—Pilgangoora, Tabba Tabba.

Manganotantalite—Moolyella, Pilgangoora, Strelley, Tabba Tabba, Wodgina.

Microlite—Moolyella, Strelley, Tabba Tabba.

Tantalite—Greenbushes, Londonderry.

Tanteuxenite—Eleys.

In order to ascertain if the columbite present in a mixed tin-tantalum concentrate could be satisfactorily separated magnetically, a sample of concentrates from Greenbushes was forwarded to the South Australian School of Mines for that purpose. These concentrates consisted mainly of cassiterite, with some columbite and magnetite, and small amounts of ilmenite, zircon, rutile and iron scales. It assayed:

SnO₂ 81.6; (TaNb)₂O₅, 14 per cent.

The concentrates were crushed to pass a 20 mesh screen and graded before passing through the magnetic separator. The products returned from Adelaide were—

Mesh.	—20+48	—48+100	—100	Total.
	(Per cent. of whole sample)			
"Magnetics"—				
0.2 Amp.	1	.8	.4	1.3
0.3 "	2.1	5.2	.6	7.9
0.4 "	6.1	.2	.1	6.4
0.5 "	2.2	.3	.1	2.6
"Non-magnetics"	55.4	21.7	4.7	81.8
	65.9	28.2	5.9	100.0

The 0.2 Amp. "magnetics" consisted solely of magnetite and iron scale.

The 0.3-0.5 Amp. "magnetics" were combined for assay, as also were the three grades of "non magnetics." The results obtained were—

	0.3—0.5 Amp. "magnetics."	"Non- magnetics."
	%	%
Tin oxide, SnO ₂ ...	5.8	96.2
Tantalic oxide, Ta ₂ O ₅ ...	38.2	} 1.9
Niobic oxide, Nb ₂ O ₅ ...	36.4	

It might be possible to further improve the separation by finer grinding of the —20 +48 products before separation.

Vermiculite.—Vermiculite is fairly widespread in this State, but the majority of the samples examined to date showed poor expansion on heating, and after heating a tendency to break down into fragile lumps. Such material is valueless for incorporating in composition plaster boards for heat and sound insulation, the main use to which this interesting mineral is put at present. Bulk samples received from Bulong and Fitzgerald River, however, appear to be well suited for the purposes stated, the mineral in each case showing considerable expansion on heating, and the expanded flakes possessing considerable coherence, comparing most favourably in those respects with the commercially important type from Tanganyika. The minerals from these two localities differed appreciably in appearance, that from Bulong consisting of deep green flakes with a small amount of interleaved films of a brittle hydrous silicate that showed a tendency to decrepitate on heating. The Fitzgerald River mineral is in the form of greenish-bronze coloured flakes resembling in appearance the mineral from Tanganyika.

Talc.—Massive and foliated talc of good commercial quality has been examined from several localities. Massive talc (steatite) of extreme fineness, softness and freedom from grit and cracks, well suited for sawing into slabs for electrical switchboards, wash-tubs and sanitary appliances, has been received from Glen Lynn, near Bridgetown, and Culham (S.W. Div.).

The foliated variety, suitable for grinding into talc powder for use as a filler in the paper and rubber trades was received from Mt. Taylor (Mur. Div.).

Miscellaneous Ores.—Other samples examined were—Tin ores (18); Pigments (7); Asbestos (15); Clays (7); Aluminium ores (7); Tungsten ores (14); Zinc ores (2); Chromium (1); Titanium ores (3); Magnesite (1); Gypsum (3).

In addition, 151 samples were entered for mineral determination.

Mineral Analyses.—Complete analyses were made of the following:—

Minerals.—Allanite, Newman Rock; Andesine, Southern Cross; Anthophyllite, Rothsay; Axinite, Weld Range; Bindheimite, Gorge Creek and Mt. Amy; Carminite, Hardey River (Wyloo Station); Chrysotile, Meilga; Crocidolite, Wittenoom Gorge and Yampire Gorge, Hamersley Range; Haematite, Horseshoe and Mt. Goldsworthy; Hydroallanite, Cooglegong; Prehnite, Turkey Creek; Scorodite, Clara Hill and Hardey River (Wyloo Station); Spessartite, Moolyella; Spodumene, McPhee's Range; Vermiculite, Fitzgerald River.

Rocks.—Banded haematite quartzite, Yampire Gorge; Gibbsite laterite, Parkerville, Sawyers' Valley and Walebing; Laterite gravel, Dartmoor.

Accommodation.—The conditions in the laboratory are getting intolerable, the work of the section being carried out with great difficulty and inconvenience at present owing mainly to the constant vibration throughout the building caused by the machinery installed in the adjacent Public Hospital laundry. The vibration is so bad at times as to cause bottles and other apparatus to be rattled off the shelves, whilst it is quite common for solutions to be splashed out of shallow dishes standing on evaporating baths, with the consequent loss of valuable time required to repeat the investigation, which in some cases, may have taken 3 or 4 days to reach the stage where the loss occurred. The disastrous effect of the persistent rattle on the delicate balances and other fine physical apparatus is most noticeable and will sooner or later render them absolutely useless, with the result that the Government will be faced with the cost of replacing them at considerable expense, in order to maintain the standard of accuracy required of a Government laboratory.

Attention might be directed to the far-reaching effect of a small balance error in the assay for gold. The accuracy of this assay depends, to a large extent, on the sensitivity of the balance used for the final weighing of the gold recovered. The fine balances used for this purpose are designed to give an accurate reading of one two-hundredths of a milligram. This degree of accuracy can only be maintained under perfect conditions of housing the balances, any vibration will soon cause damage to the fine agate knife edges, thereby lowering the sensitivity of the apparatus considerably. That it is necessary to maintain a very high degree of sensitivity in a balance may be gauged from the fact that 1/100th of a milligram in the final weighing, calculated on the weight of a sample taken for the assay of tailings or low grade ores, represents 3 grains of gold per ton, equal to 14 pence per ton of ore, based on the present Australian value of gold. The financial loss involved by an error of only 1/100th milligram is therefore considerable, and when calculated on the total tonnage represented by samples submitted to this office for umpire assay from State Batteries alone for the year 1938, would amount to £840. This, in itself, would be sufficient to pay interest at 6 per cent. on a building costing £14,000.

The proximity of the new hospital laundry building has also seriously interfered with the lighting of the laboratories and although only a poor substitute for natural lighting, the installation of a number of "Megaphos" lamps has improved conditions.

General.—I was appointed Acting Government Mineralogist and Analyst during the period of Dr. Simpson's absence from the State on leave, from the 24th March to 17th May, 1938.

In November last I was honoured by my appointment for a period of three years as one of the State Government representatives on the local committee of the Council of Scientific and Industrial Research. The vacancy was caused by the retirement of Dr. E. S. Simpson, who had rendered very valuable services to the Committee, of which he had been a member since its inception, and to the Government he represented.

I read a paper before the Royal Society of Western Australia during August of this year, describing a new tantalum mineral occurring at Tabba Tabba in this State, consisting of a basic tantalate of lime and aluminium which I named Simpsonite in honour of Dr. E. S. Simpson, who has contributed so much to our present knowledge of Western Australian mineralogy.

SECTION III.—AGRICULTURE, WATER SUPPLY AND SEWERAGE.

(By A. J. Hoare, A.A.C.I.)

During the year 2,156 samples were entered for examination, an increase of 120 over those received for the previous year.

Staff.—Mr. E. A. Rogerson, B.Sc., retired from the position of temporary chemist on the 1st November, and the vacancy thus created was filled by the appointment of Mr. B. W. Stenhouse, B.Sc., just before Christmas.

Soils.—The number of soils submitted for analysis was 701, an increase of 411 over last year. The Department of Agriculture submitted 608, coming from the following districts:—Salmon Gums area (soil survey), Waroona (potato swamp soil), and Bridgetown (die back in apple trees). The Forests Department sent in 82 soils taken from the pine plantations at Keenan, Pardelup, Tallanalla, Gngara and Ludlow. The balance of the samples (11) were submitted by farmers, graziers and market gardeners.

Fertilisers.—The total number of samples received during the year was 57. Of these 23 were official samples submitted under the Fertiliser Act, 1928; of which 83 per cent. complied with the regulations under the Act. The other 34 samples consisted of superphosphate as supplied to the various Agricultural Research Stations; sheep manure, basic phosphate and wood ashes.

Fodders.—Thirty-five samples were examined during the year for the Department of Agriculture. The samples comprised:—Subterranean clover, lucerne, lupins, tick beans and peas.

Waters.—The total number of waters received during the year was 579. Of these 112 were submitted by the Engineer for Metropolitan Water Supply; 48 of these were ocean waters collected at or near the sewage ocean outfall. These will be dealt with under sewage. The balance of the samples were from streams or reservoirs supplying the metropolitan area, and were all of good potable quality. One hundred and twenty-eight (128) samples of water were submitted for analysis by the Engineers from the Department of Works and Labour, comprising country town supplies, trial bores for town or stock supplies, several from streams and regular samples from the Mundaring and Mt. Charlotte reservoirs, also the water pumped and reticulated from these reservoirs to the town of Kalgoorlie. Farmers, graziers and market gardeners submitted 260 samples, taken from bores, wells and soaks; these are principally for stock or irrigation purposes. In a number of cases these are too saline to be used for any purpose. In connection with the sudden death of fish in the Swan River, the Fisheries Department arranged for one of their Inspectors, in conjunction with an officer

from this department, to collect and estimate the dissolved oxygen and reaction (pH) in water samples from various parts of the river. Thirty-four samples were examined in all. The dissolved oxygen figures ranged from nil to 10.6 parts per million and the reaction (pH) from 7.1 to 8.8. Several days had elapsed between the time that the fish were first noticed to be dying and the taking of the water samples. In connection with the fixing of a standard for waters to be used for irrigation purposes; twenty-four samples were collected by officers of the Agricultural Department and forwarded to this department for analysis. It was found that waters containing up to 258 grains per gallon of total salts were being used for the irrigation of grape vines and citrus trees; and as high as 276 grains per gallon for lucerne, mangels, rhubarb, cabbage and cauliflower cultivation. The sodium chloride content of these waters is usually 75 per cent. or more of the total salts. These figures are much higher than the usually accepted standards for irrigation waters.

Sewage.—The total number entered during the year was 541. The majority of these samples were collected from the Perth and Fremantle sewers and from the sewage sedimentation tanks at the Subiaco and Swanbourne treatment works. The Under Secretary for Agriculture submitted eight samples of effluent from Northam, with a request to be advised as to its suitability for the irrigation of lucerne. The maximum salinity found was equal to 154 grains of sodium chloride per gallon. The number of ocean water samples collected at or near the pre-treated sewage outfall for the metropolitan area was 48. No chemical indication of pollution could be detected a few hundred yards from the outlet of the sewer.

Sands.—In connection with the construction of the Canning Dam, sixty-seven samples of sand were received from the Engineer for Metropolitan Water Supply for mechanical analysis, as to the percentage of "silt, clay and loam" present, and their suitability for use in the above work.

Lime and Limestone.—Fourteen samples of lime as supplied under contract for sewage treatment were received; of these seven conformed with the standards set down for caustic lime; the balance conforming with the lower standards for builders' lime. Three samples of lime received from the Superintendent of State Batteries, in connection with the treatment of gold, also conformed with the standards for builders' lime. Only one sample of limestone was received; this was sent in privately and came from Onslow.

Apple Leaves.—In continuation of the work on the dieback of apple trees, the Department of Agriculture submitted five samples of leaves, collected from trees growing at Manjimup. In some cases the soil around the trees had been treated with copper sulphate and in others the copper sulphate had been injected into the tree. The copper present in the leaves was determined; the amount found varying from less than 1 to 5.1 parts per million of Cu in the dried leaves.

Tuart Leaves and Branchlets.—In connection with the growing of pines, the officers of the Forests Department have noticed a marked improvement in the growth of the pines when they were planted on ash beds resulting from the burning of the native trees. Where artificial manures have been used the same

response was not noted. The improvement mentioned above was thought to be more apparent where the crowns of the trees have been burnt, than on the ash beds resulting from the burning of logs. The department decided to send in samples of the leaves and branchlets (twigs) from a tuart tree (*Euc. gomphocephala*) for general analysis. It was noticed that when comparing the figures obtained (calculated as parts per 10,000 on the oven-dried material) that the leaves contained less Al_2O_3 , CaO, MgO, Cl and total ash; but more K_2O , Na_2O , SO_2 and P than the branchlets.

Trade Wastes.—Ten (10) samples were received during the year; these were examined with a view to estimating (a) their detrimental effect on concrete sewer pipes, (b) their suitability for disposal by discharge into running streams. Seven of these samples came from breweries; two from professional photographers, and one from a soft drink factory. In the majority of cases, disposal by discharge into the river was not advisable. Owing to the acid nature of some, a pre-treatment with some neutralising agent would be necessary before they could be allowed to enter the concrete sewers.

Meat Meal.—Ten samples of meat meal offered for sale on the local market were analysed for the Department of Agriculture. The figures obtained varied very much. Ash from 11.77% to 46.44%; P_2O_5 3.38% to 18.23%; protein 26.37% to 68.94%, and the fat content 5.96% to 20.93%.

Fungicides.—Only one sample was received, namely, a dusting sulphur sold as 98% pure. The free sulphur found was only 39.3%, the balance of the sample being gypsum and calcite.

Miscellaneous Investigation.—Several odd samples were dealt with; such as, a reinforced concrete sewer pipe, a deposit from a rainwater tank (this contained a fair proportion of a zinc salt); gypsum, wood ashes and a sample of imported zinc dust.

Bran and Pollard.—Six samples were submitted by the Inspector of Feeding Stuff, one of bran and five of pollard. In most cases the figures obtained satisfied the provisions of the Act.

Flour.—Fifty-two samples were analysed during the year; 48 of which were submitted by the Cereal Research Officer of the Agricultural Department. They comprised (1) flour obtained from wheats milled in this laboratory and grown at the Wongan Hills Research Station, (2) flour from some of the Royal Show wheats, milled in a Brabender mill at the Agricultural Department, (3) flour from commercial mills, (4) two samples of American flour acceptable to the Egyptian market, and finally one sample each of a mixing, bakers' and biscuit flour. The Government Stores submitted three commercial flours for examination as to their suitability for use in Government institutions. Three export flours were also analysed.

Wheat.—The total number of wheats received during the year was 70. Of these 65 were in connection with the Royal Agricultural Society's wheatgrowing competitions. Two wheats were sent in by a private firm for moisture determination. Three samples of the West Australian f.a.q. 1937-38 season wheat were received, one of which was milled in the experimental

mill and the flour obtained analysed. The figures obtained are as follow:—

Lab. No.	4197
Sample	F.A.Q.
Mark	West Aust. 1937-38.
Condition and Size	Plump, sound grain.

Grain Analysis.

Moisture (per cent.)	10.75
Bushel weight (in lbs.), cleaned sample	63½ lbs.
Weight of 1,000 grains	38.5 grams.
Milling character	Firm
Date milled	13th-14th Sept., 1938
Flour (per cent.), 1st extraction ...	53.2
Flour (per cent.), 2nd extraction ...	18.8
Total Flour (per cent.)	72.0
Bran (per cent.)	16.2
Pollard (per cent.)	11.8

Wheat Meal Analysis.

Protein (per cent.) (Nit. x 5.83) ...	10.72
Ash (per cent.)	1.40
Pelshenke time (in minutes)	34.0
Specific Protein Quality	3.2

Flour Analysis.

Lab. No.	First Ex- traction.	Second Ex- traction.
Lab. No.	4631	4632
Moisture (per cent.)	12.70	11.50
Protein (per cent.) (Nit. x 5.7) ...	8.92	10.94
Strength water absorption (per cent.)	54.0	57.0
Gluten, Wet (per cent.)	23.85	28.84
Gluten, Dry (per cent.)	8.55	10.43
Ash (per cent.)	0.45	0.83
Maltose figure (K.J.) (per cent.) ...	1.63	5.14
Original pH	6.1	6.2
Buffer value—Pelshenke	1.0	0.9
Flour colour—Pekar A	4.5	3.5
” ” ” B	4.0	3.0
” ” ” C	4.5	2.5
Petrol figure (Kent Jones)	9.0	9.0

Analyses are reported on a standard moisture basis for wheat at 10 per cent. and flour at 13.5 per cent. moisture.

DIVISION VIII.

Annual Report of the Chief Inspector of Explosives
for the Year 1938.

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 1938.

The development of the gold mining industry is reflected in a further large increase in the quantity of explosives imported into the State over that of previous years, and constitutes a record in the annual importation of explosives in the history of the State.

In Table 1 will be found the quantities of the different grades of explosives imported during the year, and Table 2 gives a comparison of importations during the past five years.

TABLE No. 1.

Importations of Explosives into Western Australia during 1938.

	Quantity. lbs.
Gelignite	1,907,600
Gelatine Dynamite	2,784,950
Blasting Gelatine	56,300
Permitted Explosives	267,400
Powder—Blasting and Pellett	319,250
Miscellaneous	14,550
Total	5,450,050
Detonators	No. 4,872,000
Fuse	Yards 7,346,000

TABLE No. 2.

Explosives.	1934.	1935.	1936.	1937.	1938.
	lbs.	lbs.	lbs.	lbs.	lbs.
Gelignites	1,411,900	1,519,050	1,007,050	1,800,900	1,907,600
Gelatine Dynamite	1,432,650	1,543,750	2,457,450	2,930,650	2,784,950
Blasting Gelatine	143,700	175,050	72,500	15,200	56,300
Permitted Explosives	75,350	111,800	70,300	105,550	267,400
Powder—Blasting and Pellett	146,250	110,000	151,250	120,000	319,250
Miscellaneous ... ..	...	...	5,000	3,600	14,500
	3,209,850	3,459,650	3,763,550	4,975,900	5,450,050
Detonators	No. 2,644,000	4,316,000	2,673,000	3,860,000	4,872,000
Fuse	Yards 4,322,000	4,704,000	6,926,400	7,449,600	7,346,000

It was found necessary to provide still further storage accommodation on the Woodman's Point Explosives Reserve and to meet this requirement Nobels (Australasia) Proprietary, Limited, erected another three thirty-ton magazines, and to cope with the still increasing demand, the question of building more magazines on this and the reserve at Kalgoorlie is under consideration.

There were nineteen consignments of explosives landed at the Explosives Reserve at Woodman's Point. The samples taken from the shipments gave satisfactory tests for chemical stability and sensitiveness. Velocity of detonation as determined by the Dautriche method in every case was high.

The following table No. 3 gives the number of tests and analyses made during the year:—

TABLE No. 3.

Heat Tests	2,042
Fuse Tests	630
Velocity of Detonation	110
A.D.C. Tests	4
Fireworks Tests	131
Analyses of Explosives	12
Analyses of Gases	56
Tests of Detonators	15
Miscellaneous	27

Unfortunately, there are still a number of cases where men working in the mines on returning to the place where explosives have been fired some time previously have been overcome by fumes. With a view to determining whether the products of combustion from explosives when used under normal mining conditions contained any of the toxic gas carbon monoxide, an investigation was carried out in the mines at Kalgoorlie during the year. The result of the tests made show that in every case the air at the face immediately after firing contained varying quantities of carbon monoxide, but not in amounts sufficient to render the atmosphere dangerous to health if reasonable precautions were taken to dilute and displace the gases by means of compressed air or other approved methods of ventilation before entrance was made to places where explosives had been fired.

The distribution of explosives in the different classes of industry was as follows:—

	Lbs. used.	Percentage of Total.
Gold Mining	4,778,000	93.20
Agriculture and Land Clearing	27,900	.50
Government Departments—Railways, Public Works, and Water Supply	87,350	1.40
Quarrying	158,300	3.50
Coal Mining	55,350	.90
Lead and other Base Metals	27,950	.50

A greater part of the State was visited and inspections made of licensed premises and magazines. The stocks of explosives were examined and enquiries made to ascertain if the requirements of the Explosives Act and Regulations were being observed and complied with.

As a result of the examination and inquiries, it was not found necessary to institute legal proceedings against any person for breaches or non-observance of the law, but the following explosives had to be destroyed as being unfit for use.

TABLE No. 4.

Date.	Place.	Kind.	Reason for Destruction.
11-2-38	Fremantle	1,525 lbs. Polar S.N. Gelnite 60% ... 4,690 lbs. A.N. Gelnite " 60 " ... 6,580 lbs. A.N. Gelnite Dynamite ... 10,260 lbs. Polar A.N. Gelnite Dynamite	} Damaged by water during transport.
30-3-38	do.	60 lbs. Polar A.N. Gelnite Dynamite 5 lbs. S.N. Gelnite Dynamite ...	
14-6-38	do.	850 lbs. A.N. Gelnite Dynamite " 75 " ... 4,450 lbs. A.N. Gelnite " 40 " ...	} Damaged by water during transport.
14-5-38	Morowa	10 lbs. Gelnite	
26-7-38	Kalgoorlie	50 lbs. Gelnite	} Owing to chemical deterioration. do. do. do.
22-8-38	Fremantle	5 lbs. A.N. Gelnite " 40 "	} Damaged during transport.
6-9-38	do.	51 lbs. A.N. Gelnite	} Absorption of moisture.

The following licenses were issued during the year for the storage of explosives:—

TABLE No. 5.

Licenses Issued during 1938.

Magazines on Government Reserves	53
Magazines used by Government Departments	32
Magazines on Private Property	47
Stores Licenses—	
Mode (a)	109
Mode (b)	<i>Nil</i>
Fireworks only	265
Importation Licenses	2

The question of protecting the magazines on the Woodman's Point Explosives Reserve from the effect of lightning has been exercising my mind for some considerable time.

Up to the present there is a limitation of knowledge in regard to lightning discharges, its effect and control.

Electrical engineers appear to be unanimous in the opinion that it is preferable to erect conductors some distance from the buildings it is desired to protect rather than to place them over, or attach them to the building.

On the advice of Mr. Taylor, the Manager of the Tramway and Electricity Department, a number of lightning conductors have been erected round the boundary of the reserve, and as a result, it is felt that greater safety has been assured.

It is with sincere regret that the services of Mr. J. H. Bennett were lost to the Department through his retirement from the service.

During the period he has been on the staff he has given loyal and efficient service which has been most helpful to me and enabled the work of the Department to be carried on expeditiously and smoothly.

T. N. KIRTON,
Chief Inspector of Explosives.

MINING STATISTICS TO 31st DECEMBER, 1938.

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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 1938, 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 1938.					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	7.62	...	6.50	7.21	...	7.62	...	3,821.25	3,231.94	...
Hall's Creek	...	do. do. do.	...	...	...	8.59	...	...	...	517.55	549.03	...
Mt. Dockrell	95	Irish Lass	...	...	90.00	93.22	...	13.66	...	184.00	165.85	...
	103	Old Mac	...	...	1.75	41.28	...	...	...	1.75	41.28	...
	85	Western Lead	...	...	...	...	...	...	...	...	2.43	...
		Voided leases	...	...	...	...	...	...	...	228.00	605.64	...
		Sundry claims	...	20.03	...	...	...	20.03	...	36.00	51.13	...
Ruby Creek	98	Goliath	...	...	7.50	9.01	...	...	...	7.50	9.01	...
	97	Ruby Queen	...	...	171.25	118.65	...	...	...	171.25	118.65	...
	100	St. Lawrence	...	...	10.00	11.32	...	...	...	10.00	11.32	...
	96	West and Left	...	...	10.00	5.30	...	...	...	10.00	5.30	...
		Voided leases	...	...	...	...	...	...	...	12,633.50	9,435.13	...
		Sundry claims	...	...	92.00	22.98	...	...	...	243.00	150.26	...
The Mary	...	Voided leases	...	...	...	...	...	...	...	399.00	210.03	...
The Panton	...	Voided leases and sundry claims	...	...	...	...	...	...	...	37.70	153.71	...
		<i>From Goldfield generally:—</i>										
		Reported by Banks and Gold Dealers	314.01	...	...	...	...	6,152.91	...	.75	1.54	...
		Totals	321.63	20.03	389.00	317.56	...	6,160.53	33.69	18,301.25	14,742.25	...

Pilbara Goldfield.

MARBLE BAR DISTRICT.

Bamboo Creek	856	Bulletin	...	...	247.00	64.75	...	...	5.05	1,837.00	576.76	...
	850	Federation	...	...	40.00	5.89	...	...	...	282.00	518.01	...
	866, 901	Greater Bonnie Doon (1935), Limited...	...	...	454.00	197.28	...	...	...	2,003.00	843.05	...
	866	(Bonnie Doon)	...	...	...	...	...	...	...	204.00	78.03	...
	707	Kitchener	...	...	442.00	204.87	...	...	...	8,382.00	12,948.23	...
	1010	Mickey	...	...	228.00	46.37	...	...	...	228.00	46.37	...

	740, 794, etc.	Mt. Prophecy leases	...	...	561.00	334.25	...	...	...	6,052.50	6,646.47	...
	740	(Mt. Prophecy)	...	...	...	...	...	1.11	...	1,040.50	1,898.07	...
	794	(Perseverance)	...	...	...	...	...	...	...	290.50	584.21	...
	817	Prince Charlie	...	...	51.00	133.33	...	3.68	...	1,575.75	2,699.70	...
	907	Princess May	...	...	17.50	21.29	...	4.87	...	300.00	235.56	...
	865	Queen	...	...	...	...	...	...	...	791.00	416.49	...
	924	True Blue	...	...	165.00	10.20	...	...	...	372.00	31.04	...
		Voided leases	...	...	...	...	...	13.54	545.85	16,331.10	24,832.40	...
		Sundry claims	...	...	354.00	79.42	...	8.97	307.83	3,923.35	2,690.66	...
Boodalyerrie	...	Voided leases and sundry claims	...	...	...	...	...	...	299.23	120.25	587.86	...
Lalla Rookh	861	Lalla Rookh	...	...	...	...	...	...	...	267.50	478.55	...
		Voided leases and sundry claims	...	...	...	...	...	4.78	...	11,265.50	11,882.65	574.01
Marble Bar	927, 930, 956, 979, 934, etc.	Comet Gold Mines, Ltd.	...	...	4,996.00	6,562.58	...	...	...	9,786.00	13,384.21	...
	930	(Alexander)	...	...	234.00	31.99	...	...	...	640.00	114.59	...
	927	(Halley's Comet)	...	...	...	...	...	...	...	331.00	996.37	...
	956	(Portree)	...	...	308.00	59.14	...	...	...	308.00	59.14	...
	979	(Repeater)	...	...	286.00	20.55	...	...	...	306.00	35.05	...
	934	(Stirling Castle)	...	...	...	...	...	...	...	24.00	6.57	...
	(943)	(Coongan River)	...	...	42.00	5.20	...	...	...	170.00	26.80	...
	854	Coongan Star	...	...	32.00	35.55	...	...	...	1,038.00	2,029.57	...
	(933)	Golden Knob	...	...	32.00	4.59	...	...	...	32.00	4.59	...
	981	Gwalia	...	...	88.00	71.26	...	...	...	100.00	82.95	...
	912	Homeward Bound	...	...	207.00	141.43	...	...	...	984.00	490.14	...
	914	Jo Jo	...	...	95.00	37.59	...	...	...	390.00	272.19	...
	926	Leviathan	...	...	361.00	148.72	...	4.60	...	976.00	350.81	...
	(962)	My Chance	...	...	68.00	13.92	...	...	...	146.00	74.19	...
	845, 869	Outward Bound leases	...	...	287.00	93.59	...	...	...	1,268.80	740.94	...
	845	Outward Bound	...	...	...	...	...	...	...	1,543.50	1,873.91	...
	869	Outward Bound East	...	...	...	...	...	...	...	30.00	26.79	...
	909	Stray Shot	...	...	45.00	39.25	...	...	...	107.00	67.09	...
	(922)	Tom Thumb	...	5.48	61.00	33.20	...	5.48	...	296.00	165.72	...
	844, 851	Viking leases	...	...	71.00	34.78	...	...	...	1,129.00	831.81	...
	844	(Anglo French)	...	...	...	...	...	...	...	467.00	706.25	...
	851	(Viking)	...	...	...	...	...	...	...	34.50	45.52	...
	1001	White Hill	...	...	63.00	14.61	...	...	...	63.00	14.61	...
	929	Wingello G.Ms., N.L.	...	...	588.50	331.33	...	...	...	859.50	440.86	...
		Voided leases	...	...	...	...	...	...	181.87	22,839.45	28,732.53	...
		Sundry claims	...	...	1,304.00	401.34	...	65.71	158.31	14,667.64	10,480.09	...
North Pole	...	Voided leases and sundry claims	...	...	19.50	26.13	...	...	...	618.00	496.21	...
North Shaw	...	do. do. do.	...	...	...	...	...	10.37	567.06	1,222.95	1,105.77	...
Pilgangoora	879	Birthday Gift	...	...	952.00	139.54	...	8.34	...	1,360.00	208.28	...
	873	Boolarina	...	...	36.00	14.18	...	...	...	131.00	45.56	...
	992	Maybe	...	...	14.00	1.34	...	...	...	14.00	1.34	...
		Voided leases	...	...	...	...	...	8.31	...	637.00	123.97	...
		Sundry claims	...	...	114.00	29.66	...	161.08	8.13	421.60	135.85	...
harks	868	Mt. Ada	...	...	127.00	138.73	...	...	...	972.50	1,198.64	...
	(961)	Mt. Florence	...	...	31.00	130.32	...	...	...	51.00	161.54	...
		Voided leases	...	...	...	...	...	...	...	27.00	60.48	...
		Sundry claims	...	...	43.00	19.21	...	162.10	25.90	995.00	1,405.43	...

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 1938.					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.
Talga	(997) 915	Black Cat North Star Voided leases and sundry claims	... ..	... ..	121·50	58·36	... ..	... ..	... ..	121·50	58·36	... ..
			... ..	... ..	121·00	67·31	... ..	... ..	... ..	402·00	527·52	... ..
			... ..	... ..	81·50	99·46	... ..	64·70	154·48	2,691·15	2,498·26	... ..
Tambourah ... ..	... ..	do. do. do.	... ..	... ..	215·00	95·76	... ..	89·52	355·68	3,403·25	3,427·80	... ..
Warrawoona	(1000)	Bow Bells Voided leases and sundry claims	... ..	... ..	10·00	1·52	... ..	... ..	... ..	10·00	1·52	... ..
			... ..	... ..	458·00	146·34	... ..	70·98	603·97	13,624·34	21,708·18	... ..
Western Shaw ... ..	... ..	do. do. do.	... ..	... ..	... ..	... ..	... ..	22·34	67·47	1,285·00	1,032·52	... ..
Wyman's Well	1002 (986)	Copenhagen Coronation West Voided leases and sundry claims	... ..	... ..	392·00	23·13	... ..	... ..	... ..	392·00	23·13	... ..
			... ..	... ..	52·00	1·98	... ..	... ..	... ..	52·00	1·98	... ..
			... ..	... ..	42·00	22·65	... ..	·93	85·98	1,238·65	1,748·42	... ..
Yandicoogina	874	Uncle Tom Voided leases and sundry claims	... ..	... ..	108·00	65·04	... ..	... ..	... ..	411·00	386·24	... ..
			... ..	1·54	53·50	39·30	... ..	4·32	380·65	3,238·45	6,408·46	... ..
		<i>From District generally:—</i>										
		Sundry Parcels treated at:										
		Bamboo Creek State Battery ... ..	... ..	... ..	... ..	*644·42	... ..	... ..	... ..	... ..	*7,380·69	79·90
		Lalla Rookh Cyanide Plant ... ..	... ..	... ..	... ..	... ..	... ..	... ..	... ..	... ..	*186·65	... ..
		Marble Bar State Battery ... ..	... ..	... ..	... ..	*1,138·85	... ..	... ..	... ..	12·00	*5,119·03	... ..
		R. H. Fox Cyanide Plant ... ..	... ..	... ..	... ..	*126·43	... ..	... ..	... ..	... ..	*126·43	... ..
		Various Works ... ..	... ..	... ..	... ..	... ..	... ..	... ..	... ..	237·95	1,204·91	... ..
		Reported by Banks and Gold Dealers	156·34	... ..	... ..	... ..	... ..	13,636·00	422·09	... ..	... ..	... ..
		Totals	156·34	7·02	14,719·00	12,207·93	... ..	14,327·21	4,194·07	147,371·68	186,830·57	653·91

NULLAGINE DISTRICT.

Eastern Creek	251L 253L	Rose Shamrock Voided leases and sundry claims	... ..	... ..	19·00	23·39	... ..	... ..	... ..	59·00	49·49	... ..
			... ..	... ..	12·00	10·23	... ..	... ..	... ..	72·00	59·11	... ..
			... ..	... ..	161·00	124·36	... ..	... ..	11·96	5,754·50	10,252·34	28·67
Elsie ... ..	... ..	do. do. do.	... ..	... ..	... ..	... ..	... ..	... ..	... ..	630·50	1,781·57	... ..
McPhee's Creek ... ..	... ..	do. do. do.	... ..	... ..	... ..	... ..	... ..	... ..	... ..	189·50	270·66	... ..
Middle Creek	230L 260L	All Nations All Nations North ... ..	... ..	... ..	... ..	... ..	... ..	... ..	... ..	160·75	60·20	... ..
			... ..	... ..	348·00	203·30	... ..	... ..	... ..	348·00	203·30	... ..

	229L ...	Barton ...	...	...	...	...	...	...	...	...	47.50	37.76	...
	231L, etc. ...	Blue Spec leases ...	...	...	432.00	316.48	...	...	...	...	877.50	548.51	...
	245L ...	Elsie Jane ...	...	...	34.00	8.24	...	...	...	...	34.00	8.24	...
	246L ...	Hopetoun ...	...	...	774.00	203.36	...	...	...	...	774.00	203.36	...
		Voided leases and sundry claims	...	...	1,014.00	304.23	...	...	...	...	9,072.40	9,770.97	...
Mosquito Creek	234L ...	Alrema ...	...	...	...	...	...	...	...	...	139.00	32.98	...
	235L ...	Beatrice ...	...	...	...	...	...	...	...	...	390.00	129.70	...
	(255L) ...	Parnell North ...	...	...	179.00	132.07	...	...	...	...	179.00	132.07	...
	236L ...	Western ...	...	...	...	...	...	...	...	...	31.00	9.62	...
		Voided leases and sundry claims	...	...	46.00	26.48	...	1.07	190.13	10,699.74	16,115.48	...	...
Nullagine ...	252L ...	Marjie ...	...	...	10.00	30.34	...	...	...	...	56.00	224.88	...
		Voided leases and sundry claims	...	...	179.00	77.12	...	210.64	243.75	12,043.55	21,217.51	...	...
Twenty-mile Sandy	256L ...	Bill Jim ...	...	...	291.00	165.85	...	...	...	...	291.00	165.85	...
		Voided leases and sundry claims	...	...	494.00	223.41	...	33.10	23.75	9,411.35	12,500.80	...	...
	<i>From District generally :-</i>												
	Sundry Parcels treated at :												
		Greig's Cyanide Plant ...	...	...	...	...	...	...	...	...	...	*54.63	...
		Simpson's Cyanide Plant (Twenty-mile Sandy)	...	...	...	*21.18	...	...	...	...	...	*21.18	...
		Simpson's Cyanide Plant (Mosquito Creek)	...	...	...	*115.34	...	...	...	...	...	*448.50	...
		Vatious Works ...	...	...	...	...	...	...	...	...	112.50	*5,770.12	...
		Reported by Banks and Gold Dealers	...	...	352.98	10.83	...	...	8,464.71	88.42	...	24.77	...
		Totals ...	...	...	352.98	10.83	...	...	8,709.52	558.44	51,372.79	80,093.60	28.67

Ashburton Goldfield.

Belvedere ...	40, 41 ...	Belvedere leases ...	...	...	517.00	178.60	34.73	...	9.88	517.00	178.60	34.73
Melrose ...	43 ...	Melrose ...	...	...	405.00	46.30	2.95	...	...	405.00	46.30	2.95
	(32) ...	Melrose ...	...	...	...	4.41	...	...	...	796.00	402.73	5.63
		Sundry claims ...	11.00	...	36.00	20.21	.15	11.00	14.79	266.00	144.33	.15		
Mt. Edith ...	...	Sundry claims ...	...	...	...	...	...	...	...	5.00	3.97	...
Mt. Mortimer ...	...	Sundry claims ...	...	...	44.50	40.25	...	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	...	...	37.45	...	...	8,626.40	16.59	...	7.12	...
		Totals	48.45	...	1,002.50	289.77	37.83	9,002.03	356.90	2,033.50	823.30	7,831.15

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	...	...	4.66	...	...	499.67	1.80	...	...	...
		Totals ...	...	...	4.66	...	...	588.64	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 1938.					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	(554P)	Pegasus ... ..	...	...	26·00	72·85	...	...	...	352·00	822·67	...
	556P	Pegasus ... ..	...	...	325·00	665·82	...	...	...	325·00	665·82	...
		Voided leases and sundry claims	...	...	59·00	21·79	...	296·21	54·42	6,109·02	2,773·60	...
Horseshoe ... ..	...	do. do. do.	...	...	180·50	44·02	...	15·70	2,791·00	1,101·18	2,232·46	2·00
Jimblebar ... ..	...	do. do. do.	...	...	...	...	...	13·79	238·70	8,574·30	3,136·11	·58
Mt. Fraser ... ..	...	do. do. do.	...	...	37·00	34·92	...	88·28	40·61	790·25	662·10	...
Mt. Seabrook	541P, 542P	Mt. Seabrook Gold Mines, Ltd. ... ..	...	...	189·50	47·56	...	...	...	265·25	125·06	...
	541P	(Mt. Seabrook No. 1) ... ..	...	...	...	...	...	...	5·05	236·50	251·42	...
	542P	(Mt. Seabrook No. 2) ... ..	...	...	...	...	...	...	...	56·50	29·17	...
		Sundry claims ... ..	...	...	138·00	78·64	...	...	...	834·60	710·23	...
Peak Hill	512P	Atlantic ... ..	...	...	816·25	106·21	...	...	...	2,990·00	377·03	...
	510P	Atlantic North ... ..	...	...	190·00	58·59	...	...	...	634·00	334·34	...
	552P	Bobby Dazzler ... ..	...	...	89·75	64·17	...	·63	...	170·50	78·69	...
	507P	Central ... ..	...	...	2,827·50	171·97	...	...	...	5,653·00	363·43	...
	511P	Commercial ... ..	...	...	...	...	...	...	...	2,702·75	470·23	...
	448P	Evening Star ... ..	...	...	341·50	53·91	...	...	70·17	6,789·00	4,752·05	...
	514P	Jasper Bar ... ..	...	...	367·00	49·61	...	...	...	1,156·25	792·58	...
	553P	Morning Star ... ..	...	...	253·75	37·17	...	...	...	673·25	86·32	...
	508P	Mount Pleasant ... ..	...	...	58·00	29·19	...	...	...	816·00	321·26	...
	506P	No. 1 North ... ..	...	...	52·00	68·88	...	...	...	4,563·70	1,053·68	...
	492P	North Star ... ..	...	...	1,386·00	458·03	...	23·20	52·05	9,802·50	1,491·84	...
	Voided leases and sundry claims	...	...	365·00	76·10	...	67·16	1,098·78	533,299·18	247,857·08	2,285·63	
Ravelstone ... ..	...	do. do. do.	...	...	...	...	...	101·64	4,773·45	3,400·85	...	
Wilgeena ... ..	...	do. do. do.	...	...	...	...	...	23·54	128·50	146·79	...	
Wilthorpe ... ..	...	do. do. do.	...	...	...	...	...	...	136·00	46·64	...	
Yowereena ... ..	...	do. do. do.	...	...	58·75	16·89	...	...	136·75	239·62	...	
	<i>From Goldfield generally:—</i>											
	Sundry parcels treated at:											
		State Battery, Peak Hill ... ..	...	...	...	*223·40	...	...	3·05	15·00	*5,291·98	...
		Various Works ... ..	...	...	...	...	...	...	...	30·00	*5,661·37	23·12
		Reported by Banks and Gold Dealers	319·01	...	...	...	...	2,570·02	422·51	...	...	...
		Totals	319·01	...	7,760·50	2,379·72	...	3,074·99	4,901·52	593,114·43	284,174·42	2,311·33

East Murehison 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	...	...	do. do. do.	8.83	5.36	354.50	109.03	...	14.37	670.88	80,814.25	49,364.09	...
Lawlers	(1244) ...	...	Daisy Queen	...	...	71.00	13.55	...	...	...	324.50	75.18	...
	1236, 1240, etc.	...	Emu G.Ms., Ltd.	...	...	48,370.00	11,952.00	...	...	...	58,082.00	14,228.87	...
	1236-49-40	...	Prior to transfer to present holders	...	...	...	...	...	13.02	...	168.50	*1,216.93	...
	1317	...	Talloon Doon	...	...	136.00	41.85	...	...	...	136.00	41.85	...
		...	Voided leases and sundry claims	51.33	16.14	648.00	241.23	...	383.99	1,065.54	1,297,463.70	498,856.26	14,619.27
Sir Samuel	1238	...	Vanguard	...	...	1,531.00	495.08	...	...	...	1,827.00	669.37	...
	1314	...	Westralia	...	...	147.00	17.27	...	...	...	147.00	17.27	...
		...	Voided leases and sundry claims	...	...	171.00	75.75	...	50.42	423.99	274,057.80	143,803.44	10,225.58
<i>From District generally :-</i>													
Sundry Parcels treated at:													
		...	State Battery, Sir Samuel	...	...	...	*52.14	...	...	...	43.50	*2,155.90	...
		...	Dower & Maund's Cyanide Plant	...	...	...	*237.95	...	...	...	...	*237.95	...
		...	McPherson's Cyanide Plant	2.12	...	...	*316.34	...	2.12	...	...	*3,505.96	...
		...	Westralia T. T. Plant	...	...	...	*3.43	...	...	...	...	*3.43	...
		...	Various Works	...	...	...	...	...	...	...	1,699.50	*25,141.69	936.09
		...	Reported by Banks and Gold Dealers	25.22	...	...	...	...	6,275.55	100.17	...	9.84	...
		...	Totals	87.50	22.65	51,428.50	13,555.62	...	6,739.47	2,315.98	1,719,019.83	742,956.31	25,782.88

WILUNA DISTRICT.

Coles	628J	...	Blackadder	...	...	108.00	143.70	...	...	...	824.50	272.88	...
	637J	...	Pay Day	...	...	2.75	16.16	...	...	...	62.75	16.16	...
		...	Voided leases and sundry claims	...	...	275.25	70.88	...	...	...	3,511.00	1,338.81	...
Collavilla	...	...	do. do. do.	...	...	...	...	...	...	...	1,548.00	517.75	...
Corboys	359J	...	Corboys Reward North	...	...	251.00	137.85	...	...	...	1,705.75	1,205.41	...
	435J	...	Old Toscana	...	...	55.00	39.71	...	...	...	503.00	321.19	...
	627J	...	Vinaurum	...	...	497.50	480.95	...	...	...	752.00	1,031.36	...
	433J, 434J	...	Waratah G.Ms., Ltd., N.L.	...	...	201.00	128.42	...	...	...	309.00	534.00	...
	433J, 434J	...	Prior to transfer to present holders	...	...	...	...	...	...	...	308.00	233.62	...
		...	Voided leases and sundry claims	...	...	272.50	110.26	...	17.36	1.25	9,370.35	7,205.5	5.00
Gum Creek	635J	...	Trump	20.75	...	...	...	...	20.75	...	...	...	...
		...	Voided leases and sundry claims	...	...	...	...	...	...	1.36	1,759.25	716.62	...
Mt. Eureka	...	...	do. do. do.	...	...	260.25	101.09	...	...	...	926.00	644.92	...
Mt. Keith	545J, 463J	...	Coolgardie Brilliant, N.L.	...	...	1,777.00	400.39	...	...	...	2,127.00	435.92	...
	463J	...	Pomme D'or G.M. Co., N.L.	...	...	...	...	...	...	6.35	4,841.75	1,929.04	...
		...	Voided leases and sundry claims	...	...	114.25	60.39	...	4.81	202.29	12,291.50	9,865.19	...
New England	587J	...	Bill's Find	2.29	38.16	108.25	20.70	...	2.29	38.16	274.25	240.28	...
	636J	...	Federal	...	...	258.00	98.37	...	...	...	258.00	98.37	...
	466J	...	Simms' Find	...	...	155.00	185.23	...	...	...	634.00	864.66	...
		...	Voided leases and sundry claims	...	...	648.50	332.58	...	...	63.32	6,066.25	3,847.56	...

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 1938.					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.
Wiluna	631J	Brilliant Reduced ... ..	...	...	286.00	60.83	...	...	...	452.75	88.78	...
	552J	Florence No. 3 ... ..	...	...	1,071.50	281.30	...	...	...	2,993.25	688.87	...
	(633J)	Kookaburra ... ..	...	6.18	42.75	9.21	...	...	6.18	42.75	9.21	...
	607J	Linden (W.A.) Gold, N.L. ... ..	...	...	8,799.00	2,711.93	...	...	...	8,799.00	2,711.93	...
	607J	(Jubilee) ... ..	...	...	...	...	...	...	...	1,156.75	655.83	...
	10J, 37J, 91J, etc.	Moonlight Wiluna G.Ms., Ltd. ... ..	...	...	132,406.65	35,972.22	...	...	...	231,140.08	63,500.36	...
	10J, etc.	Prior to transfer to present holders ... ..	...	...	...	...	...	...	...	36,975.50	14,174.75	...
	630J	North Brilliant Reduced ... ..	...	...	960.00	169.93	...	...	...	1,006.25	183.87	...
	625J	Palmer's Puzzle ... ..	...	...	126.75	46.09	...	...	...	513.50	139.87	...
	6J, etc.	Wiluna Gold Mines, Ltd. ... ..	...	...	594,739.00	105,307.24	...	...	...	3,704,576.00	840,620.40	...
	6J, etc.	Prior to transfer to present holders ... ..	...	...	...	...	...	...	...	341,730.57	133,457.92	89.32
		Voided leases and sundry claims ... ..	...	1.32	783.50	161.35	...	105.39	781.41	159,466.15	88,239.58	124.33
		<i>From District generally:—</i>										
		Sundry Parcels treated at:										
		State Battery, Wiluna ... ..	...	...	...	*650.11	...	...	...	592.00	*20,964.97	218.70
		Toscana Cyanide Plant ... ..	...	...	...	*479.75	...	...	...	...	*1,916.46	...
		Various Works ... ..	...	...	...	...	...	...	...	...	*1,237.68	12.68
		Reported by Banks and Gold Dealers ... ..	...	2.20	...	1.69	...	39.83	44.07	...	1.69	...
		Totals	23.04	47.86	744,259.40	148,178.33	...	190.43	1,144.39	4,537,516.90	1,199,911.26	450.03

BLACK RANGE DISTRICT.

Barrambie	972B, 976B	Sheelite leases ... ..	...	...	119.75	169.36	...	...	...	209.00	265.41	...
	972B	(Sheelite) ... ..	...	...	...	...	...	...	...	105.50	108.88	...
	976B	(Sheelite North) ... ..	...	...	...	...	...	...	...	92.75	92.83	...
		Voided leases and sundry claims ... ..	...	...	...	...	...	3.53	180.25	18,055.97	17,013.06	125.60
Bellchambers	1051B	Bellchambers ... ..	...	...	427.50	334.11	...	...	...	427.50	334.11	...
		Voided leases and sundry claims ... ..	...	...	93.50	73.88	...	...	111.80	586.02	722.33	...
Birrigrin ... ..	...	do. do. do. ... ..	...	...	...	...	...	...	996.08	14,530.48	16,324.31	...
Curran's Find ... ..	...	do. do. do. ... ..	...	...	56.25	25.95	...	18.24	252.27	9,307.00	3,925.83	...
Erroll's ... ..	...	do. do. do. ... ..	...	...	...	...	...	20.70	551.40	15,135.25	9,924.37	...
Hancock's	1050B	Duke of Windsor ... ..	...	...	142.00	56.19	...	...	...	142.00	56.19	...
		Voided leases and sundry claims ... ..	...	...	521.25	169.22	...	4.21	6,650.92	38,769.75	35,727.86	55.72
Maninga Marley ... ..	...	do. do. do. ... ..	...	...	122.75	15.18	...	...	353.36	63,661.38	50,193.45	22.55

Montagu ...	967B, 998B ... 953B, etc. ...	North End leases ... Swan Bitter G.M. Co., N.L. Voided leases and sundry claims	...	...	3,884.00 2,302.00 149.25	635.32 1,264.17 50.37	...	...	...	20,557.45 30,539.25 13,824.00	3,135.17 9,664.56 10,277.83	...
Nunngarra ...	(1032B) ...	Two Mile ... Voided leases and sundry claims	98.00 370.25	6.18 52.03	76.21	2,410.40	236.50 16,280.90	28.80 7,696.21	...	
Sandstone ...	1064B ... 959B ... 1017B ... 958B ...	Billy's Charm ... (Bonny Note) ... (Hacks) ... Lady Mary ... Voided leases and sundry claims	463.00 14.59	64.34 875.00	463.00 136.06 ... 3,979.25 5,000.53	64.34 686.59 1.67 3,681.92 450,055.54	...	11,754.22	
Youanme ...	1046B ... 960B, etc. ... 960B ...	Camberra ... Youanmi G.Ms., Ltd. (Youanme) ... Voided leases and sundry claims	133.00 75,159.61 130.05	25.58 20,396.12 26.13	1,111.69	...	368.00 130,989.08 38.50	109.93 32,971.08 3.91	...	2,129.50
From District generally :-														
Sundry Parcels treated at:														
North End Cyanide Plant *3,376.82														
Parkinson's Cyanide Plant *53.27														
State Battery, Sandstone 256.00 *20,375.22 59.53														
State Battery, Youanme 40.00 *5,106.99														
Various Works 37.00 6,325.89														
Reported by Banks and Gold Dealers 20.38														
Totals			14.59	85,059.16	24,276.03	1,111.69	1,605.75	17,010.88	1,448,435.83	866,796.20	18,755.67			

Murchison Goldfield.

CUE DISTRICT.

Big Bell ...	2050, etc. ... 2050 ...	Big Bell Mines, Ltd. (Little Bell) Sundry claims	...	...	400,473.00 ... 30.50	70,537.47 ... 30.31	26,681.47	...	...	486,431.00 579.75 30.50	80,677.50 60.95 30.31	29,986.56
Cuddingwarra ...	2182 ... 2175 ... 2199 ... (2090) ...	Desert Gold ... Golden Gate ... Never Can Tell ... Shaughran ... Voided leases and sundry claims	...	...	10.00 32.00 44.25 30.75 33.51	3.75 23.55 5.02 9.47 627.25	...	...	19.56	89.25 346.75 44.25 511.75 469.17	44.34 146.90 5.02 116.58 60,134.94	109.71
Cue ...	(2173) ... 2084 ...	New Salisbury Plain ... Trovato di Pietro ... Voided leases and sundry claims	...	...	22.25 136.75 1,486.25	8.73 113.52 396.43	...	...	221.13	569.75 1,852.25 1,331.99	202.17 1,065.70 235,150.58	66.63
Eelya ...	...	do. do. do.	...	...	...	...	...	...	110.64	1,746.40	2,494.34	...
Mindoolah	do. do. do.	53	131.25	73.57	...	3.07	29.30	10,636.85	6,815.03	42.97	
Reedy ...	2092 ... 1977, etc. ... 1977, etc. ... 2121 ...	Culculli North ... Triton Gold Mines, Ltd. Prior to transfer to present holders Turn of the Tide G.Ms., Ltd. Voided leases and sundry claims	343.00 108,878.00 ... 1,618.50 268.50	499.12 34,436.82 ... 662.10 149.10	748.75 283,330.00 14,492.50 3,736.18 4,738.05	1,107.95 94,397.06 7,073.36 2,210.89 8,267.28	...	8,770.45
5.00														

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 1938.					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.
Tuckabianna ...	2130 ...	Garibaldi ...	...	13·82	33·75	11·53	...	...	20·06	136·88	503·89	...
	(2174) ...	Vienna ...	...	...	114·50	30·84	...	...	...	187·50	56·20	...
		Voided leases and sundry claims	...	·36	190·75	34·84	...	24·06	421·42	14,204·10	7,892·83	...
Tuckanarra ...	2079 ...	Batchelor ...	...	32·63	24·00	24·28	...	...	50·58	381·50	333·72	...
	(2176) ...	Kingfield ...	...	...	44·00	38·83	...	...	1·82	186·00	178·06	...
		Voided leases and sundry claims	...	67·67	415·00	184·21	...	129·88	3,828·93	27,641·63	31,637·04	172·77
Weld Range ...	2183 ...	Joy Long ...	...	...	124·00	112·29	...	...	...	124·00	112·29	...
		Voided leases and sundry claims	...	...	73·00	15·85	...	...	27·5	1,694·25	1,236·95	...
		<i>From District generally :—</i>										
		Sundry Parcels treated at:										
		Barker-Edmunds Cyanide Plant	...	...	...	*4·81	...	...	...	...	*4·81	...
		Cue State Battery	...	...	...	*999·26	...	...	...	12·75	*14,292·63	91·93
		Tuckanarra State Battery	...	...	...	*130·34	...	...	...	518·50	*5,313·77	...
		Various Works	...	...	...	...	...	...	...	6,925·52	*29,371·15	1,147·77
		Reported by Banks and Gold Dealers	...	...	...	...	...	2,764·12	90·73	...	18·82	...
		Totals	...	...	...	...	...	3,331·41	6,701·52	1,238,997·19	590,953·06	40,393·79

MEEKATHARRA DISTRICT.

Abbotts ...	1804N ...	Blue Horse ...	...	...	216·25	121·94	...	...	...	316·75	209·54	...
	(1799N) ...	Mt. Vranizan ...	...	...	58·25	25·77	...	...	...	535·00	379·66	...
	1726N ...	Murchison King ...	...	...	24·75	33·62	...	...	...	350·75	801·97	...
		Voided leases and sundry claims	...	...	165·00	73·18	...	...	31·74	38,316·12	39,125·54	...
Burnakura ...	1846N ...	Empire ...	...	8·16	...	...	...	...	8·16	...	...	...
		Voided leases and sundry claims	...	...	143·25	77·02	...	12·51	3,320·54	39,629·75	31,178·49	26·90
Chesterfield ...	...	do. do. do.	...	...	145·00	45·50	...	29·02	461·95	7,697·06	8,174·13	·80
Gabanintha ...	(1759N) ...	Lillian Extended ...	...	...	186·50	23·04	...	...	9·12	588·50	216·01	...
	1845N ...	Lucky Zac ...	...	11·79	...	...	...	11·79	...	...	...	...
	1725N ...	New Brew ...	...	...	195·00	168·93	...	...	...	480·75	600·89	...
		Voided leases and sundry claims	...	...	243·75	111·77	...	16·78	167·42	25,050·25	15,230·46	815·57
Garden Gully ...	1719N ...	Sabbath ...	...	...	43·50	19·40	...	...	...	278·00	342·81	...
		Voided leases and sundry claims	...	...	380·25	148·60	...	26·36	80·29	32,101·76	22,963·60	1,102·59

Gum Creek	1663N	Koldarra Rose	1.92	...	...	...	...	...	...	40.00	101.10	...
		Voided leases and sundry claims	...	...	...	...	25.27	176.82	4,524.08	4,329.49	...	...
Holden's	1551N	New Waterloo	717.00	429.64	...	...	...	.99	1,468.00	644.77	...	...
		Voided leases and sundry claims	...	...	...	...	164.95	67.07	17,018.15	6,680.75	...	...
Jillawarra		do. do. do.	22.00	30.26	...	...	173.02	1,284.72	1,803.30	3,033.76	...	...
Meeka Pools		do. do. do.	...	...	...	...	...	2.84	345.15	287.65	...	...
Meekatharra	1735N	Haleyon Extended	10.10	489.25	85.34	...	...	108.38	1,167.50	193.92	...	...
	1466N	Haveluck	...	318.50	66.46	...	...	...	2,056.80	1,678.53	...	...
	1559N	Ingliston	24.29	262.25	156.87	...	...	25.32	775.30	713.94	...	...
	1542N, etc.	Ingliston Alberts leases	...	...	44.97	...	...	...	2,062.70	1,071.68	...	...
	475N, etc.	Ingliston Consols Extended leases	...	23,385.00	3,430.37	...	...	...	854,984.22	352,725.28	...	...
	475N, 477N	Prior to transfer to present holders	...	...	...	...	...	...	323,853.94	277,527.17	...	30
	1539N, 1606N	Ingliston South Gold Development, N.L.	...	120.50	281.01	...	...	...	120.50	281.01	...	...
	1539N	(Ingliston South)	...	...	...	...	...	...	16,274.61	12,815.17	...	...
	1811N	Kelly's Luck	...	363.25	94.49	...	...	...	363.25	94.49	...	...
	533N	Marmont	51.03	526.25	469.38	...	...	51.03	57,137.45	41,343.48	...	...
	1576N, 1547N	Meekatharra Central Gold, N.L.	5.29	1,030.50	542.87	...	...	5.29	3,155.50	1,361.73	...	...
	1576N, 1547N	(Lady Central leases)	...	...	...	...	...	11.06	2,951.42	5,198.33	...	...
	1552N, 1565N, etc.	Mines Selection of W.A., Ltd.	116.72	1,036.01	516.41	...	...	233.73	3,496.51	1,677.75	...	...
	1552N, 1565N, etc.	Prior to transfer to present holders	...	...	...	...	...	46.99	4,097.97	2,984.16	...	...
	1577N	Mopoke	...	90.50	18.12	...	...	...	623.75	158.02	...	...
	1800N	Peter Pan	...	220.50	18.87	...	...	...	718.50	63.82	...	...
	1571N	Phar Lap	...	807.25	540.32	...	...	...	3,320.00	2,030.44	...	...
	1529N, etc.	Prohibition G.M. Co., Ltd.	...	...	...	...	...	...	5,978.75	1,116.43	...	...
	1529N	(Prohibition)	...	...	...	...	...	...	29,422.00	4,971.30	...	...
	1574N	Rough up	...	295.25	38.87	...	...	...	6,214.50	765.48	...	...
		Voided leases and sundry claims	80.37	302.50	42.60	...	233.59	1,449.89	373,995.99	204,465.95	2,454.74	...
Mistletoe		do. do. do.	...	...	...	...	123.29	1,072.09	436.75	488.24	...	...
Mt. Maitland		do. do. do.	...	53.00	8.20	...	...	...	427.50	301.72	...	...
Munara Gully		do. do. do.	...	131.25	69.58	...	...	33.13	13,926.25	6,765.22	...	...
Nannine	1564N, 1700N, etc.	Aladdin G.Ms., Ltd.	...	3,604.00	927.27	...	...	...	15,901.50	1,942.20	...	...
	1564N, 1700N	Prior to transfer to present holders	...	...	...	...	...	...	3,925.15	510.32	...	...
	1580N	Caledonian	...	65.35	62.94	...	...	...	299.10	199.38	...	...
	(1746N)	Jubilee	...	7.00	47.84	...	...	39.64	60.55	425.22	...	...
	(1809N)	Sandboy	86.69	...	...	...	...	108.80	.05	75.78	...	...
		Voided leases and sundry claims	2.97	54.05	91.78	...	138.21	1,532.51	98,827.75	73,342.56	167.45	...
Quinns	1634N, 1635N, 1745N	Quinns G.Ms., Ltd.	...	503.00	81.40	...	...	...	503.00	81.40	...	...
	1634N, 1635N, 1745N	(Commonwealth leases)	...	2,203.00	601.06	...	...	...	8,189.00	2,507.36	...	...
	(1699N)	(Nowthanna Central)	...	30.50	6.88	...	...	...	239.25	151.84	...	...
		Voided leases and sundry claims	12.29	482.00	172.14	...	22.37	2,474.97	28,173.83	13,332.09	90.70	...
Ruby Well		do. do. do.	...	...	...	...	1,015.87	452.85	7,928.25	4,655.89	...	...
Stake Well		do. do. do.	...	80.00	26.27	...	31.91	234.85	22,257.10	10,116.87	...	...

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 1938.					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.
Star of the East...	...	Voided leases and sundry claims	...	...	...	...	...	...	27,371·62	20,400·37	...	
Yaloginda ...	1807N ...	Rocklee ...	...	3·50	137·25	51·76	...	...	3·50	163·00	75·85	...
		Voided leases and sundry claims	...	...	495·75	215·51	...	80·92	2,394·81	34,690·71	17,947·95	8·68
		<i>From District generally:—</i>										
		Sundry Parcels treated at:										
		Meekatharra State Battery	...	...	20·50	*788·03	...	...	...	68·50	*18,555·01	19·00
		Gabanintha Gold Recovery Works	...	...	...	*69·13	...	...	...	...	*69·13	...
		Various Works	...	...	...	...	...	...	...	172·75	*6,297·35	342·17
		Reported by Banks and Gold Dealers	371·37	...	...	...	...	11,416·74	132·26	...	12·13	...
		Totals	386·13	452·49	39,692·39	10,815·08	...	13,522·60	16,022·76	2,126,876·14	1,225,792·58	5,028·90

DAY DAWN DISTRICT.

Day Dawn ...	640D-1D, 648D	Creme D'or leases ...	...	...	301·25	273·95	...	...	58·68	626·25	990·44	...
	640D ...	(New Ballarat)	...	...	...	...	...	...	...	149·50	76·47	...
	647D ...	Klondike ...	...	8·69	540·00	443·63	...	...	86·96	626·50	542·34	...
	639D ...	Lone Hand ...	...	...	581·50	772·01	...	...	...	900·75	1,144·11	...
	573D ...	Mountain View ...	...	...	58·50	21·48	...	...	94·05	1,465·28	1,466·18	...
	576D ...	New Fingall ...	...	...	...	...	...	6·12	6·84	1,288·00	628·16	...
		Voided leases and sundry claims	...	...	399·25	67·25	...	206·74	1,021·56	1,926,127·04	1,225,180·54	169,210·44
Lake Austin ...	649D ...	New Golconda Mines, N.L.	...	...	360·00	125·00	...	...	...	360·00	125·00	...
		Voided leases and sundry claims	...	185·19	82·00	37·17	...	660·99	3,823·86	38,834·79	51,610·95	...
Mainland ...	...	do. do. do.	...	4·54	20·53	...	...	9·69	4,014·71	8,503·07	25,555·95	...
Pinnacles ...	642D ...	Baby Mine ...	...	...	41·00	31·90	...	...	...	70·50	57·14	...
	599D ...	Eclipse ...	...	...	134·50	27·24	...	...	...	583·25	193·80	...
		Voided leases and sundry claims	...	5·18	99·50	21·98	...	4·90	1,658·62	20,294·32	10,802·25	...
		<i>From District generally:—</i>										
		Sundry Parcels treated at Various Works	...	...	...	...	...	...	16·61	940·75	1,741·97	...
		Reported by Banks and Gold Dealers	26·42	...	...	...	...	1,880·02	33·02	...	...	...
		Totals	30·96	219·59	2,597·50	1,821·61	...	2,768·46	10,814·91	2,000,770·00	1,320,116·07	169,210·44

MOUNT MAGNET DISTRICT.

Jumbulyer	1365M ...	Pantomine ...	...	97.50	60.60	...	...	97.50	60.60	...
	1369M ...	Pantomine West ...	...	4.75	4.05	...	...	4.75	4.05	...
		Sundry claims ...	41.48	138.50	108.13	...	1.74	41.48	344.00	300.13		
Lennonville	1308M ...	Empress ...	...	285.00	95.09	...	...	285.00	95.09	...
	1362M ...	Gambier Lass ...	...	76.50	62.99	...	...	76.50	62.99	...
	1374M ...	Souvenir ...	...	16.00	33.17	...	...	16.00	33.17	...
		Voided leases and sundry claims	2.73	615.25	212.64	...	19.14	3,318.40	153,780.07	129,472.66		
Mt. Magnet	1273M ...	Abbotts ...	...	29.75	3.57	...	1.43	...	1,599.50	154.48	
	1251M ...	Broken Bond ...	98.00	1,352.75	539.42	...	...	317.69	2,329.25	1,812.51
	1275M ...	Cascade ...	...	104.50	21.92	...	...	...	104.50	21.92
	1255M ...	Edward Carson ...	...	2,839.25	2,064.37	...	...	...	6,958.50	7,113.84
	1286M ...	Evening Star ...	...	213.25	79.67	...	...	36.37	448.57	820.02
	1332M ...	Fine Cut ...	...	30.50	53.09	...	...	...	120.75	136.33
	1366M ...	Hall Mark ...	4.37	360.00	42.06	...	...	4.37	360.00	42.06
	1287M ...	Havelock ...	8.58	325.50	64.77	...	...	8.58	1,197.75	305.58
	1320M ...	Hesperus Dawn ...	...	5.00	13.13	...	...	56.49	47.00	55.62
	1353M ...	Hill Crest ...	...	120.50	17.38	...	...	...	161.50	23.77
	1282M, 1356M ...	Hill 50 G.M., No Liability	...	24,424.00	5,569.38	7.31	...	...	52,643.00	13,528.80
	1361M ...	Jupiter ...	...	82.25	26.06	...	...	...	115.25	53.69
	(1333M)	Lady Jean ...	...	13.00	9.95	...	...	...	103.50	216.83
	(1242M)	Lucky Hit ...	...	88.00	18.67	...	...	...	1,964.75	502.85
	1339M ...	Mars ...	...	246.50	59.55	...	...	...	772.50	150.03
	1334M, 1256M, 1349	Metropolitan M. & D. Co., Ltd.	...	423.35	706.05	...	...	...	423.35	706.05
	1334M, 1256M ...	Prior to transfer to present holders	...	...	...	...	...	2.12	988.30	974.23
	1215M, 1254M, etc.	Mt. Magnet Gold Mines, Ltd.	...	59,671.00	7,639.10	...	...	...	226,574.00	35,458.84
	1215M, 1254M ...	Prior to transfer to present holders	...	...	...	...	...	45.00	25,715.03	12,176.93
	(1274M)	Nathan ...	...	23.00	2.78	...	...	...	3,192.50	561.79
	1264M ...	Neptune ...	...	657.50	322.43	...	...	713.22	974.65	1,290.28
	1281M ...	Saturn ...	...	1,531.50	429.98	...	...	...	2,209.00	516.50
	132M, 1368M ...	Three Boys leases ...	18.06	111.00	121.93	...	...	90.61	177.28	379.61
	1367M ...	Trump ...	...	82.50	19.58	...	...	...	82.50	19.58
	1357M ...	Wind Bag ...	...	331.25	338.33	...	...	...	413.25	347.76
		Voided leases and sundry claims	283.33	1,314.00	426.30	...	147.35	10,569.88	425,768.20	242,872.24		
Mt. Magnet East	...	do. do. do.	...	...	...	...	63.29	801.75	5,940.53	3,240.04
Moyagee	1355M ...	Moyagee ...	...	335.25	477.08	...	...	...	669.00	962.25
		Voided leases and sundry claims	...	12.25	9.98	...	2.83	135.00	6,540.10	9,185.43		
Paynesville	1245M ...	Milgoo Mine ...	...	30.00	18.76	...	...	...	220.50	521.74
		Voided leases and sundry claims	...	19.00	4.14	...	3.36	2,138.17	1,098.84	1,941.85		
Winjangoo	(1360M)	Buccaneer ...	.99	63.00	20.76	...	.99	76.40	63.00	20.76
	(1376M)	Lucky Spot ...	...	15.08	...	...	...	15.08	...	...
	1371M ...	Make Sure ...	...	96.93	9.00	...	...	96.93	9.00	49.22
		Sundry claims	...	83.07	3.00	...	...	183.18	18.50	13.54
		From District generally :-	...	...	...	...	...	...	...	...
		Sundry Parcels treated at:	...	...	...	...	...	...	...	...
		State Battery, Boogardie	...	...	*1,458.98	...	...	...	92.51	*26,518.81
		Welcome Cyanide Plant	...	...	*74.19	...	...	...	...	*74.19
		Various Works	...	...	...	...	...	...	43.06	17,427.01
		Reported by Banks and Gold Dealers	37.28	10.24	...	...	1,989.56	47.28	...	12.38
		Totals	38.27	661.87	96,084.85	21,291.64	7.31	2,229.69	18,698.00	924,743.24	510,238.05	1,181.49

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

Yalgoo Goldfield.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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.
Bilberatha	1139	Blaney's Gold Mine	...	...	236.50	179.30	...	...	...	336.50	277.54	...
		Voided leases and sundry claims	...	...	221.20	90.31	...	...	6.64	3,314.55	1,574.46	...
Carlaminda	1095	Reliance	...	...	134.75	22.17	...	1.28	...	842.25	277.77	...
		Voided leases and sundry claims	...	...	39.00	41.6	...	...	...	2,195.32	1,072.26	3.30
Fields Find	907	Brown's Reward	...	...	...	...	...	...	...	4,840.55	3,876.07	...
		Fields Find Central West	...	...	65.50	8.20	...	...	...	65.50	8.20	...
		Field's Find No. 2 South	...	...	52.00	4.76	...	...	...	160.50	20.77	...
		Rose Marie	...	...	626.00	245.74	...	...	...	1,134.50	457.71	...
		Voided leases and sundry claims	...	...	175.75	32.81	...	5.77	392.79	42,895.05	28,895.99	...
Goodingnow	1122	Adeline	...	...	49.00	7.71	...	...	...	125.75	69.63	...
		Ark	...	...	16.50	14.12	...	...	...	332.00	161.53	...
		Aster	...	...	451.50	517.30	...	...	...	1,290.00	825.96	...
		Carnation	...	...	2,583.50	1,632.83	...	...	...	7,533.05	6,731.33	...
		Lake View	...	...	...	...	...	...	...	3,260.00	1,633.09	...
		Lake View West	...	...	17.50	1.06	...	...	...	32.50	4.62	...
		Marigold	...	...	...	...	...	...	...	294.00	165.24	...
		Orchid	...	...	2,542.50	1,502.36	...	...	...	6,049.50	3,495.26	...
		Princess Mary	...	...	16.00	4.19	...	...	...	603.50	178.47	...
		Sweet William	...	...	57.50	19.20	...	...	2.97	537.50	197.92	...
		Voided leases and sundry claims	...	13.55	231.00	81.03	...	299.23	441.11	40,362.06	42,697.59	...
		Gudewa	1123	Golden Stream	9.00	13.24	308.50	90.52	...
King Solomon's Mines, Ltd.	...			...	2,831.00	1,126.86	...	...	...	4,067.10	1,623.67	...
Mugga King	...			...	1,570.00	353.40	...	...	...	4,063.50	1,261.89	2.35
Shenandoah	...			...	343.00	53.08	...	...	...	1,589.00	589.81	...
Voided leases and sundry claims	...			...	278.00	34.20	...	...	171.23	27,242.75	17,005.53	...
Kirkalucka	...	do. do. do.	...	...	19.00	4.80	...	...	4.14	307.30	167.23	...
Messenger's Patch	1010, 1011	Gnow's Nest leases	...	6.18	35.00	171.52	...	...	13.89	1,863.75	1,720.80	...
		Voided leases and sundry claims	...	...	131.50	33.86	...	463.12	655.78	38,367.61	26,829.42	1,083.01
Mt. Farmer	...	do. do. do.	...	...	202.25	43.39	...	...	...	433.75	160.77	...
Mt. Gibson	...	do. do. do.	...	...	84.00	55.69	...	...	33.06	1,286.85	1,203.55	...
Ninghan	...	do. do. do.	...	...	...	...	...	...	...	334.75	124.69	...
Noongal	1137	City of Melbourne	...	...	607.50	283.05	...	...	...	920.50	499.55	...
		Continental	...	...	119.50	167.28	...	...	...	209.00	462.35	...
		Don Bradman	...	3.48	12.00	1.03	...	...	3.48	253.50	41.43	...

	1136	...	East Victory	...	...	91.00	56.10	...	...	...	211.50	148.29	...
	953	...	Revival	...	...	174.00	26.56	...	...	...	2,481.75	1,129.45	...
		...	Voided leases and sundry claims	...	...	320.75	88.71	...	42.43	331.71	10,510.5	5,171.82	...
Nyounda	...	...	do.	do.	do.	23.00	6.85	...	...	221.91	810.00	280.51	...
Pinyalling	1143	...	Trump	...	...	66.58	11.75	53.10	...	66.58	11.75	53.10	...
		...	Voided leases and sundry claims	...	...	55.24	7.00	13.19	...	59.19	3,189.10	1,345.44	...
Retaliation	1046	...	Alma May	...	...	212.00	90.84	...	...	...	907.75	444.09	...
	1023	...	Atlas G.Ms., Ltd.	...	...	300.00	35.33	...	...	...	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.	...	...	15,135.00	3,085.44	...	...	...	22,730.00	5,371.12	...
	1013, 1014, etc.	...	Prior to transfer to present holders	...	...	...	...	...	...	...	415.50	176.15	...
		...	Voided leases and sundry claims	...	...	99.50	50.05	...	...	...	14,977.25	5,915.22	...
Wadgingarra	...	...	do.	do.	do.	229.50	77.66	...	...	...	2,555.91	1,133.53	...
Warda Warra	(1142)	...	Mistake	...	...	160.00	34.55	...	...	...	306.00	137.23	...
	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	...	...	...	...	...	...	...	1,555.25	549.94	...
Warriedar	1081	...	Highland Chief	...	...	399.00	143.77	...	...	...	1,324.50	265.76	...
		...	Voided leases and sundry claims	...	...	422.25	61.28	...	...	2.84	20,676.85	6,160.29	7.30
Yalgoo	...	...	do.	do.	do.	168.50	24.66	...	...	26.79	8,785.75	10,944.22	...
Yuin	...	...	do.	do.	do.	...	...	...	...	131.82	68,475.00	27,976.10	130.13
<i>From Goldfield generally:—</i>															
Sundry Parcels treated at:															
		...	Revival Cyanide Plant	...	...	...	*4.61	...	...	...	...	*570.25	...
		...	Paynes Find State Battery	...	...	...	*364.10	...	...	...	38.50	*3,428.45	...
		...	Warriedar State Battery	...	...	...	*138.56	...	...	...	...	*6,227.55	...
		...	Yalgoo State Battery	...	...	...	*172.58	...	...	...	...	*843.82	...
		...	Shenandoah Cyanide Plant	...	...	...	*8.69	...	...	...	...	*245.88	...
		...	Various Works	...	...	...	...	...	9.42	...	664.00	*2,131.66	26.67
		...	Reported by Banks and Gold Dealers	...	6.42	9.36	...	...	868.96	46.63	...	...	...
Totals						6.42	154.39	31,511.00	11,282.97	...	1,690.21	2,613.15	371,858.10	232,006.67	1,252.76

Mt. Margaret Goldfield.

MOUNT MORGANS DISTRICT.

Australia United...	...	...	Voided leases and sundry claims	...	...	136.00	19.66	...	...	2,492.61	17,200.94	25,492.44	1.76
Eucalyptus	...	...	do.	do.	do.	47.96	20.25	42.49	...	3,352.76	2,493.85	4,166.65	...
Linden	396F (406F, etc.)	...	Bindah Gold Mines, Ltd.	...	...	...	...	...	...	...	386.00	67.88	...
	396F (406F, 407F)	...	(Bindah leases)	...	...	...	...	...	...	...	478.00	80.41	...
	508F	...	Coronation	...	...	12.50	591.14	...	...	...	12.50	591.14	...
	494F	...	Local Lady	...	...	180.00	88.21	...	...	...	393.00	171.73	...
	503F	...	Mount Celia	...	...	189.00	56.9	...	...	...	189.00	56.39	...
	(502F)	...	Star of the Sea	...	...	56.00	31.72	...	...	...	133.00	83.77	...
		...	Voided leases and sundry claims	...	14.66	32.99	610.00	675.04	...	127.10	725.62	69,428.41	52,172.40	68

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

MT. MARGARET GOLDFIELD—continued.

MT. MORGANS DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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. Margaret ...	954H ...	Mt. Margaret Mission ...	21·66	15·50	100·00	46·58	...	21·66	15·50	210·00	87·02	...
	418F, 432F ...	Westralia Renown Mines, N.L. ...	...	...	...	...	...	...	1,388·25	630·98	...	
	418F, 432F ...	Mt. Margaret Mines, N.L. ...	...	...	...	...	...	...	890·25	332·37	...	
		Voided leases and sundry claims	...	...	19·00	8·57	...	25·59	99·24	7,280·99	4,770·88	12·55
Mt. Morgans ...	399F, etc. ...	Morgans G.Ms., Ltd. ...	...	...	253·80	929·12	...	...	...	253·80	929·12	...
	501F ...	V's United ...	...	...	...	...	...	...	68·75	23·44	...	
	5F, 399F, etc....	(Westralia Renown Mines, Ltd.) ...	...	...	146·25	53·99	...	...	5,842·25	1,937·09	...	
	5F, etc. ...	Prior to transfer to present holders ...	...	...	...	...	...	16·66	773,736·18	352,288·77	5,552·63	
		Voided leases and sundry claims	...	...	164·00	46·71	...	38·74	497·83	63,347·07	37,089·64	77·86
Murrin ...	395F ...	Arthur Rymer ...	...	...	180·00	41·89	...	...	8·42	3,756·25	712·78	...
	482F ...	Hill End ...	...	...	950·00	426·67	...	...	...	2,340·75	1,278·85	...
		Voided leases and sundry claims	...	9·17	225·70	177·42	...	61·58	676·82	134,054·20	105,260·71	29·60
Redcastle ...		do. do. do.	...	...	10·00	3·81	...	4·49	540·12	4,319·02	4,462·77	...
Yundamindera ...	501F ...	Landed at Last ...	...	...	1005·00	135·54	...	...	...	1,005·00	135·54	...
	509F ...	New Golden Treasure ...	...	...	310·00	51·22	...	...	...	310·00	51·22	...
		Voided leases and sundry claims	...	57·60	511·00	176·25	...	...	240·88	78,047·60	52,463·71	5·82
	<i>From District generally:—</i>											
	Sundry Parcels treated at:											
		State Battery, Linden ...	...	85	...	*299·64	...	...	7·63	263·29	*7,925·79	...
		Rymer's Cyanide Plant ...	...	...	...	*120·52	...	...	...	...	*795·85	...
		Various Works ...	...	...	...	...	...	...	...	1,257·81	*5,238·32	99·97
		Reported by Banks and Gold Dealers ...	117·06	...	...	...	...	2,602·06	67·54	10·30	56·69	...
		Totals ...	153·38	164·07	5,078·50	4,022·58	...	2,881·22	8,741·63	1,169,096·46	659,352·85	5,780·87

MOUNT MALCOLM DISTRICT.

Cardinia ...	1769c ...	Black Chief ...	...	...	30·00	4·66	...	...	...	30·00	4·66	...
		Voided leases and sundry claims	...	...	7·25	22·66	...	18·12	1,686·61	2,569·74	3,934·19	...
Diorite ...	1750c ...	Wotan ...	...	...	35·00	29·89	...	...	...	98·50	235·04	...
		Voided leases and sundry claims	...	2·86	132·50	47·61	...	11·21	1,063·84	38,079·33	35,427·03	24·05
Dodger's Well ...		do. do. do.	...	...	...	...	...	95	86·22	2,813·55	2,840·75	...
Lake Darlot ...	(1768c) ...	Ace ...	...	...	13·00	22·07	...	...	...	13·00	22·07	...
	1772c ...	Afrikander ...	...	...	72·00	13·42	...	...	...	72·00	13·42	...
	1727c ...	Corboy's Pinnacles Reward ...	...	...	...	...	...	...	...	68·00	52·55	...
		Voided leases and sundry claims	...	...	749·00	210·97	...	67·68	5,033·13	73,648·30	54,217·30	2·60

Leonora ...	1754c ...	Gold Blocks ...	...	197-00	196-43	...	...	...	504-00	319-87	...
	1594c ...	Leonora Central G.M. Co., N.L. ...	...	395-00	33-61	...	...	...	2,924-00	126-06	...
	1701 ...	New Year Gift ...	...	10-00	1-09	...	...	...	44-50	4-69	...
	489c, etc.	Sons of Gwalia, Ltd. ...	...	138,203-00	45,691-94	3,727-52	...	...	4,360,901-67	1,866,108-39	127,439-46
		Prior to transfer to present holders ...	...	...	...	...	...	...	109,081-00	55,989-21	8-66
	1557c ...	Tower Hill ...	...	29-50	22-81	...	...	...	172-55	69-17	...
		Voiced leases and sundry claims ...	...	717-50	135-73	...	30-31	2,195-41	176,161-50	98,555-30	10-71
Malcolm ...		do. do. do. ...	...	8-00	1-64	...	5-75	80-46	66,670-00	50,094-12	...
Mertondale ...		do. do. do. ...	...	332-00	113-23	...	1-82	63-04	91,038-21	62,942-87	1,497-58
Mt. Clifford ...	1725c ...	Bannockburn ...	...	252-50	76-27	...	...	9-61	1,122-50	392-19	...
	(1761c) ...	Marionette ...	...	215-00	113-81	...	...	...	248-00	139-94	...
	(1749c) ...	North Wind ...	...	21-00	14-52	...	...	...	225-50	141-20	...
		Voiced leases and sundry claims ...	1-81	184-00	84-65	...	53-98	1,896-12	11,090-06	18,558-50	...	
Pig Well ...		do. do. do. ...	...	19-00	3-11	...	...	34-61	16,483-97	15,902-04	63-68
Randwick ...	1753c ...	Lady Doris ...	...	90-00	21-52	...	...	...	212-00	52-60	...
	1760c ...	Mighty Splash ...	...	607-00	237-83	...	...	...	804-00	323-98	...
		Voiced leases and sundry claims ...	...	...	...	...	66-57	403-51	10,519-29	9,978-07	...
Websters ...		do. do. do. ...	...	12-00	9-31	...	67-14	16-52	24,285-20	15,773-61	...
Wilson's Creek ...		do. do. do. ...	...	201-50	214-51	...	...	4-24	649-50	429-39	...
Wilson's Patch ...	1748c ...	Chein D'or ...	...	139-00	59-51	...	...	...	563-00	135-52	...
		Voiced leases and sundry claims ...	...	14-00	5-30	...	4-68	149-95	29,600-26	14,235-99	1-05
<i>From District generally:—</i>												
Sundry Parcels treated at:												
		Park & Hunt's Cyanide Plant ...	...	...	*3-82	...	...	...	...	*762-40	...
		Homeward Bound Cyanide Plant ...	...	...	*89-96	...	...	...	...	*153-05	...
		Merton's Reward North Cyanide Plant ...	...	...	*130-04	...	...	...	...	*563-38	...
		Reefer Cyanide Plant ...	...	...	*349-25	...	...	...	...	*1,040-65	22-38
		Various Works ...	...	...	...	...	...	...	789-50	*20,217-33	123-15
		Reported by Banks and Gold Dealers ...	62-45	1-81	...	...	3,226-86	226-35	9-50	32-04	...
		Totals ...	62-45	6-48	142,685-75	47,961-17	3,727-52	3,555-07	12,950-20	5,021,492-13	2,329,788-37	129,193-32

MOUNT MARGARET DISTRICT.

Burtville ...	2138r ...	Nil Desperandum ...	...	30-00	28-74	...	...	5-30	1,201-87	2,704-81	...
	2412r ...	Sailor Prince ...	...	467-25	89-16	...	...	...	467-25	89-16	...
		Voiced leases and sundry claims ...	1-08	628-75	484-31	...	4-19	575-89	74,498-34	109,054-66	275-27
Duketon ...		do. do. do. ...	7-61	58-25	40-75	...	3-54	3,444-7	32,160-67	23,079-74	27-23
Eagle's Nest ...		do. do. do. ...	...	50-75	11-76	...	11-45	601-44	1,460-50	1,536-74	...
Erlistoun ...	2141r, etc.	King of Creation G.Ms., Ltd. ...	...	360-00	156-47	...	...	...	6,208-00	1,137-04	11-00
	2141r, etc.	Prior to transfer to present holders ...	...	...	...	...	...	...	13,723-00	3,199-66	...
	2402r ...	Midas ...	...	189-25	85-61	...	...	...	357-50	173-36	...
	(2383r) ...	Nungal ...	...	186-50	46-08	...	...	...	224-25	52-46	...
	2345r, etc.	Western Mining Corporation, Ltd. ...	...	17,985-00	17,871-88	932-21	...	...	41,752-00	38,326-26	1,811-97
	2345r ...	(Morgood) ...	...	...	...	...	...	...	119-25	140-97	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

MT. MARGARET GOLDFIELD—continued.
MOUNT MARGARET DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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.		
Eristoun—cont. ...	2374r ...	Westralia Tasmania ...	...	...	201·00	36·77	...	...	...	226·75	42·58	...
	2411r ...	Victory ...	...	...	1·50	28·56	...	...	...	71·50	2·56	...
	2421r ...	Victory Extended ...	...	...	8·00	98·43	...	...	...	8·00	98·43	...
		Voided leases and sundry claims	...	1·77	334·75	200·26	...	1,181·65	166·80	32,914·11	22,156·13	...		
Euro ...		do. do. do.	...	...	59·00	26·67	...	...	111·66	92,892·50	38,310·93	...
Laverton ...	(2260r)	Australian Mechanised Prospecting Co., Ltd.	...	...	154·75	30·25	...	...	...	181·00	35·40	...
	(2260r)	(Just in Time) ...	...	...	...	...	...	...	...	308·75	66·35	...
	2216r ...	Beria Main Lode ...	...	...	...	...	...	...	...	740·25	123·40	...
	2373r ...	Fairfield ...	...	...	99·50	31·55	...	...	...	156·00	119·11	...
	2408r ...	Gladiator ...	...	...	3,628·00	500·67	...	...	...	3,628·00	500·67	...
	2229r, 2230r	Ida H. leases ...	...	...	...	...	...	...	...	2,683·75	379·62	...
	2229r ...	(Ida H) ...	...	...	...	...	...	...	...	154·00	25·95	...
	2230r ...	(Ida H. North) ...	...	...	...	...	...	...	...	148·50	24·73	...
	715r, etc.	Lancefield (W.A.). G.Ms., No Liability ...	...	...	101,176·00	29,611·56	...	...	...	380,918·00	117,890·17	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	941,424·98	360,139·22	51,882·27
	2382r, etc.	Pinnacles ...	...	...	...	...	...	...	...	114·75	16·66	...
	2423r ...	She's right ...	...	...	17·20	12·32	...	...	...	17·20	12·32	...
		Voided leases and sundry claims	...	...	1,194·50	297·40	...	230·47	3,443·42	473,623·74	269,374·19	4,674·69
Mt. Barnicoat ...	(2410r)	Golden Gordon ...	...	...	66·75	43·04	...	...	...	66·75	43·04	...
	2254r ...	Ulalla ...	...	...	...	...	...	...	...	356·50	85·32	...
		Voided leases and sundry claims	...	...	214·25	141·82	...	...	...	1,935·50	713·39	...
Mt. Shenton ...		do. do. do.	...	...	11·00	11·10	...	...	...	294·25	236·32	...
		<i>From District generally:—</i>												
		Sundry Parcels treated at:												
		State Battery, Laverton	...	...	...	*603·02	...	...	...	97·50	*5,270·79	15·64
		Hootanui Battery ...	...	...	...	*14·34	...	...	...	...	*14·34	...
		Bolwarrah & Gordon's Cyanide Plant ...	...	...	...	*379·54	...	...	...	...	*4,474·89	...
		Mary Mac Cyanide Plant	...	...	...	*56·28	...	...	...	...	*1,688·26	...
		Craggiemore Cyanide Plant	...	...	...	...	...	...	...	...	*629·72	...
		Various Works	...	...	...	...	...	...	...	157·00	*9,921·74	...
		Reported by Banks and Gold Dealers	...	...	23·18	20·93	...	2,369·73	79·16	...	10·08	...
		Totals	23·18	31·39	127,191·95	50,938·34	932·21	3,801·03	8,428·38	105,291·91	1,011,927·17	58,698·07

North Coolgardie Goldfield.

MENZIES DISTRICT.

Comet Vale	5590z	King of the Hills	...	...	...	...	...	...	...	...	...	7.08	...
	5591z	Post Town	...	...	...	...	...	...	...	...	...	4.88	...
	5217z, 5476z	Sand-Queen-Gladsome Mines, N.L.	...	...	16.75	152.94	4.31	...	...	...	42,096.75	14,106.29	6.45
		Prior to transfer to present holders Voided leases and sundry claims	...	...	...	...	...	...	...	459.93	150,165.88	120,206.30	3,839.28
Goongarrie	...	do. do. do.	...	35.97	95.00	72.55	...	47.40	3,207.87	29,475.81	20,191.49	...	
Menzies	5539z	(Aeroplane)	...	...	...	...	...	...	...	...	151.50	174.25	...
	5691z	Black Bird	...	9.08	6.50	22.83	...	...	9.08	...	6.50	22.83	...
	5543z	Black Swan	...	...	159.00	31.10	...	...	...	...	679.63	838.53	9.08
	5676z	Coronation	...	...	162.50	145.75	...	...	...	...	245.50	238.10	...
	(5628z)	Donegal Sligo	...	...	55.00	41.24	...	...	...	...	660.00	442.94	...
	(5662z)	Dreadnought	...	...	20.00	2.65	...	...	...	...	266.00	116.05	12.90
	5511z, 5554z, etc.	First Hit G.M. (1934), N.L.	...	...	7,794.00	5,727.85	793.04	...	...	...	21,517.20	16,484.24	2,167.34
	5511z	(First Hit)	...	...	...	...	...	...	...	...	1,672.75	4,687.69	...
	5542z	Good Block	...	2.87	205.50	170.56	...	...	7.32	...	990.00	1,218.39	...
	5549z	Lady Harriet	...	...	...	...	...	...	...	...	221.00	64.18	...
	5689z	Lady Harriet North	...	...	153.50	62.23	...	...	...	...	153.50	62.23	...
	(5673z)	Lady Kathleen	...	...	...	...	...	...	...	...	14.00	41.95	...
	5575z, etc.	Lady Shenton G.Ms. (1934), N.L.	...	...	9,295.00	3,931.29	724.83	...	...	...	23,382.00	12,562.28	2,138.44
	5520z	Mignonette	...	...	20.00	27.03	...	...	...	...	168.50	209.47	...
	5666z	Spion Kopp	...	...	60.50	40.44	...	...	...	...	156.25	112.65	...
	5663z	Springfield	...	...	18.00	5.00	...	...	...	...	80.00	23.82	...
	(5584z)	Sydney	...	...	18.00	25.02	...	...	...	...	171.00	440.29	...
5484z	Warrior	...	...	263.00	104.51	...	...	...	...	2,016.00	940.48	...	
5484z	(Happy Warrior G.Ms., N.L.) Voided leases and sundry claims	...	41.11	640.00	54.58	...	94.17	1,622.33	929,166.24	729,014.63	12,118.22		
Mt. Ida	5681z	Bell Bird	...	...	83.00	36.79	...	...	...	...	83.00	36.79	...
	5626z	Bungarra	...	...	579.25	78.17	...	...	...	...	2,802.25	443.54	...
	5658z	Carida	...	...	54.00	64.03	...	...	...	...	224.95	271.89	...
	5668z	Federation	...	...	90.00	94.45	...	...	...	...	175.00	288.76	...
	5667z	Golden Ridge	...	...	702.00	460.03	...	...	...	...	1,306.00	861.06	...
	5685z	Golden Ridge North	...	...	231.00	187.51	...	...	...	...	317.00	222.70	...
	5551z, etc.	Mt. Ida Gold Mines, Ltd.	...	...	3,126.00	876.72	11.28	...	...	...	5,375.50	2,429.38	31.06
	5537z	(Timoni)	...	...	...	...	...	...	...	...	1,512.75	737.95	...
	5674z	Quin Hill	...	...	597.00	103.34	...	...	...	...	844.50	176.25	...
	5651z	Temora	...	...	260.00	55.48	...	...	...	...	818.00	293.75	...
	5597z	Unexpected Voided leases and sundry claims	...	20.12	812.00	404.96	...	48.14	132.85	72,185.20	75,618.17	106.63	
Twin Hills	5677z	Twin Hills South	...	...	182.00	242.15	...	...	...	...	230.00	277.95	...
		Voided leases and sundry claims	...	...	...	...	...	...	...	...	307.60	309.27	...
<i>From District generally :-</i>													
Sundry Parcels treated at :													
	Howell's Cyanide Plant	...	...	...	...	*81.17	...	...	...	...	...	*185.27	...
	Lady Harriet Battery	...	...	...	...	*592.54	...	...	...	279.50	...	*11,470.40	30.00
	Quinlan's Cyanide Plant	...	...	...	...	*243.25	...	...	...	...	...	*1,658.39	...
	Mt. Ida State Battery	...	...	...	...	...	...	...	...	1,866.25	...	*5,370.61	...
	Parry's Cyanide Plant	...	...	...	...	*98.05	...	...	...	...	...	*134.98	...
	Thompson's Cyanide Plant	...	...	...	...	*4.35	...	...	...	...	...	*578.10	...
	Various Works	...	...	...	...	...	...	...	...	2,512.30	...	*33,015.90	1,813.40
	Reported by Banks and Gold Dealers	...	47.15	12.71	...	...	...	1,344.86	276.88	35.00	...	7.72	...
Totals			...	47.15	121.86	25,718.75	14,648.52	1,533.46	1,534.57	5,716.26	1,370,683.52	1,115,789.87	23,778.45

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

NORTH COOLGARDIE GOLDFIELD—continued.

ULARRING DISTRICT.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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.
Davyhurst	1051u ...	Golden Pole	...	...	...	...	...	727.09	231.85	...	
	(1071u) ...	Golden Rod	...	...	40.50	25.99	...	82.50	46.13	...	
	(1075u) ...	King Ned	...	...	249.00	68.51	...	249.00	68.51	...	
	1077u ...	Makai	...	...	395.00	219.65	...	395.00	219.65	...	
	1016u ...	New Callion	...	...	883.30	472.62	16.40	1,123.30	521.91	16.40	
	1033u ...	Waihi	...	...	66.00	15.02	5.33	152.50	44.13	5.33	
		Voided leases and sundry claims	241.00	101.91	...	2.93	182.40	169,260.17	128,964.04	5,403.14
Morley's	1072u ...	Fallen Stars	...	66.56	11.00	104.66	...	66.56	11.00	104.66	...	
	1088u ...	Golden Cockatoo	...	21.99	4.00	75.22	...	21.99	4.00	75.22	...	
	1081u ...	Isabell	...	...	77.50	96.51	...	...	77.50	96.51	...
	1080u ...	Morning Glory	...	10.50	44.00	180.50	...	10.50	44.00	180.50	...	
	1089u ...	Paramount	...	...	68.00	137.74	...	...	68.00	137.74	...
	1078u ...	Rabbit	...	30.93	38.50	139.88	...	30.93	38.50	139.88	...	
	1086u ...	Terminal	...	...	34.00	42.49	...	...	34.00	42.49	...
	1074u ...	Two Chinamen	...	864.61	70.00	256.14	...	864.61	93.50	500.00	...	
		Sundry claims	2.16	904.49	467.50	1,053.33	...	2.16	904.49	575.00	1,486.17	...
Mulline	(1087u)	First Hit	...	...	16.00	19.77	...	...	16.00	19.77	...
	1066u ...	Lady Mabel	...	...	...	...	...	...	39.00	63.72	...
	1079u ...	Larne Pride	...	...	217.00	118.84	...	...	217.00	118.84	...
	1068u, etc.	Riverina Gold Mines, Ltd.	...	...	15,812.00	5,166.12	...	...	29,634.00	10,730.67	...
		Voided leases and sundry claims	...	1.80	501.00	595.40	...	443.24	110,765.86	110,379.94	531.44	
Mulwarrie	1084u ...	Oakley	...	...	61.00	81.41	...	...	61.00	81.41	...
		Voided leases and sundry claims	...	139.03	210.23	181.35	...	252.65	21,652.01	28,312.66	38.47	
Ularring	1083u ...	Red Leaf	...	...	183.00	96.73	...	...	183.00	96.73	...
		Voided leases and sundry claims	...	...	160.00	63.29	...	563.34	10,018.60	13,906.22	...
		<i>From District generally:—</i>										
		Sundry Parcels treated at:										
		S A B Mulline Cyanide Plant	...	...	...	*244.50	...	...	639.99	*16,001.21	...
		S A B Mulwarrie Cyanide Plant	...	...	...	*119.57	...	...	613.18	*6,230.73	...
		Golden Pole Cyanide Plant	...	...	...	*553.32	...	...	...	*3,312.74	...
		Waihi Cyanide Plant	...	...	...	*167.11	...	...	...	*1,318.93	...
		Young Australia Cyanide Plant	...	...	...	*49.15	...	...	...	*49.15	...
		Various Works	...	...	...	...	...	15.82	205.15	*816.79	...
		Reported by Banks and Gold Dealers	14.57	4.49	85.00	13.73	...	89.36	39.14	85.00	19.51	
		Totals	16.73	2,044.40	19,934.53	10,460.46	1.73	94.45	3,395.67	347,064.85	324,318.41	5,994.78

NIAGARA DISTRICT.

Desdemona	...	...	Voided leases and sundry claims	...	...	180.50	68.39	...	...	16.11	11,594.45	8,395.95	12.04
Kookynie	...	868G	Altona	...	...	90.50	31.59	...	3.35	79.74	102.00	44.45	...
	...	872G	Margory	...	...	413.00	198.67	...	...	...	783.00	346.53	...
	...	810G, 811G	Two D's	...	...	...	*93.27	...	...	...	1,590.00	746.20	...
	...		Voided leases and sundry claims	...	...	284.00	204.37	...	56.74	367.40	746,728.51	397,783.07	5,375.97
Niagara	...	873G	Peter Pan	...	...	...	...	...	...	...	302.00	91.53	...
	...		Voided leases and sundry claims	...	...	489.50	130.76	...	28.10	201.76	97,833.66	59,590.48	...
Tampa	...	809G	Fortune	...	...	...	...	...	...	...	95.25	211.17	...
	...	901G	Perseverance	...	...	105.00	14.18	...	...	...	05.00	14.18	...
	...	900G	Waratah	...	...	207.00	59.72	...	...	...	419.50	389.13	...
	...		Voided leases and sundry claims	4.39	.04	927.50	223.54	...	32.60	321.76	56,120.15	26,223.60	174.24
<i>From District generally:—</i>													
Sundry Parcels treated at:													
Grafter Battery							*7.11						*7.11
Owen and Party's Cyanide Plant							*9.18						*9.18
Various Works											1,220.50	*15,924.14	41.17
Reported by Banks and Gold Dealers				22.16	10.43				1,563.49	823.66		63.53	
Totals				26.55	10.47	2,697.00	1,040.78		1,684.28	1,810.43	916,894.02	509,840.25	5,603.42

YERILLA DISTRICT.

Edjudina	...	1078R	Ace of Hearts	...	...	...	...	...	...	...	611.50	331.55	...
	...	1201R	Edjudina Perseverance	...	...	86.75	58.28	...	...	...	124.75	95.65	...
	...	1134R	Fingall	...	...	113.00	37.52	...	...	...	203.00	67.35	...
	...	1011R, etc.	Paget Gold Mines of Edjudina, Ltd.	...	...	140.00	36.71	...	...	...	140.00	36.71	...
	...	(1010R), 1011R	Prior to transfer to present holders	...	...	...	...	...	...	...	738.75	559.80	...
	...	1123R	Seventy-two	...	...	25.00	26.49	...	...	...	200.75	144.16	...
	...		Voided leases and sundry claims	...	...	8.00	8.41	...	...	45.33	39,152.28	46,525.34	37.79
Patricia	...	1080R, 1081R	Kimberley Oil Options, N.L.	...	...	62.50	49.49	...	...	...	4,075.25	5,245.54	25.40
	...		Voided leases and sundry claims	...	...	...	...	...	...	...	78.25	30.61	...
Pingin	...	1206R	Ajax	...	...	320.50	60.66	...	...	...	320.50	60.66	...
	...		Voided leases and sundry claims	...	4.82	280.75	138.67	...	...	203.20	20,075.39	13,689.34	...
Yarri	...	1189R	East West Gold Reefs	...	...	85.00	61.70	...	...	...	270.25	145.30	...
	...	1126R, etc.	Edjudina G.M. Co., N.L.	...	...	295.00	73.95	...	...	...	30,186.00	4,271.32	448.52
	...	1126R	(Chateau Tanunda)	...	...	...	...	...	...	...	124.50	38.89	...
	...	(1200R)	Selborne	...	...	104.00	17.59	...	...	...	626.75	77.69	...
	...	1162R, 1187R	Wallaby Central leases	...	...	110.00	9.19	...	...	...	1,147.25	179.62	...
	...	1187R	(Wallaby)	...	...	...	...	...	...	...	108.00	14.58	...
	...	1162R	(Wallaby Central)	...	...	...	...	...	...	...	700.00	267.49	...
	...		Voided leases and sundry claims	...	...	925.00	222.12	...	7.17	92.88	50,566.10	24,560.47	2.00
Yerilla	...		do. do. do.	...	...	42.00	13.45	...	19.30	3,138.05	18,793.51	14,227.29	13.93
Yilgangie	...	(1193R)	Melody	...	1.42	...	...	...	...	1.42	102.50	204.67	...
	...	1207R	Melody	...	.18	...	...	...	...	.18	...	...	...
	...	1194R	Yilgangie King	...	...	112.75	62.69	...	...	...	171.75	134.02	...
	...	1176R	Yilgangie Queen	...	.85	101.00	91.73	...	...	.85	700.25	1,418.84	...
	...		Voided leases and sundry claims	...	...	298.7	130.39	...	121.67	87.58	2,463.55	1,619.95	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

NORTH COOLGARDIE GOLDFIELDS—continued.

YERILLA DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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.
		<i>From District generally :—</i>										
		Sundry Parcels treated at :										
		Yarri State Battery	...	...	...	*253·71	...	...	271·50	*6,391·45	3·50	
		Various Works	...	...	...	...	...	2·17	642·25	*6,049·24	...	
		Reported by Banks and Gold Dealers	26·25	...	...	·44	...	1,134·57	159·59	...	1·56	...
		Totals	26·25	7·27	3,110·00	1,353·19	...	1,284·88	3,729·08	172,594·58	126,389·09	531·14

Broad Arrow Goldfield.

Balgarric	...	Voided leases and sundry claims	...	...	...	...	...	10·94	94·05	6,631·25	5,317·53	1·38
Bardoc	2102w	Despatch	...	...	29·75	16·14	...	...	...	316·00	95·38	...
	2171w	Eureka	...	...	15·00	13·73	...	...	...	15·00	13·73	...
	2127w	Ora Munda	...	170·85	66·50	19·49	...	...	432·92	96·59	188·68	...
	2079w	Wycheproof	...	·57	625·00	177·09	...	...	12·02	1,524·00	563·12	...
	1833w, 2089w	Zoroastrian leases	...	...	1,356·00	137·25	...	...	23·25	3,266·45	638·51	...
		Voided leases and sundry claims	...	73·31	1,027·00	439·07	...	54·22	2,761·14	84,590·80	58,152·06	203·60
Black Flag	2149w	Bellevue Gold Mine	...	...	101·75	179·92	...	...	...	143·75	214·64	...
	2128w	King Edward	...	...	17·50	9·19	...	...	1·22	34·00	26·45	...
	2154w	Pirates Mine	...	...	605·00	92·28	...	...	...	670·00	105·35	...
	2137w	Royal Standard	...	...	48·00	13·81	...	...	...	133·50	61·51	...
		Voided leases and sundry claims	...	...	377·41	104·71	...	738·80	602·13	48,175·25	29,214·57	...
Broad Arrow	(2161w)	Beryl	...	...	39·00	8·36	...	...	...	39·00	8·36	...
	(2153w)	Blew Bar	4·53	...	18·00	10·60	...	4·53	...	94·00	29·94	...
	2160w	Double A	...	...	144·00	25·03	...	...	...	144·00	25·03	...
	2039w	Golden Arrow	...	...	164·00	28·01	...	...	...	2,792·00	328·41	...
	(2074w)	Golden Basin No. 7	...	...	2,892·00	341·53	...	...	...	7,293·00	945·43	...
	(2115w)	Golden Crown	...	...	8·00	1·51	...	...	...	46·04	50·68	...
	1958w	Grace Darling	...	...	161·00	72·57	...	...	...	1,772·75	1,433·87	...
	2148w	Lady Betty	...	...	65·00	10·94	...	...	...	126·80	21·10	...
	2159w	Lady Phyllis	...	...	33·00	10·85	...	...	...	33·00	10·85	...
	(2158w)	Mona	...	...	23·00	30·41	...	...	...	23·00	30·41	...
	2165w	Monte Carlo	...	...	102·00	65·52	...	...	...	102·00	65·52	...
	2136w	Mt. Pleasant	...	...	679·00	153·94	...	...	...	1,151·00	271·83	...

	1771w	North Duke						1,533.79	192.80	(28.42)	
	(2157w)	Oriental			42.50	13.50			42.50	13.50	
	1933w	(Oversight Tara United)			21.00	13.33		1,131.72	401.54	835.51	
	2168w	Trumps		13.01	16.00	191.45		13.01	16.00	191.45	
	2151w	Vesuvio		2.78	225.00	101.97		2.78	638.50	285.94	
		Voided leases and sundry claims		96.23	1,654.43	761.49		1,052.74	9,147.24	142,010.45	15,987.95 18.85
Cane Grass	2028w	Big Four		20.76	.72	4.75			20.76	169.72	118.34
		Voided leases and sundry claims			1.03	1.43			234.56	1,116.30	830.01
Carnage		do. do. do.		6.43	323.75	97.51		176.04	665.74	3,952.33	2,975.35
Cashman's	2046w	Lady Evelyn			77.00	21.34			1.17	284.00	93.50
		Voided leases and sundry claims						67.51	832.99	8,800.65	7,272.28
Christmas Reef		do. do. do.		8.52	125.25	295.03			257.67	2,728.44	2,120.81
Fenbark		do. do. do.			389.50	83.44			4.42	3,861.52	2,542.30
Grant's Patch	1936w	Dundas G.Ms., N.L.			930.25	180.70				3,681.25	1,019.41
	1936w	(Wentworth)								4,642.00	1,689.27
	1962w, etc.	Ora Banda Amalgamated Mines, Ltd.			18,730.00	8,699.86	175.00			48,418.00	24,293.01
	1962w, etc.	Prior to transfer to present holders								12,424.50	9,540.07
	(1953w)	Wentworth South			177.75	19.03				1,179.25	285.97
		Voided leases and sundry claims		.78	610.50	134.14			578.76	7,995.64	3,130.58
Ora Banda	1336w, 1399w, etc.	Associated Northern Ora Banda, N.L.			1,689.50	174.08				1,740.50	82.46
	1336w, 1399w (2116w)	Prior to transfer to present holders								315,958.95	123,252.22
	2117w	Mighty Atom			10.00	13.51				321.50	140.07
	1943w, 1944w, etc.	Missed Chance			135.00	61.41				733.00	447.76
	(1371w), 1944w, 1943w, etc.	Ora Banda United Mines, Ltd.			252.00	14.14				2,182.25	74.80
	(2142w)	Prior to transfer to present holders								76,612.22	14,630.93
		Wotan			22.00	38.72				141.00	218.98
		Voided leases and sundry claims		3.61	1,506.50	287.62			990.02	31,845.10	14,839.00
Paddington	2122w	George & Mary			225.25	36.17				408.40	82.03
	2059w	Lochinvar Gold Mines, Ltd.								223.50	12.15
	2059w	(Paddington North)								52.00	9.50
	2114w	Lone Oak			98.50	73.99		8.58		173.50	163.95
	2105w	Minnie Palmer			946.00	71.19				5,414.00	339.30
	2156w	Miss Catherine		169.06	76.03	64.18			169.06	76.03	64.18
	2170w	Mt. Corlac			61.00	43.68				61.00	43.68
	2060w	Paddington Gift			69.00	13.39				268.25	42.90
		Voided leases and sundry claims		243.93	738.03	318.96		7,271.88	532.33	189,895.11	90,815.35 18.96
Riche's Find	(2147w)	Golden Belle			26.00	8.10				101.50	95.19
	2129w, etc.	Western Mining Corporation, Ltd.			3,748.25	2,244.77	49.79			3,830.75	2,325.40
	2129w	(Three Eighths)								328.75	640.11
		Voided leases and sundry claims		16.64	153.25	118.32			133.75	946.34	1,577.41
Siberia	2164w	Siberia G.M.			58.00	14.31				58.00	14.31
		Voided leases and sundry claims			331.00	183.50		290.13	3,690.69	47,187.76	43,450.16
Smithfield	2139w	Mountain Maid			307.25	98.13				562.21	216.73
		Voided leases and sundry claims		33.90	240.25	85.73			57.69	2,287.34	821.11

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 1938.					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.
<i>From Goldfield generally:—</i>												
Sundry Parcels treated at:												
		Black Flag Cyanide Plant				*307·01					*2,026·40	
		Golden Arrow Cyanide Plant				*127·76					*889·71	
		Minnie Palmer Cyanide Plant				*392·97					*445·81	
		Mitchell's Cyanide Plant				*111·19					*574·68	
		Pearce's Cyanide Plant				*392·99					*964·23	
		Rustand's Cyanide Plant				*235·56					*272·99	
		State Battery, Ora Banda			8·00	*1,494·81				80·05	*12,455·61	
		Various Works							2,275·66	1·24	16,854·02	*38,710·26
		Reported by Banks and Gold Dealers	152·53	·24	9·00	4·69			9,559·28	87·27	57·43	39·04
		Totals	157·06	860·62	42,641·37	19,611·80	224·79		21,510·31	24,013·39	1,100,164·03	622,548·04
												4,008·05

North-East Coolgardie Goldfield.

KANOWNA DISTRICT.

Gindalbie ...	1536x ...	Melton ...			417·50	56·79					417·50	56·79	
		Voided leases and sundry claims			665·25	172·29			698·97	47,448·30	41,777·97	38·31	
Gordon ...	1532x ...	Sirdar ...			492·50	174·83				954·25	304·10		
	1534x ...	Star of Gordon			93·25	74·46				143·00	125·15		
		Voided leases and sundry claims			174·00	14·30			767·26	49,848·48	17,462·06		
Kalpini ...		do. do. do.		2·08	26·75	7·14		24·70	288·40	14,675·25	7,601·62		·07
Kanowna ...	(1535x)	Golden Eagle			9·00	20·88				31·00	55·78		
	1537x ...	John Terence		2·60	41·00	14·38			2·60	41·00	14·38		
	1538x ...	Lady Violet			7·00	4·33				7·00	4·33		
		Voided leases and sundry claims		40·41	387·25	115·08		117·82	6,625·33	705,020·37	390,243·60		2,483·74
Mulgarrie ...		do. do. do.		3·49	18·50	7·60			1,233·41	8,164·01	4,829·38		
Six Mile ...		do. do. do.		10·76	20·75	8·57			1,645·12	927·00	938·13		
<i>From District generally:—</i>													
Sundry Parcels treated at:													
		Carlson's Cyanide Plant				*175·16						*2,012·67	
		Fox's Cyanide Plant				*178·98						*191·69	
		Job's Cyanide Plant				*163·29						*732·10	
		Leslie's Cyanide Plant				*49·53						*49·53	
		Various Works						330·42	867·52	158,919·05	*149,406·03		
		Reported by Banks and Gold Dealers	182·32					105,408·93	34·55	·50	96·25		
		Totals	182·32	59·34	2,352·75	1,240·61			105,881·87	12,163·16	986,596·71	615,901·56	2,522·12

KURNALPI DISTRICT.

Jubilee ...	(444k)	Evelyn Gladys ...	39.50	12.25	...	...	...	301.25	56.65	...
		Voided leases and sundry claims	153.50	39.33	...	25.57	158.65	2,958.25	1,898.11	...		
Kurnalpi ...	(447k)	Easter Gift ...	37.62	...	...	...	37.62	...	...	...
	451k	Rainbow ...	50.50	23.44	...	...	...	50.50	23.44	...
		Voided leases and sundry claims	403.75	31.17	...	674.54	3,586.04	8,016.87	5,798.64	6.27		
Mulgabbie ...	450k	Embill ...	158.17	19.00	14.69	...	158.17	19.00	14.69	...		
	448k	Golden Gleam ...	...	10.10	195.55	...	...	10.10	195.55	...
	449k	V.R.C. ...	...	59.00	8.87	...	...	59.00	8.87	...
		Voided leases and sundry claims	381.74	303.75	441.86	...	6.50	3,449.14	757.60	9,320.62	4.95	
<i>From District generally :-</i>												
Sundry Parcels treated at:												
		Success Battery ...	...	...	...	...	...	45.00	192.66	...
		Various Works ...	...	...	...	...	...	56.50	193.15	...
		Reported by Banks and Gold Dealers	36.61	...	...	11,930.90	67.08	...	2.35	...
Totals			36.61	577.53	1,039.10	767.16	...	12,637.51	7,456.70	12,274.07	17,704.73	11.22

East Coolgardie Goldfield.

EAST COOLGARDIE DISTRICT.

Binduli ...	(5802E)	Belle of Kalgoorlie ...	46.00	3.17	...	...	...	257.75	25.78	...
		Voided leases and sundry claims	1.13	272.50	95.18	...	13.01	3,963.12	1,514.36	...	
Boorara ...	5486E	Olympian ...	59.75	33.78	...	...	...	475.75	408.33	...
		Voided leases and sundry claims	15.88	115.25	27.65	...	49	548.72	309,127.64	173,085.13	408.36
Boulder ...	5862E	Albert Adventure ...	595.25	121.87	...	...	...	595.25	121.87	...
	5630E	Argennum ...	...	...	...	...	...	97.25	21.08	...
	5540E, etc.	B.A.N.Z. Mines, Ltd.	...	...	...	...	...	148.25	52.69	...
	5465E	Birthday Gift ...	120.50	20.65	...	...	...	4,661.14	1,282.16	...
	5690E, (66E)	Boulder Perseverance, Ltd.	111,824.15	40,957.57	12,295.99	...	...	1,124,466.80	569,128.39	150,547.17
	(66E)	Prior to transfer to present holders	...	...	...	...	...	3,306,942.88	1,841,159.00	203,821.43
	5556E	Brown Hill Extended ...	229.75	17.90	...	...	...	371.25	43.84	...
	5759E	Forty-five East ...	186.25	94.45	...	...	...	586.25	252.08	...
	5472E	Golden Key ...	2.22	92.25	32.00	...	18.27	19.03	261.50	114.64	
	(5856E)	Golden Mile ...	...	41.50	3.40	...	...	...	41.50	3.40
	5521E, etc.	Golden Mile Block 45, N.L.	...	24.25	6.96	...	...	...	646.00	152.84
	(5586E)	Golden Mile Croesus ...	...	68.75	69.57	...	...	...	107.75	81.05
	5692E, etc.	Gold Mines of Kalgoorlie, Ltd.	102,615.25	36,059.01	14,543.38	...	...	161,534.11	71,637.41	21,090.72
		Prior to transfer to present holders	...	...	...	...	543.23	527,790.53	568,643.05	4,844.50
	5696E-9E, etc.	Great Boulder Proprietary G.M., Ltd.	276,430.47	97,232.35	33,828.22	...	...	5,432,672.83	4,117,654.41	544,092.09
	5845E	Happy Returns ...	135.00	42.44	...	...	...	135.00	42.44	...
	5345E, etc.	Kalgoorlie Enterprise Mines, Ltd.	39,593.72	12,592.23	809.72	...	...	47,513.36	15,561.73	940.02
		Prior to transfer to present holders	...	...	...	...	...	15,320.68	8,957.01	...
	5708E, (15E), etc.	Lake View and Star, Limited	566,749.00	172,702.98	6,959.47	...	...	3,744,654.55	1,408,497.76	90,488.86
		Prior to transfer to present holders	...	...	...	...	8.49	15,791,843.88	9,149,047.13	1,348,055.82
	5159E	Lake View South (G.M.K.), Ltd.	8,888.00	3,110.84	...	...	...	14,483.88	6,473.20	...
	5513E, etc.	Lake View South Extended, N.L.	...	...	...	...	...	656.50	176.67	...
	5700E, (22E), etc.	North Kalgurli (1912), Ltd.	135,135.16	52,339.60	18,917.40	...	40.70	814,059.26	311,565.25	42,107.44	
		Prior to transfer to present holders	...	...	...	...	43.99	4,018,436.01	2,815,911.21	97,625.03
	5434E	North Kalgoorlie Central Gold, N.L.	132.00	32.23	...	...	...	1,975.25	477.23	...
		Prior to transfer to present holders	...	...	...	...	...	675.05	158.46	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

EAST COOLGARDIE GOLDFIELD—continued.

EAST COOLGARDIE DISTRICT—continued.

MINING CENTRI.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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.
	5429E, etc. ...	North Kalgurli United Mines, Ltd. ...	...	...	2,911·00	607·21	322·93	...	...	4,651·76	926·62	232·93
		Prior to transfer to present holders	...	...	...	...	...	...	...	131·74	76·74	...
	5539E ...	Oroya East ...	...	...	250·00	31·91	...	...	...	309·25	36·45	...
	5854E ...	Paringa Junction North ...	...	...	35·00	8·13	...	...	...	35·00	8·13	...
	5855E ...	Paringa Junction South ...	...	...	96·25	23·21	...	...	...	107·00	26·41	...
	5456E, 5782E, etc.	Paringa Mining & Exploration Co., Ltd.	...	...	40,939·00	9,804·04	453·86	...	...	63,701·06	19,800·46	453·86
		Prior to transfer to present holders	...	...	...	...	...	...	...	48,675·71	22,439·99	...
	5808E, 5873E, etc.	South Kalgurli Consolidated, Ltd. ...	...	...	87,947·00	25,194·52	...	...	...	1,884,056·25	811,070·70	15,071·52
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,344,254·70	531,792·77	17,722·97
	5466E ...	South Star ...	...	...	277·43	187·24	...	...	...	393·18	244·79	...
		Prior to transfer to present holders	...	...	...	...	...	...	5·22	1,835·75	748·78	...
	(5552E) ...	Trafalgar ...	...	...	44·00	13·01	...	...	...	56·00	15·41	...
		Voided leases and sundry claims	...	...	494·75	104·74	...	134·48	12,199·55	631,014·08	476,417·91	6·83
Cutter's Luck ...		Sundry claims ...	...	...	52·75	12·21	...	...	114·90	650·15	235·25	...
Feysville ...		Voided leases and sundry claims	...	...	52·00	1·65	...	...	260·35	1,421·06	945·59	...
Hampton Plains ...	P.P.L. 9 ...	Celebration G.M. Co., N.L. ...	...	...	...	113·88	...	...	...	61,399·75	15,206·00	...
	P.P.L. 86 ...	Golden Hope, N.L. ...	...	...	645·00	282·14	...	...	...	5,964·00	2,006·14	...
	P.P.L. 1 ...	Consolidated Gold Areas ...	...	...	...	...	...	...	...	30,012·53	12,541·79	...
	P.P.L. 252 ...	Mount Martin ...	...	...	99·00	44·25	...	...	...	14,355·00	5,516·72	...
	P.P.L. 279 ...	Mutooroo ...	...	...	2,246·00	256·44	...	...	...	5,222·00	858·98	...
	P.P.L. 277 ...	New Hope ...	...	...	7,935·00	1,371·11	...	...	...	31,792·25	6,775·27	...
		Voided leases and sundry claims	...	...	6,900·50	703·39	...	4,568·30	228·19	90,469·85	28,308·27	69·60
Kalgoorlie ...	5455E ...	Argument ...	...	...	360·75	157·90	...	...	24·91	2,051·47	758·28	...
	5735E ...	Bonnie Lass ...	...	...	32·00	9·24	...	...	...	167·00	47·53	...
	5449E, 5739E, 5460E, etc.	Broken Hill Proprietary Co., Ltd. ...	...	...	30,224·00	12,616·53	...	...	...	115,038·76	48,794·31	1,843·28
	5739E, 5460E ...	Prior to transfer to present holders	...	...	...	...	...	...	...	1,027·75	166·81	...
	5531E ...	Cassidy's Hill ...	...	...	...	...	...	...	79	243·50	135·04	...
	5565E, 5564E, etc.	Charity leases ...	...	...	...	...	...	...	33	127·75	26·23	...
	5665E ...	(Jolly Bill) ...	...	...	...	...	...	...	...	35·50	3·64	...
	5839E ...	Coronation ...	...	...	16·25	2·60	...	...	...	16·25	2·60	...
	5510E ...	Golden Dream ...	...	...	...	...	...	...	...	361·74	103·34	...
	5737E ...	Golden Mile Channel ...	...	...	369·50	32·13	...	...	97	1,797·75	138·11	...
	5512E ...	Golden Mile North ...	...	...	94·25	17·04	...	...	...	487·00	96·82	...
	5519E ...	Hannans Enterprise ...	...	...	...	...	...	...	...	362·00	79·80	...
	4547E, etc. ...	Hannans Hill Amalgamated, Ltd. ...	...	...	71·00	12·47	...	...	...	766·75	211·31	...

	4547E, etc.	Prior to transfer to present holders	...	...	...	...	...	...	5.72	47,525.85	13,719.48	...
	5859E	Hidden Secret	...	...	101.00	17.65	...	...	...	101.00	17.65	...
	5625E	Kapai	...	...	39.00	9.85	...	...	...	320.00	75.60	...
	5549E	Maritana Hill	...	...	...	...	...	...	...	381.50	42.12	...
	5437E	North End Extended	...	103.73	28.50	19.92	...	...	415.96	180.05	269.34	...
	5852E	Pedestal	...	...	225.50	90.19	...	...	...	298.50	135.27	...
	5468E	Phar Lap	...	...	16.00	17.86	...	...	...	318.50	271.59	...
	5415E, etc.	Return	...	...	564.25	83.70	...	...	5.64	2,854.50	420.56	...
	5716E	Two Bs	...	...	260.00	77.79	...	...	...	381.02	125.43	...
		Voided leases and sundry claims	...	60	587.25	78.67	...	474.89	10,355.88	1,015,379.12	418,415.31	44,017.12	
Wombola	5740E	Big Bull	...	...	112.75	137.36	...	...	...	233.83	870.19	...
	5688E	Caledonian	...	...	401.25	226.97	...	...	...	778.00	534.01	...
	5798E	Capitol	...	...	381.75	160.70	...	...	...	599.50	270.63	...
	5497E	Daisy	...	...	401.50	278.10	...	...	...	1,066.25	1,803.35	...
	5689E	Haoma	...	...	292.25	335.71	...	...	...	1,207.00	1,142.71	...
	5500E	Happy-go-lucky	...	...	175.00	75.85	...	...	...	637.75	573.60	...
	5863E	Inverness	...	...	129.00	37.72	...	...	...	129.00	37.72	...
	5865E	Lady Dorothea	...	...	95.50	24.51	...	...	...	95.50	24.51	...
	5616E	Leslie	...	...	44.75	80.34	...	...	...	564.50	885.10	...
	5829E	Lurgan	...	...	104.00	21.55	...	...	...	341.75	95.45	...
	5741E	Maria	...	...	182.00	66.92	...	...	...	376.75	114.74	...
	5493E	Milano	...	...	600.25	2,472.67	...	...	...	2,038.25	5,903.24	...
	5734E	M.L.S.	...	...	204.50	91.77	...	...	...	1,201.00	672.03	...
	5850E	Pauline	...	...	52.75	94.71	...	...	...	63.25	137.95	...
	4766E	Pericles G.M., Ltd.	...	...	96.50	36.44	...	...	358.11	4,336.03	19,169.29	...
	5795E	Transvaal	...	...	22.25	1.85	...	...	...	90.00	48.73	...
	5796E	Twenty Grand	...	...	192.50	143.78	...	...	...	483.00	354.47	...
	5525E	Xmas Flat	...	...	23.75	16.33	...	...	...	330.25	264.74	...
		Voided leases and sundry claims	...	2.97	2,808.00	790.11	...	...	2,258.83	27,472.76	25,648.78	...
	<i>From District generally:—</i>												
		Sundry claims	...	...	...	...	...	11,014.57	465.61	5,440.46	2,541.10	...
		Sundry Parcels treated at:	...	...	...	...	...	...	...	...	...	...
		Golden Horseshoe (New), Limited	...	...	...	*25,373.14	11,220.31	...	...	...	*148,431.32	74,361.89
		Gold Recovery Syndicate, Ltd.	...	...	...	*1,067.68	...	...	...	...	*4,834.52	...
		Lakeside Re-treatment Works	...	...	...	*169.25	173.38	...	...	...	*1,425.78	1,450.48
		Mt. Monger Cyanide Plant	...	...	14.00	*360.58	...	...	...	14.00	*622.02	...
		New Kalgoorlie Cyanide Plant	...	...	...	*300.40	...	...	...	375.50	*1,583.16	2.00
		Polkinghorne's Cyanide Plant	...	...	...	*72.25	...	...	...	...	*147.72	...
		Kalgoorlie State Battery	...	...	53.00	*2,106.65	...	...	...	61.75	*12,683.04	...
		Various Works	...	...	...	7.57	...	384.36	64.70	40,673.27	*255,792.33	12,604.81
		Reported by Banks and Gold Dealers	...	283.89	10.56	39.00	66.92	15,772.84	9,207.57	142.50	975.45	...	
		Totals	...	283.89	137.09	1,433,695.93	502,216.28	99,434.66	32,412.19	37,148.41	40,823,984.15	23,969,892.62	2,671,858.73

BULONG DISTRICT.

Balagundi	...	Voided leases and sundry claims	...	...	...	...	...	3.51	2,679.52	1,755.69	1,927.96	12.92
Bulong	1306y	Lady Gwen	...	...	6.25	11.92	...	...	...	6.25	11.92	...
	1308y	Southern Cross	...	...	77.75	15.58	...	...	...	77.75	15.58	...
		Voided leases and sundry claims	...	21.34	911.05	178.80	...	1,763.40	10,013.84	115,737.78	101,903.58	...
Majestic	...	do. do. do.	...	...	63.00	17.08	...	62.33	214.58	3,101.74	1,564.50	...
Morelands	...	Sundry claims	...	...	...	...	...	...	.13	159.00	53.31	...

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

EAST COOLGARDIE GOLDFIELD—continued.

BULONG DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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. Monger	...	Voided leases and sundry claims	...	...	...	...	...	215.60	2,771.39	1,816.90	1,564.58	...
Randalls	...	do. do. do.	...	...	114.75	24.88	...	20.70	64.20	35,046.10	11,467.01	...
Taurus	...	do. do. do.	...	...	632.75	92.10	...	114.75	55.58	3,509.85	1,780.35	...
Trans Find	P.P.L. 308	Dawn of Hope	...	...	105.00	37.67	...	...	2.87	426.00	201.63	...
		Voided leases and sundry claims	...	...	...	...	...	...	5.93	1,660.92	1,173.22	...
		<i>From District generally:—</i>										
		Sundry Parcels treated at:										
		Davis Cyanide Plant	...	...	...	*198.98	...	...	...	...	*302.98	...
		Various Works	...	...	...	...	...	...	...	6,102.15	6,330.23	...
		Reported by Banks and Gold Dealers	...	...	...	...	...	25,101.11	63.38	.01	4.01	...
		Totals	...	...	...	...	...	27,281.40	15,871.42	169,400.14	128,800.86	12.92

Coolgardie Goldfield.

COOLGARDIE DISTRICT.

Bonnieva e	5596	Jenny Wren	...	90.39	52.00	174.58	...	...	90.39	52.00	174.58	...
	5522	Lucky Hit	...	...	390.00	122.28	...	...	...	998.50	381.62	...
	4600	Melva Maie	...	...	...	...	...	...	...	1,306.00	2,842.35	...
	4600	(Kunanalling Gold, N.L.)	...	...	...	...	...	...	...	614.50	1,099.21	11.63
	5321	Westralia Extended	...	...	76.00	6.76	...	...	...	141.50	27.18	...
		Voided leases and sundry claims	...	...	369.50	114.00	...	...	178.28	356,576.27	192,540.99	...
Bullabulling	...	do. do. do.	...	...	132.50	54.78	...	5.21	15.98	2,063.07	1,215.38	...
Burbanks	5417	Bernard Frank	...	...	...	...	...	...	...	13.00	1.75	...
	5545	Boshter	...	...	341.50	262.02	...	...	...	534.50	369.43	...
	(5433)	Burbanks Deeps	...	...	22.00	16.02	...	...	...	85.00	55.66	...
	5605	Burbanks Deeps	...	...	16.00	6.82	...	...	...	16.00	6.82	...
	(5592)	Cheapside	...	...	48.00	7.13	...	...	...	48.00	7.13	...
	(5588)	Commonwealth	...	...	35.00	19.93	...	...	...	45.00	29.68	...
	(5320)	Golden Arch	...	...	20.00	5.15	...	10.15	...	516.35	159.73	...
	5473	Grosmont	...	...	363.00	99.93	...	...	...	1,403.00	359.04	...
	(5382)	Ivan	...	...	27.00	12.99	...	...	...	175.00	220.92	...
	5263	Lord Bobs	...	...	72.00	27.73	...	...	8.59	1,383.00	606.50	...

	5432	...	Main Stay	...	...	...	1-54	1-10	262-00	103-25	...	
	5443	...	New Gift	...	...	110-50	28-70	...	378-50	135-28	...	
	(5503)	...	Royal Standard	...	...	374-00	87-13	...	1,142-50	256-59	...	
	5250	...	Vice Regal	...	...	656-00	189-52	...	1-91	2,365-00	859-70	
	5454	...	Westraad	...	...	28-00	7-24	...	...	28-00	7-24	
		...	Voided leases and sundry claims	...	11-30	610-00	169-23	...	64-78	793-60	421,048-71	310,086-02	521-06
Cave Rocks	5553	...	Blue Spec	...	...	345-00	55-18	...	...	826-75	126-03	...
	(5591)	...	Gold Spec	...	...	182-00	40-01	...	...	182-00	40-01	...
	5604	...	Squeaker	...	...	127-55	56-34	...	...	127-55	56-34	...
		...	Voided leases and sundry claims	...	...	302-50	85-15	...	49-33	2,719-00	592-26	...
Coolgardie	5557	...	Caledonia	...	...	140-00	55-13	...	...	405-00	157-47	...
	5297, etc.	...	Consolidated Gold Mines of Coolgardie, Ltd.	...	...	...	...	...	...	75-00	22-92	...
		...	Prior to transfer to present holders	...	...	...	...	...	4-55	1,946-35	547-45	3-22
	5597	...	Evening Star	...	25-12	...	...	...	25-12	...	...	...
	5585	...	Gleasons	...	...	185-00	63-41	...	...	230-00	81-62	...
	5218	...	Great Western	...	...	...	...	...	...	99-30	613-20	...
	5577	...	Iron Duke	...	...	51-50	67-41	...	...	93-50	190-53	...
	5598	...	King Solomon	...	...	30-00	2-32	...	...	30-00	2-32	...
	(5571)	...	Lady Grace	...	...	94-00	56-68	...	...	358-00	151-12	...
	5590	...	Lady Grace	...	...	224-00	86-30	...	...	224-00	86-30	...
	5277	...	Lady Theresa	...	...	...	...	...	...	216-00	205-11	...
	5384	...	Lindsay's Gold Mine	...	10-40	42-50	43-43	...	10-40	158-50	89-25	...	
	5606	...	Lucky Star	...	...	92-50	20-43	...	...	92-50	20-43	...
	(5579)	...	Manolive	...	...	19-00	18-11	...	...	32-50	119-94	...
	5269	...	Master Key G.M.	...	...	112-50	13-75	...	...	476-00	65-39	...
	5595	...	Morning Star	...	47-67	51-00	26-84	...	47-67	51-00	26-84	...	
	(5578)	...	Once More	...	...	56-00	6-83	...	...	86-00	9-85	...
	5239, etc.	...	Phoenix Gold Mines, Ltd.	...	...	513-50	101-41	2-54	...	513-50	101-41	2-54
	5239, etc.	...	Prior to transfer to present holders	...	...	...	...	...	2-74	167-56	237-80	...
	5225	...	Queen Extended	...	...	...	...	...	63-83	714-15	297-76	...
	5407	...	Rose Hill United	...	...	193-00	31-94	...	...	363-50	61-81	...
	5573	...	Teri-Bus	...	...	108-00	14-35	...	...	314-50	29-25	...
	5531	...	Wallaby	...	...	13-00	3-49	...	...	13-00	3-49	...
		...	Voided leases and sundry claims	...	2-48	1,536-75	396-66	...	1,498-20	6,892-73	621,352-01	345,610-03	-96
Eundynie	(5509)	...	Brilliant	...	...	25-00	4-77	...	...	242-50	62-44	...
	5589	...	Brilliant Gold Mine	...	...	13-00	36-41	...	...	138-60	36-41	...
	5287	...	Eundynie	...	4-30	110-60	72-00	...	92	16-09	1,379-25	1,269-16	...
		...	Voided leases and sundry claims	10-18	30,470-64	15,287-65	1-75
Gibraltar	5217	...	Lloyd George	271-00	138-96	14-69	3,173-88	2,461-72	...
		...	Voided leases and sundry claims	64-00	17-18	66-04	34,433-95	17,579-02	...
Gnarlbine	(5574)	...	Phaeton	...	...	611-00	193-70	...	...	704-50	226-12	...
		...	Voided leases and sundry claims	13-50	4-05	18-85	2,777-35	1,536-48	...
Hampton Plains	P.P.L. 119	...	Golden Eagle	198-00	90-09	7-63	1,453-09	1,877-83	...
		...	Voided leases and sundry claims	...	60	306-00	131-45	526-12	9,591-50	8,187-77	...
Higginsville	5444	...	Daughter of Erin	...	...	...	*108-62	...	...	1,382-25	1,667-08	...
	5496	...	Sons of Erin	...	...	...	...	...	...	881-00	147-22	...
	5293, etc.	...	Two Boys	...	...	548-00	389-43	...	...	5,583-00	2,954-01	...
		...	Voided leases and sundry claims	...	26-57	118-75	67-37	354-65	38,181-18	16,675-96	134-79
Larkinville	5236	...	Ground Lark	63-00	21-47	3-87	1,769-91	2,996-6	...
		...	Voided leases and sundry claims	...	27-85	29-00	181-88	...	22-77	88-57	226-25	424-54	...

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 1938.					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.
Logan's Find	5561 ...	Frankson ...	...	...	76·00	10·65	...	...	...	422·00	54·90	...
	5324, etc. ...	Spargo's Reward G.M. (1935), N.L. ...	...	...	21,520·00	2,296·46	...	...	...	24,555·00	2,757·21	...
		Voided leases and sundry claims	...	...	56·00	18·58	...	...	9·41	1,766·21	978·57	...
Londonderry	5402 ...	Christmas Box ...	...	...	428·00	245·84	...	...	1·37	2,397·50	2,194·83	...
	(5575) ...	Iron Ridge ...	...	...	18·00	15·97	...	...	...	18·00	15·97	...
	5584 ...	Londonderry ...	...	45·51	...	...	...	45·51	...	...	...	...
		Voided leases and sundry claims	...	31·75	23·00	23·60	...	...	84·97	30,038·52	20,741·38	...
Mungari	...	do. do. do.	...	...	78·75	15·45	...	1·77	125·53	1,550·26	652·82	...
Paris	5311, 5500, 5530	Listers G.M. ...	...	...	1,120·00	740·47	...	...	...	3,872·00	2,203·88	...
	5500 ...	(Paris Central) ...	...	...	...	...	...	...	...	113·00	24·16	...
	5530 ...	(Paris Extended) ...	...	...	66·00	25·04	...	...	...	463·00	209·47	...
	5514 ...	Paris ...	...	...	186·00	91·95	...	...	...	283·00	129·54	...
		Voided leases and sundry claims	...	...	...	...	...	...	4·30	1,993·25	493·31	...
Red Hill	5602 ...	Butterfly ...	14·87	10·33	...	...	...	14·87	10·33	...	...	...
		Voided leases and sundry claims	...	...	...	39·30	...	15·29	1,631·59	42,059·17	31,760·18	...
Ryan's Find	...	do. do. do.	...	...	...	...	...	...	44	155·85	380·35	...
St. Ives	5593 ...	Catherine ...	...	37·13	34·90	50·62	...	...	37·13	34·90	50·62	...
	5195, etc. ...	Clifton leases ...	...	...	594·00	288·57	...	...	...	3,056·25	1,252·18	...
	5195, etc. ...	Prior to transfer to present holders	...	...	...	...	...	...	...	7,244·40	3,565·36	...
	(5406) ...	Idough ...	...	13·69	6·00	20·71	...	7·27	57·29	844·75	223·11	...
	4720, etc. ...	Ives Reward Gold Mines, N.L. ...	...	...	199·00	41·05	...	...	...	19,710·66	6,120·23	...
	4720, etc. ...	(Lake View Reward leases)	...	...	...	...	...	...	...	883·25	544·64	...
	Voided leases and sundry claims	...	...	5·50	4·36	...	265·88	992·69	9,364·81	5,050·64	...	
Wannaway	...	do. do. do.	...	...	308·75	107·30	...	...	186·20	2,636·77	2,052·52	...
Widgiemooltha	5332 ...	Banquet ...	...	...	102·25	86·97	...	...	20·74	365·00	289·92	...
	5576 ...	Cardiff Castle ...	...	...	153·00	27·77	...	...	...	212·00	33·05	...
	5451 ...	Host Group ...	...	...	124·00	17·88	...	...	...	179·00	30·36	...
	(5319) ...	Imperial ...	...	2·01	50·00	13·34	...	...	2·01	2,546·50	479·05	...
		Voided leases and sundry claims	...	5·53	472·50	179·62	...	4·02	1,454·02	23,934·56	14,157·70	17
From District generally :—												
Sundry Parcels treated at:												
Australian Machinery and Investment Company's												
Cyanide Plant ...						*625·20					*1,183·38	86·31
Coolgardie State Battery ...						*1,172·79				771·01	*26,00·07	9·65

Collins (Burbanks) Cyanide Plant	...	...	...	*182.46	...	...	...	...	*202.23	...
Collins (Coolgardie) Cyanide Plant	...	...	...	*562.68	...	...	...	...	*1,576.19	...
C. B. Frank Cyanide Plant	...	...	...	*127.60	...	...	...	...	*269.09	...
H. A. Frank Cyanide Plant	...	...	...	*269.46	...	...	...	...	*626.54	...
Imperial Cyanide Plant	...	...	...	*5.15	...	...	...	26.00	*334.50	...
James Cyanide Plant	...	...	...	*124.50	...	...	...	...	*247.68	...
Parry Cyanide Plant	...	...	...	*269.96	...	...	...	...	*764.43	...
Saltbush Cyanide Plant	...	...	...	...	...	...	...	...	*77.64	...
Terrell Cyanide Plant	...	...	...	*109.20	...	...	...	...	*109.20	...
Widgiemooltha Cyanide Plant	...	...	...	*186.92	...	...	...	...	*698.17	...
Various Works	...	...	...	...	...	7.75	...	3,871.61	*21,078.43	223.06
Reported by Banks and Gold Dealers	234.68	2.23	...	...	...	14,020.35	697.51	38.25	53.76	...
Totals	249.55	394.86	36,279.20	12,112.16	2.54	15,980.62	14,664.69	1,740,877.30	1,084,639.11	995.14

KUNANALLING DISTRICT.

Carbine	(33s) 970s	Carbine	...	60.00	81.59	...	...	9,097.00	4,845.93	...
	(33s) 974s, etc.	(Carbine leases)	...	...	...	...	687.98	51,991.86	39,862.25	...
	917s	Homeward Bound G.Ms., N.L.	...	5,275.00	323.12	...	...	5,275.00	323.12	...
	917s	(Homeward Bound)	...	...	...	...	...	1,775.50	279.75	...
	(986s)	Providence	...	55.00	11.04	...	...	55.00	11.04	...
	978s	Wotan	...	26.00	50.37	...	...	77.00	102.72	...
		Voided leases and sundry claims	4.30	675.00	229.77	...	136.08	93.96	10,251.43	5,211.76		
Chadwin	(958s)	Argosy	...	10.50	7.72	...	...	456.75	564.06	...
	998s	Drabbco	...	103.50	69.57	...	...	103.50	69.57	...
	999s	Magdala	...	101.60	73.97	...	...	101.60	73.97	...
		Voided leases and sundry claims	7.97	15.57	213.55	183.34	14.28	53.82	4,262.85	4,525.99		
Dunnsville	992s	Expectation	...	10.50	69.91	...	...	10.50	69.91	...
	997s	Min Min Light	170.94	...	1.30	...	170.94	...	1.30	...		
		Voided leases and sundry claims	29.72	284.70	177.81	...	2.82	1,554.47	19,167.66	9,871.42		
Jourdie Hills	...	do. do. do.	12.29	97.50	25.02	...	1.86	67.81	29,582.49	20,174.05		
Kintore	961s, etc.	Goldfields Australian Development	...	3,754.50	3,536.42	486.18	...	3,754.50	3,536.42	486.18		
	950s	Hands Across the Sea North	...	8.50	7.20	...	...	8.50	7.20	...
	902s	New Haven	...	780.00	314.69	...	...	1,791.25	687.64	...
	(979s)	Newminister	...	116.00	20.73	...	...	315.00	126.24	...
		Voided leases and sundry claims	2.62	81.50	63.71	...	118.57	257.83	46,987.52	33,874.41		
Kunanalling	919s	Eureka	...	449.00	375.67	...	...	449.00	375.67	...
	919s, 987s	Prior to transfer to present holder	...	886.00	660.14	...	...	7,172.50	6,291.18	12.78
	913s	Golden Bounty Syndicate, Ltd.	...	175.00	175.36	...	...	175.00	175.36	...
	913s	Prior to transfer to present holders	...	...	...	...	...	2,946.19	1,730.36	8.86
	914s	Kioro	...	8.00	67.84	...	...	5,144.00	1,821.47	...
	(984s)	Last Chance	1.44	8.50	27.97	...	1.44	21.50	70.17	...		
	977s	Peter Pan	4.66	17.00	27.03	...	4.66	125.00	218.18	...		
	987s	Premier	...	552.00	146.81	...	...	552.00	146.81	...
	(945s)	Sydney Mint	...	44.00	15.34	...	...	13.51	1,463.50	292.96
		Voided leases and sundry claims	2.23	287.00	154.55	...	300.52	2,480.33	117,533.54	93,811.26		
Kundana	...	Voided leases and sundry claims	...	266.75	24.89	...	...	770.25	162.75	...
		From District generally:—	...	...	...	...	42.23	1,782.26	*5,061.33	...
		Sundry Parcels treated at Various Works	...	...	...	...	754.40	16.89	2.38	...
		Reported by Banks and Gold Dealers	29.16	...	...	...	...	...	...	...
Totals			37.13	243.77	14,346.60	6,922.88	486.18	1,370.76	1,403.64	323,219.65	2,4318.63	557.61

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

Yilgarn Goldfield.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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.	
Blackborne's	...	Voided leases and sundry claims	...	...	14.00	2.02	...	...	...	1,623.00	415.96	...
Bullfinch	3345	Copperhead	...	...	2,000.00	483.38	...	...	...	6,799.32	1,937.11	...
	3378	Copperhead Deeps	...	...	2,774.00	605.06	...	...	...	11,122.65	3,640.41	...
	3337, 3458	Easter Gift leases	...	...	344.00	78.25	...	...	...	1,366.00	419.75	...
		Prior to transfer to present holders	...	...	...	...	...	...	48.03	3,594.26	1,169.82	...
	3400	Frances May	...	...	602.50	154.77	...	...	7.74	7,950.55	3,201.39	...
	3397	Goldfinch	...	...	755.50	177.12	...	...	6.73	5,078.03	2,337.27	...
	3753	Lady Agnes	...	...	70.00	21.35	...	...	...	306.00	150.68	...
	3825	Mistletoe	...	...	1,202.00	834.63	...	...	...	1,798.00	1,182.16	...
	3865	Peter Pan	...	...	172.00	204.20	...	...	...	172.00	204.20	...
	10PP	Reynold's Find	...	...	664.00	174.91	...	...	...	1,200.25	476.22	...
	3350	Rising Sun	...	...	3,754.50	1,433.81	...	...	2.30	10,597.53	6,060.46	...
		Voided leases and sundry claims	...	99	549.50	246.37	8.47	36.18	488,558.2	183,573.54	27,833.41
Corinthian	34PP	Badaglio	...	...	139.00	158.40	...	...	...	289.00	392.02	...
	3398	Corinthian	...	...	238.00	135.70	...	...	...	6,893.75	2,390.82	...
	3425	Corinthian North	...	...	630.00	238.72	...	...	...	3,077.00	1,374.41	...
	3415	Deliverence	...	...	256.30	280.51	...	...	...	1,208.40	1,883.20	...
	35PP	Little Baby	...	...	22.00	15.03	...	...	...	22.00	15.03	...
		Voided leases and sundry claims	...	...	...	...	...	...	68	135,492.85	29,862.82	...
Eenuin	3871	Eenuin Daisy	...	...	36.00	26.69	...	...	...	58.00	44.21	...
	(3787)	Morning Glory	...	...	30.00	20.66	...	...	...	82.00	137.63	...
	3936	Newfield Central	...	...	87.00	94.93	...	...	...	87.00	94.93	...
		Voided leases and sundry claims	...	...	88.50	72.19	...	...	9.39	1,891.16	1,737.78	...
Evanston	3895	Blue Peter	...	...	613.00	147.19	...	...	...	1,288.00	283.53	...
	3868	Evanston	...	...	1,125.30	764.61	...	...	...	1,125.30	764.61	...
	3870	Evanston East	...	...	34.00	13.59	...	...	...	34.00	13.59	...
	3869	Evanston North	...	...	442.95	510.25	...	...	...	442.95	510.25	...
	3890	Everett	...	...	274.00	116.68	...	...	...	274.00	116.68	...
	3888	Goldies	...	...	200.00	43.15	...	...	...	200.00	43.15	...
	3912	Harbour Lights	...	...	337.00	80.38	...	...	...	337.00	80.38	...
		Sundry claims	...	...	287.00	64.14	...	...	...	287.00	64.14	...
Forrestonia	...	Voided leases and sundry claims	...	...	45.00	26.83	...	...	...	1,557.00	439.93	...
Golden Valley	3575	Great Bingin	...	...	871.00	532.30	...	...	...	871.00	532.30	...
	3573	Marie's Find	...	...	742.00	353.15	...	...	...	742.00	353.15	...
	(3768)	North Radio No. 1	...	...	11.50	12.40	...	...	...	168.50	301.22	...
	3822	Queen Marie	...	...	...	...	...	...	...	77.00	72.01	...
	3266, 3347	Radio leases	...	...	818.00	832.16	...	...	2.70	12,638.30	33,298.50	7.43
	3248, etc.	Radio Deeps leases	...	...	827.00	348.23	...	...	...	4,846.58	5,952.12	...
		Voided leases and sundry claims	128.50	66.50	4.58	81.53	15,323.61	14,143.93	2.00

Greenmount	...	do.	do.	do.	...	...	201.00	42.75	...	46.45	25.89	126,419.72	32,085.77	944.50
Holleton	...	3923	...	Holleton East	...	...	375.00	43.60	...	...	...	375.00	43.60	...
	...	3312, 3458	...	North End leases	...	...	...	...	...	...	13.08	38,210.50	11,660.54	...
	...		...	Voided leases and sundry claims	...	...	56.00	22.76	...	...	...	4,655.80	1,646.25	31.79
Hope's Hill	...	3414, 14PP	...	Pilot leases	...	1.08	3,035.00	372.32	...	6.12	108.14	13,100.00	2,214.16	...
	...		...	Voided leases and sundry claims	...	1.01	124.00	22.05	...	...	...	135,624.07	37,513.12	1.00
Kennyville	...	3667	...	Battler Gold Mine	...	...	1,526.00	348.95	...	...	...	5,004.00	1,247.11	...
	...	3766	...	Golden Arrow	...	...	129.00	25.15	...	...	...	265.00	75.19	...
	...	3432, etc.	...	Leviathan Amalgamated G.Ms., Ltd.	...	...	978.00	529.72	...	...	...	7,449.50	3,150.05	...
	...	3845	...	Rainbow	...	...	358.00	49.30	...	...	...	476.00	66.33	...
	...	3875	...	Victoria	...	...	267.00	51.56	...	...	...	267.00	51.56	...
	...		...	Voided leases and sundry claims	...	...	650.50	101.68	...	...	23.82	41,639.13	17,540.88	59
Koolyanobbing	...	3514	...	Chadwick's Reward	...	...	116.00	44.57	...	...	...	990.05	498.24	...
	...		...	Voided leases and sundry claims	...	...	112.00	31.60	...	26	...	1,196.00	600.57	...
Marvel Loch	...	3918	...	Blanket	...	...	406.00	117.71	...	...	...	406.00	117.71	...
	...	3393	...	Bohemia	...	...	531.00	159.05	...	...	...	3,825.00	1,748.91	...
	...	3675	...	Christmas Gift	...	...	36.00	146.41	...	...	59.31	435.50	762.83	...
	...	13PP	...	Cricket	...	...	164.00	95.59	...	...	...	1,405.00	844.24	...
	...	3925	...	Desert Rose	...	...	32.00	27.47	...	...	...	32.00	27.47	...
	...	3942, 3943	...	Edward's Reward leases	...	...	1,411.50	1,016.58	...	...	...	1,411.50	1,016.58	...
	...	(11PP), 3942	...	(Edward's Reward)	...	...	...	...	...	...	...	2,080.00	2,016.32	...
	...	(12PP), 3943	...	(Sunshine)	...	...	470.00	450.39	...	...	...	3,866.00	2,120.04	...
	...	3899	...	Eveless Eden	...	...	263.00	96.91	...	...	...	308.00	121.63	...
	...	(3512)	...	Evelyn Molly	...	...	1,219.00	319.54	...	...	...	4,610.00	1,096.87	...
	...	(3904)	...	Four Threes	...	...	75.00	95.66	...	...	...	75.00	95.66	...
	...	3917	...	Four Threes	...	...	10.00	83.00	...	...	...	10.00	3.00	...
	...	3724	...	Frances Furniss	...	...	1,434.00	702.33	...	...	...	3,068.00	2,008.30	...
	...	3824	...	Ganymedes	...	...	1,446.00	546.34	...	...	1.24	2,107.00	1,040.13	...
	...	3941	...	Geelong	...	...	20.00	5.99	...	...	...	20.00	5.99	...
	...	3683	...	Golden Cube	...	5.74	63.00	77.88	...	...	18.39	409.00	283.28	...
	...	3707	...	Grand National	...	...	...	...	...	...	...	2,883.00	497.44	...
	...	(3832)	...	Ireland	...	...	25.00	2.48	...	...	...	195.00	21.43	14
	...	3542	...	Jacoletti South	...	...	235.00	26.06	...	...	...	940.00	113.49	...
	...	(3828)	...	Jester	...	...	314.00	46.34	...	...	...	453.00	93.09	...
	...	3718	...	Kurrajong	...	...	1,767.00	978.29	...	...	...	3,380.00	1,845.12	...
	...	3434	...	Lady Gladys	...	...	149.00	39.11	...	...	...	1,800.00	639.39	...
	...	33PP	...	Lady Luck	...	1.32	73.00	65.70	...	...	1.32	207.00	140.38	...
	...	24PP	...	Lady Mary	...	...	50.00	33.01	...	...	...	281.00	167.2	...
	...	3431, 3781	...	Lenodo leases	...	...	1,465.00	281.06	...	...	...	2,650.00	521.33	...
	...	3431	...	(Jacoletti G.M. & Battery Co.)	...	...	...	...	...	...	...	996.00	169.64	...
	...	3781	...	(Jacoletti West)	...	...	...	...	...	...	...	60.00	8.03	...
	...	3928	...	Marco Paolo	...	...	56.00	24.95	...	...	...	56.00	24.95	...
	...	3413	...	Marvel Loch	...	...	956.00	172.35	...	...	...	2,172.00	421.33	...
	...	3423	...	Marvel Loch Gold Development, N.L.	...	...	11,810.10	1,693.23	277.98	...	...	83,616.10	12,247.19	1,239.90
	...	3423, 3430	...	Prior to transfer to present holders	...	...	...	...	...	...	...	1,185.00	215.67	...
	...	3856	...	Marvel Loch North	...	...	448.00	87.82	...	...	...	797.00	135.98	...
	...	3914	...	May	...	...	39.00	27.89	...	...	...	39.00	27.89	...
	...	3837	...	Maydo	...	...	45.00	21.20	...	...	...	116.00	55.79	...
	...	3459	...	May Queen	...	...	943.00	1,376.81	...	...	...	2,278.00	5,424.83	...
	...	(3840)	...	Midas	...	...	31.00	20.43	...	...	...	69.00	70.49	...
	...	3835	...	Mountain King	...	...	379.00	258.76	...	...	...	664.00	446.98	...

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 1938.					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.
Marvel Loch— <i>Continued</i>	3861	Mountain Queen ... ..	...	...	217·00	60·00	...	...	...	357·00	117·85	...
	3866	Mountain Queen Extended ... ..	...	...	25·00	1·77	...	...	...	143·00	16·93	...
	3846	Mountain Queen South ... ..	...	...	412·00	301·37	...	...	...	948·00	668·00	...
	(3491)	New Democrat ... ..	...	4·37	41·00	23·77	...	...	...	206·00	175·89	...
	3515, etc. ...	N.G.M., Ltd. ... ..	...	...	...	...	...	...	...	...	...	...
	3515, etc. ...	Prior to transfer to present holders ... ..	...	...	...	...	...	...	...	2,675·00	459·60	...
	3404, etc. ...	New Yilgarn G.M., N.L. ... ..	...	...	4,024·00	1,980·13	148·09	...	...	4,246·00	2,029·46	148·09
	...	Prior to transfer to present holders ... ..	...	...	...	...	...	...	...	2,302·30	1,309·21	95·53
	3908	North Comet ... ..	...	...	322·00	49·65	...	...	...	322·00	49·65	...
	3468	(Prince George) ... ..	...	...	...	...	...	...	...	1,409·00	117·84	...
	3382	Salvation ... ..	...	...	347·00	183·57	...	...	...	1,801·00	1,320·34	...
	(3816)	Watsonia ... ..	...	...	20·00	4·36	...	...	...	322·00	78·22	...
	...	Voided leases and sundry claims ... ..	...	...	2,428·50	600·63	...	11·35	217·41	508,250·70	154,017·76	773·44
Mt. Jackson	3860	Allen's Find ... ..	...	...	314·00	193·19	...	...	28·22	560·00	334·53	...
	3930	Bulls Eye ... ..	...	...	180·00	24·33	...	...	...	180·00	24·38	...
	(3900)	Coronation ... ..	...	...	214·00	91·04	...	...	...	214·00	91·04	...
	3449	Die Hardy ... ..	...	...	...	...	...	...	...	312·00	248·20	...
	3931	Dolly Pot Hill ... ..	...	...	90·00	87·0	...	...	...	90·60	87·80	...
	(3857)	Golden Reef ... ..	...	...	59·00	50·68	...	...	...	113·00	127·00	...
	3940	Golden Reef ... ..	...	...	18·00	3·30	...	...	...	18·00	3·30	...
	3859	Great Unknown ... ..	...	...	144·00	138·04	...	...	...	348·00	189·53	...
	3889	Lake Barlee ... ..	...	...	8·00	6·57	...	...	...	33·00	14·45	...
	3418	Mt. Jackson G.Ms., N.L. ... ..	...	...	1,851·00	652·71	6·34	...	...	7,184·00	6,275·06	6·34
	3418	(Clamps Central) ... ..	...	...	...	...	...	...	...	40·00	182·57	...
	3929	Mt. King Enterprise ... ..	...	...	215·00	53·41	...	...	...	215·00	53·41	...
	(3804)	North Yilgarn ... ..	...	...	6·00	7·78	...	...	...	618·50	269·24	...
	3893	Trump ... ..	...	...	42·00	35·34	...	...	...	68·00	56·57	...
...	Voided leases and sundry claims ... ..	...	...	620·50	330·55	...	6·44	167·75	49,405·38	33,234·73	2,306·02	
Mt. Palmer	3544, etc. ...	Yellowdine Gold Development, Ltd. ... ..	...	...	47,175·00	30,040·73	...	...	...	123,119·50	82,943·87	...
	3544	Prior to transfer to present holders ... ..	...	...	...	...	...	...	...	1,564·65	2,540·71	...
	...	Voided leases and sundry claims ... ..	...	...	...	...	...	1,643·48	7·50	35·00	343·62	...
Mt. Rankin	3555	No Trumps ... ..	...	...	316·50	82·81	...	...	...	1,217·00	280·72	...
	...	Voided leases and sundry claims ... ..	...	...	...	...	...	3·84	5·20	987·00	239·76	...
Parker's Range	3801	Blue Hills ... ..	...	...	30·00	7·36	...	...	...	95·00	21·45	...
	(3892)	Centaur ... ..	...	...	94·00	27·22	...	...	...	94·00	27·22	...
	3520	Centenary ... ..	...	...	631·00	95·96	...	...	...	972·00	368·90	...
	3411	Constance Una ... ..	...	...	...	...	...	...	...	306·25	489·04	...

	3460	Fortuna	137.00	57.97				941.00	274.96			
	3873	Golden Lighthouse	27.00	21.65				45.00	31.40			
	3872	Golden Venture			8.71		8.71	15.00	18.07			
	(3779)	Janetta	91.00	51.86				215.00	189.77			
	(3909)	Kernel	56.00	13.36				56.00	13.36			
	3671	Mundy Hills 1	249.00	71.56				616.00	157.06			
	3452	Pomeranian	75.00	32.49				1,320.00	762.23			
	2801	Scots Greys						1,677.00	602.00			
	3858	Snowdrop	550.00	263.15				800.00	372.31			
	3702, etc.	Southern Cross Options Co., Ltd.						188.00	38.31			
	3702	(New Hope)						209.00	48.91			
	3815	Spring Hill No. 5	718.00	189.68				1.9.1.00	432.34			
	3813	Spring Hill No. 6	441.00	81.31				2,056.00	454.85	.45		
	3818	Triumph	170.00	48.81				504.00	110.57			
		Voiced leases and sundry claims	1,276.00	234.35	.99	7.01	112.84	45,636.25	24,358.07	.04		
Southern Cross	(3568)	Nil Desperandum	201.00	71.33				577.00	186.90			
	3473	Queen Ann	426.00	51.54				1,531.50	256.84			
	3770, etc.	Southern Cross United Mines, Ltd.	2,466.00	516.42				12,873.50	1,407.21			
	3444, etc.	Yellowdine Options, N.L.	2,360.00	515.57				7,854.25	1,927.11			
	3444	(Three Boys)						398.50	224.35			
		Voiced leases and sundry claims	302.00	62.46		22.97	889.34	441,226.79	214,658.24	364.41		
Westonia	3556	Contemptible	10.00	6.18				83.25	64.92			
	3308, etc.	Edna May (W.A.) Amalgamated G.Ms., N.L.	14,450.00	5,451.13	385.14			18,910.00	6,922.02	447.31		
	3308, etc.	Prior to transfer to present holders						4,092.00	2,867.26			
	3874	Phar Lap	227.00	131.60				227.00	131.60			
		Voiced leases and sundry claims	180.00	95.76	4.56	9.51	69.02	448,065.59	316,447.90	21.78		
<i>From Goldfield generally:—</i>												
Sundry Parcels treated at:												
		Battler Cyanide Plant		*123.72					*355.80			
		Butcher Bird Cyanide Plant		*414.68					*2,332.98			
		Copperhead Cyanide Plant		*2,118.25					*10,999.18			
		Centenary Cyanide Plant		*151.33					*151.33			
		Corinthian Cyanide Plant		*14.06					*14.06			
		Coronation Cyanide Plant		*71.98					*71.98			
		Holleton Cyanide Plant		*194.40					*194.40			
		Howlett's Cyanide Plant		*1,029.56				110.00	*9,276.56			
		Invermay Cyanide Plant		*190.87					*209.78			
		Mt. Jackson Cyanide Plant		*156.32					*929.72			
		North End Cyanide Plant		*817.90					*2,923.34			
		Passmore's Cyanide Plant		*16.46					*385.98			
		Pilot Cyanide Plant		*339.16					*2,950.99			
		Radio Deeps Cyanide Plant		*289.54					*960.59			
		Scots Greys Cyanide Plant		*133.75					*811.78			
		Sunshine Cyanide Plant		*56.52					*321.27			
		Triumph Cyanide Plant		*270.34					*614.63			
		E. C. Wesley Cyanide Plant		*163.13					*163.13			
		L. C. Wesley Cyanide Plant		*206.92					*313.85			
		Variois Works						156.78	*49,137.57	36.54		
		Reported by Banks and Gold Dealers	14.71	3.60		297.16	58.31		6.13			
		Totals	16.78	30.30	139,734.65	70,015.04	817.55	2,067.64	2,016.11	2,937,380.37	1,389,683.39	34,260.71

TABLE I.—Production of Gold and Silver from all sources, etc.—continued.

Dundas Goldfield.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1938.					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.
Buldania ...	...	Voided leases and sundry claims	...	...	76·50	13·49	...	...	39·55	1,728·82	1,439·58	...
Dundas ...	1550 ...	May Bell ...	1·88	...	49·00	16·47	...	1·88	...	49·00	16·47	...
		Voided leases and sundry claims	·76	...	188·50	133·00	...	·76	389·82	5,632·48	2,801·84	...
Norseman ...	1488 ...	Abbotshall ...	...	...	...	...	...	...	...	234·50	41·59	...
	1382, etc.	Blue Bird G.Ms., N.L.	...	1,229·30	1,185·00	6,947·23	...	...	1,229·30	1,778·00	8,895·29	...
	1382, etc.	Prior to transfer to present holders	...	...	...	...	...	...	...	651·25	1,141·90	...
	1517, 1529	Blue Bird South leases	...	...	120·00	91·18	...	...	...	120·00	91·18	...
	1319, etc.	Central Norseman Gold Corporation, N.L.	...	...	71,117·00	17,691·49	36,286·11	...	...	140,316·75	36,316·64	93,105·70
	1319, etc.	Prior to transfer to present holders	...	...	...	...	...	...	...	16,382·71	13,939·02	2,049·45
	1490	Commercial Gold Mine	...	...	...	...	...	...	...	83·25	23·47	...
	1452	Cumberland Central	...	...	...	...	...	...	...	221·75	59·44	...
	1462	Cumberland Central West	...	...	...	...	...	...	...	118·00	36·75	...
	1364	Lady Mary	...	...	...	...	...	...	...	99·00	15·45	...
	(1503)	Lady Mavis	...	...	15·00	1·39	...	...	...	15·00	1·39	...
	1347, etc.	Lady Miller G.Ms., N.L.	...	...	1,163·00	293·25	256·00	...	...	1,987·87	423·39	256·00
	1347, etc.	Prior to transfer to present holders	...	...	...	...	...	...	...	805·00	216·37	...
	1560	Lily	...	...	40·75	21·58	...	...	...	40·75	21·58	...
	1568	Lily West	...	...	56·00	17·96	...	...	...	56·00	17·96	...
	1453	Norseman Developments, N.L.	...	...	3,965·00	1,590·00	2,884·00	...	...	4,166·00	1,654·00	2,985·00
	1453	(Lady Evelyn)	...	...	...	...	...	...	...	462·00	116·96	...
	1315, etc.	Norseman Gold Mines, N.L.	...	...	79,250·00	27,692·00	50,467·00	...	...	283,433·00	108,354·15	124,608·54
	1315, etc.	Prior to transfer to present holders	...	...	...	...	...	...	...	2,656·75	669·38	...
	1427	Northern Star Extended	...	...	...	...	...	...	...	40·50	9·68	...
	1317, etc.	O.K. Gold Mines, N.L.	...	...	1,791·65	638·04	725·00	...	8·34	6,477·90	4,569·00	725·00
	1422, 1468	Onkaparinga	...	...	12·75	7·25	...	...	...	619·75	1,259·79	...
	1530	Second Try	...	...	21·75	6·18	...	...	...	21·75	6·18	...
	1516	Surprise	...	7·20	10·00	16·73	...	...	7·20	10·00	16·73	...
	1524	Valhalla	...	...	164·00	62·02	...	...	...	164·00	62·02	...
		Voided leases and sundry claims	...	43·35	2,052·00	622·03	6·00	1,023·28	13,732·03	915,259·38	596,966·66	34,966·29
Peninsula ...	(1506) ...	Peninsula	...	...	223·75	115·21	...	...	...	675·50	378·17	...
	(1569) ...	Peninsula	...	...	29·50	30·28	...	...	...	29·50	30·28	...
		Voided leases and sundry claims	...	...	...	...	...	...	17·61	8,010·39	4,927·22	...
		<i>From Goldfield generally:—</i>										
		Sundry Parcels treated at:										
		Dehring Cyanide Plant	...	...	...	*2·00	4·00	...	...	...	*2·00	4·00
		Hill Cyanide Plant	...	...	...	*113·68	...	...	...	...	*113·68	...
		Princess Royal Cyanide Plant	...	...	...	*224·59	215·06	...	...	...	*915·93	702·89
		Davies Cyanide Plant	...	...	...	*412·34	2·32	...	...	...	*670·59	102·32
		State Battery, Norseman	...	...	...	*1,530·55	...	...	...	...	*18,548·85	885·41
		Various Works	...	...	...	...	...	...	54·52	483·14	*11,202·88	702·24
		Reported by Banks and Gold Dealers	...	...	...	...	...	...	1,080·82	41·03	47·50	...
		Totals	3·17	1,280·61	161,531·15	58,283·94	90,845·49	2,106·74	15,519·40	1,393,282·58	815,984·89	261,092·84

Phillips River Goldfield.

Hatter's Hill	(244)	Sunday Gift	...	...	553.00	273.46	1.5	74.91	26.07	198.00	166.38	...
		Voided leases and sundry claims	...	...	...	...	...	...	...	5,170.65	3,176.77	1.25
Kundip	248	Ardpatrick	...	...	122.00	108.88	9.9	...	...	122.00	108.88	9.99
	(211)	Gem Restored	...	...	102.00	22.06	...	...	...	1,018.50	319.62	...
	247	Little Mary	...	...	3,745.00	318.69	...	...	...	5,949.00	541.54	...
	M.L. 370	North Harbour View	...	...	...	...	...	...	...	35.27	†22.16	...
		Voided leases and sundry claims	...	...	236.00	43.92	...	201.90	629.01	73,570.19	†57,668.52	†3,812.69
Mt. Desmond	...	do. do. do.	...	...	...	...	...	...	1.40	9.00	†3,938.27	†6,942.60
Ravensthorpe	(212)	Bridgetown	...	...	39.00	39.57	...	...	...	359.70	142.96	...
	(245)	Jim Dunn	...	...	464.00	69.72	...	...	...	999.00	178.95	...
	(1PP)	Westeria	...	...	59.00	25.69	...	...	...	502.00	161.42	...
		Voided leases and sundry claims	...	...	692.50	266.63	3.48	163.96	148.40	28,859.32	†28,411.66	†4,425.19
West River	...	do. do. do.	...	...	...	...	...	...	...	...	†11.63	†34.50
<i>From Goldfield generally :-</i>												
Sundry Parcels treated at:												
Floater Cyanide Plant 12.00 *229.1												
Hatter's Hill Cyanide Plant *201.90												
Maori Queen Cyanide Plant *420.67												
Plowman Cyanide Plant *57.51												
Various Works *1,119.92 493.66												
Reported by Banks and Gold Dealers ... 1.50 ... 160.45 11.47												
Totals			1.50	...	6,012.50	1,484.10	14.72	601.22	81.35	116,804.43	96,882.87	15,719.88

Outside Proclaimed Goldfield.

Burracoppin	13PP	Christmas Gift	...	...	11.00	15.01	...	...	...	237.25	171.84	...
		Voided leases and sundry claims	...	...	8.50	10.23	...	...	...	800.35	736.42	...
Donnybrook	...	do. do. do.	12.12	...	...	...	...	40.78	37.83	1,732.80	831.94	15.18
Roebourne	5PP	Shaw's Shaft	...	...	40.00	37.26	...	...	...	40.00	37.26	...
		Voided leases and sundry claims	...	...	52.00	43.33	...	210.69	182.18	20,118.71	22,285.25	1,331.07
		Reported by Banks and Gold Dealers	7.54	8.60	...	...	...	5,982.99	158.17	103.50	228.32	...
<i>From State generally :-</i>												
Sundry Parcels treated at:												
Fremantle Smelting Works 1,476.97 737.74												
Seabrook Cyanide Plant 332.02 18.48												
Weeriana Cyanide Plant 49.07												
Various Works 27.00 *6,796.27 30,394.19												
Sundry specimens 4.24 56.85												
Voided leases and sundry claims ... 1.27 ... 243.83 14.13 157.85 26.44												
Reported by Banks and Gold Dealers ... 39.81 105.96 ... 105.40 ... 597.82 707.86 ... 211.66 59.99												
Totals			60.74	114.56	111.50	593.81	18.48	7,080.35	1,157.02	23,217.46	33,193.64	32,556.65

† 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 1938.

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 ...	...	321.63	20.03	389.00	317.56	659.22	...	321.63	20.03	389.00	317.56	659.22	...
Pilbarra ...	Marble Bar ...	156.34	7.02	14,719.00	12,207.93	12,371.29	...	509.32	17.85	18,712.00	14,193.31	14,720.48	...
	Nullagine ...	352.98	10.83	3,993.00	1,985.38	2,349.19	...						
Ashburton ...	...	48.45	...	1,002.50	289.77	338.22	37.83	48.45	...	1,002.50	289.77	338.22	37.83
Gascoyne ...	...	4.66	...	...	...	4.66	...	4.66	...	...	...	4.66	...
Peak Hill ...	...	319.01	...	7,760.50	2,379.72	2,698.73	...	319.01	...	7,760.50	2,379.72	2,698.73	...
East Murchison ...	Lawlers ...	87.50	22.65	51,428.50	13,555.62	13,665.77	...	110.54	85.10	880,747.06	186,009.98	186,205.62	1,111.69
	Wiluna ...	23.04	47.86	744,259.40	148,178.33	148,249.23	...						
	Black Range ...	...	14.59	85,059.16	24,276.03	24,290.62	1,111.69						
Murchison ...	Cue ...	308.86	262.16	515,151.25	108,749.34	109,320.36	29,679.61	764.22	1,596.11	653,525.99	142,677.67	145,038.00	29,686.92
	Meekatharra ...	386.13	452.49	39,692.39	10,815.08	11,653.70	...						
	Day Dawn ...	30.96	219.59	2,597.50	1,821.61	2,072.76	...						
	Mt. Magnet ...	38.27	661.87	96,084.85	21,291.64	21,991.78	7.31	6.42	154.39	31,511.00	11,282.97	11,443.78	...
Yalgoo ...	...	6.42	154.39	31,511.00	11,282.97	11,443.78	...						
	Mt. Morgans ...	153.38	164.07	5,078.50	4,022.58	4,340.03	...						
Mt. Margaret ...	Mt. Malcolm ...	62.45	6.48	142,685.75	47,961.17	48,030.10	3,727.52	239.01	201.94	274,956.20	102,922.09	103,363.04	4,659.73
	Mt. Margaret ...	23.18	31.39	127,191.95	50,938.34	50,992.91	932.21						
	Menzies ...	47.15	121.86	25,718.75	14,648.52	14,817.53	1,533.46						
North Coolgardie ...	Ularring ...	16.73	2,044.40	19,934.53	10,460.46	12,521.59	21.73	116.68	2,184.00	51,460.28	27,502.95	29,803.63	1,555.19
	Niagara ...	26.55	10.47	2,697.00	1,040.78	1,077.80	...						
	Yerilla ...	26.25	7.27	3,110.00	1,353.19	1,386.71	...						
Broad Arrow ...	...	157.06	860.62	42,641.37	19,611.80	20,629.48	224.79	157.06	860.62	42,641.37	19,611.80	20,629.48	224.79
N.E. Cologardie ...	Kanowna ...	182.32	59.34	2,352.75	1,240.61	1,482.27	...	218.93	636.87	3,391.85	2,007.77	2,863.57	...
	Kurnalpi ...	36.61	577.53	1,039.10	767.16	1,381.30	...						
East Coolgardie ...	East Coolgardie	283.89	137.09	1,433,695.93	502,216.28	502,637.26	99,434.66	377.43	160.11	1,435,606.48	502,793.29	503,330.83	99,434.66
	Bulong ...	93.54	23.02	1,910.55	577.01	693.57	...						
	Coolgardie ...	249.55	394.86	36,279.20	12,112.16	12,756.57	2.54						
	Kunanalling ...	37.13	243.77	14,346.60	6,922.88	7,203.78	486.18	286.68	638.63	50,625.80	19,035.04	19,960.35	488.72
	Yilgarn ...	16.78	30.30	139,734.65	70,015.04	70,062.12	817.55						
Dundas ...	...	3.17	1,280.61	161,531.15	58,289.94	59,573.72	90,845.49	3.17	1,280.61	161,531.15	58,289.94	59,573.72	90,845.49
Phillips River ...	...	1.50	...	6,012.50	1,484.10	1,485.60	14.72	1.50	...	6,012.50	1,484.10	1,485.60	14.72
Outside Proclaimed Goldfields ...	...	60.74	114.56	111.50	593.31	768.61	18.48	60.74	114.56	111.50	593.31	768.61	18.48
		...	...	...	...	...	...	3,562.23	7,981.12	3,759,719.83	1,161,406.31	1,172,949.66	228,895.77

TABLE III.

RETURN SHOWING TOTAL PRODUCTION REPORTED TO THE MINES DEPARTMENT, AND RESPECTIVE DISTRICTS AND GOLDFIELDS FROM WHENCE DERIVED, TO 31ST DECEMBER, 1938.

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 ...	...	...	...	...	...	...	...	6,160.53	33.69	18,301.25	14,742.25	20,936.47	...
Pilbara ...	Marble Bar ...	14,327.21	4,194.07	147,371.68	186,830.57	205,351.85	653.91	} 23,036.73	4,752.51	198,744.47	266,924.17	294,713.41	682.58
	Nullagine ...	8,709.52	558.44	51,372.79	80,093.60	89,361.56	28.67						
Ashburton ...	...	...	...	...	...	...	...	9,002.03	356.90	2,033.50	823.30	10,182.23	7,831.15
Gascoyne ...	...	...	...	...	...	...	...	588.64	41.57	387.00	517.29	1,147.50	...
Peak Hill ...	...	...	...	...	...	...	...	3,074.99	4,901.52	593,114.43	284,174.42	292,150.93	2,311.33
East Murchison ...	Lawlers ...	6,739.47	2,315.98	1,719,019.83	742,956.31	752,011.76	25,782.88	} 8,535.65	20,471.25	7,704,972.56	2,809,663.77	2,838,670.67	44,988.58
	Wiluna ...	190.43	1,144.39	4,537,516.90	1,199,911.26	1,201,246.08	450.03						
	Black Range ...	1,605.75	17,010.88	1,448,435.83	866,796.20	885,412.83	18,755.67						
Murchison ...	Cue ...	3,331.41	6,701.52	1,288,997.19	590,953.06	600,985.99	40,393.79	} 21,852.16	52,237.19	6,341,386.57	3,647,099.76	3,721,189.11	215,814.62
	Meekatharra ...	13,522.60	16,022.76	2,126,876.14	1,225,792.58	1,255,337.94	5,028.90						
	Day Dawn ...	2,768.46	10,814.91	2,000,770.00	1,320,116.07	1,333,699.46	169,210.44						
	Mt. Magnet ...	2,229.69	18,698.00	924,743.24	510,238.05	531,165.74	1,181.49	} 1,690.21	2,613.15	371,858.10	232,006.67	236,310.03	1,252.76
Yalgoo ...	...	...	...	...	...	...	...
Mt. Margaret ...	Mt. Morgans ...	2,881.22	8,741.63	1,169,096.46	659,352.85	670,975.70	5,780.87						
	Mt. Malcolm ...	3,555.07	12,950.20	5,021,492.13	2,329,788.37	2,346,293.64	129,193.32	} 10,237.32	30,120.21	8,295,880.50	4,001,068.39	4,041,425.92	193,672.26
	Mt. Margaret ...	3,801.03	8,428.38	2,105,291.91	1,011,927.17	1,024,156.58	58,698.07						
North Coolgardie ...	Menzies ...	1,534.57	5,716.26	1,370,683.52	1,115,789.87	1,123,040.70	23,778.45	} 4,598.18	14,651.44	2,807,236.97	2,076,337.62	2,095,587.24	35,907.79
	Ularring ...	94.45	3,395.67	347,064.85	324,318.41	327,808.53	5,994.78						
	Niagara ...	1,684.28	1,810.43	916,894.02	509,840.25	513,334.96	5,603.42						
	Yerilla ...	1,284.88	3,729.08	172,594.58	126,389.09	131,403.05	531.14						
Broad Arrow ...	...	...	...	...	...	...	...	} 21,510.31	24,013.39	1,100,164.03	622,548.04	668,071.74	4,008.05
N.E. Coolgardie ...	Kanowna ...	105,881.87	12,163.16	986,596.71	615,901.56	733,946.59	2,522.12						
	Kurnalpi ...	12,637.51	7,456.70	12,274.07	17,704.73	37,798.94	11.22	} 118,519.38	19,619.86	998,870.78	633,606.29	771,745.53	2,533.34
East Coolgardie ...	East Coolgardie ...	32,412.19	37,148.41	40,823,984.15	23,969,892.62	24,039,453.22	2,671,858.73						
	Bulong ...	27,281.40	15,871.42	169,400.14	128,300.86	171,453.68	12.92	} 59,693.59	53,019.83	40,993,384.29	24,098,193.48	24,210,906.90	2,671,871.65
Coolgardie ...	Coolgardie ...	15,980.62	14,664.69	1,740,877.30	1,084,639.11	1,115,284.42	995.14						
	Kunanalling ...	1,370.76	5,403.64	323,219.65	234,318.63	241,093.03	557.61	} 17,351.38	20,068.33	2,064,096.95	1,318,957.74	1,356,377.45	1,552.75
Yilgarn ...	...	...	...	...	...	...	...
Dundas ...	...	...	...	...	...	...	...	2,067.64	2,016.11	2,937,380.37	1,389,683.39	1,393,767.14	34,260.71
Phillips River ...	...	...	...	...	...	...	...	2,106.74	15,519.40	1,393,282.58	815,984.89	833,611.03	261,092.84
	...	...	...	...	...	...	...	601.22	816.35	116,804.43	96,882.87	98,300.44	15,719.88
From Outside Proclaimed Goldfield	7,080.35	1,157.02	23,217.46	33,193.64	41,431.01	32,556.65
	317,707.05	266,409.72	75,961,116.24	42,342,407.98	42,926,524.75	3,526,056.94

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* 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, 1938; 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 1936	22,422.06	8,632.81	31,054.87	147,302.43	187,102.87	334,405.30
1936	...	311.83	311.83	...	9,057.34	9,057.34
1937	...	364.09	364.09	...	12,836.23	12,836.23
1938	...	789.03	789.03	6.22	14,672.11	14,678.33
Total	22,422.06	10,097.76	32,519.82	147,308.65	223,668.55	370,977.20
	^a WEST PILBARA.			ASHBURTON.		
Prior to 1936	4,351.11	26,760.61	31,111.72	4,104.96	2,550.19	6,655.15
1936	...	...	...	...	310.84	310.84
1937	...	...	...	...	266.93	266.93
1938	...	...	...	...	342.55	342.55
Total	4,351.11	26,760.61	31,111.72	4,104.96	3,470.51	7,575.47
	^b GASCOYNE.			^c PEAK HILL.		
Prior to 1936	304.55	968.06	1,272.61	41,102.62	191,574.95	232,677.57
1936	...	3.51	3.51	...	2,066.22	2,066.22
1937	...	16.50	16.50	...	2,085.61	2,085.61
1938	...	10.72	10.72	...	1,777.79	1,777.79
Total	304.55	998.79	1,303.34	41,102.62	197,504.57	238,607.19
	EAST MURCHISON.			MURCHISON.		
Prior to 1936	230,882.91	1,918,442.71	2,149,325.62	1,458,084.41	2,236,648.10	3,694,732.51
1936	356.66	109,468.76	109,825.42	27,695.60	38,658.81	66,354.41
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
Total	236,561.74	2,323,739.07	2,560,300.81	1,546,625.18	2,453,205.32	3,999,830.50
	^d YALGOO.			^e MT. MARGARET.		
Prior to 1936	11,528.21	135,337.70	146,865.91	611,459.14	3,054,569.82	3,666,028.96
1936	85.10	10,003.11	10,088.21	6,460.04	82,542.12	89,002.16
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
Total	12,602.95	166,453.40	179,056.35	651,664.86	3,300,315.26	3,951,980.12
	^f NORTH COOLGARDIE.			^g BROAD ARROW.		
Prior to 1936	262,388.44	1,780,723.79	2,043,112.23	121,985.78	271,616.30	393,602.08
1936	46.46	25,166.87	25,213.33	63.76	18,365.40	18,429.16
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
Total	262,651.33	1,874,298.24	2,136,949.57	122,195.89	332,538.74	454,734.63
	^f NORTH-EAST COOLGARDIE.			^f EAST COOLGARDIE.		
Prior to 1936	235,728.35	447,266.93	682,995.28	6,808,284.95	17,340,407.40	24,148,692.35
1936	17.15	1,773.68	1,790.83	14,649.91	389,729.73	404,379.64
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
Total	235,788.33	452,131.55	687,919.88	6,875,681.85	18,619,906.10	25,495,587.95
	^h COOLGARDIE.			YILGARN.		
Prior to 1936	661,920.68	924,514.55	1,586,435.23	216,235.17	1,073,643.61	1,289,878.78
1936	93.85	20,409.24	20,503.09	109.76	44,212.10	44,321.86
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
Total	662,187.81	984,718.00	1,646,905.81	216,485.67	1,248,449.53	1,464,935.20
	ⁱ DUNDAS.			^j PHILLIPS RIVER.		
Prior to 1936	113,946.22	668,940.32	782,886.54	40,195.24	50,601.67	90,796.91
1936	5,375.94	36,655.24	42,031.18	...	1,591.98	1,591.98
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
Total	149,935.49	817,945.88	967,881.37	40,195.24	55,338.89	95,534.13
	¶ DONNYBROOK.			OUTSIDE PROCLAIMED GOLDFIELD.		
Prior to 1936	282.21	557.53	839.74	18,287.84	27,036.09	45,323.93
1936	...	...	...	70.35	856.43	926.78
1937	...	...	...	66.45	796.16	862.61
1938	...	...	...	210.01	1,464.89	1,674.90
Total	282.21	557.53	839.74	18,634.65	30,153.57	48,788.22

^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.

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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
Total	11,251,088.83	33,122,250.19	44,373,339.02

* 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 1938, AND PREVIOUS YEARS.

Period.	ANTIMONY.								FELSPAR.		GLAUCONITE.			
	E. Murchison Gold-field.		Pilbara Goldfield.		State generally.		Total.		Coolgardie Goldfield.		State generally.			
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.		
Prior to 1935....	£	£	£	£	1,049	£	1,973	775	£	3,875
1935 .....	.....	.....	.....	.....	21	491	.....	491	4,208	8,437	308	1,540
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	1,873	5,746	183	915	
Total	901	13,055	3	39	21	491	925	13,585	12,870	27,637	1,650	8,250		

* By-product for Moonlight Wiluna G.Ms.

Period.	ASBESTOS.								GYPSUM.					
	Ashburton Gold-field.		Pilbara Gold-field.		State generally.		Total.		Yilgarn Gold-field.		State generally.		Total.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Prior to 1935....	2	£ 189	1,160	£ 53,633	853	£ 20,333	2,015	£ 74,155	6,243	£ 6,243	35,319	£ 51,037	41,562	£ 57,280
1935 .....	.....	.....	.....	.....	141	2,889	141	2,889	487	487	4,975	6,401	5,462	6,888
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	11,132	10,113	13,428	12,409
Total	10	959	1,281	58,454	1,184	28,593	2,475	88,006	9,960	9,960	66,266	83,995	76,186	93,955

* Not available.

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 1935	372·62	5,511·20	5,883·82	£ 543,642	350·96	10,757·71	11,108·67	£ 966,063	724·18	16,273·78	16,997·96	£ 1,510,126		
1935 .....	.....	.....	.....	80	.....	17·32	17·32	2,360	.....	17·87	17·87	2,440
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	
Total	372·62	5,519·72	5,892·34	544,974	419·30	10,831·72	11,251·02	984,558	792·52	16,356·31	17,148·83	1,529,953		

* Includes 4·72 tons, value £300; 15 tons, value £15; and ·60 tons, value £46, the produce of Cue and Coolgardie Districts and Yilgarn Goldfield respectively.

Period.	TANTALITE.											
	14·49	157·31	171·80	29,864	.....	3·94	3·94	2,009	14·49	161·25	175·74	31,873
Prior to 1935	14·49	157·31	171·80	29,864	.....	3·94	3·94	2,009	14·49	161·25	175·74	31,873
1935	7·35	.....	7·35	2,859	.....	.....	.....	.....	7·35	.....	7·35	2,859
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
Total	72·21	160·67	232·88	96,411	.....	3·94	3·94	2,009	72·21	164·61	236·82	98,420

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 1935	408,667	£ 1,270,141	107	£ 1,529	408,774	£ 1,271,670	4,932	£ 88,766	11,616,727	£ 7,777,630
1935 .....	.....	.....	.....	.....	.....	.....	3,728	67,108	537,188	318,012
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
Total	416,715	1,280,207	107	1,529	416,322	1,281,736	18,183	327,288	13,877,292	9,142,734

* 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 1935	tons. 109	£ 1,709	tons. 33	£ 386	tons. 14	£ 480	tons. 82,745	£ 748,482	tons. 351	£ 6,408	tons. 1,015	£ 32,212	tons. 238	£ 4,364
1935	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	109	1,709	33	386	14	480	82,745	748,482	351	6,408	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 1935	tons. 1,024	£ 11,236	tons. 39	£ 413	tons. 24,019	£ 119,451	tons. 172	£ 1,889	tons. 47,861	£ 230,846
1935	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
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.		Yalgarn Goldfield.		State generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Prior to 1935	tons. 6	£ 51	tons. 51	£ 330	tons. 95,727	£ 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
1935	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	6	51	51	330	95,729	588,200	22	410	253,423	1,746,867	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.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Prior to 1935	tons. 100	£ 300	tons. 450	£ 247	tons. 57,280	£ 36,148	tons. 57,830	£ 36,695	carats.	£ 24	carats, cut and rough. 18,373	£ 1,609	tons. 825	£ 1,053	tons. 77	£ 436
1935	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	100	300	450	247	57,280	36,148	57,830	36,695	.....	24	18,373	1,609	825	1,053	77	436

TABLE VI.—Minerals other than Gold—continued.

Period.	SILVER LEAD ORE.						TUNGSTEN ORES.											
	Pilbara Gold-field.		Ashburton Goldfield.		Total.		WOLFRAM.		SHELLITE.									
	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 1935	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
1935	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1937	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1938	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	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

Period.	FIRECLAY.		GADOLINITE.	
	Collie Mf.		Pilbara Goldfields.	
			Marble Bar District.	
	Quantity.	Value.	Quantity.	Value.
tons.	£	tons.	£	
Previous to 1935	1,051	738	1	112
1935	.....	.....	.....	.....
1936	.....	.....	.....	.....
1937	.....	.....	.....	.....
1938	.....	.....	.....	.....
Total	1,051	738	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.